

THE EFFECT OF A SELF-REGULATED EXERCISE PROGRAM  
ON PHYSICAL FITNESS, SATISFACTION  
AND THE RISK FACTORS FOR STROKE  
AMONG CLIENTS WITH TRANSIENT ISCHEMIC ATTACK  
AND MINOR STROKE

WALLADA CHANRUANGVANICH

A THESIS SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR  
THE DEGREE OF DOCTOR OF NURSING SCIENCE  
FACULTY OF GRADUATE STUDIES  
MAHIDOL UNIVERSITY

2005

ISBN 974-04-6066-6

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Thesis  
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*Wallada Chanruangvanich*

Mrs. Wallada Chanruangvanich  
Candidate

*Saipin Kasemkitwattana*

Assoc. Prof. Saipin Kasemkitwattana,  
D.N.S.  
Major-Advisor

*Chounchom Charoenyooth*

Assoc. Prof. Chounchom Charoenyooth,  
Ph.D. (Population & Development)  
Co-Advisor

*Chakarg Pongurgsorn*

Dr. Chakarg Pongurgsorn,  
M.D., Ph.D. (Kinesiology)  
Co-Advisor

*Somchai Towanabut*

Dr. Somchai Towanabut,  
M.D.  
Co-Advisor

*Rassmidara Hoonsawat*

Assoc. Prof. Rassmidara Hoonsawat,  
Ph.D.  
Dean  
Faculty of Graduate studies

*Fongcum Tilokskulchai*

Assoc. Prof. Fongcum Tilokskulchai,  
Ph.D. (Nursing)  
Chair  
Doctor of Nursing Science  
Faculty of Nursing

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was submitted to the Faculty of Graduate Studies, Mahidol University  
for the degree of Doctor of Nursing Science

on  
9 May, 2005

*Wallada Chanruangvanich*

Mrs. Wallada Chanruangvanich  
Candidate

*Saipin Kasemkitwattana*

Assoc. Prof. Saipin Kasemkitwattana,  
D.N.S.  
Chair

*Chounchom Charoenyooth*

Assoc. Prof. Chounchom Charoenyooth,  
Ph.D. (Population & Development)  
Member

*S. Khampalikit*

Assoc. Prof. Siriporn Khampalikit,  
Ph.D.(Nursing)  
Member

*Somchai Towanabut*

Dr. Somchai Towanabut,  
M.D.  
Member

*Yajai Sitthimongkol*

Assoc. Prof. Yajai Sitthimongkol,  
Ph.D.(Nursing)  
Member

*Chakarg Pongursorn*

Dr. Chakarg Pongursorn,  
M.D., Ph.D. (Kinesiology)  
Member

*Rassmidara Hoonsawat*

Assoc. Prof. Rassmidara Hoonsawat,  
Ph.D.  
Dean  
Faculty of Graduate studies  
Mahidol University

*Kobkul Phanchaoenworakul*

Assoc. Prof. Kobkul Phanchaoenworakul,  
Ph.D. (Nursing)  
Dean  
Faculty of Nursing  
Mahidol University

## ACKNOWLEDGEMENT

I would like to express my sincere appreciation to the dissertation committee. The major advisor, Associate Professor Dr. Saipin Kasemkitwattana, has worked hard and closely with wisdom, dedication and kindness. My co-advisor, Associate Professor Dr. Chounchom Charoenyooth, and Dr. Somchai Towanabut, Dr. Chakarg Pongurgsorn, have provided valuable knowledge and suggestions for this study. Associate Professor Dr. Siriporn Khampalikit, and the external committee, has given valuable guidance for this dissertation.

My sincere thanks to the many experts involved in this study, Assistant Professor Dr. Narirat Jitramontree, Assistant Professor Bunsha Pittayawaranant, Assistant Professor Surinda Pittayawaranant, Dr. Napaporn Wanitkun. They were vital in the validating of the menu script and video tape of self-regulated exercise. Thanks also to Associate Professor Dr. Chunhakasem Chotinaiwattarakul, Assistant Professor Dr. Rungsan Chaisaewikul, Assistant Professor Dr. Voramont Bamroongsuk, Dr. Tasanee Tantirittisak, Associate Professor Dr. Orasa Panpakdee, Associate Professor Dr. Yupapin Sirapongam, and Dr. Piyanee Klainin, for validating the instruments of the research. Moreover, I am grateful to every instructor in the curriculum, who taught me to become a scholar.

Very special thanks to Associate Professor Dr. Kobkul Phanchaoenworakul, Dean of Faculty of Nursing, Associate Professor Kanya Auprasert-Chairman, and my colleagues at the department of Surgical Nursing who provided support for my study. Also, I do not wish to forget the research grant foundation, the Ministry Of University Affairs, and the Thai Health Promotion Foundation for Research Grants for providing financial support.

Thanks for the support provided by the director of Prasat Neurological Institute, Dr. Maiyadhaj Samsen, and the deputy director of academic service - Ms. Wimolratana Limranangkura, Mrs. Narumol Patthanaathum and the staff for providing the setting and warm support through out the study. Moreover, I am grateful for the support from the staffs of Somdejprapinkhlao Hospital, Capt. Dr. Wasutha Khaykaew R.T.N., Lt.cdr. Nathapathra Pumkaew R.T.N., and the others in helping to try out the research program.

The completion of this dissertation would not be possible without my father, Mr. Vipoj Suadee, a TIA patient. He was my inspiration to further explore self-regulated exercise for TIA and minor stroke patients with love and hope to promote their health and reduce risk from stroke. I profoundly thank every patient for taking part in the research program and being so friendly to me.

I received so much love and support from my family, father, mother, A, Boy, O, Jack, Oat, Ohm, Aim, especially my husband - Dr. Narit Chanruangvanich, and my two daughters - Sea, and Boat. Further thanks to Mrs. Sudcharee Kiartivich, my friends, and my assistant researchers, who have been a source of strength and help during this Doctoral of Nursing study.

And lastly, I would also like to take this opportunity to apologize and express my thanks to those whose names I failed to list on this page. I genuinely appreciate all your help. Thank you.

Wallada Chanruangvanich

THE EFFECT OF A SELF-REGULATED EXERCISE PROGRAM ON PHYSICAL FITNESS, SATISFACTION AND THE RISK FACTORS FOR STROKE AMONG CLIENTS WITH TRANSIENT ISCHEMIC ATTACK AND MINOR STROKE.

WALLADA CHANRUENGVANICH 4336809 NSNS / D

D.N.S.

THESIS ADVISORS: SAIPIN KASEMKITWATTANA, D.N.S.,  
CHOUNCHOM CHAROENYOOTH, Ph.D. (POPULATION &  
DEVELOPMENT), SOMCHAI TOWANABUT, M.D., CHAKARG  
PONGURGSORN, M.D., Ph.D. (KINESIOLOGY)

ABSTRACT

This study tested the effect of a self-regulated exercise program on physical fitness, and the risk factors for stroke among clients with transient ischemic attack and minor stroke. A randomized controlled trial design was employed. This program integrated the health-promotion model, the self-regulation concept, and the new concept of physical activity. The samples included 62 transient ischemic attack and minor stroke patients of Prasat Neurological Institute who exercised less than 1000 Kcal / week. The samples were randomly selected for the experimental and control group (31 persons/group). The effect of program was measured by a 6-minute walk distance, satisfaction with response to physical activity, heart rate, blood pressure, fibrinogen, total cholesterol and HDL-cholesterol, and fibrinogen.

The findings revealed that the experimental group had significantly increased the 6-minute walk distance and were satisfied with the response to physical activity at the 6<sup>th</sup> week and the 12<sup>th</sup> week ( $p < .01$ ) and had improved significantly more than the control group ( $p < .05$ ). Heart rate and blood pressure of the experimental group had significantly decreased at the 12<sup>th</sup> week ( $p < .05$ ) but there was no difference from the control group. Moreover, there were no differences of total cholesterol, HDL-cholesterol and fibrinogen between the experimental and control groups. The study suggests that a self-regulated exercise program should be used to promote health and prevent risk of strokes for transient ischemic attack and minor stroke patients.

KEY WORDS: EXERCISE / SELF-REGULATION/ PHYSICAL FITNESS /  
SATISFACTION/ TRANSIENT ISCHEMIC ATTACK /  
MINOR STROKE / RISK FACTOR FOR STROKE/  
RANDOMIZED CONTROLLED TRIAL

142 P. ISBN 974-04-6066-6

ผลของโปรแกรมการออกกำลังกายโดยใช้วิธีกำกับตนเอง ต่อความแข็งแรง ความพึงพอใจและปัจจัยเสี่ยงต่อโรคหลอดเลือดสมองของผู้ป่วยที่มีภาวะสมองขาดเลือดชั่วคราวและสมองขาดเลือดไม่รุนแรง (THE EFFECT OF A SELF REGULATED EXERCISE PROGRAM ON PHYSICAL FITNESS, SATISFACTION AND THE RISK FACTORS FOR STROKE AMONG CLIENTS WITH TRANSIENT ISCHEMIC ATTACK AND MINOR STROKE)

วัลย์ลดา ถิ่นที่เรืองวณิชย์ 4336809 NSNS / D

พย.ด.

คณะกรรมการควบคุมวิทยานิพนธ์: สายพิน เกษมกิจวัฒนา, D.N.S., ชื่นชม เจริญยุทธ, Ph.D. (Population & Development), สมชาย ไทฉะบุตร, M.D., นภาพงษ์ อภัยธร, M.D., Ph.D. (Kinesiology)

#### บทคัดย่อ

การศึกษานี้เป็นการทดสอบประสิทธิผลของโปรแกรมการออกกำลังกายโดยใช้วิธีกำกับตนเอง ต่อความแข็งแรง และปัจจัยเสี่ยงต่อโรคหลอดเลือดสมองของผู้ป่วยที่มีภาวะสมองขาดเลือดชั่วคราวและสมองขาดเลือดไม่รุนแรง โดยใช้ randomized controlled trial เพื่อเปรียบเทียบระหว่างกลุ่มทดลองและกลุ่มควบคุมก่อนและหลังการทดลอง โปรแกรมพัฒนาขึ้นจากการบูรณาการแนวทางการส่งเสริมสุขภาพ แนวคิดการกำกับตนเองและแนวคิดใหม่ของการออกกำลังกาย กลุ่มตัวอย่างเป็นผู้ป่วยที่มีภาวะสมองขาดเลือดชั่วคราวและภาวะสมองขาดเลือดไม่รุนแรงของสถาบันประสาทวิทยา ที่มีการออกกำลังกายน้อยกว่า 1000 กิโลแคลอรีต่อสัปดาห์ จำนวน 62 ราย ซึ่งได้รับการสุ่มแบบง่ายเพื่อเข้ากลุ่มทดลองและกลุ่มควบคุม กลุ่มละ 31 ราย ประสิทธิภาพของโปรแกรมวัดด้วย ระยะทางการเดิน 6 นาที ความพึงพอใจต่อผลของการออกกำลังกาย อัตราเต้นของหัวใจ ความดันโลหิต โคเลสเตอรอลโดยรวม เอชดีแอลโคเลสเตอรอล และไฟบริโนเจน

ผลการวิจัยพบว่า กลุ่มทดลองมีระยะทางการเดิน 6 นาที และมีความพึงพอใจต่อผลของการออกกำลังกาย ภายหลังเข้าโปรแกรม 6 สัปดาห์ และ 12 สัปดาห์ มากกว่าก่อนการทดลองอย่างมีนัยสำคัญทางสถิติ ( $p < .01$ ). และมากกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ ( $p < .05$ ). กลุ่มทดลองมีอัตราเต้นของหัวใจและความดันโลหิต ภายหลังเข้าโปรแกรม 12 สัปดาห์ลดลงอย่างมีนัยสำคัญทางสถิติ ( $p < .05$ ). แต่ไม่แตกต่างจากกลุ่มควบคุม นอกจากนั้นไม่พบความแตกต่างของค่าโคเลสเตอรอลโดยรวม เอชดีแอลโคเลสเตอรอล และไฟบริโนเจนระหว่างกลุ่มทดลองและกลุ่มควบคุม ผลการวิจัยมีข้อเสนอแนะในการนำโปรแกรมไปใช้ส่งเสริมสุขภาพและการป้องกันการเกิดโรคหลอดเลือดสมองให้แก่ผู้ป่วยที่มีภาวะสมองขาดเลือดชั่วคราวและสมองขาดเลือดไม่รุนแรง ด้วยการจัดโปรแกรมการออกกำลังกายโดยใช้วิธีกำกับตนเองให้แก่ผู้ป่วย

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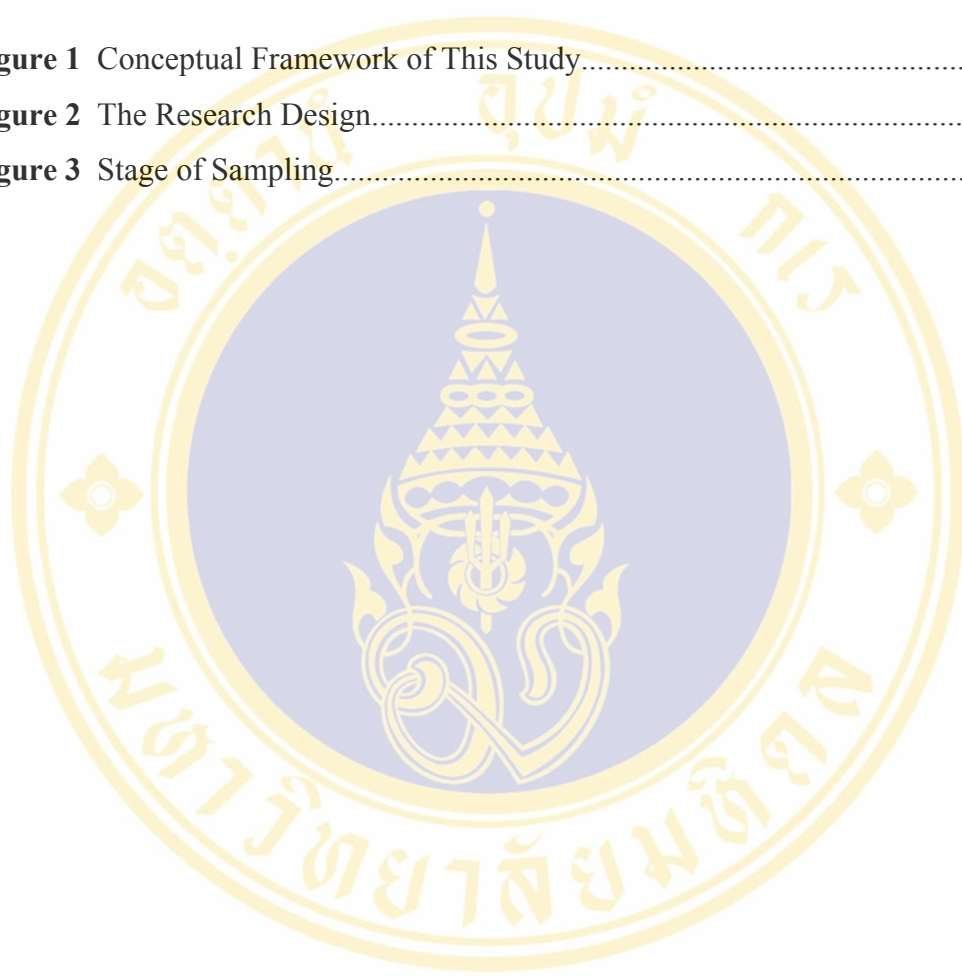
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## CHAPTER I

### INTRODUCTION

#### **Background and Significance of the Study**

Stroke is an increasing public health problem due to high mortality and disability rates. It is the third and the first cause of death in Asia and in the world, respectively (Pongvarin, 2003). Among 15 provinces in Thailand including Bangkok, circulatory disease is the first leading cause of death. The major cause is from cerebrovascular disease (9.5%) followed by ischemic heart (4.3%) and hypertension (2.6 %) (Ministry of Public Health, 2002). In Bangkok alone, the mortality rate for a cerebrovascular disease was as high as 50.86 people per 100,000 people or 7 people per 100,000 people nationwide in 1998 and had increased to 10.8, 13.4, and 18.2 respectively from 1999-2001 (Ministry of Public Health, 2001). The nationwide stroke prevalence among elderly is 1.12 % (Viriyavejakul, et al., 1998). In Bangkok, it is 690: 100,000 people, which is similar to that of other countries (Pongvarin, 2001). Seventy percent of them are ischemic strokes (Pongvarin, 1998).

Approximately, 1 in 4 of the ischemic stroke patients dies while 64 percent of those who survive will be permanently disabled (Dennis, et al., 1990; Johnston, et al., 2000). However, before these problems are presented, the Transient Ischemic Attack (TIA) and a minor stroke will occur as a warning sign due to the arterial disease and puts patients at high risk for severe stroke. Those who suffer from one or more TIAs are 10 times more likely to develop an Ischemic stroke than other persons who are at the same age and gender (Hankey, 2001; American Stroke Association, 2003). The change of 6 months occurrence in those patients is 27 times, and 13.4 times in 12 months, more than that of healthy people. The average of stroke development is 3.7 years (Dennis, et al., 1990) and the risk of TIA patients for stroke is between 12.7 – 34 percent (Kernan, et al., 1991; Johnston, et al., 2000; Grau, et al., 2001). For minor stroke, the chance for a recurrent stroke is 11.5 - 23.89 percent (Nithinant, &

Udommongkol, 2001; Coull, Lovett, & Rothwell, 2004). TIA and minor stroke, therefore, are a critical problem that requires immediate attention.

TIA and minor stroke are often found in the middle-aged and elderly patients. The incidence increases as age increases. (Dyken, 1977; Lindenstrom et al., 1993). An average of worldwide incidence per 100,000 persons per year is about 8.4 to 29.2 persons in men and 3.9 to 18.8 in women (Lemesle, et al., 1999). The incidence rates per 100,000 persons in Russia are 56 and 134 persons whose age between 45-65 years old and 65-74 years old, respectively. (Feigin, 2000). In England, the average of every group of age equals to 190 per 100,000 persons per year (Gibbs, et al., 2001). In Thailand, at the Prasat Neurological Hospital, there are 2,673 TIA patients per year with 423-577 newly diagnosed patients. TIA is most common in people who are between 45-74 years old (1996-2001 Hospital Record, 2001). It is estimated that the number of stroke patients is about 80,000 persons per year in the country (Srithara, 2002).

Subsequent effects of TIA and minor stroke for patients are loss of ability in doing their daily activities and dependency resulting in depression and low self-esteem. Taking care of these patients becomes a burden of the family caregiver and poses a serious economic threat to the nation. The calculation of a burden of disease, according to the Disability-Adjusted Life Years, shows that stroke is the second and third effect of the country for loss of a healthy life classified by gender. There are a total of 75,931 patients with a cerebrovascular disease, excluding Bangkok, being hospitalized in the health service units of Ministry of Public Health (Ministry of Public Health, 2002) whereas medical expenses for cerebral infarction patients being treated at Prasat Neurological Institute totals 162,665 baht per patient per year (Youngkong, et al., 2002). Compared with the total number of patients, it is a great amount of money, over THB 12,351,316,115 yearly. For this reason, cerebrovascular disease is regarded as a critical problem affecting people's health, society, and the country's economy. The Thai government has realized the urgency of this issue and has therefore adopted some preventive measures targeted at preventing the disease and promoting health to be included in the 9<sup>th</sup> National Health Developmental Planning Year 2001-2006. It corresponds with the UN policies focusing on finding ways to prevent stroke and its relevant risk factors in an attempt to decrease the mortality and disability rates (WHO, 1997).

A risk factor for stroke is age. The chance of occurrence doubles every 10 years a person gets older. Once over 55, the factors include hypertension, diabetes, over 10 minutes of TIA symptoms, high total cholesterol, low HDL- cholesterol, high fibrinogen, obesity, smoking, physical inactivity, high alcohol consumption, and heart disease (Arunatit and Tungtongpairoj, 1999; Albers, et al., 1999; Boonyakarnjanakorn, 1999; Chambless, et al., 1996; Duncan ,et al., 1997; Goldstein, et al., 2000; Johnston, et al., 2000; American Stroke Association, 2003). The non-exercise has 3.1 times higher risk for recurrent stroke than other factors (Arunatit and Tungtongpairoj, 1999) while obesity has 1.75-2.37 times of risk (Goldstein, et al., 2001). Therefore, to encourage the TIA and minor stroke patients to exercise is a crucial way to prevent stroke.

However, the problem of most people is a lack of physical activities. Fifty-five percent of the elderly in Bangkok rarely exercise and do not exercise in their leisure time (Chinuntuya, 2001). Seventy-one point eight of the elderly living in downtown Chiang Mai never exercise while 64.2 percent are found in the rural areas (Pothiban, et al., 2000). Fifty-eight point six of the patients with recurrent stroke have a record of never participating in any physical activities (Arunatit and Tungtongpairoj, 1999). Due to their poor health, TIA and minor stroke patients are likely to participate in very little physical activities compared with normal people causing them the physical function restrictions. Their physical, mental, and emotional health, vitality, and social function are also lower compared with patients with heart disease or hypertension (Duncan, et al., 1997). Therefore, effective motivation is required for them. What they really need is non-vigorous physical activity. Too much of this may overheat the body, which is one of the factors for stroke development (American Heart Association, 1999), and it also affects the arterial thrombogenesis. The platelet and the platelet aggregation will be increased (Wang, et al., 1997; Cadroy, et al., 2002). However, moderate physical activity can prevent such problems. At the same time, it reduces fibrinogen, blood viscosity, and risks for thrombotic tendency of the cerebral artery which is a cause of stroke (Wannamethee, et al, 2002).

The new concept of physical activity to promote health and reduce mortality and illness rates suggests that the activity should be at a moderate level which is 3–6 METs (Shephard, 2001, Ainsworth, et al., 2000), 30 minutes each or 10 minutes intervals/ batches to accumulate over 1,000 kcal/week. This amount has been proven

useful for health and physical fitness by maximizing the use of oxygen, improving heart rate and blood pressure, and reducing body weight. The body is resistant to activities and is able to walk a longer distance (Nieman, 1995; ACSM, 2001; 1996; Harada, Chiu, & Stewart, 1999). Also, fibrinogen and total cholesterol is decreased while HDL-total cholesterol is increased (Jakicic, et al., 1995; Kesaniemi, et al., 2001), it also increases activation (Ekkekakis, et al., 2000) and well being which can be seen from the feeling good effect of exercise (Fox, 1999).

Application of this concept of short bout physical activity into the lifestyle and leisure-time is suitable for TIA and minor stroke patients. The researcher hopes that this program will bring more successful than a leisure-time exercise or a 30 minute-and-above group exercise since the latter requires time and place (Chinuntuya, 2001; Asawachaisuwikrom, 2001).

According to the literature reviews concerning the promotion of exercise, Pender's Health Promotion Model (1996) can profoundly explain factors supporting the exercise, be it a leisure time exercise or a lifestyle exercise e.g. chores, occupational work, and etc., among healthy or unhealthy adults and senior citizens (Inpaeng, 2000; Lucas, et al., 2001: 94; Chinuntuya, 2001; Asawachaisuwikrom, 2001). This model also corresponds with the new concept of physical activity and Bandura's self-regulation concept (1986), developed for a physical activity program to change the patients' behaviors, to make them realize the value of exercise, and allow them to choose their own mode of exercise while giving them constant motivations. With this approach, they will be more determined and motivated to exercise.

The self-regulation concept has been successfully implemented with the health behavior developments such as weight control, fat consumption control, quit smoking program and exercise in the patients with heart disease (Janz, 1999; Duangsong, 2001). The self-regulation exercise, therefore, should yield a desired result.

At present, there is no report of a physical activity for TIA and minor stroke patients in Thailand for which efficient and appropriate exercise is needed. In this study, the researcher has introduced moderate physical activity, where the exercise time is separated into 15 minutes intervals each to sum up over 1,000 kcal per week, derived from a combination of Bandura's self-regulation concept and Pender's health promotion model to adopt a self-regulation physical activity program and has its

effectiveness tested. Also, the patients with low levels of physical activity, after being trained according to this program, will ceaselessly improve their behavior to the standard given. Its outcome helps diminish risk factors for stroke and strengthen the patients. This is in agreement with the nation's policy and WHO's. Moreover, this revolutionary program is vital for nursing science to promote physical activity in TIA and minor stroke patients and is a practice theory which can further be used as an applicable and robust guide for the promotion of exercise in the future.

### **Research Question**

Is the self-regulated exercise program effective in reducing heart rate, blood pressure, fibrinogen, and total cholesterol, and increasing HDL-cholesterol, a 6-minute walk test distance, and satisfaction with response to physical activity of TIA and minor stroke patients?

### **Purposes of the Study**

The purposes are as follows:

1. To test the differences of heart rate, blood pressure, total cholesterol, HDL-cholesterol, fibrinogen, 6-minute walk test distance, and satisfaction with response to physical activity between the experimental group, before and after intervention.
2. To test the differences of heart rate, blood pressure, fibrinogen, total cholesterol and HDL-cholesterol, fibrinogen, 6-minute walk test distance, and satisfaction with response to physical activity between the experimental group and control group after intervention.

### **Conceptual Framework**

Pender's Health Promoting Model (1996), Bandura's self-regulation concept (1977) and the new concept of physical activities have been integrated to form an exercise program for TIA and minor stroke patients. Pender's exercise (1996) composes of leisure-time exercise and lifestyle exercise. The first refers to any activity performed at a moderate intensity e.g. jogging, sports, and etc. while the latter to occupational or household physical activities Pender's concept corresponds with the new concept of exercise suggesting a physical movement at a moderate level, at least,

both in leisure or lifestyle exercise. In order to promote health, the patients should exercise at a short length of time for more than 10 minutes per session to reach 1,000 kcal of energy consumed per week (Shephard, 2001, Ainsworth, et al., 2000).

Factors affecting exercise are personal characteristics and experiences such as age, sex, and existing illness. The behavior-specific cognition and affect factors to predict health promotion behaviors are perceived benefits of action, perceived barriers to action, and perceived self-efficacy. Activity-related effects, interpersonal influences, situational influences, commitment to a plan of action, and immediate competing demands and preferences lead to more exercise (Pender, 1996).

The health promotion program was created based on Pender's concept and focuses on following processes: changing the patients previous behavior of not participating in any exercise by making them realize the benefits of exercise, finding out the obstacles and solutions in advance be it house surroundings and facilities, obtaining ways to solve problems if there are some unexpected situations to prevent the patients from doing exercise, encouraging a family to take part in promoting exercise, promoting perceived self-efficacy for exercise, adopting good attitudes towards exercise, and intensifying the motive to determinedly exercise.

However, in order to change the sedentary behavior, the patients must be able to self-regulate. They must learn its procedures and practice themselves accordingly to achieve the desired result of exercise. Bandura (1986, 1997) defines self-regulation as "human ability to do something to control one's thought, feeling, and action. This self-control can't be achieved by motivation alone but requires specific skills obtained through training." Processes of self-regulation skills are self-observation, judgment process, and self-reaction. These skills increase factors promoting exercise of the patients by helping them make a decision to change their behavior, reducing their perceived barriers to action, increasing their perceived self-efficacy to exercise (Schnoll & Zimmerman, 2001) adopting their good attitudes towards exercise, raising tactics to overcome their temptations and increasing their motivation to determinedly exercise (Pender, 1996).

The self-regulated exercise program consists of 4 steps: preparation of basic knowledge, training to self-regulate, application of the program, and, lastly,

monitoring the results. The program will add factors for promoting exercise and urge TIA and minor stroke patients to do more exercise.

The procedures of the program include basic knowledge about the disease and training self-regulate in exercise to be applied in real situations. Methods of self-regulation are comprised of: self-observation, a comparison between patient's own behavior and the standard, in which the patients evaluate their ability to successfully perform such behavior and its benefits and whether it is worth doing. This leads to judgment to change their behaviors by setting their own goals and looking for a means to reach those goals; self-reinforcement is exercised via positive self-reaction, e.g. self-reward, self-compliment, to initiate an attempt to self-regulate. Directing their attention to positive attitudes towards exercise and making an effort to resist the deviating temptations by means of self-monitoring together with a regular evaluation. The concrete success is within reach of the patients while their perceived self-efficacy is also raised. These together with the reinforcement of family, fellow patients, and the researcher support ensure more patients' determination to exercise.

Sufficient and continuous moderate exercise reduces the heart rate and blood pressure while at rest (Shin, 1999; Jackicic, et al., 1995; Whelton, et al., 2002). The heart contracts more efficiently, thereby increasing the stroke volume and cardiac output. (Fletcher, et al., 2001). Also, with high functioning of the parasympathetic, the heart beats slower. Moreover, the expanded coronary artery and active muscle area vascular decrease the total peripheral resistance and blood pressure (Chakravarthy, Joyner, & Booth, 2002; Fletcher, 2001). Other advantages are firmer and toned muscle, better joints movement, higher body balance, longer walk, and endurance to perform activities (Nieman, 1995; ACSM, 2001, Klin-ual, 2001).

Regular exercise affects the metabolism of the muscle fat, fat in adipose tissues, and vessels resulting in lower total cholesterol (Durstine, et al., 2002) and higher HDL-cholesterol caused by a lipoprotein Lipase activity which is used to produce HDL-cholesterol. At the same time, the catabolism decreases and the HDL-C increases (Thompson, & Rader, 2001) to prevent cells from taking in LDL-cholesterol and releasing cholesterol from cells and blood to be metabolized in the liver and excrete through the bile. (Heeren, et al., 2003). The atherosclerosis is prevented.

Moderate exercise also blocks platelet thrombus formation and aggregation stimulated by epinephrine and norepinephrine (Cadroy, et al., 2002; Lee, & Lip, 2003). Increased blood circulation during exercise arouses the nitric oxide secretion to reduce the norepinephrine-evoked platelet activation. Therefore, the platelet thrombus aggregation is reduced (Wang, 1997). Moreover, moderate exercise decreases the anti-inflammatory effect. This mechanism may reduce fibrinogen, platelet, coagulation factor, and blood viscosity so that blood circulation is improved. At the same time, it reduces the risk of clinical ischemia and/or thrombosis (Wannamethee, et al., 2002) which is the cause of stroke (Shephard, 2001; Lee & Skerrett, 2001; CDC1, 2003).

Ten to fifteen minutes of moderate exercise can increase activation and bring about energetic arousal, pleasant effect (Ekkekakis, et al., 2000) and feeling of confidence. It diminishes tension and anxiety as well (Murphy, et al., 2002). The result is the feeling good effect of exercise (Fox, 1999).

The self-regulated exercise program enables the patients to exercise as planned and to consume more energy making them healthy which can be measured by their lower heart rate and blood pressure, their ability to walk longer, more satisfaction with response to physical activity, lower fibrinogen and total cholesterol, and higher HDL-cholesterol. This means the risks for ischemic stroke are minimized as shown in figure 1. of the conceptual framework.

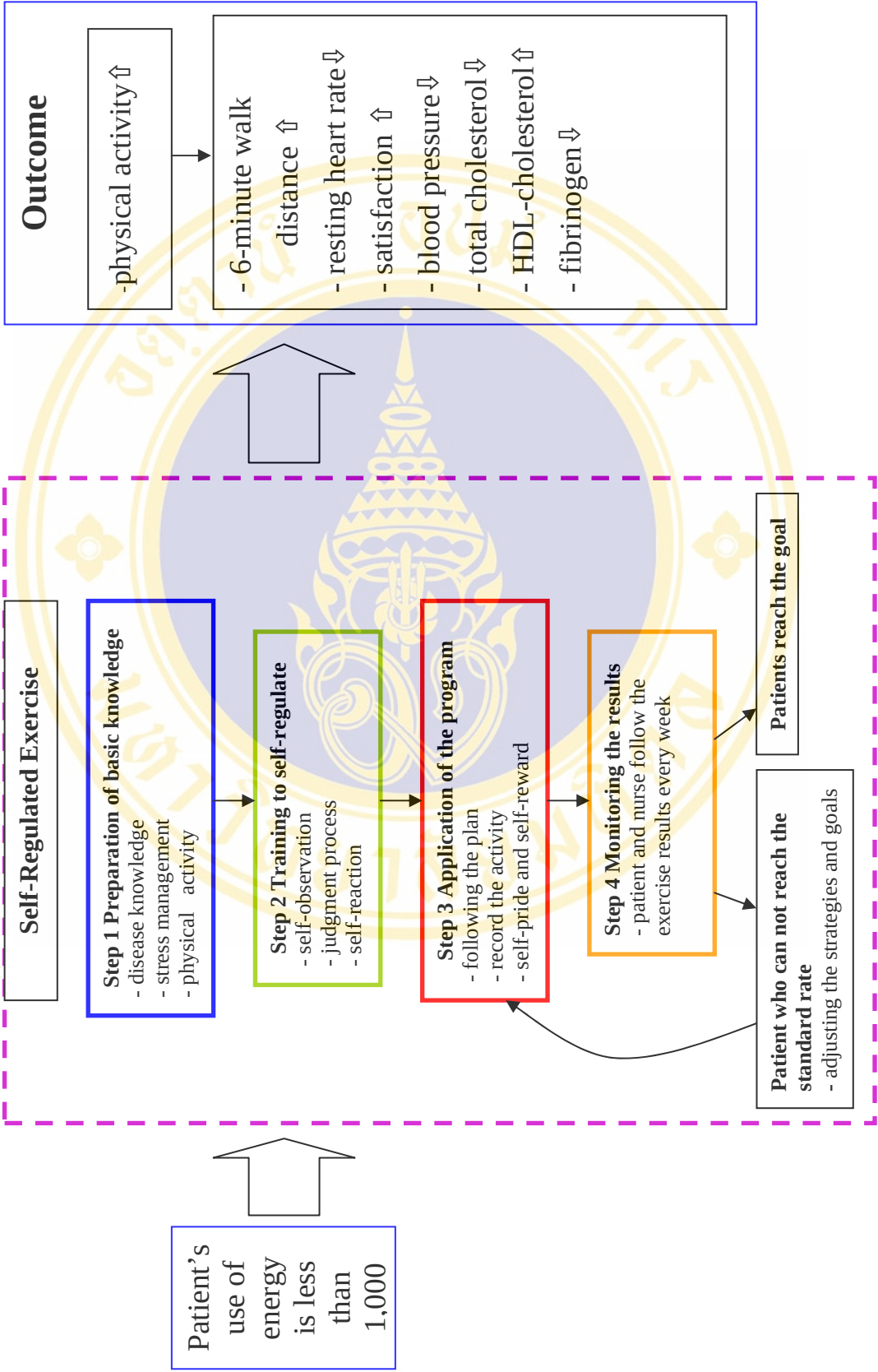


Figure1. Conceptual framework of this study

## Hypotheses

1. After the intervention, in the experimental group, heart rate, blood pressure, total cholesterol, and fibrinogen decreased while HDL-cholesterol, 6-minute walk test distance, and satisfaction with response to physical activity increased compared to pre-intervention data.
2. After the intervention, heart rate, blood pressure, total cholesterol, and fibrinogen of the experimental group were lower whereas HDL-cholesterol, 6-minute walk test distance, and satisfaction with response to physical activity were higher than those of the control group.

## Scope of the Study

This study examines the effectiveness of the physical activity program, integrated work from Pender's Model of Health Promotion and Bandura's self-regulation concept, on heart rate, blood pressure, total cholesterol, HDL-cholesterol, fibrinogen, 6-minute walk test distance, and satisfaction with response to physical activity of 72 TIA and minor stroke patients. The patients are 45 years old or over being treated as outpatients at the Prasat Neurological Institute from December 2004-March 2005

## Definition of Terms

**Transient Ischemic Attack (TIA)** refers to a patient diagnosed by a neurologist or neurosurgeon as TIA whose one or more symptoms of ischemic attack are shown at the same time for not more than 24 hours and has recuperated without disabilities which include dysarthria, dysphasia, numbness or weakness of face arm or leg especially on one side of the body, vertigo, double vision, blindness of one or both eyes, choking, and syncope (American Stroke Association, 2003).

**Minor Stroke** refers to a patient diagnosed by a neurologist or neurosurgeon as minor stroke whose one or more symptoms of ischemic attack are shown at the same time. The symptoms are similar to TIA patients but they last for more than 24 hours. Recuperation involves slight weakness of limbs and may suffer from minor dysarthria or blindness of one eye (Nitinant, & Udommongkol, 2001; Evan, 1995).

**Self-regulated exercise program** refers to a program developed by the researcher based on Bandura's self-regulation concept (1997) together with Pender's Model of Health Promotion (1996) and the evolution of physical activity (Shephard, 2001, Ainsworth, et al., 2000) to teach the patients self-regulated exercise at a moderate level through self-observation, establishment of goals, activity log, reinforcement or self-reward, and follow-up. The patients are entitled to choose their own activities and draft their own practice plan in which they spend no less than 15 minutes per session to perform their activities such as cleaning the house, mopping floor, jogging, brisk walking, and etc. to consume over 1,000 kcal a week.

**Physical fitness** refers to cardiorespiratory endurance in response to oxygen level required by the body and an ability to walk. A healthy person with regular exercise will have the adaptation of heart, vascular and respiratory system. The heart pumps efficiently at a lower rate and walking endurance longer. An assessment is based on heart rate at rest and distances achieved in the 6-minute walk (Finch, et al., 2002).

**Risk factor for stroke** refers to factors encouraging the thrombotic tendency causing atherosclerosis and the factors able to predict the occurrence of cerebrovascular disease. They are blood pressure, fibrinogen, total cholesterol, and HDL-cholesterol assessed by venopuncture to obtain a lab value, and blood pressure using a sphygmomanometer.

**Satisfaction with response to physical activity** refers to overall health satisfaction resulting from responses to physical activity namely pleasant affect, physical activeness, and decrease tension assessed by a satisfaction with response to physical activity scale adapted from Cantril self-anchoring ladder scale (Cantril, 1965 cited in McKeehan, Cowling & Wykle, 1986).

## CHAPTER II

### LITERATURE REVIEW

This research is to study the effect of self-regulated exercise program on physical fitness and risk factors for stroke among clients with transient ischemic attack and minor stroke. The researcher conducted the literature review related to transient ischemic attack, minor stroke, and concepts of physical fitness, health promotion behaviors, and self-regulation for developing exercise program for TIA and minor stroke patients.

#### **Transient Ischemic Attack and Minor Stroke**

##### **Definition of Transient Ischemic Attack (TIA)**

Transient Ischemic Attack refers to a symptom of disease of the arteries, heart or blood. Its cause is mostly from arterial thrombosis or embolism that causes focal cerebral infarct resulting to temporary paralysis that can be recurrent or completely recovered from. The patient can have sudden onset of one or more symptoms such as dysarthria, dysphasia, numbness or weakness of face, arm or leg, especially on one side of the body, vertigo, double vision, blindness of one or both eyes, difficulty in swallowing, and syncope. Those symptoms remain for no longer than 24 hours and return to normal without any existing disability (Hankey, 2001; American Stroke Association, 2003).

##### **Definition of Minor Stroke**

Minor stroke refers to a patient has been diagnosed from neurologist or neurosurgeon with minor stroke with any symptom of cerebral infarct. One or more of these symptoms occur as well as in TIA patients, but they remain longer than 24 hours and usually result in mild weakness, mild dysphasia or monocular blindness (Nithinan & Udommongkol, 2001; Evan, 1995).

### **Etiology**

The cause of minor stroke and transient ischemic attack is arterial disease (75-80 %). The inferior cause is embolism from the heart to brain (20 %). The cause from the blood disease (Thrombophilia) which generates abnormal adhesion of red blood cells, platelet and fibrin is less than 5% (Hankey, 2001). Other contributing factors TIA and minor stroke include hypertension, diabetes mellitus, heart disease, hypercholesterolemia, high coagulation factor, smoking, drinking and physical inactivity (Chambliss, et al., 1996; Duncan, et al., 1997; Hanchinski, et al., 1996; Goldstein, et al., 2000; Johnston, et al., 2000). Those factors are no different from the predicting factors of stroke. Most strokes (70-80 %) result from ischemic stroke (American Stroke Association, 2003).

### **Risk of Recurrent Strokes**

TIA is a significant warning sign of stroke because the patients often have onset symptoms prior to having a stroke. A patient who has at least one TIA has a stroke risk as high as 12.7-36 % (Kernan, et al, 1991; Johnston, et al., 2000; Grau, et al, 2001) or 10 times the risk of stroke of normal people (American Stroke Association, 2003: 1). Patients with minor stroke have a high chance to have a recurrent stroke (11.5-23.89 %) (Nithinan & Udommumkol, 2001; Coull, Lovett, & Rothwell, 2004).

General symptoms of stroke are like the symptoms of TIA, but they remain longer than 24 hours. If the symptoms are severe, the patient may become unconscious, paralyzed, or even die (WHO, 1989; American Stroke Association, 2003).

Sudden onset of TIA can include more than one symptom. Speech dysfunction is mostly found (77 %). Other symptoms are hemiparesis (45.6 %); visual impairment (31.4 %); double vision (22.3 %); numbness/tingling (10.5 %) and dizziness or loss of balance (1.2 %) (Toole, et al., 1996).

Influencing factors of stroke onset are age over 60 years, hypertension, diabetes mellitus, heart diseases, TIA symptoms over 10 minutes, hypertriglyceride, high total cholesterol, high LDL-cholesterol, high HDL-cholesterol, high fibrinogen, smoking, physical inactivity, and high body mass index. Risk also includes heavy drinking (Arunathit & Tungtrongpairoj, 1999; Albers, et al, 1999; Boonyakarnjanakorn,

1999; Chambless, et al., 1996; Duncan, et al., 1997; Goldstein, et al., 2000; Johnston, et al., 2000; Tanne, et al., 2001).

A lot of TIA and minor stroke patients have combined risk factors. Over half of the patients have existing underlying diseases. In addition, arterial stenosis from atherosclerosis is found in larger arteries than small ones (Moncayo, et al., 2000). Those patients who have thicker than normal initial-medial carotid artery walls (0.73-0.84 mm) have increased risk for stroke onset (Chambless, et al., 1996). The study of Johnston, et al. (2000) on predicting factors of stroke within 90 days of 1,707 TIA patients expressed that five factors were independently linked with stroke: age greater than 60 years, diabetes mellitus, symptom duration longer than 10 minutes, weakness, and speech impairment ( $p < .01$ ). People who have 1-5 risk factors have a stroke risk of 3 %, 7 %, 11 %, 15 %, and 34 % respectively. According to findings, 25.1 % of TIA patients showed recurrent TIAs, stroke, hospitalizations for cardiovascular events and deaths. Hence, multiple problems increase the incidence of stroke or death.

### **Effect of Transient Ischemic Attack (TIA) and Minor Stroke**

Transient Ischemic Attack (TIA) and Minor Stroke occur due to brain pathology resulting in various physical function impairments. The alterations depend on severity, onset location, period of neurological impairment, and combined risk factors e.g. diabetes mellitus, hypertension, and hypercholesterolemia. The results may be physical, psychological, social and economic effects:

#### **1. Physical effects**

Because of existing ischemic brain damage, parts of the brain will be impaired. Duration of brain dysfunction and recovery from ischemic brain depend on how long the brain ischemia occurs. In cases of 10-15 minutes or less of temporary ischemic brain impairment, focal neurological symptoms will occur and disappear within 24 hours without any remaining disability. However, TIA patients (12-35 %) also have cerebral infarcts with or without symptoms (Evan, et al., 1991; Herderschee, 1992). Arterial sclerosis, stenosis and complete occlusion cause small cerebral infarcts.

Patients having stroke, severe prolonged cerebral infarct, neurological symptoms around 24-72 hours and reversible ischemic neurological defect should recover within 3 weeks. However, some patients have constant severe symptoms from

arterial stenosis or occlusion to brain edema or other combined pathologies. These symptoms can lead to complete stroke which can result in hemiparesis, speech difficulty, memory loss, behavioral and emotional impairment. Very severe cerebral infarct can force the patients into comas, and they become dependent with different demands depending on the severity of the disease.

Cerebral infarct from arterial defect may happen in other parts of the body other than the brain. The combined problems of arterial defect are heart disease, myocardial infarct, and heart failure from thickness of coronary arteries. Patients with cerebral stenosis or infarct have abnormal EKG (64.8 %) (Aungsuwan, 2001).

## **2. Psychological effects**

TIA and minor stroke patients must have constant lifetime treatment. The side effects of medication promote discomfort such as fatigue and dizziness that can increase anxiety about their health. Cerebral atherosclerosis decreases blood supply to brain which can induce small cerebral infarcts. Although there is no physical symptoms, poor intellectual, depression or apathy are found (Stuart-Shor, Buselli & Carroll, 2003). TIA patients have worse psychological and emotional health than other at-risk patients such as patient with diabetes or heart diseases (Duncan, et al., 1993). However, if the patients do not have good constant healthcare for promoting health, stroke can cause more serious effects than paralysis such as low self-esteem, suffering, depression and hopelessness. The expressions of stress are anxiety, depression, emotionalism, general tiredness, and sleep problems (Eccless, House & Knapp, 1999).

## **3. Social effects**

The physical and psychological effects of TIA and minor stroke patients may have tremendous impact on patient's social roles. Paralysis makes the patient unable to provide self-care which induces a change in lifestyle, inability to continue the roles of father or mother or husband or wife, and inability to work or participate in social activities. The patient becomes dependent and needs help from others, especially family members.

## **4. Economic effects**

When a patient as well as a family member gets sick, the family has to carry the burden of medical expenses. Particularly, caring for TIA patients who become

paralysis require expensive medication and healthcare. If the caregiver is a family member, he/she may have to quit their job to take care of the patient. Hence, other family members have to work for the patient as well as the caregiver and the economic effect is more detrimental.

The medical expenses for caring TIA and minor stroke patient with or without underlying disease e.g. hypertension, heart diseases and hypercholesterolemia etc are the expenses for preventing the stroke. However, the reduction of some risk factors does not require any expenses. For instance, exercise, smoking cessation and diet control are inexpensive treatments. The total expense for medication for a typical TIA patient from Siriraj Hospital is 1,218 Baht a month or 14, 616 Baht per year. Medical treatment consists of aspirin (6 Baht) for blood coagulation, Lopid (390 Baht) for hypercholesterolemia, Sibelium (312 Baht) for cerebral vasodilatation, and Plendil and Anapril (510 Baht) for hypertension. This is the medical expense for a TIA patient who still has physical strength and is able to do routine activities with no assistance. If stroke occurs, the expenses for both medication and patient care would inarguably be higher.

The government sector that is responsible for the healthcare and treatment policies for people has to accept all the medical expenses that are incurred when the patients are treated in hospital for cerebrovascular disease. Total expense for the treatment of cerebral infarction in Neurological Institute is 162,665 Baht per head per year (Youngkong, et al., 2002). The number of patients with cerebral infarction who were admitted into hospitals under the Ministry of Public Health throughout Thailand, excluding Bangkok, is 75,931 (Ministry of Public Health, 2002). Hence, the expenses for all patients throughout Thailand are immense and total no less than 12,351,316,115 Baht per year.

As mentioned above, cerebral infarction has a lot of impact on patients, especially if there is no available care or education regarding the reduction of risk factors for stroke. TIA and minor stroke patients are at high risk for complete strokes which will result in physical, psychological, social, and economic impacts to families and the country. Consequently, the treatment, reduction of risk factors to stroke and promotion of physical fitness in TIA and minor stroke patients are significant.

## **Treatment and Care of TIA and Minor Stroke Patients**

Treatment and care of TIA and minor stroke patients involve medical treatment, surgical treatment, and behavior modification to decline the risk factors to stroke (Alber, et al., 1999; Wolf, et al., 1999; Hankey, 2001).

### **1. Medical treatment**

The prevention of stroke caused by atherothrombosis usually requires anti-platelet aggregation medication, such as Aspirin, Ticlopidine, Clopidogrel and anticoagulants, such as Warfarin (Wolf, et al., 1999; Gibbs, et al., 2001).

Aspirin is effective, inexpensive and safe in preventing vascular diseases. It can reduce the risk by 22-23 % even in low doses from 75-325 mg. These low doses result in fewer side effects, such as stomach aches and gastric bleeding (Alber, et al., 1998; Pongvarin, 2001). Ticlopidine and Clopidogrel have higher efficacy rates than aspirin but are more expensive. Fewer side effects are found, but the possibility of thrombotic thrombocytopenic purpura and neutropenia from Ticlopidine should be a concern. Clopidogrel has similar effectiveness but is safer. It can be used as a substitute (Hankey, 2001). In Thailand, from the report of usage of anti-platelet aggregation – aspirin and Ticlopidine can prevent recurrent paralysis in minor stroke patients with a statistical level of significance ( $p < .01$ ,  $p < .05$ ) (Nithinan, & Udommongkol, 2001). Treatment with anti-platelet aggregation should be a constant lifetime treatment because stroke patients who have irregular medicine administration are found to have a higher risk of recurrent stroke than the patients who strictly followed their recommended medication schedules (4.43 times) (Arunathit, & Tangtroungpairon, 1999).

Heparin or Warfarin are the anticoagulant agents that are used if the medicines in the first group fail or for some patients with heart diseases, such as cardiac arrhythmia, cardiac-valve defect and cardiac thrombosis. Then a lifetime treatment with anti-platelet aggregation should be recommended (Hankey, 2001).

Statins: HMG-CoA reductase inhibitors can reduce total cholesterol and LDL-cholesterol and also prevent stroke in the patients. This medicine should be administered to the patients who have total cholesterol of over 5 mg/l. It can decrease the incidences of paralysis (by as high as 32 %) and myocardial infarction and other vascular diseases (Jackson & Wallis, 2001; Goldstein, et al., 2001).

## **2. Surgical treatment**

Some patients who have moderate-to-severe carotid artery stenosis may need carotid endarterectomy surgery to remove the thrombus. This surgery yields good outcomes and results in very few side effects (Wolf, et al., 1999).

## **3. Decrease of risk factors to cerebrovascular diseases**

Decreasing risk factors such as smoking, drinking, physical inactivity, hypertension, diabetes mellitus, heart disease, hypercholesterolemia and obesity should be provided through behavior modification. Patients should be encouraged to stop drinking, avoid a salty diet, and quit smoking. Cerebrovascular disease patients who smoke or have irregular diet control are 1.6 times more likely to have recurrent strokes than patients who did not smoke and have regular diet control (Arunathit, N. and Tungtroungpairoj, V., 1999). Controlling underlying diseases combined with physical activity will decline the risk factors to cerebrovascular diseases. In addition, stress significantly influences blood vessels because stress causes vasoconstriction of all vessels resulting in hypertension and tachycardia (Rozanski, et al., 1999). Stress promotes atherothrombosis that is harmful to both the brain and heart. Hence, behavior modification to reduce stress is important (Struart-Shor, Buselli & Carroll, 2003).

Treatment plan of TIA and minor stroke patients should include the recommendations on behavior modification, medication, and control of underlying diseases that can reduce the risk factors for stroke. Nurses can use the knowledge on medication and treatment to better to explain to patients the importance of precise medication administration and possible side effects. The nurse should also be a key person who promotes physical activity to patients for better health and thereby decrease their risk of stroke.

## **Concept of Physical Activity**

### **Definition of Physical Activity**

Physical activity refers to physical movement from skeletal muscular contractions that increase energy expenditure (Howley, 2001; CDC2, 2003). Pender (1996) stated the familiar definition as physical activity was physical mobilization that

daily energy expenditure in terms of leisure-time exercise and lifestyle exercise. Leisure-time exercise was moderate physical activity such as playing sports, running, swimming etc. Lifestyle exercise was to perform various activities in work or house work.

### **Exercise for Health**

The recent concept of exercise supports moderate physical activity in both leisure-time exercise or lifestyle exercise during the day even if in the short period that should be constant over 10 minutes. It can be periodic accumulation of exercise that requires the patient to expend over 1,000 kilocalories per week. This is sufficient for health promotion and reducing sickness and mortality rates (U.S. Department of Health and Human Services, 1996; Ainsworth, et al., 2000; Hardman, 2001; Shephard, 2001).

The concept of physical activity for health has been periodically developed from the Center for Disease Control and Prevention (CDC) of the United States of America. In 1990, it recommended people to participate in vigorous exercise 3 times a week for 20 minute sessions. It should require oxygen demands of 60 % of the maximum oxygen expenditure during regular physical activity. In 2000, the policy of the US government for Healthy People 2000 reduced the oxygen demand to only 50 % of the maximum oxygen expenditure. It required 30 minutes of daily exercise with light-to-moderate physical activities such as walking while maintaining a heart rate of 60 % of the maximum heart rate of each age interval (50 % of  $VO_{2\max}$ ).

The Center for Disease Control and Prevention (CDC) of the United States of America and the American College of Sports Medicine (CDC-ACSM) set up criteria which requires adults to engage in moderate physical activity over 3 METs (Metabolic Equivalents) for at least 30 minutes a time and accumulating until over 150 minutes a week without a limit on frequency. The Surgeon General (SGR) also set up criteria which requires moderate physical activity using 150 kcal/day or more than 1,000 kcal/week, 5 times/week. Then the modification was to have moderate physical activity requiring the use of 1,000 kcal/week without a limit on frequency (U.S. Department of Health and Human Services, 1996; Brownson, et al., 2000; CDC1, 2003). The trend of recent physical activity emphasizes daily energetic use of energy. Increasing the intensity of physical activity is related to physical fitness and reduces

the risk and mortality rate caused from other diseases (Howley, 2001). Light physical activity with inadequate daily exercise duration and energy expenditure may not yield any health benefit. Hence, to develop physical activity program has to consider the type, level and duration of daily exercise including frequency for sufficient total volume of activity.

### **Volume of Activity**

Volume of activity is total energy expenditure of any activity from intensity, duration and frequency of activity such as per week or per day. The measuring unit is kcal, MET-min or MET-hour (Howley, 2001). In this research, the researcher measures the effectiveness of physical activity program for patients by total volume of activity per week. To calculate it, the energy expenditure is in MET and volume of activity is in kilocalories (kcal). People who exercise all day will have high volume of activity.

Volume of energy expenditure 1 MET (Metabolic Equivalents: METs) refers to the rate of energy expenditure for sedentary behavior. Volume of oxygen expenditure in adults is 3.5 ml/kg/minute. Energy expenditure 1 MET is equaled to 1 kcal (or 4.184 kilojoules) per body weight 1 kg/hour (Ainsworth, et al., 1993). To calculate energy expenditure, besides intensity of physical activity as METs, body weight and duration of activity should be used.

### **Intensity of Physical Activity**

Intensity of physical activity can assess from energy expenditure of each physical activity with the report in METs. Intensity of any physical activity is the proportion of physical exercise metabolic rate to resting metabolic rate (RMR) for instance, the activity with 2 METs refers to the activity that use 2 times of resting metabolic rate.

There are 3 levels of intensity of physical activity (Ainsworth, et al., 2000: S498-S516; International Physical Activity Questionnaire, 2002; CDC, 2003).

1. Light physical activity refers to the activity that uses less physical effort with no breathing rate changed. That kind of activity spends energy less than 3 METs such as watching TV, sitting and working, preparing food, standing to work or slow walking, taking shower, dressing etc.

2. Moderate physical activity means the activity that needs the functions from large muscles with moderate physical effort. Hence, breathing should be heavier than usual until having the feeling of tiredness. Those activities spend 3-6 METs such as rapid walking in the office or leisure time, cleaning floor, blooming housing area or lawn, swimming, Tai Chi practice, low impact aerobic dance, dancing and so forth.

3. Vigorous physical activity refers to any activity that needs functions of large muscles and heavy physical effort with heavier breathing than normal. Those activities spend more than 6 METs such as running, rope jumping, speed swimming, basketball, football, and high impact aerobic dance.

### **Calculation of Energy Expenditure**

To calculate energy expenditure, MET x body weight (kg) x duration (hour) equal to numbers of kcal. For instance, elderly (weight 60 kg) washes a vehicle (4.5 METs) for 30 minutes. The energy expenditure will equal to 135 kcal (4.5 METs x 60 kg x (30 minutes/60minutes) = 135 kcal) or divided 135 kcal by 30 minutes, the energy expenditure will be 4.49 kcal/minute (Ainsworth, et al., 1993). Total moderate physical activity with constant 10 minutes in a week should spend the energy expenditure more than 1,000 kcal for sufficient volume of physical activity that can promote health according to the criteria.

To explain about the limits of physical activity using METs in the calculation of energy expenditure, Ainsworth and colleague (2000) stated that the different characters in body mass, adiposity, age, gender, efficiency of movement, geographic and environmental conditions may have the effects to the assessment of energy expenditure. Hence, the same activity may not spend the same amount of METs in the criteria. Factors of individual differences are significant and should be realized.

According to the mentioned limits, the researcher measures the effectiveness of physical activity program for TIA and minor stroke patients by measuring volume of physical activity in a week plus physical strength, blood pressure, heart rate, blood cholesterol level and fibrinogen for confirming the obvious outcome of physical activity to health.

### **Benefits of Physical Activity**

Regular moderate physical activity yields the following benefits (Nieman, 1995, Mazzeo, et al., 1998, CDC1, 2003).

## **1. Physical benefits**

### **1.1 Benefits for cardiorespiratory systems**

#### **1.1.1 Cardiorespiratory endurance**

Physical activity increase in myocardial contractility resulting in elevated minute cardiac output and volume of cardiac output (Fletcher, et al., 2001) and motivates the maximum volume of oxygen expenditure ( $VO_{2MAX}$ ) (Jakicic, et al., 1995). Good blood circulation results due to the fact that during physical activity, rapid breathing with increased minute ventilation effectively distributes oxygen throughout the body. Furthermore, total peripheral resistance occurs and the vessels in active muscle areas are extended (Nieman, 1995).

1.1.2 Physical activity causes the decrease of resting heart rate and physical activity heart rate and lower blood pressure which assist reducing cardiac function and control and prevent hypertension (Whelton, et al., 2002; CDC1, 2003). Because of better effectiveness of myocardial contractility, stroke volume and cardiac output are increased. In addition, parasympathetic nervous function is elevated resulting in a slower heart rate and lower blood pressure (Neiman, 1995; Fletcher, 2001).

### **1.2 Benefits for metabolism**

Physical activity multiplies the metabolism of carbohydrates and fat. Energy expenditure from accumulated fat reduces total cholesterol, triglyceride and LDL-cholesterol and increase HDL-cholesterol (Dustine, et al., 2002) which diminish thrombosis and atherosclerosis (Snell & Mitchell, 1999: 2; Lakka, et al., 2001). Regular constant physical activity will raise fat metabolism in muscles (Neiman, 1995).

### **1.3 Benefits for homeostasis**

Physical activity assists in declining fibrin, platelet, coagulation factors and blood viscosity resulting in better blood circulation that eliminates the risk of thrombus formation and arterial occlusion (Snell & Mitchell, 1999; Wannamethee, et al., 2002). Physical activity can help prevent and diminish mortality rates from stroke (Shephard, 2001; Lee & Skerrett, 2001; CDC1, 2003).

#### **1.4 Benefits for skeletal and muscle**

Physical activity increases bone density and decrease osteoporosis including elevate firmer toned muscle. In addition, it improves joint movement, body balance and physical endurance (Nieman, 1995; ACSM, 2001).

#### **2. Psychological and emotional benefits**

Physical activity assists in the elevation in moods and diminishing anxiety and depression (Shin, 1999; Dunn, Trivedi, & O'Neal, 2001) including fatigue. Physical activity for only 10-15 minutes promotes activation, energetic arousal and pleasant affect. In the meantime, tension is declined with the increase of relaxation and calmness (Ekkekakis, et al., 2000) and better sleeping (Nieman, 1995).

#### **Dangers from Physical Activity**

Over or inappropriate physical activity to actual physical condition may generate dangers that may be severe as death. Moderate physical activity offers fewer dangers. The dangers from physical activity are as follows (Nieman, 1995; Fletcher, et al., 2001; Shephard, 2001).

1. Palpitation, dizziness and faint can be found from over exercising or sudden cessation of exercise without muscular stretching because blood congests in muscles and there is less return to the heart. Consequently, insufficient blood supply to brain and heart can induce faint and dizziness (Phokakul & Chomwatanachai, S., 2002).

2. Injuries of muscle, skeletal, joint, tendon and ligament may result from accidents from misusing physical exercise equipment, redundant high-impact exercise and over exercise such as running too quickly or for too long, and heavy aerobic dance (Kowsuwan, 1994; Fletcher, et al., 2001).

3. Hypertension can be life threatening, especially in hypertensive patients (Shephard, 2001) because of heavy or inappropriate physical activity such as weight lifting or push-resistant objects by Valsava's maneuver (Nieman, 1995). Holding breath or forcing out increases blood pressure. Cerebrovascular sclerosis may rupture and cause paralysis (Phokakul & Chomwatanachai, 2002).

4. Ischemic heart, heart failure, and death are possibly found except in healthy people and cardiovascular patients who engage in regular physical activity by

walking or riding bicycle. Patients who engage in very heavy physical activity are at higher risks for those dangerous symptoms. The risk will be elevated particularly in the patients with cardiac disease aged over 40 years and the type physical activity engaged (Wannamethee & Shaper, 1992; Fletcher, et al., 2001).

5. Heat injury is possible with the patients who have just recovered from sickness, have insufficient sleep, are sedentary and obese, or participate in physical activity in the hot weather and humidity. Heat cramps and muscle aches occur when the body loses electrolytes. Profuse sweating results in loss of both electrolytes and water resulting in heat exhaustion and heat syncope because blood flow to the skin causes decrease blood flow to the brain. More severe symptoms come from imbalance of heat release through the skin inducing hyperthermia. Temperatures at 41-43°C affect the brain and other physical functions causing heat stroke and death (Suphakaseam, 1990; Fletcher, et al., 2001).

6. Thrombus after heavy exercise for 30 minutes and platelet deposition is increased. Regular people with intact endothelium do not easily have thrombi but the patients who have had vascular sclerosis may have thrombi if they have heavy physical activity because it promotes a plague of platelet-rich thrombi which are risky to vascular occlusion (Wang, 1994). In the meantime, moderate physical activity assists in preventing thrombus onset and platelet adhesion and aggregation (Wang, 1997; Cadroy, et al., 2002).

### **Protocol for Preventing Danger of Physical Activity**

Patients should do appropriate physical activity according to their physical condition. Individual has different physical condition in each moment. The protocol for preventing danger of physical activity is as follows (ACSM, 2001; Fletcher, et al., 2001; Phokakul & Chomwatanachai, 2002).

1. Stop moderate physical activity in 6 weeks after TIA or cerebrovascular thrombosis.
2. Stop physical activity during fatigue, sick or insufficient sleep or febrile at least 2 days.
3. Patients with underlying diseases or in high-risk group such as elderly or age over 40 years, smoker, stress, hypercholesterolemia, hypertension, obese, diabetes

mellitus, family history involving with heart disease and stroke should have pre-check up before joining the physical activity program. They should begin with low physical activity such as 20 minutes of walking. If they have no abnormal tiredness, they can increase exercise to rapid walking and jogging (Phokakul & Chomwatanachai, 2002).

4. Patients have systolic pressure and diastolic pressure while resting as 180-200 mmHg and 110 mmHg respectively and fluctuated, they should not have physical activity until blood pressure is controlled. In addition, they should avoid exercising in the posture of push-resistant object. However, after the approval from physician, the patients can do physical activity with minimum to moderate weight (ASCM, 2001; Women in Motion, 2004) that will be comfortable weight to lift and increase muscle strength.

5. Diabetic patients with fasting blood sugar lower than 100 mg/dl or over 300 mg/dl should stop physical activity until controlled. Furthermore, diabetic patients have more chance to have hypoglycemia during or after exercise so they should avoid neither heavy physical activity nor full-force physical activity combining with straining and breath holding because retinal detachment can happen. They should not exercise alone and should carry some candies or sugar cubes. They should have a break for snack that has the component of flour every 30 minutes and sufficient water intake (Neiman, 1995). Insulin-dependent diabetes mellitus patients should do regular physical activity because irregular exercise elevates the difficulty of insulin adjustment and should avoid using the muscle that had insulin injection for around 1 hour. Additionally, feet care of diabetic patients is very important because there is a lot of pressure during physical activity so too-tight shoes will induce sore (Siriphol, 1999).

6. During physical activity, straining and breath holding or pushing should not be done because breath holding increases blood pressure. Atherosclerotic lesion may be ruptured and cause paralysis. Hence, for weight lifting, push up etc, the patient should take deep breath in before doing and out while lifting (Evan, 1999).

7. Prevention of musculoskeletal injury can do by warm up prior to aerobic exercise of heavy exercise. Warm up assist muscular extension and prepare muscles that enhance joint motion without tear. After physical activity, sudden stop physical activity should be avoid and cool down would require for preventing hypotension due

to blood congestion in the muscles and insufficient blood return to heart. Stretching after exercise for all joints and muscles in every time of physical activity is needed to decrease muscle ache (Kitkusol, 1997; Fletcher, et al., 2001).

8. Observing abnormal signs and symptoms that need to stop physical activity for instance, cardiac arrhythmia, angina, dizziness, light-headedness, vomit-nausea, constant breathless after exercise, musculoskeletal pain or chronic tiredness and sleepless (Fletcher, et al., 2001).

9. Patients should not do physical activity after immediate full from meal. They should wait for a while around 2 hours (Fletcher, et al., 2001).

10. Patients should drink enough water for substituting sweat. If they do physical activity over 30 minutes and feel thirsty, dehydration is occurred. However, substitute water intake should be average not to drink a lot in one time (Kerdprang, 1998).

11. Using appropriate exercise equipment such as running shoes for running, aerobic dance should perform on wooden or rug floor.

12. To prevent heat injury by exercising in the morning or afternoon for avoiding strong sun (American Heart Association, 2001).

13. Any people who have knee problem should avoid any physical activity that has weight compression. Riding the standing bicycle or sedentary physical activity, especially for upper limbs should be considered.

14. Should not perform heavy physical activity or race because it will make heart over load.

15. Be careful all possible accidents.

### **Principles of Physical Activity for TIA and Minor Stroke Patients**

Most patients obtain the problem of arterial sclerosis with other underlying diseases. Appropriate physical activity for promoting health and decreasing risk of stroke emphasizes on cardiorespiratory fitness as a major key and then flexibility and range of motion for energetic and unlimited motion of all body parts. Strength training should be done for effectively increasing muscle strength (Pate, et al., 1995; Mazzeo, et al., 1998; Fletcher, et al., 2001). Physical activity program consists of:

1. Moderate physical activity to promote cardiac and pulmonary endurance is aerobic exercise that involves with large muscle rhythmic movement. This exercise helps heart pumping more blood to all parts of the body, increasing blood circulation, motivating oxygen-carbon dioxide exchange in lungs and transferring oxygen to muscles (Nieman, 1995). Patients can choose various activities in the level of 3-6 METs such as rapid walking, swimming, walking up and down the stairs and blooming house area by spending at least constant 15 minutes and periodically performing it daily for the whole week (Woolf-May, 1999). Goal setting should begin with the increase of frequency of physical activity and then elevate duration of exercise to be longer such as rapid walking should begin with 5 minutes and add to 10 minutes and 15 minutes respectively. Finally, light and heavy level of physical activity should be in the level of most likely tired but not too tired (Mezzeo, et al., 1998). They can communicate during the exercise. They can lift dumbbells, weight around 0.5-2 kg, while walking for elevating energy expenditure (ACSM, 2001).

In general, moderate physical activity will slightly increase body temperature. However, warming up for 1-5 minutes by walking and floor exercise will assist preparing muscles for actual physical activity (Neiman, 1995). Furthermore, after rapid walking or extended physical activity, the patients should take about 5 minutes to slow down the walking steps, keep stock-still feet movement and continue physical floor exercise for preventing syncope (Phokakul & Chomwatanachai, 2002).

2 Physical activity for increasing flexibility and range of motion will promote energetic body movement and no stiff joint. Stretching motivates muscular relaxation and decline body exhaustion. Appropriate physical activity postures are as follows (Appendix C).

2.1 Exercise position 1- Before get up: It comprises of stretching muscles of arms, legs and back that should be done in the morning while staying in bed for preparing muscles and adjusting the body before doing routine activities (Anderson, Pearl, & Bruke, 2002). According to the report stated that time of stroke onset associated with time of morning awakening including higher blood pressure and pulse rates. Hence, awakening and immediate moving for routine activities might cause stroke from rapid movement from supine position to sedentary position

(Stergiou, et al., 2002). TIA patients should not rush and should perform some exercise before getting up from bed.

2.2 Exercise position 2 – Neck and Shoulder Exercise: It refers to stretching neck and shoulder muscles for relaxation (Kowsuwan, 1994; Phokakul & Chomwatanachai, 2002). It promotes better blood circulation to brain through internal carotid arteries after this exercise twice daily for 8 weeks (Prasansuk, et al., 2001). TIA patients should perform this neck and shoulder exercise at least twice daily.

2.3 Exercise position 3: Physical activity during the day consists of stretching muscles of calves, waist and shoulder as well as warm up and cool down prior to walking that promote energetic walking and reduce muscle and Achilles tension (Anderson, Pearl, & Bruke, 2002) including elevate effective physical mobilization.

3 Strength training, especially large muscle groups that are necessary for routine activities (Fletcher, et al., 2001). It increases numbers of muscles by self-body weight such as pull up, get up to sit, push up or use some equipment e.g. dumbbells, weight lifting equipment, spring etc. To practice this training, it should be done 8-12 times per position per set (may have 8-10 exercise positions) for 2 days a week (Neiman, 1995: 223; Phokakul & Chomwatanachai, 2002). For instance, patients who do not use arm force may choose the exercise that can improve arm muscle strength by weight lifting 2 days a week plus aerobic exercise.

### **Self-assessment for Exercise Safety**

Patients should have self-assessment for being aware of heavy workload of heart or over tiredness during the physical activity. Appropriate heart rates are 55-70 % of maximum heart rate calculated from American College of Sport Medicine (Fletcher, et al., 2001) as follows:

Use 220 minus with age (years)

Example: a patient age 60 years will have maximum heart rate as  $220 - 60 = 160$ /minute. Hence, appropriate and safe heart rate should be 55-70 % of 160 times.

Appropriate HR =  $55/100 \times 160$  to  $70/100 \times 160$

Appropriate HR = 88 to 112 /minutes

Self-assessment by counting wrist pulse compared with the tiredness for monitoring the pulse during exercise that should not be over the standard. A rapid heart rate and feeling of tiredness or the inability to speak with anyone are the indicators of over exercise (Neiman, 1995). Patients may have some physical changes to the level that can harm the heart. Consequently, patients aged over 60 should have a moderate heart rate during physical activity as around 88-112 beats/minute and the tiredness feeling should be at the beginning or slightly tired which can be measured by Borg Rating of Relative Perceived Exertion as the level of 12-13. However, for people who have ever had arrhythmia or ischemia, the heart rate during physical activity should be lower than abnormal heart rates around 10 beats/minute (Fletcher, et al., 2001).

### **Evaluation of Physical Fitness**

Physical fitness is a qualification relating to capability of physical activity (CDC2, 2003). Evaluation of physical fitness in the terms of health comprises of the measurement on cardiorespiratory endurance, body composition e.g. height compares with weight and skin fold measurements for evaluating fat accumulation in the body; and musculoskeletal ability in terms of flexibility, muscular strength and muscular endurance e.g. to measure range of motion by sitting and folding, weight lifting, push up and distance walking (Neiman, 1995; Phokakul & Chomwatanachai, 2002).

Physical activity program for the patient emphasizes on increasing cardiovascular strength. The evaluation focuses on cardiorespiratory endurance because cardiovascular and respiratory systems response to demands of oxygen during exercise by increasing heart rate and respiratory rate for sufficient oxygen supply throughout the body. People with physical fitness will have maximal oxygen consumption:  $VO_{2MAX}$  greater than normal people. The standard evaluation is to measure  $VO_{2MAX}$  by spirometer during maximal exercise test (Wibur, et al., 2001; Neiman, 1995). But this method must be done in the laboratory with expensive equipment, and it can cause harm or injury. Hence, a submaximal exercise test was developed that could also indicate physical fitness. A 6-minute walk test is used with criteria classified by female and male subjects (Enright, et al., 2003; Finch, Brooks, Stratford, & Mayo, 2002).

A 6-minute walk test is a test for standard performance by walking for the distance in 6 minutes and the unit of measurement is meters or feet. Longer walking distance indicates better physical efficacy. It is popular to use in the evaluation of physical fitness and endurance because of convenience, quickness and safety (Bautmans, Lambert, & Mets, 2004: 1; Enright, et al., 2003). This method was developed by Butland and colleague in 1982 and was applied in various groups of patients such as cerebrovascular patients, heart disease patients, hypertension patients, DM patients, patients with joint replacement, and elderly people with good health. This instrument passed the reliability test and had the efficiency to detect the changes from the experiment (Finch, Brooks, Stratford, & Mayo, 2002) and identifies active elderly from inactive ones. Values of test-retest reliability were 0.95 for elderly (Harada, Chiu, & Stewart, 1999) and 0.82 for heart disease patients. It can be used to predict heart failure for any person who walks less than 300 meter (Roul, Germain, & Bareiss, 1998).

To evaluate the physical fitness, stimulation to increase oxygen consumption should be provided. People have good health because they have regular physical activity until having cardiovascular adjustment, heart beat efficacy, and decrease of heart rate. Consequently, 6-minute walk test can reflect an energetic lifestyle with regular physical activity resulting in a decrease of resting heart rate and longer distance achieved in the 6-minute walk.

### **Evaluation on Satisfaction with Response to Physical Activity**

Physical activity induces feelings of well being that address the holistic satisfaction to health. It consists of clear and alert thinking, motivating and energizing, pleasant affect, happiness and calmness, limberness/better movement and decrease of tension and distress (Schneider, 1999; Shin, 1999; Dunn, Trivedi, & O'Neal, 2001). In summary, those feelings are good effects of exercise (Fox, 1999).

Cantril (cited in McKeecham, Cowling, & Wykle, 1986) defined the concept of life satisfaction when people have perception, self-assessment, hope, goals and self-esteem. Cantril also created the Cantril self-anchoring ladder scale for measuring life satisfaction. It is comprised of 10 continuous steps. The highest step and the lowest step refer to maximal and minimal satisfaction respectively. This well-established

scale is popular for studying life satisfaction (Kashdan, 2004: 1226). It can be used to find the convergent validity with The Quality of Life in Bone Marrow Transplant Survivors Tool and The Psychosocial Adjustment to Illness Scale. The outcome is good ( $r = .71$ ,  $r = .69$ ,  $p < .01$ ) (Seleh & Brockopp, 2001) and can be effectively applied to elderly people and hypertension patients in Thailand (Nukate, 1998; Klin-ual, 2001).

Cantril believed that the self-assessment of the subjects would not be accurate if the subjects were forced to select categories or alternatives (cited in McKeecham, Cowling & Wykle, 1986) because the scale were separated into several categories that could not offer an obvious holistic picture of the situation. Chotikacharoensuk (2002) studied the correlation of physical activity and pleasant effect of elderly people by employing Dupuy Pleasant Effect Scale (cited in McDowell & Newell, 1996). This scale consisted of 6 aspects: anxiety, depression, general health status, energetic effect, pleasant effect, and self-control. Pleasant effect had low correlation with physical activity ( $r = .242$ ,  $p < .01$ ). The explanation could be due to other factors influencing pleasant effects such as economic status, family support, health status etc. In addition, the multiple questions and answers are difficulty to answer for elderly people and other events were sometimes involved such as lack of income, loss of family member, etc. without considering physical activity done. Hence, Cantril self-anchoring ladder scale is appropriate to measure overall feeling about satisfaction to physical activity because of single questions and simple answer and also has been proved about its effectiveness to measure life satisfaction of Thai elderly people.

## **Physical Activity Research for Reducing the Risk of Stroke and Promoting Health**

### **Physical Activity to the Decrease of the Stroke Risk**

Sacco and colleague (1998) revealed the correlation of stroke and leisure time activity in 369 first ischemic stroke attack patients and 678 well-being people age 39 years and up with the age mean of  $69.9 \pm 12$  years. The finding showed that the stroke patients had leisure time activity of  $4.0 \pm 4.4$  hours/week. In the meantime, well-being

people had leisure time activity of  $4.7 \pm 4.8$  hours/week. Physical activity also declined the risk of stroke ( $OR = 0.37$ ; 95 %  $CI = 0.25 - .55$ ). Most elderly people did light to moderate exercise more than heavy ones, and they claimed to walk (47-69 %). That level of physical activity can reduce the stroke onset ( $OR = .39$ ) but heavy physical activity can decrease the risk of stroke onset more ( $OR = .23$ ). The more exercise time the more decrease of stroke onset. That means if physical activity is less than 2 hours/week, the risk of stroke will be 0.42 times. If physical activity is about 2-5 hours/week, the risk of stroke will be 0.35 times. The risk will be reduced to 0.31 times if physical activity is over 5 hours/week. In summary, physical activity yields great benefits for stroke prevention in both female and male, adults and elderly people.

In the same way, the study of Evenson and colleague (1999) indicated that besides playing sports and leisure time activity, people who had more activity during working e.g. walking back and forth, lifting objects would have the declined risk of ischaemic stroke ( $OR = .69$ ) when compared with people who had less activity during work. An explanation may be that physical activity affects fibrinogen, cholesterol and blood pressure as well as the risk factors of stroke that yield a decrease in risk of stroke.

The research on risk factors of recurrent ischaemic stroke by Arunnathit and Tangtrongpaioj (1999), Neurological Institute, Thailand stated that patients with recurrent onset as 58.6 % had the history of no physical activity and most patients without recurrent onset as 68.7 % had regular physical activity. Furthermore, the patients who had no physical activity gained higher risk of recurrent stroke than the ones who had regular physical activity as 3.1 times (95 %  $CL$ ,  $OR = 1.828-52.57$ ).

### **Assessment of Physical Activity**

Brownson and colleague (2000) surveyed physical activity of 124,085 people age 18 years and over by the television interview about physical activity according to the criteria of American Health Institute and employing Physical activity with the behavioral risk factor surveillance (BRSFF). The outcome showed that people age 45-56 years as 30.8 % had moderate exercise with energy expenditure as 1,000 kcal/week and as 25.9 % had regular light-to-moderate exercise. People age 65-74 years, 30.4 % exercised in moderate and higher levels with energy expenditure as 1,000 kcal/week;

and 25.7 % could exercise for 150 minutes/week. However, most subjects, 38.4 % applied the criteria of performing moderate and higher physical activity with total 150 minutes/week and no limit of frequency. Inferior is people, 33.8 % took the criteria of moderate physical activity spending 1,000 kcal/week. In the researcher's opinion, using only one criteria as minute is inappropriate to over-weight people even if they completely exercise for 150 minutes/week but the energy expenditure may not reach 1,000 kcal/week and the questionnaire miss the questions about chore and occupational activities.

The research team of South Carolina University by Ainsworth, et al. (2000) modified the physical activity scale that was in the study of Brownson, et al. by adding some questions indicated moderate physical activity including career, household and transporting activities. Then the physical assessment question (PAQ) was tested and compared with the physical activity log and Computer Science and Applications (CSA) for validity according to the criteria of 38 male subjects, 35 female subjects age  $47.2 \pm 15.3$  years and  $45.4 \pm 15$  years respectively. The findings addressed that activities from the questionnaires had correlation with the movement that was recorded from CSA with the statistic level of significance. PAQ associated with CHA = 0.26-0.32 ( $p < 0.05$ ). PAQ related to PA log = 0.26-0.54 ( $p < 0.05$ ). PA log correlated with CHA = 0.34 ( $p < 0.01$ ). For heavy physical activity, PA log related to CHA = 0.22 ( $p < 0.05$ ). PAQ and PA log had no correlation. As the finding of PAQ, there were 35 minutes/day of walking that was not related to career and 15 minutes/day of moderate physical activities. The outcome of PA log revealed that most subjects spent 2 hours/day for moderate physical activity and one-fourth was occupied for career. The rest were for household and gardening respectively. Minority was sport. The problem found is record error such as moderate level to heavy level. In addition, PA log has no details of complete-10-minute activity or constancy. The researcher suggested that in the record, the numbers of physical activity should be added. However, those three research tools have effectiveness of physical activity measurement with fair significance.

Consequently, a physical activity scale is adequate for measuring any moderate physical activities that can calculate a whole volume of exercise per week.

However, it is necessary to adjust for assessing behavioral physical activity of Thai people in this research.

### **Physical Activity and Physical Fitness**

Physical activity has large effects on oxygen consumption. According to the research of Shin (1999), efficiency of pulmonary and cardiac functions,  $VO_{2\text{ max}}$  during exercise and force ventilation capacity (FVC) in female elderly patients were increased after joining the walking program. Resting heart rate and blood pressure declined.

However, only typical physical activity assists maintaining physical endurance. As the study of Wilbur and colleague (2001) about adherence of walking program in 156 females age 45-65 years for 24 weeks by using portable heart rate monitor and physical activity record model including the measurement of  $VO_{2\text{ max}}$ , the subjects who followed the program or periodically exercised for 3 weeks had the increased  $VO_{2\text{ max}}$  with the statistic level of significance ( $p < 0.001$ ,  $p < 0.05$ ). But the subjects who did not exercise over the 3 weeks had no increase of  $VO_{2\text{ max}}$ . The numbers of physical activity had high correlation with heart rate and physical activity record ( $r = 0.96$ ,  $p < 0.01$ ) that was more than duration and intensity of the exercise. The physical activity record model yielded effective evaluation of physical activity, especially the frequency of it.

Frequency of physical activity has a greater impact on cardiac function than heavy or prolonged but irregular exercise. The oxygen consumption is increased in the first-three weeks and would decline if stop exercise. The finding is consistent with the study of Wang, et al. (1997) which showed that moderate physical activity for 30 minutes daily, 5 days a week was able to elevate maximal oxygen consumption. In summary, people who regularly perform moderate physical activity will have more cardiac and pulmonary endurance.

Regular 10-minute physical activity promotes physical strength the same as regular 30-minute exercise does. Jackicic, et al. (1995) conducted the experimental research with female adults separated into 2 groups doing gait training, 28 females for each group. The first group walked a short distance for 10 minutes, twice daily in the first-four weeks, three times a day in the next 4 weeks and 4 times a day in the final 4

weeks. The second group walked 20 minutes, once daily in the first-four weeks, 30 minutes, once daily in the next 4 weeks and 40 minutes, once daily in the final 4 weeks. Both groups spent 20 weeks in the program as 650 minutes even and were compared. From the Triaxial accelerometers, the first group spent average time of physical activity as 15-25 minutes, 3 times daily, 5 days a week and regularly exercised more than the second group with the statistic level of significance ( $p < 0.001$ ). However,  $VO_2 \text{ max}$ , heart rate, blood pressure and weight are changed to the better way in both groups ( $p < 0.05$ ) with no difference. That means physical activity either short term many times a day or long term once a day yield good benefits to health but short-term exercise is easy to regularly do.

Klin-oul (2001) studied the result of walking program to physical fitness and well being in older adults both female and male. The experimental group had 13 older adults and the controlled group had 15 older adults. The program started with the warm up for 5 minutes and walking until the heart rate as 40-60 % of maximal heart rate measured by portable heart rate monitor for 20-40 minutes and then stretched muscles for 40-60 minutes, 3 times a week. Monitoring could be done in the fourth and eighth weeks by measuring physical fitness in flexibility and oxygen consumption during exercise with the distance as 1.6 kilometer. Participants earned more physical fitness and life satisfaction relating to physical activity with the statistic level of significance ( $p < 0.05$ ,  $p < 0.01$ ). Oxygen consumption began to change in the second week and was different from the controlled group with the significance in the eighth week. The researcher stated that the experimental group had slower heart rate without obvious results presented.

Physical activity for increasing flexibility will decrease the problem of blood circulation to brain in older adults. Prasansul, et al. (2001) found out the causes of vertigo in 215 older adults by checking blood circulation to brain by Doppler Intra-cranial Ultrasonography. The findings showed that there were abnormalities of blood circulation at internal carotid artery as 18.9 %, basilar artery as 79 % and ophthalmic artery as 93.4 %. From the body balance monitoring by Posturography, abnormality found as 85.12 % and 45.12 % were from brain degeneration due to insufficient blood supply and cerebral infarct respectively. Subsequently, the experimental research was conducted to convince older adults to do neck exercise along the program for 8 weeks.

The research outcome addressed better blood supply through internal carotid artery that was different from the previous period without exercise with the statistic level of significance ( $p < 0.03$ ) but for basilar artery and ophthalmic artery, there was no evidence of alteration. In addition, the experimental group had the decrease on body balance and vertigo than the controlled group with the statistic level of significance ( $p < 0.03$ ). The researcher explained that head exercise helped improving blood circulation because older adults would have better relaxation and movement of neck muscles and joints.

Hence, to develop physical activity program, the instruction of moderate aerobic exercise and the exercise for physical flexibility should be provided for promoting blood supply to brain and joint mobilization. The program will be exercise in the short 15 minute periods and over, 2-3 times a day done regularly.

#### **Effect of Physical Activity to Resting Heart Rate and Blood Pressure**

Whelton and colleague (2002) provided Meta-analysis of the research on aerobic exercise program on blood pressure. From 54 experimental research studies with random sampling and a control group, 2,419 subjects, mean age 21-79 years for 3 weeks to 2 years of program duration, median 12 weeks; the aerobic exercise assisted decreasing systolic pressure by 3.84 mmHg (95 % CI, -4.97 to -2.72 mmHg,  $p < 0.001$ ) and diastolic pressure by 2.58 mmHg (95 % CI, -3.35 to -1.81 mmHg,  $p < 0.001$ ). Patterns of physical activity e.g. riding bicycle, walking, jogging or others can reduce blood pressure. Exercise duration less than 120 minutes (Effect size -2.82, 95 % CI = -4.22 to -1.43), 120-150 minutes (Effect size -4.67, 95 % CI = -7.19 to -2.16) or more than 150 minutes per week yielded the same decrease of blood pressure. However, the effect size of systolic pressure from physical activity over 150 minutes per week expressed the increasing trend (Effect size -5.13, 95 % CI = -7.64 to -2.16). Any levels of physical activity offered no difference of decreasing blood pressure but moderate physical activity had the trend to reduce the diastolic pressure (Effect size -3.55, 95 % CI = -4.76 to -2.35) more than light physical activity (Effect size -2.71, 95 % CI = -4.05 to -1.36) and heavy one (Effect size -1.52, 95 % CI = -2.82 to -0.22). The research results of Whelton, et al. were lower than the one of Thompson, et al. (2001)

as moderate physical activity could reduce systolic and diastolic pressure as 18-20 and 7-9 mmHg respectively.

The program duration less than 10 weeks or 10-24 weeks (Effect size  $-4.31$ , 95 % CI =  $-6.09$  to  $-2.53$ ; Effect size  $-2.54$ , 95 % CI =  $-3.07$  to  $-2.02$ ) would offer more benefit than the program duration over 24 weeks with the statistic level of significance (Effect size  $-1.44$ , 95 % CI =  $-2.33$  to  $-0.55$ ,  $p < 0.05$ ). Size of the body, either weight loss much or less had no effect to reduce blood pressure. The researcher summarized that aerobic exercise whatever method done has the effectiveness on decreasing blood pressure in both of hypertension patients and regular people, people within standard weight or overweight. However, moderate physical activity over 150 minutes per week showed better trend of decreasing blood pressure.

Stefen, et al. (2001) researched the outcome of only physical activity and the physical activity with weight reduction to ambulatory blood pressure in 59 male subjects and 74 female subjects with mean age as 48 years. They had hypertension or high normal blood pressure. They were separated to 35 subjects who had physical activity for 35 minutes; and 42 subjects for physical activity and weight reduction. Fifteen subjects were on the controlled group who had most activity as sedentary behavior and overweight. The research results after 6-month monitoring indicated that both experimental groups had maximal oxygen consumption during ambulatory physical activity had better treadmill period and weight loss than the controlled group with the statistic level of significance ( $p < 0.001$ ). Significantly, the groups having physical activity had lower diastolic pressure and heart rate than the controlled group, particularly the group that exercised and controlled weight had the decrease of heart rate and diastolic pressure in all levels of activities. The group with high distress would have higher blood pressure and heart rate with the statistic level of significance ( $p < 0.001$ ). Physical activity and weight reduction can reduce diastolic pressure and heart rate in the group with low distress ( $p < 0.05$ ). Outstanding issue of the research is to emphasize on the result of physical activity, weight control and distress to ambulatory blood pressure. Anyone who studies physical activity should realize those variables that can have an effect on blood pressure.

In this research, the researcher employs resting heart rate and blood pressure to evaluate the result of physical activity in the patients who join the physical activity program for 12 weeks.

### **Measurement of Physical Fitness by 6-Minute Walk Test**

Enright, et al. (2003) established the equation to predict walking distance in 6 minutes of 2,117 elderly patients with cardiovascular diseases comprising of angina, myocardial infarction, congestive heart failure, minor stroke, cerebrovascular accident and arthritis with mean age  $77 \pm 4$  years for only the first test. The result showed that mean walking distances of female and male elderly subjects were 332 and 362 meters respectively. The factors e.g. age, weight, race and health factors e.g. grip strength, ankle-arm index, waist circumference, depression, mental status, diastolic pressure, lung function, arthritis, and C-reactive protein can explain the variance as 30 %.

For 752 patients with good fitness, walking distances of female and male patients were 367 (CI, 249-479) and 400 (CI, 280-532) respectively. Age, weight and height are major variables to walking distance, but they can explain the variance as 20 % only. The entire group with better fitness as 10.5 % will have longer walking distance. Furthermore, after 6 minutes of walking, there was no harm that needed immediate treatment. The patients, 75 % had no abnormal sign and 25 % had leg pain, joint pain or tired and 4 % had chest pain. The researcher explained that this physical activity was safe and had benefit to measure functional status, pre-intervention and post-intervention in clinical setting. Variables in the prediction of walking distance in the group with good fitness of Enright, et al. (2003) are consistent with the study of Troosters, Gosselink, and Decramer (1999) that involved with 51 older adults with good fitness age 50-80 years. The finding confirmed that age, height, gender and body weight affected walking distance and could explain the variance as 66 %.

Dean, Richards, and Malouin (2000) conducted the experimental research for promoting health condition and mobilization of 12 cerebrovascular patients with hemiparesis age 53-74 years for 8 weeks of monitoring. In pre-experiment, the experimental group walked over 6 minutes had the mean distance as  $207.9 \pm 119.0$  meter and in post-experiment; the mean walking distance was  $277.7 \pm 130.5$  meter that was longer than the controlled group with the statistic level of significance ( $p < 0.05$ ).

The walking distance in the experimental group was increased as 42.1 meters; in the meantime, the walking distance of the controlled group was elevated 4.7 meters. Those findings are consistent with the outcome of the research of Visintin, et al. (1998) that used the body weight support to promote gait training in 100 cerebrovascular patients (50 patients in the experimental group and the controlled group each). They had rehabilitation by treadmill exercise for 6 weeks and fitness test by walking as far as they could. The experimental group walked with the mean distance as  $147.4 \pm 18.2$  meter and faster walking than the controlled group with the statistic level of significance ( $p = 0.018$ ). It demonstrates the walking test has responsiveness in 6-8 weeks and can be applied to monitor the result in cerebrovascular patients.

In Thailand, there is no evidence of the report on physical fitness by 6-minute walking. Klin-ual (2001) studied about the gait training program to physical fitness and well being of 28 female and male older adults for 8 weeks and physical fitness test by measuring  $VO_{2\max}$  for walking 1.6 kilometer. The finding stated older adults could walk faster with reduced heart rate detected by portable heart rate monitor. As the calculation of  $VO_{2\max}$ , there was obvious difference between pre and post participation in the gait training program with the statistic level of significance in the fourth and eighth weeks ( $p < 0.05$ ,  $p < 0.01$ ).

The evidence details the physical response to physical activity in the experimental period from the 4<sup>th</sup> to 8<sup>th</sup> week. The researcher needs to evaluate the effectiveness of the moderate physical activity for TIA and minor stroke patients by monitoring for 12 by using the 6-minute Walk Test in the measurement for change in physical fitness.

### **Physical Activity and Fibrinogen**

Regular physical activity decreases fibrinogen in blood. Preost (1997) researched the correlation of regular physical activity and fibrinogen level in 40 male heart disease patients with mean age  $65 \pm 9.8$  years. The research finding indicated that the patients who exercised more than 3 times a week had lower fibrinogen level than ones who exercised less than once a week ( $p < 0.05$ ). It yielded the same outcome as the research on 2,398 regular male subjects with age 50-64 years who

spent energy expenditure in leisure time exercise that subjects who spent total energy expenditure would have lower fibrinogen level with the statistic level of significance ( $p < 0.005$ ) (Elwood, et al., 1993).

Wannamethee, et al. (2002) studied the correlation of physical activity level and coagulating factors in 3,810 male and female subjects, age 40-59 years and monitored for 20 years until the subject's ages became 60-79 years. The research measured energy expenditure from walking, working, gardening or physical activity. The outcome was consistent with existing research that demonstrates that people who had no or low physical activity would have higher level of fibrinogen than people who had moderate or higher physical activity with the statistic level of significance ( $p < 0.0001$ ) and other factors such as coagulation time, numbers of platelet, Factor XIII and IV, Von Willebrand factor, fibrin D-dimer, plasminogen activated antigen and C-reactive protein including white blood count were higher with the statistic level of significance ( $p < 0.001$ ). The researcher explained that moderate physical activity had anti-inflammatory effect. For the mechanism to reduce risk of stroke, it should be the decrease of fibrinogen, platelet, coagulating factors and blood viscosity that increased blood circulation and decreased the risk of ischemia or thrombosis.

An experimental research was conducted on the pattern of physical activity by Wosomu, Allarddyce, and Tansey (1992) in male patients with post coronary artery surgery for 1 year. The subjects were separated into 3 groups: 15 patients for doing aerobic exercise by treadmill exercise, lifting arms, bending body etc; 20 patients for power exercise by doing moderate weight lifting; and 20 patients for the controlled group. Those three groups spent 12-60 minutes, 3 times a week for the activities. The outcomes indicated that the group which did aerobic exercise had the decrease of fibrinogen and had obvious difference from the controlled group with the statistic level of significance in the 3<sup>rd</sup> month and the 6<sup>th</sup> month ( $p < 0.01$ ,  $p < 0.05$ ). For the group doing moderate weight lifting and the controlled group, they had the alteration with no statistic level of significance. The explanation is that patterns of physical activity may result in the reduction of fibrinogen, and aerobic exercise offers better and faster result. However, the researcher believes power exercise may yield the same outcome, but may require longer exercise duration.

Rauramaa, Li, and Vaisanen (2001) tried to confirm the conclusion by conducting the Meta-Analysis Research that particularly selected 8 research studies with the controlled randomized clinical trials in the sampling group which had regular moderate-heavy and heavy physical activity age 32-80 years. The outcomes were varied and they were unable to get any certain conclusion of physical activity to fibrinogen level. The researcher addresses that fibrinogen is a half-life protein around 3-4 days if the blood test after physical activity may be later than acute phase, the fibrinogen will not be reduced. Genetic factors also have an influence on high levels of fibrinogen such as in people who have chromosome G-453-A. In addition, intrinsic variances of individual also are major factors. It is consistent with the study of Rosenson, Tangney and Hafner (1994) that studied the intrinsic variances of fibrinogen in 39 male subjects with physical fitness. They had intrinsic variance of fibrinogen as 0.5-1.85 g/l daily. Hence, blood test should be done at the same time daily. The experiment showed the change had to take over 6 weeks. Validity would be more if the blood tests were repeated more than 1 time or size of the sampling group was enlarged. For instance, if the need is to have the variable value as 20 % from the previous value,  $\alpha = 0.05$ , statistic power as 0.80, the sampling group should not have less than 18 subjects and not less than 37 subjects for each randomized assign group for two-tailed paired t test.

Fibrinogen is a major indicator of cerebrovascular diseases because it has a relation with TIA and stroke (Chambless, et al., 1996). People who had fibrinogen levels of 3 mg/l, especially those with 3.5 mg/l were considered high-risk (Herderschee, et al., 1992) because fibrinogen motivated platelet adhesion in the end process of blood coagulation. Increased fibrinogen elevated blood viscosity that increased the risk of thrombosis. Consequently, it is appropriate to use fibrinogen to indicate the effectiveness of physical activity program for TIA patients.

However, there are other influencing factors that can increase fibrinogen such as inflammation, obese, diabetes mellitus, smoking and hypercholesterolemia. The research of Yano, et al. (1990) in 329 Japanese people and 3,571 Japanese people who migrated to live in the USA age 71-93 years expressed that predicting factors about fibrinogen were white blood cells, total cholesterol, systolic blood pressure, diabetes mellitus, HDL-cholesterol, triglyceride, hematocrit and body mass index that

presented negative correlation with the statistic level of significance ( $r = 0.12$ ,  $p < 0.05$ ). Fibrinogen that related with the white blood cells had no correlation with smoking. It had less ability to explain about the variance because there were other factors that were not studied and had influence to fibrinogen such as diet and physical activity.

Consequently, to use fibrinogen as well as an indicator of effectiveness of physical activity program have to control those confounding factors such as variance of intrinsic fibrinogen, the same time of blood juncture daily, duration of the experiment  $> 6$  weeks to yield the result, the sample size at least 18 subjects. For disease condition or confounding variables, repeated measurement would help eliminate those problems (Munro, 2001).

### **Physical Activity and Cholesterol**

Chaidaisuk (1996) studied aerobic exercise or Tai-chi exercise to cholesterol level e.g. total cholesterol, triglyceride, HDL-cholesterol and LDL-cholesterol in female older adults, age 60-72 years by separating into 2 groups. The first group, 30 subjects exercised longer than 120 minutes per week and the second group, 27 subjects exercised irregularly or less than 120 minutes per week for 10-week monitoring. Total cholesterol and LDL-cholesterol of the first group were lower than the second group with the statistic level of significance ( $p < 0.05$ ) and other kinds of cholesterol showed positive trend with no statistic significance. The group with less physical activity stated poor trends for all kinds of cholesterol. This research recorded details of diet consumption for explaining the effects of diet to cholesterol. Both groups consumed the same volume of food ( $p < 0.05$ ) and had no correlation between frequency of food consumption in any sampling groups and all kinds of cholesterol except the group with physical activity that high triglyceride associated with frequency of high-sugar diet consumption with the statistic level of significance ( $p = 0.02$ ).

Positive trends of cholesterol without statistic level of significance may be because the short period of research duration. Appropriate research duration should be longer than 12 weeks even if there would be no cholesterol change found especially HDL-cholesterol. Durstine, et al (2002) researched volume of activity and cholesterol level where physical activity decreased total cholesterol and LDL-cholesterol by

controlling fatty diet or weight together. Positive outcome were seen with low volumes of activity but had energy expenditure of 1,200-2,200 kcal/week. Reduction in triglyceride and HDL-cholesterol were found from gait training for 15-20 miles/week or rapid walking or jogging that had energy expenditure of 1,200 kcal/week. The result was a decline in triglyceride (3-8 mg/dl) and increase in HDL-cholesterol (2-8 mg/dl). Physical activity over 1.5 hours will motivate HDL-cholesterol immediately or in a day after exercise. Total cholesterol will be changed when having prolonged exercise and sufficient energy expenditure as of total energy expenditure, not only as of tension of activity. It did relate to neither the baseline nor prolonged program. Significant components in the program should be physical activity, weight reduction and decrease of body fat and high fatty diet together. For tension of physical activity, gait training as 4.8-8 km/hr, 30-60 minutes/time, 5 times/week for 24 weeks can elevate HDL-cholesterol with the statistic level of significance even if the weight is not changed (Duncan, et al., 1991).

Leon and Sanchez (2001) reviewed 28 randomized control trial researches associating with physical activity to cholesterol in people with sedentary behavior with energy expenditure as 500-5,000 kcal/week, mean of energy expenditure as  $1,408 \pm 824.7$  kcal/week for 12 weeks to 2 years. Cholesterol stated uncertain response to physical activity because each kind of cholesterol had many confounding variables e.g. factors in gender; race; age; female hormonal status; diet consumption; alcohol; smoking; drug administration particularly antihyperlipidemic agents, birth control pill and substitute hormonal agents; other types of exercise extra from the program and economic factors. In addition, physical characteristics of the sampling group such as body weight, body fat and baseline cholesterol,  $VO_{2MAX}$  affected to cholesterol level in the body. Significantly, if the level of HDL-cholesterol of pre-participation in the program were high, it would respond more to physical activity.

Although LDL-cholesterol and triglyceride are important to the risk of cardiovascular diseases, diet and genetic factors affect them. LDL-cholesterol is a key to predicting the risk of cardiovascular diseases. This LDL-cholesterol will be high in people who consume high fat diet; especially saturated fat will be certain or decreased a little. In people who do aerobic exercise, this little change relates to  $VO_{2MAX}$  and is not associated with BMI. The literature reviews by Leon and Sanchez (2001) and

Durstine, et al. (2002) showed the consistent outcomes that LDL-cholesterol had little or no change responding to aerobic exercise because the change required heavy physical activity as 1,500 kcal or longer exercise period over 3 hour/session.

Hence, the research on the outcome of moderate physical activity in TIA patients should take at least 12 weeks and should use total cholesterol and HDL-cholesterol as major variables to reduce the stroke (Lee, et al., 1999; Tanne, et al., 2001). To monitor the outcome of physical activity, it needs to control the variables of age, gender, body weight, BMI, high fat diet and drug used in both experimental and controlled groups as close as possible that would generate the feasibility of the research results.

### **Physical Activity and Psychological Well Being**

The research of Ekkekakis, et al. (2000) on short gait training for 10-15 minutes to emotional and feeling affects in 298 subjects who had good health, 137 males and 161 females with mean age 20-22 years. The sampling group consisted of 177 subjects in the experimental group and 121 subjects in the controlled group. There were 4 groups in this research. The first group had regular walks outdoors and measured emotions and feelings pre and post walking. The second group did the same as the first group but had a quiet sedentary period for 10 minutes before measurement. The third group had treadmill exercise in the laboratory for 15 minutes and measurements were done in the eighth minute during the treadmill and at 10 minutes after finished the treadmill activity. The fourth group, consisting of 42 subjects, had treadmill exercise for 10 minutes and then immediately measured and repeated it in 15 minutes after finished the treadmill activity. This group had done the retest within 2 days to 1 month. The results from four groups were the same as short-distance walking increased activation, energetic arousal and pleasant affect. After rest for 10-15 minutes, the tension was decreased and relaxation and calmness were elevated more than the controlled group had with the statistic level of significance ( $p < 0.01$ ). The results support the concept that moderate gait training for 15 minutes should generate pleasant affect and satisfaction from physical activity resulting to constant practice.

Cox, Thomas and Davis (2001) studied moderate and heavy level of walking up on the stationary stepper and treadmill jogging track in 24 male subjects with mean age as  $28.3 \pm 8.3$  years after exercise for 30 minutes. Both kinds of physical activity and 2 levels of exercise intensity generated positive well being and decreased psychological distress with the statistic level of significance ( $p = 0.003$ ,  $p = 0.001$ ) since the fifth minute to 60<sup>th</sup> minute during the resting period. Furthermore, fatigue was reduced in the 30<sup>th</sup> minute to the 60<sup>th</sup> minute with the statistic significance ( $p = 0.037$ ). People who exercised by stationary stepper would feel more tired than by treadmill jogging track with the statistic significance ( $p < 0.025$ ). It showed that moderate physical activity affected well being, reduced stress and fatigue and remained at least 30 minutes after the exercise.

In Thailand, Nukate (1998) studied self-care behavior and well being of 60 diabetic elderly patients with hypertension. Self-care behavior had positive correlation with the well-being ( $r = 0.42$ ,  $p < 0.001$ ). Klin-ual (2001) researched the results of gait training program to physical fitness and well being in both female and male older adults. There were 28 subjects in each group having 40-60 minutes of the program, 3 times a week and the 4<sup>th</sup> week and 8<sup>th</sup> week monitoring by employing Cantril self-anchoring ladder scale. The participants had more physical fitness and well being than the controlled group with the statistic significance ( $p < 0.05$ ,  $p < 0.01$ ) in the 8<sup>th</sup> week. The researcher explains that the program promotes more activation, energetic and endurance for physical activity. The patients also acknowledged the well being from physical activity resulting in an increase in life satisfaction. The research result is consistent with the study of Schneider (1999) in 364 female older adults that subjects who exercised more would have more well being than ones who had less exercise with the statistic significance ( $p < 0.05$ ).

In this research, the researcher intends to study the satisfaction as a result of 15-minutes and more of moderate physical activity and measure overall psychological well being. Cantril self-anchoring ladder scale is employed to evaluate psychological well being and the changes from physical activity in the 8<sup>th</sup> week and beyond.

## **Health Promotion Model of Pender on Physical Activity**

Pender (1996) gave the definition of physical activity as any physical mobilization that required daily energy expenditure. They include leisure-time exercise and lifestyle exercise. Leisure-time exercise had certain obvious patterns with moderate to higher intensity of activity such as aerobic exercise, other sports, running and swimming. Lifestyle exercise was any activity involved with an occupation or household work e.g. rapid walking, gardening, and baby-sitting.

Major factors for physical activity behavior are 1) Characters and individual experience e.g. age, gender, education level, income, previous experience and physical fitness including remaining illness, 2) Knowledge and specific cognition that are important to induce healthy behaviors with predictable variables as perceived benefit to action, perceived barrier to action, perceived self-efficacy, feeling related to exercise, individual and situational influences. Those had direct effects on health behaviors or transferred through the variables intending to keep the behavior. The final variables are the necessary and satisfaction of incentive matters that can immediately veer health behavior resulting in missing the goal of physical activity.

There is both local and international research available to test each variable in the model in the predicting power of health promotion behaviors. Those variables had the predicting power of good health promotion behavior (Yamchanchai, 1995; Inkhum, 1996; Suwapap, 1999; Intrpang, 2000; Pender, Murdaugh & Parsons, 2002) and physical activity behavior.

## **Physical Activity Research of Older Thai Adults**

Chinuntuya (2001) studied the causal model relating to leisure-time exercise and lifestyle exercise for finding the factors influencing to physical activity of 300 Bangkok older adults by using Pender's Health Promotion Model. The finding showed that older adults had less physical activity in walking, mobilization, standing and heavy exercise such as jogging etc. They did not do leisure-time exercise (59 %). For lifestyle exercise, there were older adults as 88.30 % did house work, 56 % did gardening and 48 % did gait training. Light physical activity was 74 % and moderate activity was 63.3 %. Regulated physical activity model can explain the variance of physical activity behaviors ( $r^2 = 0.52$ ) more than the no regulated one ( $r^2 = 0.32$ ).

Intensive factor to the plan of physical activity is the best predicting indicator about physical activity behavior in both conceptual frameworks ( $\beta = 1.95$ ,  $\beta = 1.22$ ,  $p < 0.05$ ).

Regulated physical activity model and social support have positive direct effects on physical activity behavior ( $\beta = 0.45$ ,  $p < 0.05$ ) and have an indirect influence to intensive plan of physical activity ( $\beta = 0.53$ ,  $p < 0.01$ ). Perceived self-efficacy has positive direct influence to physical activity ( $\beta = 0.36$ ,  $p < 0.05$ ). Perceived barriers to action has negative direct influence to physical activity ( $\beta = -0.26$ ,  $p < 0.05$ ) and has indirect influence to intensive plan of physical activity ( $\beta = -0.27$ ,  $p < 0.01$ ). In the meantime, for non-regulated physical activity model, social support has positive direct influence to the action ( $\beta = 0.21$ ,  $p < 0.05$ ) and has indirect influence to intensive plan of action ( $\beta = 0.37$ ,  $p < 0.05$ ). However, perceived self-efficacy has only indirect influence to intensive plan of action ( $\beta = 0.26$ ,  $p < 0.01$ ). In summary, Pender's Health Promotion Model can predict physical activity. The variables involved in the prediction are intention to physical activity, social support, perceived self-efficacy and perceived barriers to action.

Asawachaisuwikrom (2001) developed the Physical Activity Promotion Model modified from Pender's Health Promotion Behavior Model (Pender, 1996) and path analysis for verifying factors that could explain physical activity behavior of Thai elderly by including all kinds of activity e.g. chores, sport exercise and leisure-time exercise. The sampling group consisted of 56 male elderly patients, and 71 female elderly patients aged 60-94 years. According to the findings, most elderly patients (57 %) had no regular physical activity. All variables are associated with physical activity with the statistic significance except gender ( $p < 0.01$ ) such as income ( $r = 0.59$ ), education level ( $r = 0.25$ ), perceived benefits to action ( $r = 0.25$ ), perceived barriers to action ( $r = 0.34$ ), family support ( $r = 0.40$ ), house surroundings ( $r = 0.46$ ), convenient facilities ( $r = 0.58$ ) and perceived self-efficacy ( $r = 0.32$ ), which could explain the variance of action as 50 % ( $p < 0.01$ ). Those results are close to the study of Chinuntuya, P. (2001) but when path analysis was done, the variables which had direct effects and total effects and could predict the physical activity with statistic significance were only 4 of them such as income ( $r = 0.38$ ,  $r_t = 0.55$ ), perceived barriers to action ( $r = 0.16$ ,  $r_t = -0.16$ ), house surroundings ( $r = 0.20$ ,  $r_t = 0.42$ ) and

convenient facilities ( $r = 0.26$ ,  $r_t = 0.49$ ). The explanation can be other variables have combined effects that generate high standard error and rarely identify the differences with statistic significance. However, perceived benefits to action, family support and perceived self-efficacy have the effect to house surroundings and convenient facilities that may have indirect effect on physical activity. Consequently, the researcher needs to maintain those three variables within the model and requires more research supporting those matters.

From those researches, Pender's Health Promotion Model has the effectiveness to predict physical activity behavior. Major variables in the prediction of physical activity are income, perceived barriers to action, family support, house surrounding, convenient facilities and perceived self-efficacy of both leisure-time exercise and lifestyle exercise by having intensive factors to plan of action as well as the best predictor on physical activity behavior ( $\beta = 1.95$ ,  $\beta = 1.22$ ,  $p < 0.05$ ).

Although, a variable as perceived benefit to action was not in the predicting equation in both two researches but Pender, Mudaugh and Parsons (2002) reviewed 18 researches and found 11 of them as 61 % stated that perceived benefits to action could predict health promotion behavior with the statistic significance. Six in eight researches as 75 % addressed that previous experience could predict health promotion behavior with the statistic significance. Hence, to develop the physical activity promoting program for cerebrovascular disease, patients should emphasize on adjusting previous behavior as sedentary behavior, inducing perceive benefits of action, seeking barriers to action and advanced solutions either house surroundings or convenient facilities for eliminating the immediate situation that may veer the physical activity. Family support, perceived self-efficacy, good attitude to physical activity and encouragement of physical activity intention should also be increased.

General physical activity program for elderly is leisure-time exercise such as Taichi, gait training and physical exercise, aerobic dance (Chaidaisuk, 1996; klin-ual, 2001; Duangsong, 2001). This kind of exercise needs materials, place, time and group. Even if the research result is good but the survey result from elderly in urban and rural areas indicated that elderly exercised low-moderate exercise such as Tai-chi as 41.1-43 %, mobilization as 7-31 %, walking and swinging arms as 22 %, stationary

bicycle as 0.9 %, aerobic dance as 2.3 %, swimming as 0.3-1 %, heavy exercise – jogging as 7 % and running as 0.03 %.

Problems and obstacles of physical activity are weak family support, no public park or facilities for exercise, no sidewalks near the house, and insufficient safety. In addition, physical condition such as chronic diseases; feelings of old age; feel tired when exercising or the fear of their children, and possible injury barred the patients from sufficient physical activity.

Consequently, motivating the patients to engage in physical activity of daily living for short periods around 15 minutes for not too tired, 2-3 sessions a day with accumulate energy expenditure of at least 1,000 kcal/week will yield the maximal benefit to the patients. However, there is no research on this kind of physical activity in Thailand. The knowledge on physical activity for TIA and minor stroke patients is less in both Thailand and abroad, so there is no developed physical activity program for those kinds of patients.

## **Concept of Self-regulation**

### **Evolution of Self-regulated Concept**

The concept of self-control or self-regulation was derived from the psychological study since 1850 based on the fundamental belief that human beings control self-behavior and self-leading (Klausner, 1965). There is more research in the era of the concepts of psychological behaviorism or experiment. Initially, psychological behaviorism was separated into 2 matters. One was Classical Condition Theory of Pavlov (1936) that emphasized on the arousal and the response when having appropriate condition. The acceptable expression would be the one that could be measured and observed. Another matter was Operant Condition Theory of Skinner (1953) that added the encouragement or penalty for controlling behavior with the belief as behaviors were the results of environment. Degree of behavior would be increased because of encouragement, and it would be decreased because of penalties.

Cognitive behaviorists such as Lazarus (1971), Bandura (1968, 1977), Beck (1976) etc extended and mixed the behavioral and cognitive concepts together for covering all problems because human behaviors did not result from only external encouragement and penalty but human beings could do things to control feelings,

thoughts and actions. Consequently, there are some people who define different meanings of self-control based on the belief of different basic theories and a variety of control methods that may emphasize on extrinsic behavioral control or intrinsic behavioral control such as thoughts, emotions, and sensory perception.

After 1980s, technocrats in various fields paid attention and brought the self-control concept into semi-experimental research (the research to find out the correlation and develop a predicting model). The knowledge on self-control was developing. The studies in this period depended on the interests of theorists, such as theory emphasizing on intrinsic enthusiasm for self-control, strategy of self-control, self-control process and the outcomes. There were various names depending on theoretical believes such as self-regulation, self-control, self-modification and self-change. Technocrats would select any theory that relates to population and interesting problems, such as a practical method of self-control as a self-control triad for psychological patients, alcoholism patients and drug-addicted patients that was used for eliminating inappropriate behaviors (Aimsupasit, 1999). Self-regulation in clinical practice for people who had behavioral problems has been increasingly applied in behavioral adjustment programs (Febbraro & Clum, 1998).

### **Definition of Self-Regulation**

Bandura (1977, 1986, 1997), a social learning theorist defined as self-regulation was human ability to do something for controlling thinking, feeling and self-actions by self-employed methods. This self-regulation could not be successful with only psychological power or encouragement. Effectiveness of self-regulation that involved with health behaviors needed specific skills. Hence, people should be trained for specific skills on self-regulation by self-observation, judgement process and self-reaction with the details as follows:

#### **1. Self-observation**

Self-observation is an initial important process of self-regulation because individuals should know what happens to themselves then change their behavior. People will use the data for self-diagnosis, goal setting, monitoring and evaluation on actions or behaviors. Individuals should know what should be observed because each

behavior has different noticeable components such as quality, quantity of action or propriety of action etc.

For the initial process, a significant skill is to monitor behavior by observation and recording that is self-monitoring consisting of obvious setting on target behaviors, what kind of behavior, what to notice, when they should be done and recorded, what kind of recorder and instrument used, self-observation and recording. The results of recording behavior should be obviously presented in numbers. Analysis on the recording behaviors would be used for inverse data to compare the behavioral changes. The results from behavioral monitoring promote to realize in self-action and necessary information to set realistic sub-goals that can lead to individual behavioral changes.

## 2. Judgement Process

Judgement process is a continuous process from self-observation. After observing and recording self-behaviors, people will take all information to compare with the model, individual standards, or social norm and use it for judging what they should do with their existing behaviors. The judgement process will not show any behavioral change if the behavior is not worth while. Self-evaluation affects immediate behavioral change. The major skill for this process is goal setting that assists people to know which behaviors are preferable ones, and it can be the criteria to evaluate and compare with previous behaviors.

The characteristics of goal setting are specific and obvious as to what behavior should be performed. There are both short-term and long-term goals because short-term goal will increase encouragement to action more than long-term goal as people reach the short-term goal quicker which increases encouragement to maintain that behavior until achieving the major goal as well as the long-term goal in the future. However, from the habitual behavior, one trial may be insufficient to achieve the goal. Goal setting should be realistic and achievable. It should not be lower or higher than real practical capability. If the first trial fails; modification and reattempt should be performed. Self-goal setting will increase motives of personal locus and promote self-efficacy and self-satisfaction. Goal setting and self-monitoring are significant to the permanent behavioral change process.

### 3. Self-reaction

Self-reaction is the final process in self-regulation mechanism. If people can reach preferable behavior or perform higher than the goal set, they will have positive self-reaction or self-incentives. If they can not achieve, they should have negative self-reaction or self-punishment. However, positive motive will offer positive behavioral change more than punishment. Major skill in this process is to establish the motive by self-incentives because other people may not know what we really want. To practice positive self-reaction; to notice positive feeling e.g. satisfaction, pride, pleasant feeling when reaching the goal; and to do tangible self-incentive are simple and good immediate reinforcement generating the satisfaction that result to maintain those behaviors or improve their behaviors to achieve the long-term goal.

Similarly, the concept of Bandura comprised with self-observation, judgement process and self-reaction. Kanfer (1986) defined self-regulation as the process with definite goal to deautomatize behavior pattern and learn new good behaviors. This process consists of 3 stages as self-monitoring stage, self-evaluation stage and self-reinforcement stage that were emotional and cognitive reactions in the way of satisfaction or dissatisfaction. People supposed to realize that the behavioral problems were under self-control and behavioral intention. Self-monitoring would be Bandura's self-observation and recording. Comparing information would be in judgement process. Self-reinforcement had the details as well as in the stages of self-reaction according Bandura's concept. The details of those two theorists are almost the same.

In summary, details of self-regulation consist of self-observation and self-monitoring of emotions and feelings, and actions. People will evaluate themselves and decide whether to maintain certain behaviors or not and consider what benefits can gained from those behaviors. Then it goes to the judgement for behavioral change by self-goal setting; creative thinking for various methods to achieve the goal; self-reinforcement to increase self-regulation to act either self-incentives, self-complimentary; self-reaction in positive attitude e.g. pride, pleasant effect. In another view, it is the attempt to increase power to resist the incentives that can veer the intention to achieve the goal by stimulus control and win over obstacles. Self-

evaluation helps in achieving a goal (Bandura, 1977, 1986; Kanfer, 1986; Baumeister, 1994; Wood & Pesut, 1981; Massy & Pesut, 1991; Fleury, 1998; Carver & Scheier, 1996).

### **Self-regulation Research in Health**

The research of Schnoll & Zimmerman (2001) about the effectiveness of self-regulation program in diet control, high fiber consumption and the correlation among various factors in self-regulation process by path analysis in total 113 male and female students with mean age as  $23 \pm 6.3$  years supports Bandura's concept. The research result indicated that the subjects with goal setting and self-monitoring had high fiber consumption with the statistic significance ( $p < 0.01$ ). The inferior was the group with only goal setting ( $p < 0.01$ ). The group with only self-monitoring was the group that acknowledged but had no goal or self-monitoring and the controlled group had no result on high fiber consumption. As the analysis on the correlation among factors, goal setting and self-monitoring assisted establishing the behavioral change the most by passing on the increased knowledge and self-efficacy. The record would be a good way to reinforce self-regulation because only knowledge could not yield direct effect to behavioral change. The significance of self-observation, self-monitoring and goal setting induce the application of the knowledge to effectively change the behavior by self-efficacy according to Bandura's concept.

Clark, et al. (1992) applied Bandura's self-regulation to develop a practical program on self-regulation in various fields that were the problems of 246 male and female heart disease patients. They had practiced self-observation, judgement process and self-incentives and then adjusted behaviors to social and environment. The researcher would offer help and supervision by conducting group meetings once a week for 4 sessions. The patients selected their behavioral problems in the second week such as self-regulation about diet control, exercise, stress release etc and then monitored for 2 months. The findings stated that 89 % of the patients set the goal for behavioral control, in which group, 19 % were successful and 76 % were improved but 5 % had no change. At the end of the 4<sup>th</sup> week, patients, 17 % who were successful selected to manage other problems by using the same process as 95 % using self-observation, 81 % using goal setting and 67 % planning to achieve the goal but only 45 % setting self-incentives if the goal achieved. This group achieved the goal more as 21 %

of the goal achieved, 77 % of having improvement and only 3 % of no change. That means even if the patients did not do the perfect process, behavioral change can occur.

Clark, et al. (2000) modified self-regulated exercise program and conducted the study in 570 female elderly patients who had heart disease. They encouraged the subjects on self-regulation by joining the group 2-2.5 hours/week for 4 weeks and monitoring in 4 months and 12 months. The evaluation would be performed for physical functioning, symptom experience and psychosocial status. Details of the program began from educating the knowledge of the disease, exercise, medication administration, appropriate diet consumption, abnormal signs and symptoms, practicing observation and recording daily routine activity including distributing manuals by female staff members who were trained. The patients would receive phone calls once a week for 3 months for encouragement. Then encouragement letters and the records were additionally sent out. The group leader called for encouragement in six months later. The findings showed that in the 4<sup>th</sup> month and the 12<sup>th</sup> month, the experimental group had more weight loss than the controlled group with the statistic level of significance ( $p = 0.004$ ,  $p = 0.02$ ). Severity of discomfort from heart disease was decreased and the numbers of attacks were declined with the statistic level of significance ( $p < 0.05$ ,  $p < 0.01$ ). They could walk in 6 minutes more than the controlled group did with the statistic significance ( $p = 0.008$ ). There was 12-month monitoring, psychosocial function such as social interaction, energetic reaction, depression, perceived social support etc. had no difference. The researcher explained that the research instrument might not be appropriate to evaluate self-confidence. However, this program could reduce discomforts such as fatigue, short of breath, sleep difficulty. A bothersome symptom of exercise was muscular ache. In the first-four months, overall symptoms were better and in 12-month monitoring, all symptoms were fine and the patients could well manage those problems. The program should be performed for 12 months.

Similarly, Rejeski, et al. (2002) studied on the effectiveness of physical activity program for health promotion of 147 male and female heart disease patients age 50-68 years. Both controlled group and experimental group had been educated in rehabilitation center about walking, aerobic exercise and stretch exercise. The controlled group had to exercise at the center around 45-55 minutes/session for 3

days/week and perceived about the risk of the disease. They were instructed to maintain the exercise at home for another 3 months. The experimental group received the introduction on self-regulated exercise. They exercise at the center around 45-55 minutes/session for 2 days/week and did moderate exercise at home for 30 minutes daily on the date of no exercise at the center. Then in the third month, they had to come to the center once a week and did self-regulated exercise at least 3 days/week. They should practice on self-monitoring by using DIGI-Walker to count the numbers of steps; record the frequency of exercise (days/week); use the physical activity record form; and practice on goal setting and solution finding to eliminate failure. Group activity took around 20-25 minutes. The center provided the conclusion from the group meeting about the winning methods after exercising at the center. The experimental group had more exercise quantity than the controlled group and male subjects exercised more than female ones with the statistic significance ( $p < 0.05$ ). The experimental group was able to do better routine activity than the controlled group with the statistic significance ( $p < 0.01$ ). Male experimental subjects had more distance in six-minute walk test than female experimental subjects and the male controlled ones with the statistic significance ( $p < 0.02$ ). However, the satisfaction of both groups was not different.

A similar research in Thai people was the weight control community project of Duangsong (2001). The semi-experimental research involved 200 people age 40-65 years using a modified model of Clark, et al. (1992) for the weight control and physical activity. The first four weeks included self-regulated training for once a week, 2 hours/session by using interacting support among participants. The research team visited once a week for progress monitoring. The research results indicated that the groups, which were overweight, gained more knowledge about obesity, self-observation, decision to control or reduce weight, perceived self-efficacy, self-incentives or self-punishment. They also had better diet consumption and exercise. In addition, body weight, body mass index and lipid density in the experimental group declined with the statistic level of significance ( $p < 0.01$ ). The changes were detected in the 10<sup>th</sup> week and remained until the 20<sup>th</sup> week which was consistent with the study of Clark, et al. (1992).

Therefore, self-control can be achieved when people understand self-problems and earn problem-solving skills. The concept of self-regulated training of Bandura has the apparent principle that can be employed to Thai society for successfully promoting health behaviors.

In a Meta Analysis on physical activity promotion program, the research related to successful health behavioral change program employed the self-regulated technique and effective reinforcement such as social support – group counseling that shared opinions in the group about negative activity, problems and obstacle, and helped each other for the solution. Staff members or friends called to monitor the progress. Close interaction between researcher and patients should be provided (Kahn, et al., 2002; Conn, Valentine, & Cooper, 2002). However, social support should emphasize the development of individual ability more than dependent reinforcement (Bandura, 1997: 416). The support had to be as person's perspective, not order or enforcement.

Similarly, Febraro, and Clum (1998) conducted the Meta Analysis of the research associated with a rehabilitation program for behavioral change using self-regulated concept as well as the basic concept. The sampling group was people who had all kinds of behavioral problems such as smoking, consumption (Obesity), sleep disturbance or depression by evaluating the outcome of various methods in self-regulated process. The findings from 20 research studies presented that a program with self-regulation as the component achieved more effectiveness than others without it with the statistic level of significance ( $d = 0.25$ ,  $P < 0.005$ ). The more self-regulated process is, the more effectiveness of the program will be ( $d = 0.42$ ,  $p < 0.001$ ). Self-regulated process could be effectively applied with various behavioral problems. In comparing the program duration of 1-4 weeks and 5-8 weeks, the success was not different. However, there was only one research involving with a program over 8 weeks that did not conclude any long-term outcome.

In summary, the literature review offers a concept to develop the program for health behavioral change. It consists of education, training on observation skill and behavioral recording. The measurement of encouragement to action can be a guideline to promote cognition on the worth of physical activity. It can be done by inviting people who are successful in self-regulation to pass on the benefits and

perceived experience in the form of video presentations with manuals of exercise instruction (Clark, et al., 2000; Duangsong, 2001). To promote realistic goal setting and implementation plan, the patients are asked to begin with self-action, establish environment or atmosphere for motivating physical activity and offer other alternatives for unchangeable environment (Rejeski, et al., 2002). Encouragement and support from significant people in patient's life emphasize on developing the patient's ability more than promoting dependence (Bandura, 1997). The continuous process of monitoring, recording and evaluation in order to compare the findings with the standard should be performed. Seeking solutions, strategy adaptation, and retrieval after failure should also be provided by having the staff members and the counseling group encourages the patients to achieve the goal of self-health behavioral change (Febraro & Clum, 1998).

## CHAPTER III

### METHODOLOGY

#### Research Design

This is a randomized controlled trial design (Norwood, 2000; Fogg & Gross, 2000; Hudson, Aranda, & McMurray, 2001) to evaluate the effectiveness of self-regulated exercise program. The design is detailed as follows:

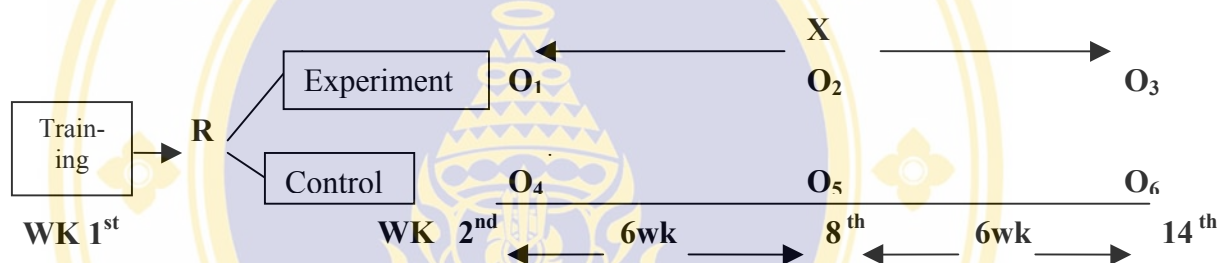


**Figure 2. The research design**

R (Randomization): a random sampling of the patients qualified to include in the experimental group and control group.

Experimental group: patients with basic knowledge about the disease, exercise, diet, stress management, and who have practiced the self-regulated exercise program (X).

Control group : patients with basic knowledge about diet and stress management.

Observe(O) : an evaluation of physical activity, heart rate, blood pressure, total cholesterol, HDL-cholesterol, fibrinogen, 6-minute walk distance and satisfaction with response to physical activity of the experimental and control groups after acquiring basic knowledge about the disease.

O<sub>1</sub>, O<sub>4</sub> : baseline data evaluation

O<sub>2</sub>, O<sub>5</sub> : eighth-week evaluation

O<sub>3</sub>, O<sub>6</sub> : fourteenth-week evaluation at the end of the study

## Population and Sample

**Population of the Study.** The population is comprised of patients diagnosed with TIA and minor stroke who are living in Bangkok and its vicinity and are being treated at the Prasart Neurological Institute.

**Sample of the Study.** The samples are selected by means of the purposive sampling and the inclusion criteria are:

1. Age over 45.
2. Diagnosed with TIA or an ischemic stroke.
3. No cognitive impairment when completing the Thai Mental State Exam, with a minimum mark of 23.
4. Grade 3 and above of limb muscle strength and spasticity does not prohibit exercise.
5. Energy consumption below 1,000 kcal/week
6. Willing to participate in the research.
7. No signs of TIA or ischemic stroke were shown over the past 6 weeks.
8. No systolic blood pressure and diastolic blood pressure over 180 mmHg and 100 mmHg respectively.
9. No fasting blood sugar over 150 mg%
10. No heart attack or chest symptoms presented in the past 6 months.

### Exclusion criteria

1. Complications such as heart attack, chest pain, extremely high blood pressure, joint pain, that prohibit patients from exercise.
2. Exercise time less than 80 % or 10 weeks because of injury or illness.

### Sample size

The sample size is calculated by the formula for analysis of variance as follows (Cohen,1988).

$$n = \frac{n.05}{400 f^2} + 1$$

when n = number of samples

f = effect size index for F-test =  $\frac{1}{2} d$

d = effect size index for F-test of the standard unit mean

when a significant level is at .05 and a statistical power = .80 at f = .05 (from table)

$$\text{Effect size index (d)} = \frac{m_A - m_B}{\sigma}$$

$m_A, m_B$  = population means expressed in raw units

$\sigma$  = standard deviation

$m_A, m_B$  and standard deviation resulted from exercise behavior means, blood pressure, fibrinogen, and cholesterol of similar researches, and it yielded a control group and an experimental group of 31 persons with a statistical power = .80 at  $f = .05$ . The extra five persons (16%) were added into each group in the event of loss. The total sample size was 72 persons.

**Sampling procedures:** a simple random sampling technique was employed via lots drawing. It began by grouping male and female patients who received training and had low exercise ratings. They were then paired according to their Body Mass Index (BMI) ( $\pm 5$  Kg) and age ( $\pm 5$  years). Eighteen pairs of men and women who were most similar were selected and lastly, each of them drew the lots to decide in which group, control or experimental, they would belong. Each group contains 18 men and 18 women. Random sampling procedures are shown in Figure 3.

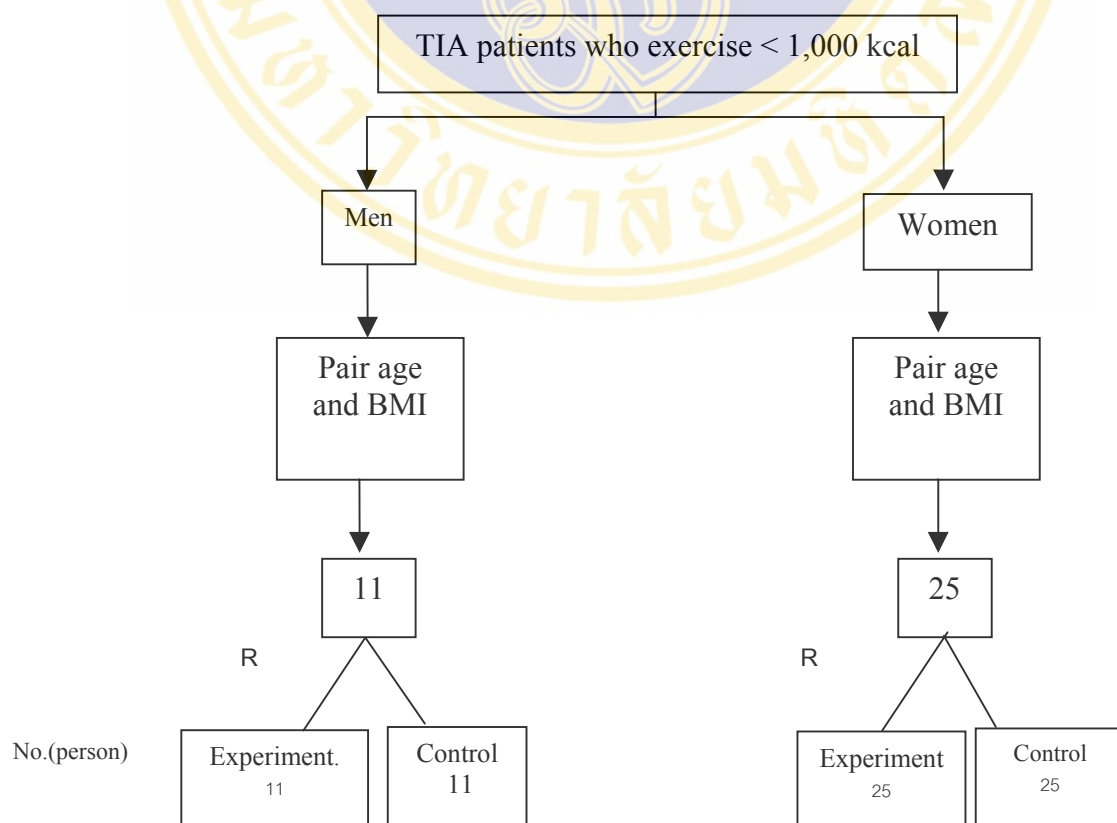


**Figure 3. Stage of sampling**

Random sampling (R): random selection of 11 pairs of male and 25 pairs of female patients with similar age and BMI and assign them into the experimental and control groups

Experimental group : contains 11 male and 25 female patients

Control group : contains 11 male and 25 female patients

**Setting :** the research was conducted at the Prasart Neurological Institute as it is a centre specializing in neuropathy. In 2001, there were 2,892 TIA and minor stroke patients there, of which 1,204 were men and 1,688 were women.

Healthcare services are provided by the neurologist everyday from 8:00 a.m.- 4:00 p.m. at the Outpatients Department. Health counseling services are given by 3 nurses and a physical educationist at the Health Room. Their services include knowledge about the disease, eating, and exercise focusing on leisure-time exercise. No house visits and programs specially designed for TIA or minor stroke patients are available. Most services concern individual counseling depending on patients' interest or physicians' instructions.

**Table 1** Procedures for experimental and control groups

| Period    | Experimental Group                                                                                                                                                                                                   | Control Group       |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Week 1    | 30-min training course on TIA, minor stroke, treatment and diet control<br>30 min of stress confrontation using lectures,<br>information on the direction of the research,<br>data collection of physical activity   |                     |
| Week 2    | Details of research procedures<br>data collection on heart rate, blood pressure, total cholesterol,<br>HDL-cholesterol, fibrinogen, 6-min walk test<br>and satisfaction with response to physical activity           |                     |
|           | 30 min of exercise knowledge by<br>lectures and demonstrations of self-<br>regulated exercise<br>Instruments used are:<br>.self-regulation exercise video<br>.exercise handbook and posters<br>.daily exercise sheet | Practice as advised |
| Week 3    | Self-regulated exercise by patients at<br>home<br>Monitoring patients' practice at their<br>house                                                                                                                    |                     |
| Week 4-7  | House or telephone visits to encourage,<br>evaluate and solve problems together                                                                                                                                      |                     |
| Week 8    | First data collection after the experiment                                                                                                                                                                           |                     |
|           | Patients' self-regulation exercise at<br>home                                                                                                                                                                        | Practice as advised |
| Week 9-13 | House or telephone visits to encourage,<br>evaluate and solve problems together                                                                                                                                      | Practice as advised |
| Week 14   | Second data collection after the experiment                                                                                                                                                                          |                     |

## Instrumentation

There are two types of instruments used in this research: instruments for data collection and experimental instruments.

### 1. Instruments for Data Collection

1.1 Physical Activity Questionnaire is divided into 4 parts: Part 1– Personal data, Part 2 – Occupational activity, Part 3 – Physical activity related to household and home care activities, Part 4 – Physical activities related to recreation, exercise, sports, and pleasure activities (Appendix D). Personal data contains patient records including age, body weight, height, marital status, occupation, other health problems, medical usage, headache, drinking and smoking habit, and history of heart disease or cerebrovascular disease in the family.

Thai physical activity assessment questionnaire designed by Pongurgsorn (2001) is employed in this study. It is based on Ainsworth's (Ainsworth, et al., 1993; 71-80) concept of physical activity. When tested on 887 healthy adults, age 26-50 living in Bangkok and its vicinity, its reliability was .83 while the validity analysis correlated with Computer Science and Application Incorporation (CSA) portable accelerometer of 69 samples showed  $r = .30$  ( $p < .05$ ). The items of questionnaire include daily physical activities such as household tasks, occupational tasks, leisure-time activity, which cover activities, time spent, and frequency of activities in 1 week.

The questionnaire is linguistically adjusted; however, its contents still remain unchanged. Its reliability is tested and retested and the result given was  $r = .88$  ( $p < .01$ ). There are 24 questions. Each answer involves time and frequency of the patient's activities throughout the week will be calculated with body weight for the average energy consumed during the week. Based on the standard criteria, it must be over 1,000 kcal.

For example: walking (3 METs) , 20 minutes/day, 7 days/week, weight 60 Kg.

$$\begin{aligned} &= 3 \times 20/60 \times 7 \times 60 \\ &= 420 \text{ Kcal/week} \end{aligned}$$

1.2 Satisfaction with response to physical activity scale is adapted from Cantril self-anchoring ladder scale (Cantril, 1965 cited in McKeehan, Cowling & Wykle, 1986). Its contents and language are adjusted to be suitable for the physical activity to evaluate overall feeling about health, which are pleasant effect, physical activeness, decreased tension, etc. resulted from physical activity. There is one question in the 10-laddering scale. Scores range from 1 to 10, one for lowest satisfaction and ten for highest satisfaction (Appendix E). The scale test of well-being to physical activity of the normal elderly by Klin-ual (2001) showed the reliability of .83. The test-retest reliability yielded the following result,  $r = .95$  ( $p < .01$ ).

1.3 Opinion about Physical Activity Questionnaire, derived from the literature review, to find out positive and negative views of benefits of physical activity, irregularity, problems, and suggestions. There are 6 open-end questions in the questionnaire (Appendix E).

1.4 Perceived Exertion Scale based on Borg's Rating Scale of Perceived Exertion, of which some adjustments to the text have been made to make it easier to understand, to evaluate exertion during physical activity. Numbers on the scale range from 6 to 20. Six refers to No exertion at all and the level of exertion gradually increases to 20 which means Maximal exertion (Appendix G). The scale correlates with %VO<sub>2</sub>;  $r = 0.76$  to  $0.97$  (Finch, et al., 2002).

1.5 To test cardiorespiratory endurance, the six-minute walk test distance along the rectangular tapes is employed. At every one-meter, the tapes are marked and total distance is 30 meters. Distance is measured by tape and walking time by a timer.

1.6 Omron HEM-907 sphygmomanometer to check blood pressure and heart rate.

1.7 Blood sample collecting tools are syringe, needle no. 21, tourniquet, blood tube, alcohol, clean cotton, plaster, gloves, and cool container.

1.8 Cholesterol analysis instruments are Dimension RxL, Dade Behring.

1.9 Fibrinogen analysis instrument is Sysmex CA500.

## **Validity and Reliability of Measurement**

### **Instrument Validity**

The Physical Activity Questionnaire is verified by 5 experts, Satisfaction with Response to Physical Activity Scale and Opinion about Physical Activity Questionnaire by 3 experts. Their content validity was inspected and suggestions were made. Linguistic changes were made to them before being tested on 5 samples to assure their understanding of the contents. Other device tools have been calibrated and inspected by the manufacturers before every application.

### **Instrument Reliability**

The questionnaires and scale test were tried out on 20 TIA and minor stroke patients at Somdej Prapinklao Hospital. Then, the reliability of their steadiness is tested by means of the test-retest method.

## **2. Experimental Instruments**

They consist of basic knowledge training about TIA and minor stroke and how to behave, self-regulated exercise program, exercise manual, daily exercise sheet, and self-regulation practice to the exercise video. Details are shown below.

### **2.1 Training course about TIA and Minor Stroke**

The experimental group is educated by the researcher in TIA and minor stroke, irregular signs that require physician consultation, risk factors for stroke, its care and treatment, health guides, such as weight control and a diet, to reduce risk factors, stress management, and exercise for TIA and minor stroke patients (Appendix A) to help them understand, perceive the value and practice. These training take 1.5 hrs.

The control group is educated by the researcher in TIA and minor stroke to look for irregular signs that require physician consultation, risk factors for stroke, its care and treatment, health guides, such as weight control and a diet, to reduce risk factors, and stress management for 1 hr. This session serve as a fundamental knowledge for patients.

## **2.2 Self-regulated Exercise Program**

This program is developed based on a study of textbooks and related works. Pender's Model of Health Promotion (Pender,1996) is integrated with the new concept of exercise (Shephard, 2001, Ainsworth, et al., 2000) and Bandura's Self-regulation Concept (Bandura,1977). There are four parts in this program. Part 1: Preparation of Basic Knowledge, Part 2: Self-regulation Training, Part 3: Application, and Part 4: Follow-up (Appendix B). During the self-regulation training process, patients will be shown a video about self-regulation training to give them an overview of how they should behave to become more motivated. They also receive an exercise manual to assist them at home and a daily exercise sheet.

2.2.1 Exercise poster and manuals were derive from a study of textbooks and related works. The manuals present the moderate level of physical activity (3-6 METs) commonly found in household tasks, occupational tasks, leisure-time activity, recreation, and sports to increase cardiorespiratory endurance. They also recommend exercise and physical activities to strengthen muscles, increase activation and mobility of joints (Appendix C). The poster showed pictures of exercise and its precautions, and they are to be visibly attached for convenience.

2.2.2 The Daily exercise sheet is designed based on types of activity selected from the exercise manual by each patient. It is in the one-week tabular form including types of exercise selected, duration, frequency, exercise time, and a remark column. The Daily exercise sheet is recorded by the patients (Appendix H) and serves as their home practice goal and also serves as a reminding technique.

### **Quality Inspection of Instruments**

The contents of the self-regulated exercise program, exercise manuals and postures, and daily exercise sheet were verified by 3 medical and nursing experts before being tried out on 5 patients to assess each processing step of the program. Recommendations of the group are revised for further implementation.

2.2.3 Self-regulated training video tape, a video player, and a 16" television are utilized. The purpose is to show TIA models that have successfully carried out this training and are willing to appear in the video. The scripts contain the models' persuasion to exercise through self-regulation process in which they tell the audiences of their experiences. The main points are self-observation, setting exercise

goals, how to self-reward when goals are achieved, as well as regular evaluation of the progress.

The contents of the video scripts (Appendix H) were verified by 3 medical and nursing experts as well as 2 video producers from medical Education Technology Center, Faculty of Medicine, Siriraj Hospital (Appendix I). Video recording, editing, sound recording are done by audio-visual experts at this center before having them reexamined by the same group of experts. Some revisions are made to the video before testing its efficiency on 5 samples. Suggestions and remarks are accepted for final adjustment of the video prior to the real application.

### **Procedures for Experimental Exercise Program**

#### **First week** – beginning of Part I of the program

It is training course on stroke and TIA, its treatment, diet, and stress management as basic knowledge for patients.

#### **Second week** – beginning of Part II

It is a demonstrational lecture about exercise (Appendix A) and training to self-regulate. Patients are separated into 3 groups, 12 persons each, and are scheduled to come at different times: the first group on Thursday from 9.00-12.00 a.m., the second group on Friday, 9.00-12.00 a.m., and the third group on the same day at 13.00-16.00 p.m. Presentation media are PowerPoint and a self-regulation video containing successful models of physical activity. Patients are instructed to follow to the manuals and posters provided together with some advice. In addition, they are trained to fill in their daily exercise sheet and give feedback data. The first data sheet contains only a table with no details of activity since the activity is to be chosen by patients who have to fill it in at home. Copy of this sheet is made for a follow-up purpose.

#### **Third week** – development of self-regulation in daily life

Appointments with patients are scheduled at their home to examine their home practices to make the exercise and self-regulation go as planned. At the same time, problems can be monitored for early solutions together and additional advices

are given in case of any queries. The researcher talks to their relatives about how the patients should behave and asks for their support and help with observation and recording their behavior. They are also asked to compliment, facilitate, provide patients with moral support, and encourage them to exercise regularly. Patients will be admired and cheered up for their attempt to practice the program while relatives are praised as well. Each house visit takes approximately 1-1.30 hrs.

**Fourth to seventh week** – weekly subsequent monitoring and reinforcement of results obtained for regular exercise of patients

This process will continue from fourth week to thirteenth week. Evaluation takes place over the phone or at house in case the phone is not available, using data from the daily exercise sheet compared with pre-defined goals. Those who have reached their goals will be complimented and encouraged. They are inquired about their opinions about exercise, their self-reward, and changes in their health to motivate them to continue their exercise determinedly. For those who have not, their problems are identified, their techniques adjusted and they will be encouraged to find the solutions to their problems together. They are also urged to try again and have their goals readjusted and to look for a way to prevent possible failures.

A house visit is reserved for those who fail to exercise as planned to increase their self-regulation skill and revise the details of exercise program. Everyone involved; researcher, patient, relatives, work together to solve their problems or provide something the patients might need. Goals are readjusted to help patients maintain their confidence and self-esteem. They are admired for achieving the short-term goal. Energy consumption is calculated to show the increase in their progress. They are informed of the next appointment for evaluation at which they are advised how to prepare themselves for the laboratory blood test. Also, for those who succeed, a follow-up visit and encouragement are given over the phone.

**Eight week** – first evaluation of the program's effectiveness

Patients are scheduled to come to the Prasart Neurological Institute, on the first day of the week from 8.00-12.00 a.m. in which their physical activity, physical

fitness, and psychological well-being are evaluated and blood samples are collected by the research assistant.

Patients are shown the results reflecting their first success. Exercise time is extended or the number of activities is increased. They will be encouraged to continue the exercise. Some who fail are urged to revise their technique and try again with help and suggestions from those who succeed. Fellow patients are invited to provide them with moral support and monitor their progress by phone. Patients will be visited in the next day to improve their self-regulation skills and boost their confidence for self-control every week until they can meet with the standard given. This session takes approximately 1-2 hrs.

#### **Ninth to thirteenth week – monitoring process**

The assessment of the exercise is made by phone or through a house visit in case the telephone is not available. Activities of the third to seventh evaluation are repeated for 10-20 minutes. Benefits of self-regulation exercise are summarized.

#### **Fourteenth week – evaluation of the results of the program**

Patients come to the Prasop Ratanakorn Room, Prasart Neurological Institute, at 8.00-12.00 a.m. for a final evaluation of the program's effectiveness. Activities of the first evaluation in the eight week are repeated for 3-4 hrs. Special thanks are given to the samples for their cooperation before the research is concluded.

### **Research Assistant Preparation**

There are 2 types of research assistants.

1. Experimental process: 2 clinical nurses with master degree in nursing who have been trained to give advice about the calculation of energy consumption in the exercise to the samples, pay a home visit to patients, and provide advice by phone.

2. Data collection: 3 clinical nurses with master degree in nursing who have been trained to collect data with a physical activity questionnaire, satisfaction with response to physical activity scale, opinions about exercise, and 6-minute walk test. They have had a trial practice with the researcher before a real practice upon exercising the program.

The interrater reliability of the 6-minute walk test between the researcher and research assistants yielded 100 percent reliability.

## Data Collection

The recommendation letter from the Faculty of Nursing Sciences, Mahidol University, was submitted to the Prasart Neurological Institute for their permission to conduct the research regarding the following information:

1. Meeting with chief of Information Technology and Academic Support Division and chief of Records Division to inform them of the research project and data collection of TIA and minor stroke outpatients being treated there. Once the list of patients, aged 45-47 and reside in Bangkok and its vicinity, has been compiled from the computer database. Patients contact address whose qualifications match the sampling group criteria are searched and written down.

2. Giving them a call to inquire about their physical activity and the condition of their disease according to the selection criteria of the samples. They are also informed of the research and those who have lower-than-standard physical activity are invited to participate in the introductory course on TIA and minor stroke and stress management. Training brochures are sent by mail to those interested in the project.

3. Describing the details of the research project followed by training course on TIA and minor stroke and health guide. The rights of all participants in the research are declared. Physical activity questionnaires are distributed along with the assessment of health condition by weight scale, height measurement to assess the body mass index, pulse, blood pressure test to record in the physical data sheet given. Patients are informed that their names will be drawn and that they will be contacted later. Patients of similar characteristics as specified in the criteria are paired and randomly selected into the control and experimental groups. There are a total of 36 persons each.

4. Telephoning patients to prepare and inform them before the research starts. As part of the data collection, each group is notified to bring sneakers and exercise outfits used for the walk test, to refrain from eating after midnight of the appointment date for laboratory blood collection, and etc.

5. Data collection of the samples before the experiment for 2 consecutive days from 8.00 - 12.00 a.m. at Prasop Ratanakorn Room, Outpatients Unit, Prasart

Neurological Institute. The first day is set aside for data collection of the experimental group and the second day for the control group.

In the next 2-3 days, patients are scheduled to participate in the self-regulated exercise training. The control group is advised to behave according to what they have learned. The two groups are scheduled to come again in the eight and fourteenth week for post-data collection.

Data collection includes heart rate and blood pressure at rest, total cholesterol, HDL-cholesterol, fibrinogen, satisfaction with response to physical activity, opinion about physical activity, and 6-minute walk test distance.

**Table 2** Data collection

| Week | Monday                                                                      | Tuesday                                                                | Wednesday                                                           | Thursday                              | Friday                           |
|------|-----------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------|----------------------------------|
| 1    |                                                                             |                                                                        | Training course and assessment of exercise behavior of the 2 groups |                                       |                                  |
| 2    | Explanation of research & data collection procedures for experimental group | Explanation of research & data collection procedures for control group |                                                                     |                                       |                                  |
| 8    | Data collection of experimental group                                       | Data collection of control group                                       |                                                                     |                                       |                                  |
| 14   |                                                                             |                                                                        |                                                                     | Data collection of experimental group | Data collection of control group |

5.1 Upon arrival, patients are recommended to sit comfortably in a quiet place for 5 minutes and have their pulse and blood pressure at rest checked.

5.2 Blood samples are taken by 3 nurses before patients are allowed to eat breakfast.

5.3 Cardiorespiratory endurance of the patients is tested by the research assistants who will ask the patients about their perceived exertion before the

6-minute walk test, check their heart rate and post-exertion again and fill in the walk test record (Appendix F). Total time spent is about 8-10 minutes.

6. After the first data collection, the experimental group receives additional training on exercise and self-regulation. Monitoring is performed at home and over the phone. The control group is advised to behave in accordance with what they have been trained to do except self-regulated exercise. The patients, then, are scheduled to come for the next evaluation.

7. In the eight and fourteenth week, exercise behavior of the sampling and other data are collected.

8. Further analysis of data according to the statistical methods defined.

### **Controlling the Threats to Internal Validity**

In this case, the selection bias is controlled by pairing patients who are similar in average age, average body mass index, and exercise behavior of the sampling before randomly selecting them to the control group and experimental group. These 2 groups have been pre-tested and no different exercise behaviors are found. By doing this, positive changes among the experimental group, compared with the control group, can be obtained from the exercise program and not from natural positive changes to the mean. This has been done in order to avoid statistical regression.

Interaction to selection process is controlled by informing the patients that they are included in the research project. The two groups do not meet to keep them from knowing to which group they belong since they might be overwhelmed with determination or disappointment once they are excluded from the new concept physical activity. Moreover, the same intention to treat strategy (Fogg & Gross, 2000) is given to the control group by the researcher and assistants from the beginning to avoid such interaction.

Post-intervention data is collected by the research assistants who do not know which group the patients belong to in order to avoid biases.

Long-term monitoring may affect the mortality number of sampling who represent the population as well as the statistical significance. The number of sampling is, therefore, added for contingencies based on those of the pilot study or similar

studies (Hudson, Aranda, & McMurry, 2001). In this study, its calculation is based upon the research work on exercise program among Thai elderly to which another 16 percent is added. Additionally, the control group is given the intention to treat strategy from the beginning to reduce mortality of the sampling. Instrumentation of this study is valid and has not been changed throughout the entire study.

### **Protection of Human Subject**

The letter was submitted to the Nursing Review Committee and the Human Research Board of Health Department stating objectives and details of the study and the protection of human subject for permission to perform data collection on treatment records of TIA AND minoe stroke patients at the Prasart Neurological Institute as an approval for the research.

The sampling is informed of the objectives of this study and that it depends on their willingness to participate. The study is only possible once the consent form has been signed. Knowledge and behavior guide about the physical activity provided is safe and useful. Data will be kept confidential. Furthermore, the patients are free to discontinue with the research before it ends. The control group receives the same training course on exercise as the experiment group when the program is completed to protect all of the patients' right to equal education.

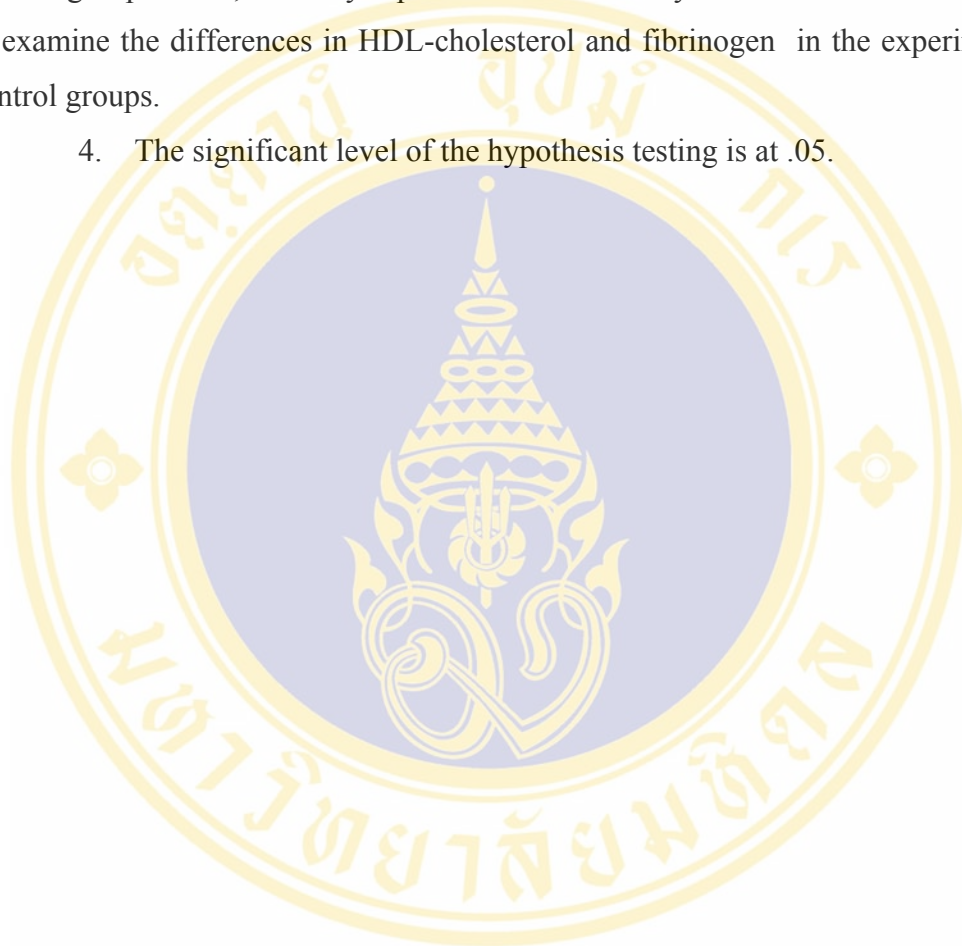
### **Data Analysis**

Analysis of research data is carried out by the SPSS for Window version 12.0 for Windows with the following statistics.

1. Descriptive statistics describe demographic data i.e. age, sex, educational level in percentage, mean, and standard deviation.
2. Chi-square test and Independent t-tests are used to examine the difference in demographic data characteristic related to health status, 6-minute walk distance, heart rate, blood pressure, total cholesterol, HDL-cholesterol, fibrinogen, and satisfaction with response to physical activity which are the baseline values of the experiment and control groups.

3. A Two- way analysis of variance with repeated measures on one factor is used to examine the difference in 6-minute walk distance, heart rate, blood pressure, total cholesterol, HDL-cholesterol, fibrinogen, and satisfaction with response to physical activity which are the baseline, 6<sup>th</sup> week , and 12<sup>th</sup> week values of the experiment and control groups. Also, one-way repeated measures analysis of variance was conducted to examine the differences in HDL-cholesterol and fibrinogen in the experiment and control groups.

4. The significant level of the hypothesis testing is at .05.



## CHAPTER IV

### RESULTS

The research results are presented into 2 sections. The first section includes characteristics of the sampling group and the second section reports on the efficacy of self-regulated exercise program.

#### 1. Characteristics of the Sampling Group

The sampling group in the research consists of 72 subjects (36 subjects in the experimental group and 36 subjects in the control group). Five and three subjects of the experimental group and the controlled group are dropped out respectively, so another two subjects in the control group were eliminated for equaling sampling groups. Therefore, the total sampling group is 62 subjects with 31 subjects in each group.

##### Dropouts from the study

There were 5 dropout patients in experimental group. One patient had a sudden meeting. One female patient injured leg from a wooden stick after participating for 1-2 months of the experiment. Another one had cracked ribs due to Thai traditional massage. One patient had a chronic common cold with vomiting. One male patient had an abdominal abscess, diarrhea, and back pain. Those 4 patients did not exercise for 3-4 weeks and, therefore, were excluded from the research according to the exclusion criteria. Three control subjects dropped out because of sudden personal business. After excluding two more subjects from the control group with the purpose of making the experimental and controlled groups even, the control group lost a total of 5 subjects (13.89%).

##### 1.1 Demographic characteristics of the samples

In the experimental and control groups, there are 11 male and 23 female patients with similar mean age, marital status, occupation, education, religion, and income. After an experiment to define the different characteristics, there were no

statistically significant differences between the experimental group and the control group (table 3)

**Table 3** Demographic characteristics of the samples

| Demographics             | Experimental group   |       | Control group        |       | Total                |       | $\chi^2$          | t                 |
|--------------------------|----------------------|-------|----------------------|-------|----------------------|-------|-------------------|-------------------|
|                          | n                    | %     | n                    | %     | N                    | %     |                   |                   |
| Sex                      |                      |       |                      |       |                      |       |                   |                   |
| Male                     | 10                   | 32.26 | 10                   | 32.26 | 20                   | 32.26 | .00 <sup>NS</sup> |                   |
| Female                   | 21                   | 67.74 | 21                   | 67.74 | 42                   | 67.74 |                   |                   |
| Age(years)               |                      |       |                      |       |                      |       |                   |                   |
| <50                      | 2                    | 6.45  | 1                    | 3.23  | 3                    | 4.84  | .51 <sup>NS</sup> |                   |
| 50-59                    | 8                    | 25.81 | 9                    | 29.03 | 17                   | 27.42 |                   |                   |
| 60-69                    | 15                   | 48.39 | 14                   | 45.16 | 29                   | 46.77 |                   |                   |
| 70-79                    | 6                    | 19.35 | 7                    | 22.58 | 13                   | 20.97 |                   |                   |
| Average age(years)       | Mean=62.83 (SD=7.41) |       | Mean=63.18 (SD=7.13) |       | Mean=63.08 (SD=7.27) |       |                   | -.4 <sup>NS</sup> |
| Marital status           |                      |       |                      |       |                      |       |                   |                   |
| Single                   | 4                    | 12.9  | 3                    | 9.7   | 7                    | 11.3  | .42 <sup>NS</sup> |                   |
| Couple                   | 20                   | 64.5  | 19                   | 61.3  | 39                   | 62.9  |                   |                   |
| Widowed                  |                      |       |                      |       |                      |       |                   |                   |
| Divorced or separated    | 7                    | 22.6  | 9                    | 29.0  | 16                   | 25.8  |                   |                   |
| Occupation with exertion |                      |       |                      |       |                      |       |                   |                   |
| light                    | 3                    | 9.7   | 7                    | 22.6  | 10                   | 16.1  | 2.8 <sup>NS</sup> |                   |
| Moderate                 | 6                    | 19.4  | 5                    | 16.1  | 11                   | 17.7  |                   |                   |
| Vigorous                 | 1                    | 3.2   | -                    | -     | 1                    | 1.6   |                   |                   |
| House wife               | 15                   | 48.4  | 14                   | 45.2  | 29                   | 46.8  |                   |                   |
| Pension                  | 6                    | 19.4  | 5                    | 16.1  | 11                   | 17.7  |                   |                   |
| Educational level        |                      |       |                      |       |                      |       |                   |                   |
| Elementary               | 20                   | 64.5  | 13                   | 41.9  | 33                   | 53.2  | 5.2 <sup>NS</sup> |                   |
| High school              | 4                    | 12.9  | 9                    | 29    | 13                   | 21.0  |                   |                   |
| Vocational/ College      | 5                    | 16.1  | 4                    | 12.9  | 9                    | 14.5  |                   |                   |
| Bachelor degree          | 2                    | 6.5   | 4                    | 12.9  | 6                    | 9.7   |                   |                   |
| Master degree and above  | 0                    | 3.2   | 1                    | 3.2   | 1                    | 1.6   |                   |                   |
| Religion                 |                      |       |                      |       |                      |       |                   |                   |
| Buddhist                 | 31                   | 100   | 29                   | 93.5  | 60                   | 96.8  | 2.1 <sup>NS</sup> |                   |
| Christian                | -                    |       | 1                    | 3.2   | 1                    | 1.6   |                   |                   |
| Muslim                   | -                    |       | 1                    | 3.2   | 1                    | 1.6   |                   |                   |
| Income (Baht)            |                      |       |                      |       |                      |       |                   |                   |
| <5,000                   | 21                   | 67.74 | 18                   | 58.06 | 39                   | 62.9  | 4.0 <sup>NS</sup> |                   |
| 5,001-10,000             | 6                    | 19.35 | 4                    | 12.90 | 10                   | 16.13 |                   |                   |
| 10,001-15,000            | 2                    | 6.45  | 3                    | 9.68  | 5                    | 8.06  |                   |                   |
| 15,001-20,000            | 2                    | 6.45  | 3                    | 9.68  | 5                    | 8.06  |                   |                   |
| >20,000                  | 0                    | 0     | 3                    | 9.68  | 3                    | 4.84  |                   |                   |

NS = Nonsignificant

## 1.2 Characteristics related to health status

Both experimental and control groups had no differences in daily moderate physical activity, energy expenditure, health problems, or health behaviors. The Chi-square and Independent t-test showed no difference between the experimental and control groups (Table 4).

In summary, the experimental group and the control group had no statistically significant differences in demographic characteristics and characteristics related to health status. These results indicated that experimental and control groups had homogeneity in demographic characteristics and characteristics related to health status.

**Table 4** Characteristics related to health status

| Demographics                  | Experimental group      |      | Control group           |      | Total                  |      | $\chi^2$          | t |
|-------------------------------|-------------------------|------|-------------------------|------|------------------------|------|-------------------|---|
|                               | n                       | %    | n                       | %    | n                      | %    |                   |   |
| Physical activity             |                         |      |                         |      |                        |      |                   |   |
| good                          | 1                       | 3.2  | 1                       | 3.2  | 2                      | 3.2  | .61 <sup>NS</sup> |   |
| average                       | 12                      | 38.7 | 15                      | 48.4 | 27                     | 43.5 |                   |   |
| poor                          | 18                      | 58.1 | 15                      | 48.4 | 33                     | 53.2 |                   |   |
| Average energy Expenditure/wk | Mean=633.23 (SD=228.91) |      | Mean=633.99 (SD=273.32) |      | Mean=635.11(SD=250.03) |      | .06 <sup>NS</sup> |   |
| Other health problems*        |                         |      |                         |      |                        |      |                   |   |
| Hypertension                  | 21                      | 36.2 | 21                      | 36.2 | 42                     | 36.2 | 5.6 <sup>NS</sup> |   |
| Hyperlipidemia                | 23                      | 39.7 | 23                      | 39.7 | 46                     | 39.7 |                   |   |
| Diabetes                      | 6                       | 10.3 | 8                       | 13.8 | 14                     | 12.1 |                   |   |
| Heart disease                 | 2                       | 3.4  | 1                       | 1.7  | 3                      | 2.6  |                   |   |
| Bone & joint pain             | 3                       | 5.2  | 3                       | 5.2  | 6                      | 5.2  |                   |   |
| Renal disease                 | -                       | -    | 1                       | 1.7  | 1                      | 9    |                   |   |
| Liver disease                 | 1                       | 1.7  | -                       | -    | 1                      | 9    |                   |   |
| Thyroid disease               | 1                       | 1.7  | -                       | -    | 1                      | 9    |                   |   |
| Cataract                      | 1                       | 1.7  | -                       | -    | 1                      | 9    |                   |   |
| Polycythemia                  | -                       | -    | 1                       | 1.7  | 1                      | 9    |                   |   |
| Current medical usage         |                         |      |                         |      |                        |      |                   |   |
| Yes                           | 31                      | 100  | 31                      | 100  | 31                     | 100  | .00 <sup>NS</sup> |   |

**Table 4** Characteristics related to health status (continued)

| Demographics                               | Experimental group    |      | Control group         |      | Total                 |      | $\chi^2$          | t                  |
|--------------------------------------------|-----------------------|------|-----------------------|------|-----------------------|------|-------------------|--------------------|
|                                            | n                     | %    | n                     |      |                       | %    |                   |                    |
| Headache                                   |                       |      |                       |      |                       |      |                   |                    |
| No                                         | 7                     | 22.6 | 9                     | 29   | 16                    | 25.1 | 2.4 <sup>NS</sup> |                    |
| Occasionally                               | 18                    | 58.1 | 20                    | 64.5 | 38                    | 62.3 |                   |                    |
| > 1 time/wk                                | 6                     | 19.4 | 2                     | 6.5  | 8                     | 12.9 |                   |                    |
| History of heart disease or CVD* in family |                       |      |                       |      |                       |      |                   |                    |
| No                                         | 17                    | 54.8 | 18                    | 58.1 | 35                    | 56.5 | 2.1 <sup>NS</sup> |                    |
| Yes                                        | 12                    | 38.7 | 13                    | 41.9 | 25                    | 40.3 |                   |                    |
| Do not know                                | 2                     | 6.5  | -                     | -    | 2                     | 3.2  |                   |                    |
| Alcohol consumption                        |                       |      |                       |      |                       |      |                   |                    |
| No                                         | 31                    | 100  | 30                    | 96.8 | 1                     | 98.4 | 1.1 <sup>NS</sup> |                    |
| Yes                                        | -                     | -    | 1                     | 3.2  | 1                     | 1.6  |                   |                    |
| Cigarette smoking                          |                       |      |                       |      |                       |      |                   |                    |
| No                                         | 30                    | 96.8 | 30                    | 96.8 | 60                    | 96.8 | 0 <sup>NS</sup>   |                    |
| Yes                                        | 1                     | 3.2  | 1                     | 3.2  | 2                     | 3.2  |                   |                    |
| BMI                                        | mean =26.94 (SD=4.48) |      | mean =26.11 (SD=3.62) |      | mean =26.53 (SD=4.05) |      |                   | .81 <sup>NS</sup>  |
| Baseline TMSE*                             | mean =28.90 (SD=1.19) |      | mean =29.26 (SD=1.09) |      | mean =29.08 (SD=1.14) |      |                   | -1.2 <sup>NS</sup> |

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

CVD\* = Cerebrovascular Disease

TMS\* = Thai Mental State Exam

## 2. Effectiveness of the Self-regulated Exercise Program

### 2.1 Comparison of study variables between the experimental and control groups

#### 2.1.1 Comparison of study variables between the experimental and control groups before the program

Means of 6-minute distance, heart rate, blood pressure, total cholesterol, HDL- cholesterol and fibrinogen, and satisfaction with response to physical activity of both experimental and control groups in the pre-experiment were close. The differences of those means from both groups were determined by independent t-test. The 6-minute walk test distance of the experimental group was farther than the control

group with the statistic level of significance ( $p < .05$ ). The remaining variables had no difference. It is concluded that most of them had homogeneity in the study variables.

#### 2.1.2 Comparison of study variables between the experimental and control groups during the different time points

The experimental group increased the mean of their 6-minute walk distance after the trial more than before and higher than the score of the control group with a statistical significance ( $p < .01$ ,  $p < .05$ ).

Resting heart rate, systolic and diastolic pressure of the experimental group after the trial were reduced with a statistical significance ( $p < .05$ ). However, differences in mean scores of the experimental and control groups were not found.

Mean scores of satisfaction with response to physical activity from the experimental group was higher than before and higher than the score of the control group with a statistical significance ( $p < .01$ ,  $p < .05$ ).

There were no differences on total cholesterol, HDL-cholesterol and fibrinogen of both the experimental and control groups (Table 5).

**Table 5** Comparison of study variables between the experimental and control groups during the different time points

| Variables                                              | F     | p-value |
|--------------------------------------------------------|-------|---------|
| <b>6-minute walk distance</b>                          |       |         |
| During the different time points                       | 17.49 | .00     |
| Between groups                                         | 9.43  | .003    |
| <b>Heart rate</b>                                      |       |         |
| During the different time points                       | 3.78  | .026    |
| Between groups                                         | .76   | .39     |
| <b>Satisfaction with response to physical activity</b> |       |         |
| During the different time points                       | 62.67 | .00     |
| Between groups                                         | 5.86  | .02     |
| <b>Systolic blood pressure</b>                         |       |         |
| During the different time points                       | 3.54  | .03     |
| Between groups                                         | .70   | .41     |
| <b>Diastolic blood pressure</b>                        |       |         |
| During the different time points                       | 3.67  | .028    |
| Between groups                                         | .79   | .378    |
| <b>Total cholesterol</b>                               |       |         |
| During the different time points                       | .01   | .99     |
| Between groups                                         | .21   | .65     |
| <b>HDL- cholesterol</b>                                |       |         |
| During the different time points                       | .39   | .68     |
| Between groups                                         | .54   | .47     |
| <b>Fibrinogen</b>                                      |       |         |
| During the different time points                       | .45   | .64     |
| Between groups                                         | 2.8   | .10     |

## 2.2 Comparison of 6-minute walk distance between the experimental and control groups in each time point

### 2.2.1 Comparison of 6-minute walk distance between the experimental and control groups during the different time points by two-way repeated measure analysis of variance.

The results indicated that the direct effect of the treatment and time were significant ( $p < .01$ ;  $p < .001$ ) respectively, but the interaction effect of treatment by time was not found (Table 6).

**Table 6** Comparison of 6-minute walk distance between the experimental and control groups during the different time points

| Source of variation | SS         | df  | MS        | F     | p-value |
|---------------------|------------|-----|-----------|-------|---------|
| Between groups      |            |     |           |       |         |
| Treatment           | 177302.78  | 1   | 177302.78 | 9.43  | .003    |
| Error               | 1128241.40 | 60  | 18804.02  |       |         |
| Within subjects     |            |     |           |       |         |
| Time                | 33631.33   | 2   | 16815.67  | 17.49 | .00     |
| Treatment by time   | 3884.47    | 2   | 1942.35   | 2.02  | .14     |
| Error               | 115351     | 120 | 961.26    |       |         |

### 2.2.2 Comparison of 6-minute walk distance mean scores between different time points.

When comparing mean scores of 6-minute walk distance between different time points (Table 7), it was found that there were two pairs of significant differences in mean scores at level .01. The mean scores of the 6<sup>th</sup> week and 12<sup>th</sup> week were higher than that of the baseline at .01 level, but the mean scores of the 6<sup>th</sup> week were not significantly different from the 12<sup>th</sup> week.

**Table 7** Six-minute walk distance mean scores between different time points

| Time                  | Mean   | SD    | Baseline | 6 <sup>th</sup> week | 12 <sup>th</sup> week |
|-----------------------|--------|-------|----------|----------------------|-----------------------|
| Baseline              | 366.79 | 89.34 | -        | 22.69*               | 32.02*                |
| 6 <sup>th</sup> week  | 389.49 | 83.76 |          | -                    | 9.33                  |
| 12 <sup>th</sup> week | 398.81 | 91.43 |          |                      | -                     |

\* $p < .05$

## 2.3 Comparison of heart rate between the experimental and control groups in each time point

### 2.3.1 Comparison of heart rate between the experimental and control groups during the different time points by repeated measure analysis of variance.

The results revealed that the direct effect of the time was significant ( $p < .05$ ) but the direct effect of the treatment, and the interaction effect of treatment by time were not found (Table 8).

**Table 8** Comparison of heart rate between the experimental and control groups during the different time points

| Source of variation | SS       | df  | MS     | F    | p-value |
|---------------------|----------|-----|--------|------|---------|
| Between groups      |          |     |        |      |         |
| Treatment           | 217.21   | 1   | 217.21 | .76  | .39     |
| Error               | 17101.96 | 60  | 285.03 |      |         |
| Within subjects     |          |     |        |      |         |
| Time                | 278.24   | 2   | 139.19 | 3.78 | .026    |
| Treatment by time   | 93.03    | 2   | 46.52  | 1.26 | .29     |
| Error               | 4417.40  | 120 | 36.81  |      |         |

### 2.3.2 Comparison of heart rate mean scores between different time points

When comparing mean scores of heart rate between difference time points (Table 9), there was only one pair of significant differences in the mean scores. The mean scores at the 12<sup>th</sup> week were higher than that of the baseline and the 6<sup>th</sup> week at level .05.

**Table 9** Heart rate mean scores between different time points

| Time                  | Mean  | SD    | Baseline | 6 <sup>th</sup> week | 12 <sup>th</sup> week |
|-----------------------|-------|-------|----------|----------------------|-----------------------|
| Baseline              | 72.53 | 11.41 | -        | -1.13                | -2.97*                |
| 6 <sup>th</sup> week  | 71.40 | 11.37 |          | -                    | -1.84                 |
| 12 <sup>th</sup> week | 69.57 | 9.92  |          |                      | -                     |

\* $p < .05$

## 2.4 Comparison of systolic blood pressure between the experimental and control groups in each time point

### 2.4.1 Comparison of systolic blood pressure between the experimental and control groups during the different time points by repeated measure analysis of variance

The results stated that the direct effect of the time was significant ( $p < .05$ ), but the direct effect of the treatment and the interaction effects of treatment by time were not found (Table 10).

**Table 10** Comparison of systolic blood pressure between the experimental and control groups during the different time points

| Source of variation | SS       | df  | MS     | F    | p-value |
|---------------------|----------|-----|--------|------|---------|
| Between groups      |          |     |        |      |         |
| Treatment           | 547.10   | 1   | 547.10 | .70  | .41     |
| Error               | 47139.63 | 60  | 785.66 |      |         |
| Within subjects     |          |     |        |      |         |
| Time                | 951.95   | 2   | 475.97 | 3.54 | .03     |
| Treatment by time   | 20.85    | 2   | 10.43  | .08  | .93     |
| Error               | 16117.20 | 120 | 134.31 |      |         |

### 2.4.2 Comparison of systolic blood pressure mean scores between different time points

When comparing mean scores of systolic blood pressure between different time points (Table 11), there were two pairs of significant differences in mean scores. The mean scores at the 12<sup>th</sup> week were higher than that of the baseline and 6<sup>th</sup> week at level .05. However, the mean scores at the baseline and the 6<sup>th</sup> week were not different.

**Table 11** Systolic blood pressure mean scores between different time points

| Time                  | Mean   | SD    | Baseline | 6 <sup>th</sup> week | 12 <sup>th</sup> week |
|-----------------------|--------|-------|----------|----------------------|-----------------------|
| Baseline              | 144.81 | 18.25 | -        | -1.07                | -5.24*                |
| 6 <sup>th</sup> week  | 143.74 | 17.83 |          | -                    | -4.18*                |
| 12 <sup>th</sup> week | 139.57 | 19.88 |          |                      | -                     |

\* $p < .05$

## 2.5 Comparison of diastolic blood pressure between the experimental and control groups in each time point

### 2.5.1 Comparison of diastolic blood pressure between the experimental and control groups during the different time points by repeated measure analysis of variance

The results indicated that the direct effect of the time was significant ( $p < .05$ ), but the direct effect of the treatment and the interaction effects of treatment by time were not found (Table 12).

**Table 12** Comparison of diastolic blood pressure between the experimental and control groups during the different time points.

| Source of variation | SS       | df  | MS     | F    | p-value |
|---------------------|----------|-----|--------|------|---------|
| Between groups      |          |     |        |      |         |
| Treatment           | 237.10   | 1   | 237.10 | .79  | .378    |
| Error               | 18013.46 | 60  | 300.22 |      |         |
| Within subjects     |          |     |        |      |         |
| Time                | 389.43   | 2   | 194.72 | 3.67 | .028    |
| Treatment by time   | 65.71    | 2   | 32.86  | .62  | .54     |
| Error               | 6366.86  | 120 | 53.06  |      |         |

### 2.5.2 Comparison of diastolic blood pressure mean scores between different time points

When comparing mean scores of diastolic blood pressure between different time points (Table 13), there was only one pair of significant differences in mean scores. The mean scores at the 12<sup>th</sup> week were higher than that of the baseline and the 6<sup>th</sup> week at level .05.

**Table 13** Diastolic blood pressure mean scores between different time points

| Time                  | Mean  | SD    | Baseline | 6 <sup>th</sup> week | 12 <sup>th</sup> week |
|-----------------------|-------|-------|----------|----------------------|-----------------------|
| Baseline              | 79.95 | 10.94 | -        | -1.18                | -3.48*                |
| 6 <sup>th</sup> week  | 78.77 | 12.48 |          | -                    | -2.31                 |
| 12 <sup>th</sup> week | 76.47 | 11.37 |          |                      | -                     |

\* $p < .05$

## 2.6 Comparison of total cholesterol between the experimental and control groups in each time point.

### 2.6.1 Comparison of total cholesterol between the experimental and control groups during the different time points by repeated measure analysis of variance.

The results addressed that the direct effect of the treatment and time and the interaction effects of treatment by time were not significant (Table 14).

**Table 14** Comparison of total cholesterol between the experimental and control groups during the different time points

| Source of variation | SS        | df  | MS      | F   | p-value |
|---------------------|-----------|-----|---------|-----|---------|
| Between groups      |           |     |         |     |         |
| Treatment           | 868.84    | 1   | 868.84  | .21 | .65     |
| Error               | 244279.23 | 60  | 4071.32 |     |         |
| Within subjects     |           |     |         |     |         |
| Time                | 9.39      | 2   | 4.69    | .01 | .99     |
| Treatment by time   | 738.81    | 2   | 369.40  | .86 | .41     |
| Error               | 50089.81  | 120 | 417.42  |     |         |

## 2.7 Comparison of HDL-cholesterol between the experimental and control groups in each time point

### 2.7.1 Comparison of HDL-cholesterol between the experiment and control groups during the different time points by using repeated measure analysis of variance

The results revealed that the direct effect of the time and the interaction effect of treatment by time were significant ( $p < .05$ ,  $p < .05$ ). However, the direct effect of the treatment was not found (Table 15).

**Table 15** Comparison of HDL-cholesterol between the experimental and control groups during the different time points

| Source of variation | SS       | df  | MS     | F    | p-value |
|---------------------|----------|-----|--------|------|---------|
| Between groups      |          |     |        |      |         |
| Treatment           | 228.15   | 1   | 228.15 | .54  | .47     |
| Error               | 25414.30 | 60  | 423.57 |      |         |
| Within subjects     |          |     |        |      |         |
| Time                | 119.07   | 2   | 59.53  | 3.52 | .03     |
| Treatment by time   | 230.91   | 2   | 115.46 | 6.83 | .002    |
| Error               | 2030.02  | 120 | 16.92  |      |         |

### 2.7.2 Comparison of HDL-cholesterol mean scores between different time points

When comparing mean scores of HDL-cholesterol between different time points (Table 16), the findings stated that there were two pairs of significant differences in mean scores at level of .05. The mean scores at the 6<sup>th</sup> week were higher than that of the baseline and 12<sup>th</sup> week at level of .05. However, the mean scores at the baseline and 12<sup>th</sup> week were not different.

**Table 16** HDL-cholesterol mean scores in the experimental and control groups between difference time points

| Time                  | Mean  | SD    | Baseline | 6 <sup>th</sup> week | 12 <sup>th</sup> week |
|-----------------------|-------|-------|----------|----------------------|-----------------------|
| Baseline              | 43.02 | 12.47 | -        | 1.63*                | -1.29                 |
| 6 <sup>th</sup> week  | 44.65 | 12.98 |          | -                    | -1.76*                |
| 12 <sup>th</sup> week | 42.89 | 11.56 |          |                      | -                     |

\* $p < .05$

### 2.7.3 Comparison of mean scores of HDL-cholesterol over time in the experimental and control groups

When comparing mean scores of HDL-cholesterol in the experimental and control groups by using one-way repeated analysis of variance, the results stated that there were no significant differences of HDL-cholesterol mean scores over time in the experimental and controlled groups (Table 17).

**Table 17** Comparison of mean scores of HDL-cholesterol over time in the experimental and control groups

| Group             | Source of variation   | SS      | df | MS     | F     | p-value |
|-------------------|-----------------------|---------|----|--------|-------|---------|
| Experiment groups | Between groups        |         |    |        |       |         |
|                   | (times)               | 13.70   | 2  | 6.85   | .39   | .68     |
|                   | Within groups (error) | 1058.97 | 60 | 17.65  |       |         |
| Control groups    | Between groups        |         |    |        |       |         |
|                   | (times)               | 336.28  | 2  | 168.14 | 10.39 | .00     |
|                   | Within groups (error) | 971.05  | 60 | 16.18  |       |         |

### 2.7.4 Comparison of HDL-cholesterol mean scores in the control groups.

Two pairs of significant differences were found in the control group in mean scores at level of .01. The mean scores at 6<sup>th</sup> week were higher than that of the base line at level of .05. Also, the mean scores at 12<sup>th</sup> week were higher than that of the Baseline and the 12<sup>th</sup> week at .01 level. However, the mean scores at the baseline and the 12<sup>th</sup> week showed no significant difference. (Table 18)

**Table 18** HDL-cholesterol mean scores in the control groups between different time points

| Time                  | Mean  | SD    | Baseline | 6 <sup>th</sup> week | 12 <sup>th</sup> week |
|-----------------------|-------|-------|----------|----------------------|-----------------------|
| Baseline              | 43.77 | 12.66 | -        | 3.49*                | -0.93                 |
| 6 <sup>th</sup> week  | 47.26 | 13.71 |          | -                    | -4.42*                |
| 12 <sup>th</sup> week | 42.84 | 12.34 |          |                      | -                     |

\*p<.05

## 2.8 Comparison of fibrinogen between the experimental and control groups in each time point

### 2.8.1 Comparison of fibrinogen between the experimental and control groups during the different time points by repeated measure analysis of variance

The results indicated that the direct effect of the time was significant ( $p < .05$ ). However, the direct effect of the treatment and the interaction effects of treatment by time were not found (Table 19).

**Table 19** Comparison of fibrinogen between the experimental and control groups during the different time points

| Source of variation | SS        | df  | MS       | F    | p-value |
|---------------------|-----------|-----|----------|------|---------|
| Between groups      |           |     |          |      |         |
| Treatment           | 13455.51  | 1   | 13455.51 | 2.8  | .10     |
| Error               | 288294.30 | 60  | 4804.91  |      |         |
| Within subjects     |           |     |          |      |         |
| Time                | 7451.19   | 2   | 3726.60  | 3.14 | .047    |
| Treatment by time   | 2951.95   | 2   | 1475     | 1.24 | .29     |
| Error               | 142548.86 | 120 | 1187.91  |      |         |

### 2.8.2 Comparison of fibrinogen mean scores between different time points

When comparing mean scores of fibrinogen in the experimental and control groups (Table 20), the mean scores at the 12<sup>th</sup> week were higher than that of the 6<sup>th</sup> week at level of .05. However, the other pairs were not different.

**Table 20** Fibrinogen mean scores in the experimental and control groups between different time points

| Time                  | Mean   | SD    | Base line | 6 <sup>th</sup> week | 12 <sup>th</sup> week |
|-----------------------|--------|-------|-----------|----------------------|-----------------------|
| Base line             | 327.85 | 41.85 | -         | -5.92                | -9.45                 |
| 6 <sup>th</sup> week  | 321.94 | 51.06 |           | -                    | -15.37*               |
| 12 <sup>th</sup> week | 337.31 | 54.31 |           |                      | -                     |

\* $p < .05$

### 2.8.3 Comparison of mean scores of fibrinogen over time in the experimental and control groups

When comparing mean scores of fibrinogen in the experimental and control groups by using one-way repeated analysis of variance, there were no significant differences in mean scores over time in the experiment group. However, it was found in the control group ( $p < .05$ ) (Table 21).

**Table 21** Comparison of mean scores of fibrinogen over time in the experimental and control groups

| Group             | Source of variation    | SS        | df | MS      | F    | p-value |
|-------------------|------------------------|-----------|----|---------|------|---------|
| Experiment groups | Between groups (times) | 1591.12   | 2  | 795.56  | .45  | .64     |
|                   | Within groups (error)  | 105975.55 | 60 |         |      |         |
| Control groups    | Between groups (times) | 8814.02   | 2  | 4407.01 | 7.23 | .002    |
|                   | Within groups (error)  | 36573.31  | 60 |         |      |         |

### 2.8.4 Comparison of fibrinogen mean scores in the control group between difference time points

Two pairs of significant difference were found in the mean scores of the control group. The mean scores at the 12<sup>th</sup> week were higher than the baseline and the 6<sup>th</sup> week at .01 level. However, the mean scores decrease from the baseline to the 6<sup>th</sup> week were not significantly different. (Table 22)

**Table 22** Fibrinogen mean scores in the control group between different time points

| Time                  | Mean   | SD    | Baseline | 6 <sup>th</sup> week | 12 <sup>th</sup> week |
|-----------------------|--------|-------|----------|----------------------|-----------------------|
| Baseline              | 332.23 | 40.01 | -        | -3.03                | 18.97*                |
| 6 <sup>th</sup> week  | 329.19 | 41.01 |          | -                    | 22.00*                |
| 12 <sup>th</sup> week | 351.19 | 40.49 |          |                      | -                     |

\* $p < .05$

## 2.9 Comparison of satisfaction with response to physical activity between the experimental and control groups in each time point

### 2.9.1 Comparison of satisfaction with response to physical activity between the experimental and control groups during the different time points by repeated measure analysis of variance

The results stated that the direct effect of the treatment and time were significant ( $p < .05$ ,  $p < .001$ ), respectively. The interaction effect of treatment by time was found ( $p < .001$ ) (Table 23).

**Table 23** Comparison of satisfaction with response to physical activity between the experimental and control groups during the different time points

| Source of variation | SS     | df  | MS     | F     | p-value |
|---------------------|--------|-----|--------|-------|---------|
| Between groups      |        |     |        |       |         |
| Treatment           | 27.87  | 1   | 27.87  | 5.86  | .02     |
| Error               | 285.42 | 60  | 4.76   |       |         |
| Within subjects     |        |     |        |       |         |
| Time                | 211.39 | 2   | 105.69 | 62.67 | .00     |
| Treatment by time   | 62.23  | 2   | 31.11  | 18.45 | .00     |
| Error               | 202.39 | 120 | 1.69   |       |         |

### 2.9.2 Comparison of satisfaction with response to physical activity mean scores between difference time points

When comparing mean scores of satisfaction with response to physical activity between difference time points (Table 24), there were three pairs of significant difference in mean scores. The mean scores at the 12<sup>th</sup> week were higher than the baseline and the 6<sup>th</sup> week at level of .05. Additionally, the mean scores at the 6<sup>th</sup> week were higher than that of the baseline at level of .05.

**Table 24** Satisfaction with response to physical activity mean scores between different time points

| Time                  | Mean | SD   | Baseline | 6 <sup>th</sup> week | 12 <sup>th</sup> week |
|-----------------------|------|------|----------|----------------------|-----------------------|
| Baseline              | 5.95 | 1.61 | -        | 1.9*                 | 2.5*                  |
| 6 <sup>th</sup> week  | 7.85 | 1.82 | -        | -                    | .60*                  |
| 12 <sup>th</sup> week | 8.45 | 1.89 | -        | -                    | -                     |

\*p<.05

## CHAPTER V

### DISCUSSION

Chapter V presents a discussion on research findings, which include a discussion on the results of the effect of the self-regulated exercise program on physical fitness, and risk factors for stroke as well as the contribution of this research to nursing knowledge development.

#### **Effect of the Self-regulated Exercise Program**

##### **Effect of Six-minute Walk Distance**

TIA and minor stroke patients who were in the experimental group could walk longer distances than they could before joining the self-regulated exercise program in the 6<sup>th</sup> and 12<sup>th</sup> weeks with the statistic level of significance ( $p < .001$ ). They also could walk further than the control group with the statistic level of significance ( $p < .05$ ). Those findings support the research hypothesis and are consistent with the report of Dean, Richards, and Malouin (2000) which promoted mobilization of stroke patients with hemiparesis. The findings revealed that the experimental group could walk further than the controlled group with the statistic significance ( $p < .05$ ). The findings of Visintin and colleague (1998) on the use of body weight supporting gait training for cerebrovascular accident patients for 6 weeks presented that the experimental group could walk further the controlled group with the statistic significance ( $p < .05$ ). When separating the patients by fitness, patients with good fitness could walk further (Enright, et al., 2003). Hence, self-regulated exercise program is effective in improving the physical fitness of the patient as evidenced by farther walking distances.

Physical fitness of the patients is better than before because the self-regulated exercise program motivates them to participate in regular exercise. They also acknowledged appropriate behavior to the disease for reducing the risk of stroke. The video presentation of self-regulated exercise program also influenced the patients to

regularly perform their exercises. They were interested in practicing with regards to the practice manual and asked some questions to clarify misunderstandings. Preparing the physical promptness is significant to assist in achieving the goal of physical exercise, particularly neck and shoulder exercise postures that increase blood circulation to brain and decrease the dizziness (Prasansuk, et al., 2001). Exercise postures of knee muscles and muscular and ligament stretching are very effective for increasing muscular strength and reducing knee pain that make the patients are ready for exercise due to fewer health problems.

Self-regulation assists the patient in tackling problems and obstacles of the diseases such as boredom, laziness, dizziness, faint, leg numbness, swaying, hip pain, knee pain, and tiredness. Furthermore, muscular pain can be found at the first period of exercise. From the Qualitative data, most patients applied self-control methods for achieving the exercise goal as follows:

“Force and tell myself that need to do it”

“If I need to be better, I need to do it.”

“It is a duty and it needs to be done.”

“Should not break self-promise.”

“Feel guilty for not doing the exercise as well as no veracity.”

“Keep in mind at all times to walk.”

“Don’t be lazy. If I stop exercising, it will get worse.”

Many strategies were used to increase encouragement and prohibit discouragement for patient. For example, when a female patient would like to drop out from the program and transfer to be treated in another hospital because of dizziness, the researcher told her about the success of other patients who were involved in the program. The successful patients also shared their experiences with her, problem solving methods, and expected benefits of the exercise program and personally encouraged her via the phone. Three weeks later, she had the power to continue with the exercise and her dizziness and fainting disappeared without changing her medical usage. She felt fresh and stronger. Her result of the 6-minute walk test after finishing the program showed that she could walk further than before (47.26 m.). Consequently, seeing the successful model increase encouragement to follow the exercise program (Bandura, 1986) and promote the confidence on self-

efficacy to exercise. In addition, interaction among the researcher and self-help group is an effective support to enhance the success of behavior changes (Kahn, et al., 2002; Pender, Murdaugh, & Parsons, 2002).

Self-reinforcement and self-reaction improve self-control for regular continuous exercise by seeking for meaningful matters to the patients which can increase motivation to fight any obstacles and setting goal as the reward for themselves. The goals of most patients are to be healthy, fit, increase walking distance, be free of dizziness and tiredness, and have no tachypnea. Some patients love their children and wish to be with their love ones with no paralysis. They provide self-observation and self-praise with regards to the received introduction, and they underwent better physical and emotional changes. The patients stated that they saw little-by-little physical changes and recorded the exercise showing obvious outcomes of the exercise. Setting exercise goals and reminding them by using the exercise record and perceived knowledge will lead to effective behavioral changes through perceived self-efficacy (Schnoll & Zimmerman, 2001). This can be seen in the following comments from the subjects:

“Excellent, I feel pride from the success.”

“It feels good to complete the exercise, and I did it.”

“I’m so glad, I did it. I achieved my goal.”

“I did it, even though I’m close to 60 years old. Excellent”

“I’m better, and I can walk 4 rounds when before I could only do 2 rounds.”

“I feel better, can walk further, and have no leg numbness.”

“I feel fresh and motivated. My head is comfortable with no dizziness and I feel stronger.”

“My back is straight. I feel active and cheerful.”

“My family members and relatives told me that I looked so rejuvenated and healthier.”

All patients (100 %) reported on positive physical and emotional changes after exercising for 6 weeks. Most of them claimed to feel stronger. Dizziness was greatly reduced or completely eliminated. Knee or hip pain or numbness was diminished or gone. Tiredness also decreased. Better mood and clear thinking, reduced stress, and better sleep were reported. Some patients gained the greatest

change to their quality of life. For instance, a patient had not been able to lay down on her side for 1 year and 4 months because of severe dizziness, finger numbness, and spasms after staying in a prone position for a long time. Moreover, she experienced sleep disturbances and knee pain and numbness. After 1 week of the exercise, she could lay down on the side with no knee pain, numbness or dizziness. She slept better. In another case, a patient felt bored and wanted to die because he had severe vertigo attacks as of as 2-3 times a day. He could not walk far due to dizziness and fatigue. Medicines could help palliating the symptoms from time to time. After joining the exercise program for 8 weeks, his vertigo attacks were reduced to 1-2 times per week, and he felt healthier and experienced no fatigue. He had reinforcement to continue exercising. He did not want to face it again. It is clear from those examples that the patients have intentions to live their lives actively with constant exercise because they wish to see good results, better health, and more physical fitness.

A self-regulated exercise program is effective in promoting physical fitness in patients. It is consistent with the research by Clark and colleagues (2000) that showed that a proper exercise program reduced severity of discomfort in the patients with heart disease and increased walking distance of 6-minute walk test with the statistic significance ( $p < .01$ ). The research finding of Duangsong (2000) stated that the experimental group in self-regulated program had more physical exercise with statistic significance ( $p < .01$ ). The study of Febraro & Clum (1998) expressed that the program with self-regulation would have more effectiveness with the statistic significance ( $d = .25, p < .005$ ).

### **Effect to Satisfaction with Response to Physical Activity**

Positive physical and emotional changes after joining the exercise program allowed the experimental group to have more satisfaction on perceived response efficacy. It was different from the controlled group with statistic significance ( $p < .05$ ). In addition, prolonged physical exercise increases satisfaction with statistical significance ( $p < .01$ ). Increases could be found in the 6<sup>th</sup> and 12<sup>th</sup> weeks after exercise which supports the hypothesis. Satisfaction is a good support that can increases adherence to a continuous exercise program. For example, when a patient had a large figure, tiredness, dizziness, swaying, hearing loss, leg and arm numbness and

difficulty in walking, the patient was given information on the diseases, appropriate exercise, physical promptness, self-regulation, encouragement from the researcher and group of patients. The patient selected to ride stationary bicycle for 20 minutes at first and swinging arms up and down for 15-30 minutes a day. Then the patient reduced time of swinging arms to 10-15 minutes a day and increased time of riding bicycle for 30 minutes to 1.5 hours during watching television. Swaying, deafening, knee pain were completely gone, and deep breathing, farther walking distances without fatigue were found. The satisfaction scores increased from 4 to 10.

This research finding is consistent with the study of Klin-aul, (2001) where the experimental group who participated in the exercise program gained more physical strength and psychological well-being than the control group with the statistic significance ( $p < .05$ ,  $p < .01$ ). Additionally, the research of Schneider (1999) also expressed that people who had more physical exercise would have more pleasant feelings than people who had less physical exercise ( $p < .05$ ).

#### **Effect to Resting Heart Rate, Systolic and Diastolic Blood Pressure**

Mean resting heart rate, mean systolic and diastolic blood pressure of the experimental group in the 12<sup>th</sup> week after participating in the exercise program were reduced with the statistic significance ( $p < .05$ ). It supports the hypothesis. It is also consistent with the study of Jakicic and colleague (1995) that demonstrated whether short period (15 minutes/session, 3 sessions/week) or long period (30-40 minutes/session, daily) of physical exercise decreased heart rate and blood pressure with the statistic significance in both groups ( $p < .05$ ). Furthermore, the findings of Shin's study (1999) revealed that gait training increased heart and lung functions and decreased resting heart rate and blood pressure of older adults with the statistic significance ( $p < .05$ ). However, the decrease in blood pressure found in this research study was more than the one from Whelton and colleague (2002).

Reduced heart rates and blood pressure of the experimental and the control groups were not significant difference because the control group realized that they were in the exercise program and tried to participate more. Furthermore, completing the questionnaire about physical exercise acknowledged the patients on physical exercise and strength test by 6-minute walk distance that taught them to do self-

assessment on tiredness and weakness. It is the reinforcement to increase motivation and strong intention to do daily exercise for better outcomes such as longer walking distance and less tiredness. Mean of exercise behavior of the control group was raised to 2364.9 Kcal (SD = 2351.5) per week (Appendix P) affecting heart rate and blood pressure. In addition, duration of the exercise program may not be sufficient to make the differences. The finding of meta-analysis of Fagard (2001) on physical exercise stated that the change of blood pressure depended on duration of the exercise program. Guo, et al. (1999) also declared that there was no change in diastolic blood pressure after 5-13 weeks of exercise but obvious change could be found from the control group starting from the 15<sup>th</sup> to 20<sup>th</sup> weeks with the statistic significance ( $p < .05$ ). Other research also indicated that systolic blood pressure was reduced in the 16<sup>th</sup> week and diastolic blood pressure was decreased in the 36<sup>th</sup> week (Coleman, 1999). Reduced heart rate and blood pressure would assist controlling hypertension (Whelton, et al., 2002; CDC1, 2003). Hypertension is a powerful risk factor for all types of stroke and the most common risk factor, which could be found in cerebral infarction patients (Boonyakarnjanakorn, 2000). Furthermore, small reduction of 2-mmHg in diastolic blood pressure would result in a 15% reduction in risk of stroke and TIAs (Cook, et al., 1995). In summary, self-regulated exercise program helps reduce the risk factors of cerebrovascular diseases, especially hypertension, and also decreases resting heart rate even if there was no difference from the control group.

### **Effect to Total Cholesterol and HDL-cholesterol**

The experimental group showed no difference in total cholesterol and HDL-cholesterol after participating in the self-regulated exercise program and no difference from the control group. It is consistent with the report of Woof-May and colleagues that compared 5-10-minute exercise (3sessions/day), 10-15-minute exercise (3 sessions/day) and 20-30-minute exercise. The findings stated that those 3 methods could decrease heart rate with statistical significance of  $p = .05$ , but there were no differences in total cholesterol and HDL-cholesterol. The literature review of the study of Durstine, et al. (2002) expressed that besides exercise, diet and weight control should be done for effective results.

In terms of HDL-cholesterol, exercise may have an effect but it is uncertain except for 1.5-hour exercise or high volumes of weekly exercise. The exercise will be more effective if combining with caloric restriction and weight loss program. Appropriate research duration of HDL-cholesterol would be 12 weeks if less there would not be any difference (Durstine, et al., 2002). Duration of this research is 12 weeks that may not yield any obvious difference. Moreover, this self-regulated exercise program did not emphasize on diet restriction and weight control, so there were no differences in total cholesterol and HDL-cholesterol after the program finished.

### **Effect to Fibrinogen**

From this research, the mean fibrinogen of the experimental group showed no difference from the control group even if there were several researches reported reduced fibrinogen related to exercise (Wosornu, Allardyce, & Tansey, 1992; Evenson, et al., 1999; Wannamethee, et al., 2002). This research revealed the fibrinogen started to decrease in the 6<sup>th</sup> week but rose in the 12<sup>th</sup> week because of complications as well as infections with colds and fevers in the winter in 9 subjects. This complicating factor influenced to increase fibrinogen. A different summary in this research is consistent with the study of Yano and colleague (1999) which showed that other factors increased fibrinogen such as infection, obesity, diabetes mellitus, smoking, and hyperlipidemia. Additionally, the research of Raurramaa, Li, & Vaisanen (2001) with specific selection of 8 controlled randomized clinical trials in the experimental group performed moderate-to-heavy and heavy exercise that was unclear and inconclusive result of fibrinogen.

Fibrinogen of this sampling group was higher than the mean fibrinogen in normal people (Evenson and colleague, 1999). Fibrinogen at 300 mg/dl, especially 350 mg/dl and over would elevate the risk of cerebrovascular diseases (Herderschee, et al., 1992). The sample group in this research is in the risk group to high-risk group. Consequently, fibrinogen is a major factor that needs reproof for the conclusion on efficacy of the exercise program to reduce fibrinogen.

In conclusion, self-regulated exercise program promotes better physical fitness by longer walking distance, slower heart rate, feeling healthier, less fatigue,

less discomfort, and positive emotional change that increase the satisfaction of the patients to exercise. Most patients carried on with the constant exercise. In regards to efficacy of reducing the risk of stroke, after finishing the trial, the patients had decreased systolic and diastolic blood pressures. However, there was no difference on total cholesterol and HDL-cholesterol because of the insufficient duration of the exercise program. In addition the program emphasized self-regulation, not diet restriction or a weight loss program that may affect cholesterol levels. Fibrinogen was also no emphasized because complications such as infections made conclusion uncertain. However, this self-regulated exercise program can assist TIA and minor stroke patients to exercise for the goal of safety and become more physically fit. It also eliminates risk factors of stroke.

### **Limitations**

1. The sampling group in this research was patients from Neurological Institute living in Bangkok and municipality. Hence, these research results cannot be generalized to all TIA and minor stroke patients.
2. The patients in the control group had access to knowledge on the appropriate ways to exercise from the self-regulated exercise program and were tested using the 6-minute walk distance. This encouraged and motivated them to have determination to exercise daily thereby reducing heart rate and blood pressure.
3. This research had the time limit of only 12, so the 12-week monitoring cannot yield obvious results.

## CHAPTER VI

### CONCLUSION

This chapter is presented into two sections. The first section is the summary of the study and the second section focuses on the implications and applications of research finding and details further recommendations.

#### Summary of the Study

This research aims to test the effectiveness of a self-regulated exercise program among patients with transient ischemic attack and minor stroke by measuring the increased physical fitness and decreased risk factors for stroke over a 13 week trial at a neurological institute and patients' homes.

The sampling group consists of 62 subjects, 31 subjects in the experimental and control groups. They received basic knowledge of the disease, self-care on diet restriction, weight control and stress management. The experimental group had additional information about physical activity and practice including implementation of self-regulated exercise program. The control group received the regular introduction to exercise from nurses and physicians of Neurological Institute.

The self-regulated exercise program consists of 4 steps: preparation of basic knowledge, training to self-regulate, application of the program, and finally monitoring the results. The program added factors for promoting exercise and urge TIA and minor stroke patients to do more exercise within 12 weeks.

To measure the effectiveness of physical exercise, following criteria were used: 6-minute walk distance, resting heart rate, satisfaction with response to physical activity, systolic and diastolic blood pressure, and fibrinogen at the baseline of the 6<sup>th</sup> and 12<sup>th</sup> weeks respectively.

Descriptive statistics were used to analyze characteristics of data and the Repeated Measure Analysis of Variance was conducted to test the research hypothesis. A summary of findings is as follow:

### **Characteristics of the Sample.**

The samples are 22 men and 46 women. Most of them are in the age range of 60-69 years old (46.16 %) and the mean age is 63.08 years (SD = 7.22). Their marital status is 61.9 % and housewife (46.8 %). The education level is mostly elementary school (53.2 %). Buddhism is majority religion (96.8 %). The income is lower than 5,000 baht per month (62.9 %).

### **Characteristics related to health status**

Most subjects had daily moderate physical activity (53.2 %) with mean energy used for mobilizing body during exercise as 635.11 Kcal/week (SD = 250.03). Most had other health problems such as hyperlipidemia (39.7 %) and hypertension (36.2 %). They had regular medication to take. Most subjects had headache once in a while (62.3 %) and no history of heart disease or coronary artery disease in the family (56.5 %). They did not drink nor smoke (98.4 %, 96.8 % respectively). The mean of body mass index (BMI) was 26.53 (SD = 4.05) that was in the first level of obesity. The mean score of mental state was normal as 29.08 (SD = 1.14).

Regarding the effectiveness of the self-regulated exercise program, TIA and minor stroke patients who participated in the program increased the mean of their 6-minute walk distance after the trial more than before with the statistical level of significance ( $p < .01$ ). The increased scores began at the 6<sup>th</sup> and the 12<sup>th</sup> weeks. In addition, the mean scores were higher than the control group who did not join the program with the statistic significance ( $p < .05$ ).

Resting heart rate, systolic and diastolic pressure of the experimental group after the trial were reduced with a statistical significance ( $p < .05$ ). The reduced scores began in the 12<sup>th</sup> week. However, differences in mean scores in both groups were not found.

Mean scores of satisfaction to physical activity from the experimental group was higher than before with the statistical significance of ( $p < .01$ ). The increased scores began since the 6<sup>th</sup> and 12<sup>th</sup> weeks. Furthermore, the mean scores of the experimental group was higher than the score of the control group who did not join the program with a statistical significance of ( $p < .05$ ).

There were no differences on total cholesterol, HDL-cholesterol and fibrinogen of both the experimental and control groups.

## **Implications and Recommendations.**

### **Implications and Applications of Research Finding**

#### **Implications for Nursing Practice**

By analyzing the research findings, it can be concluded that the self-regulated exercise program can assist TIA and minor stroke patients to exercise and achieve a higher level of physical fitness. The patients are able to walk longer. Their individual resting heart rates were reduced. Satisfaction responses to physical activity were greatly improved. Systolic and diastolic pressures also decreased. This program consisted of knowledge and education, practical protocols, a video presentation on a self-regulated exercise program, a manual and posture about exercise, record forms and other tools to assess a patient's progress that nurses can utilize to ensure patient safety and rehabilitation in a professional manner.

In order to implement the program, nurses should prepare basic knowledge for patients. The patients will pay attention and ask some questions about the disease, other existing symptoms, and solutions. Nurse should apply appropriate teaching methods for elderly people. For instance, nurses should employ repetition or additional explanation techniques because the patients may be slower in processing and following the information explained to them. Patients need to feel the freedom to express their concerns and clarify any points of misunderstanding.

Nurses should help patients to understand the details of the assessment regarding physical activity, comments and satisfaction responses to exercise, and any problems and obstacles they may encounter while in an exercise program. The evaluation on satisfaction responses to exercise should be performed shortly after a 6-minute walk test to fully understand their perceptions and feeling regarding the exercise. Most patients stated that the 6-minute walk test helped to determine their need for improving their level of fitness and decreasing fatigue.

Group counseling and video presentations on training of self-regulated exercise were used to increase the interest of patients and allowed for the exchange of opinions and experience. Most of the patients selected their own physical activity, but in some cases nurses were required to further motivate the patients using additional methods and encouragement in the form of group counseling because the amount of

energy used from the selected physical activities was insufficient. Appropriate additional physical activity included rapid walking, swinging arms, riding a stationary bicycle, and housework for the initial use of energy (1,200-1,500 Kcal). Extension of physical activity duration was also suggested. Patients were reminded that the more effort put forth, the more physical fitness would be achieved.

Nurses need to teach patients to monitor their pulses, observe tiredness, and note any significant abnormalities to ensure patient safety during exercise. However, some patients were very old and could not be properly instructed on how to monitor their pulse. In addition, nurses should observe fatigue after the 6-minute walk to be used for comparison. Also, it is vital to ensure that patients exercise according to the information detailed in the manual. It is necessary for patients to follow the protocols designed to adequately prepare them for physical exercise, especially neck and shoulder exercises and leg and knee exercise which would help reduce dizziness and knee pain.

The research can be utilized to create a multidisciplinary approach and continuing care aims to ensure the most effective and professional care for patients. A transferring system and home visits, particularly using public health nurses, will assist nurses in providing better instructions and ensure patient compliance. Nurses need to be patient and answer all pertinent questions and be able to demonstrate the physical exercise until patients are adequately prepared. Furthermore, one patient problem that occurred repeatedly was muscular pain in the first 2-3 days. Nurses should constantly encourage patients and reassure them that muscular fatigue is very normal and that it will improve as physical fitness and muscular endurance improve. Patients need to be reminded that the muscular exhaustion will be greatly reduced if not completely eliminated after approximately 1 week of sustained exercise.

The use of regular telephone calls helps motivate the patients to comply with the self-regulated exercise program and help solve the psychological problems associated with feelings of discouragement due to the perceived absence of immediate and visible progress. For instance, when patients develop severe headaches and are not motivated to walk, nurses should encourage them and give them some alternatives and remind them of their personal goals. The findings demonstrated that the problems diminished and dizziness was disappeared without medication adjustment. Nurses

should also question patients regarding their feelings and general sense of well-being to evaluate changes to their health condition. Appropriate questions should include Did you sleep well last night? How is your numbness of legs and arms? Do you have constipation? How are you coping with your fatigue and is it improving? This series of questions is necessary due to the fact that some patients are unable or forget to self-monitor. The questions would allow them to be more aware of the changes to their health status.

Patients are especially conscious of the improvements to their 6-minute walk distances and various measured scores, so nurses should review the result with them to motivate the patients to comply with their exercise goals. Clear, discernable physical improvements in patients help to maintain good physical conditioning and ensure greater compliancy rates for continued exercise.

### **Implications for Nursing Education**

Education management should incorporate this program to the specific curricula of advanced nursing practice related to chronic illness. It will greatly enhance the skill level of nursing students allowing them to properly learn and use exercise to facilitate the rehabilitation of TIA and minor stroke patients. In addition, similar self-regulated exercise programs can be used to improve the overall health of patients with hypertension, diabetes mellitus or older adults who could benefit from strengthening their level of physical fitness and muscular endurance.

### **Implications for Health Policy Makers**

This research is consistent with the concept of health promotion that reflects global and national health promotion policies. It emphasizes the role of the individual in developing health promotion. This program can be used to promote exercise programs for other health care settings:

1. Tertiary care hospitals should employ this self-regulated exercise program for TIA and minor stroke patients in hospital units and in the community. This involves an adequate budget and manpower for the implementation of this program.

2. Clear policies should be created detailing the prevention and promotion of stroke awareness for TIA, minor stroke patients, and at-risk patients by arranging the self-regulated exercise program.

3. Increased coordination with the healthcare team to seek TIA and minor stroke patients who live in the community and arrange self-regulated exercise program is recommended.

### **Recommendations for Further Research**

1. It is necessary to monitor the response to exercise over 16 weeks, 6 months, and 1 year in order to rechecking that the patients are complying with the regular exercise program. Patients need to make exercise a lasting change and improve physical fitness thereby reducing the risk factors of cerebrovascular diseases.

2. It is recommended to arrange the self-regulated exercise program plus dietary and weight restrictions for all members of the sample group and measure cholesterol.

3. It is recommended to employ this self-regulated exercise program for hypertension patients to promote health and decrease risk of cerebrovascular diseases.

### **Contribution to Knowledge Development**

The self-regulated exercise program can encourage TIA and minor stroke patients to increase their physical fitness and decrease blood pressure, which are major risk factors of stroke. Its effectiveness and benefits were confirmed by the research process. Additionally, the nursing professional as a whole gains increased knowledge on nursing practice and innovations that can be used for promoting exercise and decreasing complications. A new concept of exercise from various theories to account for other possible variables will promote sufficient exercise and develop nursing practice by using multiple perspective methods (Whittemore & Grey, 2002: 119). This program is a goal of nursing science that requires knowledge for nursing intervention that can predict and change situations (Meleis, 1997: 142). Consequently, this research offers guidelines for future quasi- research on physical exercise that can use both quantitative and qualitative data to explain obvious outcomes. This perceived knowledge could bring be incorporated into actual practice and for research in developing new knowledge in the future.

## BIBLIOGRAPHY

- Ainsworth, B.E., et al. (1993). Compendium of physical activities: Classification of energy costs of human physical activities. *Medicine & Science in Sports & Exercise*, 25(1), 71-80.
- Ainsworth, B.E., et al. (2000). Compendium of physical activities: An update of activity codes and MET intensities. *Medicine & Science in Sports & Exercise*, 32(9), S498-S516.
- Albers, G.W., et al. (1999). Supplement to the guidelines for the management of transient ischemic attacks a statement from the Ad Hoc Committee on guidelines for the management of transient ischemic attacks. Stroke Council, American Heart Association. *Stroke*, 30, 2502-2511.
- American College of Sport Medicine. (2001). *ACSM's resource manual for guidelines for exercise testing and prescription*. (4<sup>th</sup> ed.). Baltimore: Williams & Wilkins.
- American Heart Association. (2003). *International cardiovascular disease statistics*. Retrieved May 18, 2003, from <http://www.americanheart.org>
- American Stroke Association. (2003). *What is stroke?* Retrieved May 18, 2003, from <http://www.strokeassociation.org>
- Anderson, N., Pearl, B., & Bruke, E.R. (2002). *Getting in shape: 32 workout programs for life long fitness*. (2<sup>nd</sup> ed). California: Shelter Publication.
- Asawachaisuwikrom, W. (2001). *Predictor of physical activity among older Thai adults*. Unpublished doctoral dissertation , University of Texas, Austin.
- Bandura, A. (1977). *Social learning theory*. New Jersey: Prentice Hall.
- Bandura, A. (1986). *Social foundations of thought and action*. New Jersey: PrenticeHall.
- Bandura, A. (1997). *Self- efficacy the exercise of control*. New York: W. H. Freeman and Company.
- Beck, A.T. (1976). *Cognitive therapy and the emotional disorders*. New York: International University Press.

- Baumeister, R.F., Heatherton, T.F., & Tice, D.M. (1994). *Losing control : How and why people fail at self-regulation*. Sandiego: Academic Press.
- Bautmans, I., Lambert, M., & Meta, T. (2004). The six-minute walk test in community dwelling elderly: influence of health status. [Electronic version]. *BioMed Central Geriatrics*, 4(6), 1-15. Retrive October 27, 2004, from <http://www.biomedcentral.com/1471-2318/4/6>
- Boonyakarnjanakorn, R. (1999). Risk factor of ischemic stroke in Prasat Neurological Institute. *The Journal of Prasat Neurological Institute*, 2(2), 237-43.
- Brownson, R.E., et al. (2000). Measuring physical activity with the behavioral risk factor surveillance system. *Medicine & Science in Sports & Exercise*, 32(11), 1913-1918.
- Butland, R.J.A., Pang, J., Gross, E.R., Woodcock, A.A., & Geddes, D.M. (1982). Two-, six, and twelve-minute walking tests in respiratory disease. *British Medical Journal*, 284: 1607-8.
- Cadroy, Y., Pillard, F., Sakariassen, K.S., Thalamas, C., Boneu, B., & Rivere, D. (2002). Strenuous but not moderate exercise increase the thrombotic tendency in healthy sedentary male volunteers. *Journal of Applied Physiology*, 93, 829-833.
- Carver, C.S., & Scheier, M.F. (1996). Self-regulation and its failures. *Psychological Inquiry*. 7, 32-40.
- CDC 1: Centers for Disease Control and Prevention. (2003). Health impact of physical activity. *Healthy people 2010*, Retrieved June 2, 2003, from <http://www.healthypeople.gov/>
- CDC 2: Centers for Disease Control and Prevention. (2003). Physical activity and fitness: Terminology. *Healthy people 2010*, Retrieved June 2, 2003, from <http://www.healthy people.gov/>
- Chakravarthy, M. V., Joyner, M. J., & Booth, P. W. (2002). An obligation for primary care physicians to prescribe physical activity to sedentary patients to reduce the risk of chronic heart conditions. *Mayo Clinic Proceedings*, 77, 165-173.
- Chambless, L. E., et al. (1996). Association of transient ischemic attack/stroke

- symptoms assessed by standardized questionnaire and algorithm with cerebrovascular risk factor and carotid artery wall thickness. *American Journal of Epidemiology*, 144, 857-66.
- Chinuntuya, P. (2001). *A causal model of exercise behavior of the elderly in Bangkok Metropolis*. Unpublished doctoral dissertation, Mahidol University, Thailand.
- Clark, N. M., Janz, N. K., Dodge, J. A., & Sharpe, P. A. (1992). Self-regulation of health behavior: The "take PRIDE" program. *Health Education Quarterly*, 19(3), 341-354.
- Clark, N. M., et al. (2000). Changes in functional health status of older women with heart disease : Evaluation of program Based on self-regulation. *Journal of Gerontology*, 55B(2), S117-S126.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. New Jersey: Lawrence Erlbaum Associates, publishers.
- Coleman, K.J., Raynor, H.R., Mueller, D.M., Cerny, F.J., Dorn, J.M., & Epstein, L.H. (1999). Providing sedentary adults with choices for meeting their walking goals. *Preventive Medicine*, 28(5), 510-519.
- Conn, V.S. (1998). Older adults and exercise: Path analysis of self-efficacy related constructs. *Nursing Research*, 47(3), 180-189.
- Conn, V.S., Valentine, J., & Cooper, H. (2002). Intervention to increase physical activity among aging adult: A meta analysis. *Annals of behavioral medicine*, 24(3): 190-200.
- Cook, N.R., Cohen, J., Hebert, P.R., Taylor, J.O., & Hennekens, C.H. (1995). Implication of small reductions in diastolic blood pressure for primary prevention. *Archeives of Internal Medicine*, 155, 701-709.
- Cox, R.H., Thomas.T.R., & Davis,J.E. (2001). Positive and negative affect association with an acute bout of aerobic exercise. *Journal of Exercise Physiology*, 4(4), 13-20.
- Dean, C.M., Richards, C.L., & Malouin, F. (2000). Task-related circuit training

- improves performance of locomotor tasks in chronic stroke: A randomized, controlled trial. *Archives of Physical Medicine and Rehabilitation*, 81, 409-417.
- Dennis, M., et al. (1990). Prognosis of transient ischemic attacks in the Oxfordshire Community Stroke Project. *Stroke*, 21, 848-853.
- Dishman, R.K., & Buckworth, J. (1996). *Increasing physical activity: A quantitative synthesis*. Department of Exercise, The University of Georgia, Athens, GA 30602.
- Duangsong, R. (2001). *The effect of modified "take pride" program on a weight control project in Nakhonphanom municipality*. Unpublished doctoral dissertation, Mahidol University, Thailand.
- Dunn, A. L., Trividi, M. H., & O'Neal, H. (2001). Physical activity dose response effect on outcomes of depression and anxiety. *Medicine & Science in Sports & Exercise*, 33(6), S587-S597.
- Duncan, J. J., Gordon, N.F., & Scott, C.B. (1991). Woman walking for health and fitness. How much is enough? *Journal of the American Medical Association*, 266, 3295 – 3299.
- Duncan, P. W., et al. (1997). Health status of individuals with mild stroke. *Stroke*, 28, 740-745.
- Durstine, J. L., Grandjean, P. W., Cox, C. A., & Thompson, P. D. (2002). Lipids, lipoproteins, and exercise. *Journal of Cardiopulmonary Rehabilitation*, 22(6), 385-398.
- Dyken, M.L., et al. (1977). Cooperative study of hospital frequency and character of transient ischemic attacks. *Journal of American Medical Association*, 237, 882-886.
- Eccles, S., House, A., & Knapp, P. (1999). Psychological adjustment and self-reported coping in stroke survivors with and without emotionalism. *Journal of Neural-Neurosurgery Psychiatry*, 67(1), 1265-126.
- Ekkekakis, P., Hall, E. E., Vanlanduyt, L. M., & Petruzzello, S. J. (2000). Walking in (affective) circles: Can short walk enhance affect? *Journal of Behavioral Medicine*, 23(3), 245-275.
- Elwood, P. C., et al. (1993). Exercise, fibrinogen, and other risk factors for ischemic

- heart disease Caerphilly prospective heart disease study. *British Heart Journal*, 69, 183-187.
- Enright, P. L., McBurnie, A., Bittner, V., Tracy, R. P., McNamara, R., Arnold, A, et al. (2003). The 6-min walk test. A quick measure of functional status in elderly adults. *Chest*, 123, 387-398.
- Evans, G. W., et al. (1991). Cerebral infarction verified by cranial computed tomography and prognosis for survival following transient ischemic attack. *Stroke*, 22, 431-436.
- Evans, W. J. (1999). Exercise training guidelines for the elderly. *Medicine & Science in Sports & Exercise*, 31(1), 12-17.
- Evenson, K. R., et al. (1999). Physical Activity and Ischemic Stroke Risk. *Stroke*, 30, 1333-1339.
- Feigin, V. L., et al. (2000). A population-based study of transient ischemic attack incidence in Novosibirsk, Russia, 1987-1988 and 1996-1997. *Stroke*, 31, 9-13.
- Febraro, G. A. & Clum, G. A. (1998). Meta-analysis investigation of the effectiveness of self-regulatory components in the treatment of adult problem behavior. *Clinical Psychological Review*, 18(2), 143-161.
- Finch, E., Brooks, D., Stratford, P. W., & Mayo, N. E. (2002). *Physical rehabilitation outcome measures. A guide to enhanced clinical decision making* (2<sup>nd</sup> ed.). Toronto, Ontario: Lippincott Williams & Wilkins.
- Fletcher, et al., (2001). Exercise standard for testing and training a statement for healthcare professionals from the American Heart Association. *Circulation*, 104, 1694-1740.
- Fleury, J. (1998). The index of self-regulation: Development and psychometric analysis. *Journal of Nursing Measurement*, 6(1), 3-17.
- Fogg, L., & Gross, D. (2000). Focus on research methods threats to validity in randomized clinical trials. *Research in nursing & health*, 23, 79-87.
- Ford, E. S. (2002). Does exercise reduce inflammation? Physical activity and C-reactive protein among U.S. adults. *Epidemiology*, 13(5), 561-568.
- Fox, K. R. (2002). The influence of physical activity on mental well-being [Electronic version]. *Public Health Nutrition*, 2(3A), 411-418. Retrived January 21, 2004, from

<http://intranet.bell.ac.uk/sites/courses/sports/Sport%20Psychology%203a/physical%20activity%20well%being.html>

Fogg, L., & Gross, D. (2000). Focus on research methods: Threats to validity in randomized clinical trials. *Research in Nursing & Health*, 23, 79-87.

Gibbs, R. G. J., Nenson, R., Lawrenson, R., Greenhalgh, R. M., Davies, A. H. (2001). Diagnosis and initial management of stroke and transient ischemic attack across UK health regions. *Stroke*, 32, 1085-1090.

Golding, L. A. (2000). *YMCA fitness testing and assessment manual* (4<sup>th</sup> ed.). Champaign, IL: Human Kinetics.

Goldstein, L. B., Bian, J., Samsa, G. P., Bonito, A. J., Lux, L. J., & Matchar, D. B. (2000). New transient ischemic attack and stroke. *Archives of Internal Medicine*, 160, 2941-2946.

Goldstein, J.B., Adams, R., Becker, K., & Furberg, C. D. (2001). Primary prevention of ischemic stroke a statement for healthcare professionals from the Stroke Council of the American Heart Association. *Stroke*, 103, 163 – 182.

Grau, A. J., et al. (2001). Risk factors, outcome and treatment in subtypes of ischemic stroke. *Stroke*, 32, 2559-2566.

Guo, X.H., Yi, G., Batchvarov, V., Gallagher, M.M., & Malik, M. (1999). Effect of moderate physical exercise on non invasive cardiac autonomic tests in healthy volunteers [Electronic version]. *International Journal of Cardiology*, 69(2), 155-168. Retrived April 7, 2005, from [http://sciencedirect.com/science?\\_ob=ArticalURI&\\_udi=B6T16-3W9CXBj-6&\\_user=206209&\\_coverDate=05%2F1999&\\_alid=264258612&\\_rdoc=20&\\_fmt=full&\\_orig=search&\\_cdi=4882&\\_sort=d&\\_st=4&\\_docanchor=&\\_acct=C00014278&\\_version=1&\\_urlVersion=0&\\_userid=206209&md5=5117e8e613caf547b80dc62764343b](http://sciencedirect.com/science?_ob=ArticalURI&_udi=B6T16-3W9CXBj-6&_user=206209&_coverDate=05%2F1999&_alid=264258612&_rdoc=20&_fmt=full&_orig=search&_cdi=4882&_sort=d&_st=4&_docanchor=&_acct=C00014278&_version=1&_urlVersion=0&_userid=206209&md5=5117e8e613caf547b80dc62764343b)

Hachinski, W., et al. (1996). Lipids and stroke. *Archives of Neurology*, 53, 303-308.

Hankey, G. J. (2001). Management of the first-time transient ischemic attack. *Emergency Medicine*, 13, 70-81.

Harada, N. D., Chiu, V., & Stewart, A. L. (1999). Mobility-related function in older

- adults: Assessment with s 6 minute walk test. *Archeives of Physical Medicine and Rehabilitation*, 80, 837-841.
- Hardman, A. E. (2001). Issues of fractionization of exercise (short vs. long bouts). *Medicine & Science in Sports & Exercise*, 33(6), S421-427.
- Heeren, J., Grewal, T., Laatsch, A., Rottke, D., Rinninger, F., Enrich, C., et al. (2003). Recycling of apoprotein E is associated with cholesterol efflux and high density lipoprotein internalization [Electronic version]. *Journal of Biological Chemistry*, 278(16), 14370-14378.
- Herderschee, D., Hijdra, A., Algra, A., Koudstaal, P. J., & Gijn, J. V. (1992). Silent stroke in patients with transient ischemic attack or minor ischemic stroke. *Stroke*, 23, 1220-1224.
- Howley, E. D. (2001). Type of activity: Resistance, aerobic and leisure versus occupational physical activity. *Medicine & Science in Sports & Exercise*, 33 (6), S364-S369.
- Hudson, P., Aranda, S., & McMurry, N. (2001). Randomized controlled trials in palliative care : Overcoming the obstacles. *International Journal of Palliative Nursing*, 7(9), 427-434.
- Jackson, P. R., & Wallis, E. J. (2001). Prevention of stroke and transient ischemic attack. *Lancet*, 358, 762.
- Jakicic, J. M., Wing, R. R., Butler, B. A., & Robertson, R. J. (1995). Prescribing exercise in multiple short bouts versus one continuous bout: Effect on adherence, cardiorespiratory fitness, and weight loss in overweight women. *International Journal of Obstetric*, 19, 893-901.
- Janz, N. K., et al. (1999). The impact of a disease-management program on the symptom experience of older women with heart disease. *Women & Health*, 30 (2), 1-25.
- Johnston, S.C., et al. (2000). Short – term prognosis after emergency department diagnosis of TIA. *Journal of the American Medical Association*, 284, 2901 – 2906.
- Kahn, E. B., et al (2002). The effectiveness of interventions to increase physical activity. *American Journal of Preventive Medicine*, 22(4S), 73-107.
- Kasch, F. W., Phillips, W. H., Ross, W. D., Carter, J. E. L., & Boyer, J. L. (1966). A

- comparison of maximal oxygen uptake by treadmill and step-test procedures. *Journal of Applied Physiology*, 21(4), 1387-1388.
- Kashdan, T. B. (2002). The assessment of subjective well-being (issues raised by the Oxford Happiness Questionnaire). *Personality and Individual Differences*, 36, 1225-1232.
- Kanfer, E. H., & Gaelick, L. (1986). Self-management methods. In F. H. Kanfer & A. P. Goldstein (Eds), *Helping people change* (3<sup>rd</sup> ed.). New York : Pergamon.
- Kesaniemi, Y.A., et al. (2001). Dose-response issues concerning physical activity and health: an evidencbased symposium. *Medicine & Science in Sports & Exercise*, 33(6), S351- S358.
- Kernan, W.N., et al. (1991). A prognostic system for transient ischemia or minor stroke. *Annals of Internal Medicine*, 114, 552-557.
- Klausner, S. Z. (1965). A collocation of concepts of self-control. In S.L. Klausner (Ed), *The Quest for self-control classical philosophies and scientific research*. New York: Collier- Macmillan Ltd.
- Lakka, T. A., et al. ( 2001). Cardiorespiratory fitness and the progression of carotid atherosclerosis in middle-aged men. *Annals of Internal Medicine*, 134, 12-20.
- Lazarus, A. A. (1971). *Behavior therapy and beyond*. New York: McGraw-Hill.
- Lemesle, M., Milan, C., Faivre, J., Moreau, T., Giroud, M., & Dumas, R. (1999). Incidents trends of ischemic stroke and transient ischemic attacks in a well-defined French population from 1985 through 1994. *Stroke*, 30, 371-377.
- Lee, I. M., Hennekens, C. H., Berger, J. E., & Manson, J. E. (1999). Exercise and risk of stroke in male physicians. *Stroke*, 30, 1-6.
- Lee, I., & Skerrett, P. (2001). Physical activity and all-cause mortality: What is the dose-response relation? *Medicine & Science in Sports & Exercise*, 33 (6), S459–S471.
- Lee, k. w., & Lip, G. Y. H. (2003). Effect of lifestyle on hemostasis, fibrinolysis, and platelet reactivity. *Archives of Internal Medicine*, 163, 2368-2392.
- Leon, A. S., & Sanchez. (2001). Response of blood lipids to exercise training alone or combined with dietary intervention. *Medicine & Science in Sports & Exercise*, 33 (6), S502-S515.
- Lindenstrom, E., Boysen, G., & Nyboe, J. (1993). Lifestyle factors and risk of

- cerebrovascular disease in women. *Stroke*, 24, 1468-1472.
- Lucas, et al. (2001). Determinants of health-promoting behavior among women ages 65 and above living in the community. *Scholarly Inquiry for Nursing Practice: An International Journal*, 14(1). 94-98.
- Mahoney, M. J. (1974). *Cognition and behavior modification*. Cambridge, Mass: Ballinger.
- Mancia, G., et al. (2002). *Manual of hypertension*. London: Churchill Livingstone.
- Massey, J. A., & Pesut, D. J. (1991). Self-regulation strategies of adults. *Western Journal of Nursing Research*. 13 (5), 627-634.
- Mazzeo, R.S., et al. (1998). American College of Sports Medicine position stand : Exercise and physical activity for older adult. *Medicine & Science in Sports & Exercise*, 30(6), 992-1008.
- McDowell, I., & Newell, C. (1996). The general well-being schedule. In *Measuring Health: A guide to rating scales and questionnaires* (2<sup>nd</sup> ed., pp.206-213). Newyork: Oxford University Press.
- McKeehan, K. M., Cowling, W. R., & Wykle, M. L. (1986). Cantril self-anchoring ladders: Methodological considerations for nursing sciences. IN P. L. Chin (Ed.). *Nursing research methodology* (pp.285-296). Maruland: An Aspen Publication.
- Meleis, A. L. (1997). *Theoretical nursing development and progress*. 3<sup>rd</sup>. New york: Lippincott.
- Murros, K.E., et al. (1989). Cerebral infarction in patients with transient ischemic attacks. *Neurology*, 236, 182-184.
- Moncayo, J., et al. (2000). Do transient ischemic attacks have a neuroprotective effect? *Neurology*, 54: 2089-2094.
- Munro, B. H. (2001). *Statistical methods for health care research*. NewYork : Lippincott.
- Murphy, M. M., Nevill, A., Neville, C., Biddle, S., & Hardman, A. (2002). Accumulating brisk walking for fitness, cardiovascular risk, and psychological health. *Medicine & Science in Sports & Exercise*, 34(9), 1468-1474.
- Nieman, D. C. (1995). *Fitness and sports medicine a health-related approach* (3<sup>rd</sup> ed.). California: Mayfield.

- Norwood, S. L. (2000). *Research strategies for advance practice nursing*. New Jersey: Practice hall health.
- Pate, R. R., et al .( 1995). Physical activity and public health: A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of the American Medical Association*, 273, 402 – 407.
- Pavlov, G. L. (1928). *Lectures on conditioned reflexes*. New York: International Publishers.
- Pender, N. J. (1996). *Health promotion in nursing practice* (3<sup>rd</sup> ed.). Norwalk: Appleton & Lange.
- Pender, N. J., Murdaugh, C. L., & Parsons, M. A. (2002). *Health promotion in nursing practice* (4<sup>th</sup> ed.). New Jersey: Prentice-Hall.
- Pongurgsorn, C. (2001). *A questionnaire for assessment of physical activity in Thailand*. Unpublished doctoral dissertation, University of Illinois, Urbana-Champaign.
- Poungvarin, N. (1998). Stroke in the developing world. *Lancet*, 352(SIII), 19-22.
- Prerost, M. R. (1997). Unpublished Master's dissertation, Virginia Polytechnic Institute and State University, Virginia, Retrieved from <http://www.scholar.lib.vt.edu/thesis/available/etd.474822559741551/unrestricted/find.pdf>
- Prochaska, J. J., Sallis, J. F., Sarkin, J. A., & Calfas, K. J. (2000). Examination of the factor structure of physical activity behaviors. *Journal of Clinical Epidemiology*, 53, 866-874.
- Rauramaa, R., Li, G., & Vaisanen, S.B. (2001). Dose-response and coagulation and hemostatic factors. *Medicine & Science in Sports & Exercise*, 33(6), S516-520.
- Ringelstein, E. B., & Nabavi, D. (2000). Long-term prevention of ischemic stroke and stroke recurrence. [Electronic version]. *Thrombosis Research*, 98(3): 83-96.
- Rejeski, W. J., Foy, C. G., Brawley. L. R., Brubaker. P. H., Focht. B. C., Norris. J. L., et al. (2002). Older adults in cardiac rehabilitation: A new strategy for enhancing physical function. *Medicine & Science in Sports & Exercise*, 34(11), 1705-1713.
- Rosenson, R. S., Tangney, C. C., & Hafner, J. M. (1994). Intraindividual variability of

- fibrinogen levels and cardiovascular risk profile. *Arteriosclerosis and Thrombosis*, 14(12), 1928 – 1932.
- Rozanski, A., blumenthal, L. A., & Kaplan, J. (1999). Impact of psychological factors on the pathogenesis of cardiovascular disease and implications for therapy. *Circulation*, 99, 2192-2217.
- Roul, G., Germain, P., & Bareiss, P. (1998). Does the six minute walk test predict the prognosis in patient with NYHA class II or III chronic heart failure? *American Heart Journal*, 136, 449–457.
- Santo, A. S., & Golding, L. A. (2003). Predicting maximum oxygen uptake from a modified 3-Minute Step Test . *Research Quarterly for Exercise and Sport*, 74 (1), 110-115.
- Sacco, R. L., et al. (1998). Leisure-time physical activity and ischemic stroke risk: The Northern Manhattan Stroke Study. *Stroke*, 29(2), 380-387.
- Saleh, U. S., & Brockopp, D. Y. (2001). Quality of life one year following bone marrow transplantation: Psychometric evaluation of the quality of life in bone marrow transplantation tool [Electronic version]. *Oncology Nursing Forum*, 28 (9), 1457-1464.
- Schneider, J. K. (1999). Preliminary testing of Episode-Specific Interpretations of Exercise Inventory. *Journal of Nursing Measurement*, 7(2), 153-176.
- Schnoll, R., & Zimmerman, B. J. (2001) .Self-regulation training enhances dietary self-efficacy and dietary fiber consumption. *Journal of the American dietetic association*, 101, 1006-1011.
- Skinner, B. F. (1953). *Science and human behavior*. New York: The free Press.
- Senecal, C., Nouwen, C., & White, D. (2000). Motivation and dietary self-care in adults with diabetes: Are self-efficacy and autonomous self-regulation complementary or competing constructs? *Health Psychology*, 19(5), 452-457.
- Shephard, R. J. (2001). Absolute versus relative intensity of physical activity in a dose – response context. *Medicine & Science in Sports & Exercise*, 33(6), S400-S418.
- Shin, Y. (1999) .The effect of a walking exercise program on physical function and emotional state of elderly Korean women. *Public Health Nursing*, 16 (2), 146-154.

- Sinyor, D., Amato, P., Kaloupek, D. G., Beger, R., Godenberg, M., & Coopersmith, H. (1986). Post-stroke depression: Relations to functional impairment, coping strategies, and rehabilitation outcome. *Stroke*, 17 (6): 1102-1107.
- Siscovick, D. S., Fried, L., Mittelmark, M., Rutan, G., Bild, D. & Oleay, D.H. (1997). Exercise intensity and subclinical cardiovascular disease in the elderly. *American Journal of Epidemiology*, 145(11), 977-986.
- Snell. P. G. & Mitchell, J. H. (1999). Physical inactivity: An easily modified risk factor? *Circulation*, 100(1), 2-4.
- Steffen, P. R., et al. (2001). Effects of exercise and weight loss on blood pressure during daily life. *Medicine & Science in Sports & Exercise*, 33(10), 1635-1640.
- Stergiou, G. S., Vemmos, K. N., Pliarchopou, K. M., Synetos, A. G., Roussias, L. G., & Mountokalakis, T. D. (2001). Parallel morning and evening surge in stroke onset, blood pressure and physical activity. *Stroke*, 33, 1480-1486.
- Strath, S.J., et al. (2000). Evaluation of heart rate as a method for assessing moderate intensity physical activity. *Medicine & Science in Sports & Exercise*, 32(9), S465-S470.
- Stuart-Shor, E.M., Buselli, E.F., & Carroll, D.L. (2003). Are psychosocial factor associated with the pathogenesis and consequences of cardiovascular disease in the elderly? *The Journal of Cardiovascular Nursing*. 18(3). 169-183.
- Tanne, D., Morag, N.K., Graff, E., & Goldbourt, U. (2001). Blood lipids and first-ever ischemic stroke/transient ischemic attack in the Bezafibrate Infarction Prevention (BIP) Registry. *Circulation*, 104, 2892-2897.
- Thompson. P. D., Crouse, S. F., Goodpaster, B., Kelley, D., Moyna, N. & Pescatello, P. (2001). The acute versus the chronic response to exercise. *Medicine & Science in Sports & Exercise*, 31(6), S438-445.
- Thompson. P. D., & Rader, R. (2001). Does exercise increase HDL cholesterol in those who need it the most? *Arteriosclerosis, Thrombosis, and Vascular Biology*, 21, 1097-1098.
- Toole, J.F., et al. (1978). Transient ischemic attacks: A prospective study of 225 patients *Neurology*, 28(August), 746-753.
- Toole, Toole, J.F., Lefkowitz, D.S., Chambless, L.E., Wijnberg, L., Paton, C.C., & Heiss, G. (1996). Self-reported transient ischemic attack and stroke symptoms:

- methods and baseline prevalence. The ARIC Study, 1987-1989. *American Journal of Epidemiology*, 144, 849-856.
- Troosters, T., Gosselink, R., & Decramer, M. (1999). Six minute walking distance in healthy elderly subjects. *European respiratory journal*, 14, 270-274.
- U.S. Department of Health and Human Services. (1996). Physical activity and health: A report of the Surgeon General. Atlanta, GA: Centers of Disease Control and Prevention (CDC), National Center for Chronic Disease Prevention and Health Promotion.
- Viriyavejakul, A., Senanarong, V., Prayoonviwat, N., Praditsuwan, R., Chaisevikul, R., & Pongvarin, N. (1998). Epidemiology of stroke in the elderly in Thailand. *Journal of the Medical Association of Thailand*, 81(7), 497-504.
- Visintin, M., Barbeau, H., Korner-Bitensky, N., & Mayo, N.F. (1998). A new approach to retrain gait in stroke patients through body weight support and treadmill stimulation [Electronic version]. *Stroke*, 29(6), 1122-1128.
- Wannamethee, G., & Shaper, A.G. (1992). Physical activity and stroke in British middle aged men. *British Medical Journal*, 304 (7), 597-601.
- Wannamethee, G.S., et al. (2002). Physical activity and haemostatic and inflammatory variables in elderly men. *Circulation*, 105, 1785-1790.
- Wang, J.S., Jen, C.J., Kung, H.C., Lin, L.J., Hsiue, T.R., & Chen, H.I. (1994). Different effects of strenuous exercise and moderate exercise on platelet function in men. *Circulation*, 90, 2877 – 2885.
- Wang, J. S., Jen, C. J., & Chen, H. (1997). Effects of chronic exercise and deconditioning on platelet function in women. *Journal of Applied Physiology*, 83(6), 2080-2085.
- Watkins, K.W., Connell, C.M., Fitzgerald, J.T., Klem, L., Hickey, T., & Dayton, B.I. (2000). Effect of adults' self-regulation of diabetes on quality-of-life outcomes. *Diabetes Care*, 23(10), 1511-1515.
- Wheeler, C. E., & Chin, P. L. (1989). *Peace and power: Hand book of feminist process*.  
New York: National League of Nursing.
- Whelton, P. S., et al. (2002) .Effect of aerobic exercise on blood pressure: A meta –

- analysis of randomized, controlled trials. *Annals of Internal Medicine*, 136, 493 – 503.
- Whittemore, R., Grey, M. (2002). The systematic development of nursing interventions. *Journal of Nursing Scholarship*, 34(2), 115-120.
- WHO. (1997). Focus on stroke: WHO's global initiative continues, the first Asia Pacific forum on stroke opened in Australia. Press release WHO/76. Retrieved from <http://www.who.int/archives/inf-pr-1997/en/pr97-76.html>
- WHO. (2000) .*The Asia Pacific perspective Obesity and its treatment*. Report of a WHO Regional office for The Western Pacific/International association for the study of Obesity/International Obesity task force. Sydney, 3-5 February 2000.
- Wilbur et al. (2001). Measuring adherence to a women's walking program. *Western Journal of Nursing Research*, 23(1), 8-32.
- Wilhelmsen, L., Svardsudd, K., Korsan-Bengtson, K., Larsson, B., Welin, L., & Tibbin, G. (1984). Fibrinogen as a risk factor for stroke and myocardial infarction. *New England Journal of Medicine*, 311, 501-5.
- Woods , J., et al. (2000). Special feature for the Olympics : Effect of exercise on the immune system: exercise-induce modulation of macrophage function. *Immunology Cell Biology*, Oct, 78(5) , 545-553.
- Wood, D.J., & Pesut, D. (1981) .Self-regulatory mental processes and patient recovery. *Western Journal of Nursing Research*, 3, 263-271.
- Wolf ,P.A., et al. (1999). Preventing ischemic stroke in patients with prior stroke and transient ischemic attack. *Stroke*, 30, 1991-1994.
- Woolf-May, K., et al. (1999). The effect two different 18-week walking programs on aerobic fitness, selected blood lipids and factor XIIa. *Journal of sports science*, 16, 701-710.
- Woolf-May, K., Woolf-May, K., Kearney, E. M., Owen, A., Jones, D. W., Divison, C. R., & Bird, S. R. (1999). The efficacy of accumulated shrot bouts versus single daily bouts of brisk walking in improving aerobic fitness and blood lipid profiles. *Health Education Research*. 14(6), 803-815.
- Women in Motion. (2004). *Exercise and hypertension*. Retrieved April 2, 2004, from <http://www.pages.ivillage.com/sgsamson/exercisehypertention.html>
- Wosornu, D., Allardyce, W., Ballantyne, D., & Tansey, P. (1992) .Influence of power

- and aerobic exercise training on haemostatic factors after coronary artery surgery. *British Heart Journal*, 68, 181-6.
- Yano, K., et al. (1999). Plasma fibrinogen and its correlates in study elderly Japanese man living in Japan and Hawaii. *Journal of Clinical Epidemiology*, 52(12), 1201-6.
- Youngkong, S., Riewpaiboon, A., Towanabut, S., & Riewpaiboon, W. (2002). Cost of cerebral infarction in societal perspective. *Srinakharinwirot Journal of Pharmaceutical Sciences*, 7(1), 95-105.
- กระทรวงสาธารณสุข. (2544). (Ministry of Public Health., 2002). *สถิติสาธารณสุข พ.ศ. 2544*. กรุงเทพฯ: โรงพิมพ์องค์การทหารผ่านศึก.
- กระทรวงสาธารณสุข. (2545). (Ministry of Public Health., 2003). *สถิติสาธารณสุข พ.ศ. 2545*. นนทบุรี: สำนักนโยบายและยุทธศาสตร์.
- จิรวรรณ อินคัม. (2539). (Inkhum, J., 1996). *การศึกษาพฤติกรรมส่งเสริมสุขภาพของผู้สูงอายุโรคหลอดเลือดหัวใจตีบ*. วิทยานิพนธ์ปริญญาพยาบาลศาสตรมหาบัณฑิต. มหาวิทยาลัยมหิดล.
- ณรงค์ อรุณาทิตย์ และ วราภรณ์ ตั้งตรงไพโรจน์. (2542). (Arunatit, N., & Tungtongpairroj, W., 1999). การศึกษาปัจจัยเสี่ยงในการกลับเป็นซ้ำของโรคหลอดเลือดสมองในสถาบันประสาทวิทยา. *วารสารสถาบันประสาทวิทยา*, 1(2), 46-55.
- ดาริณี สุภาพ. (2542). (Suwapap, D., 1999). *ปัจจัยที่มีอิทธิพลต่อพฤติกรรมส่งเสริมสุขภาพของพนักงานสตรีตั้งครรภ์ที่ทำงานในโรงงานอุตสาหกรรมและมารับบริการที่หน่วยฝากครรภ์*. วิทยานิพนธ์ปริญญาพยาบาลศาสตรดุษฎีบัณฑิต. มหาวิทยาลัยมหิดล.
- ดำรง กิจกุศล. (2544). (Kitkusol, D., 1997). *คู่มือออกกำลังกาย*. พิมพ์ครั้งที่ 4. กรุงเทพฯ: สำนักพิมพ์หมอชาวบ้าน.
- นิพนธ์ พวงวรินทร์. (2544). (Poungvarin, N., 2001). *โรคหลอดเลือดสมอง*. พิมพ์ครั้งที่ 2.

กรุงเทพ: เรือนแก้วการพิมพ์.

นิพนธ์ พวงวรินทร์. (2546). (Poungvarin, N., 2003). โรคหลอดเลือดสมองในประเทศไทย.

วารสารสถาบันประสาทวิทยา, 5(2), 68-73.

บรรเทิง เกิดปรำงค์. (2541). (Kerdprang, B., 1998). การเสริมสร้างสมรรถภาพทางกาย. กรุงเทพฯ:

ศูนย์ส่งเสริมวิชาการ.

บุญศรี นุกะตุ. (2541). (Nukate, B., 1998). พฤติกรรมการดูแลตนเองและความผาสุกของผู้สูงอายุ

โรคความดันโลหิตสูง. วิทยานิพนธ์ปริญญาพยาบาลศาสตรมหาบัณฑิต.มหาวิทยาลัย

เชียงใหม่.

ปิยะมิตร ศรีธรา. (2545). (Srithara, P., 2002). A breakthrough evidence in primary and

secondary CV Prevention. เมดิคอลไทม์, 2(64), 11-14.

พนิตนันท์ โชติกเจริญสุข. (2545). (Chotikacharoensuk, P., 2002). กิจกรรมทางกายกับความ

ผาสุกทางใจของผู้สูงอายุ. วิทยานิพนธ์ปริญญาพยาบาลศาสตรมหาบัณฑิตมหาวิทยาลัยเชียงใหม่.

ภัทรา อังสุวรรณ. (2544). (Aungsuwan, P., 2001). ความผิดปกติของคลื่นไฟฟ้าหัวใจในผู้ป่วย

โรคหลอดเลือดสมองตีบหรืออุดตัน. วารสารสถาบันประสาทวิทยา, 3(1), 8-17.

มัทนา อินทร์แพง. (2543). (Inpaeng, M., 2000). พฤติกรรมการออกกำลังกายและอุปสรรคต่อ

การออกกำลังกายของผู้สูงอายุในจังหวัดกำแพงเพชร. วิทยานิพนธ์ปริญญาพยาบาลศาสตร

มหาบัณฑิต. มหาวิทยาลัยเชียงใหม่.

ยุริพรรณ ชัยได้สุข. (2539). (Chaidaisuk, Y., 1996). การออกกำลังกายกับระดับไขมันในเลือด

ของผู้สูงอายุ. วิทยานิพนธ์ปริญญาวิทยาศาสตรมหาบัณฑิต (สาธารณสุขศาสตร).

มหาวิทยาลัยมหิดล.

เรืองศักดิ์ ศิริพล. (2542). (Siriphol, R., 1999). การออกกำลังกายกับการควบคุมโรคความดัน

โลหิตสูง โรคเบาหวาน โรคหัวใจขาดเลือด. สำนักพัฒนาวิชาการแพทย์ กรมการแพทย์

กระทรวงสาธารณสุข, กรุงเทพฯ: โรงพิมพ์ชุมนุมสหกรณ์เกษตรแห่งประเทศไทยจำกัด.

ลินจง โพธิบาล และคณะ. (2543). (Pothiban, L., 2000). ความชุกของปัจจัยเสี่ยง ภาวะเสี่ยงและ

การรับรู้ภาวะเสี่ยงต่อการเป็นโรคหลอดเลือดหัวใจในผู้สูงอายุไทย. *พยาบาลสาร*, 27(2), 16-23.

วันดี โภคกุล และ สมจินต์ โนมวัฒนะชัย. (2545). (Phokakul, W., & Chomwatanachai, S.,

2002). การออกกำลังกายเพื่อสุขภาพสำหรับผู้สูงอายุ. สถาบันเวชศาสตร์ผู้สูงอายุ

กรมการแพทย์ กระทรวงสาธารณสุข, กรุงเทพฯ: โรงพิมพ์ชุมนุม สหกรณ์การเกษตรแห่ง

ประเทศไทยจำกัด.

วันดี แยมจันทร์ฉาย. (2538). (Yamchanchai, W., 1995). ความสัมพันธ์ระหว่างการรับรู้

สมรรถนะของตนเอง การรับรู้ภาวะสุขภาพกับพฤติกรรมส่งเสริมสุขภาพของผู้สูงอายุ.

วิทยานิพนธ์ปริญญาพยาบาลศาสตรมหาบัณฑิต. มหาวิทยาลัยมหิดล.

วีระชัย ไควสุวรรณ. (2537). (Kowsuwan, W., 1994). การป้องกันการบาดเจ็บทางการกีฬา.

เอกสารอัดสำเนา. ภาควิชาออร์โธปิดิกส์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น.

สมโภชน์ เอี่ยมสุภาษิต. (2542). (Aimsupasit, S., 1999). ทฤษฎีและเทคนิคการปรับพฤติกรรม.

กรุงเทพฯ: โรงพิมพ์จุฬาลงกรณ์มหาวิทยาลัย.

สถิติจากเวชระเบียน. (2544). (Hospital Record., 2001). เอกสารอัดสำเนา. สถาบันประสาทวิทยา.

สามารถ นิธินันท์ & เจษฎา อุดมมงคล. (2544). (Nithinant, S & Udommongkol, J., 2001).

ปัจจัยเสี่ยงของการเกิดอัมพาตซ้ำในผู้ป่วยที่เคยเป็นโรคหลอดเลือดสมอง. *เวชสารแพทย์*

*ทหารบก*, 54, 19-25.

สีมา ศุภเกษม. (2533). (Suphakaseam, S., 1990). Heat Stroke ในภาค Neuromedicine. *เวชสารแพทย์ทหารบก*, 43(2), 57-59.

สุจิตรา ประสานสุขและคณะ. (2544). (Prasansuk, S., et al., 2001). โรคเวียนศีรษะในผู้สูงอายุ และการบำบัดฟื้นฟู. รายงานการวิจัยของคณะแพทยศาสตร์ศิริราชพยาบาลในชุดโครงการวิจัย เรื่อง “แผนงานวิจัยเพื่อสุขภาพผู้สูงอายุ” สำนักงานคณะกรรมการวิจัยแห่งชาติ, เอกสารอัดสำเนา. คณะแพทยศาสตร์ศิริราชพยาบาล.

อัญชลี กลิ่นอวล. (2544). (Klin-ual, A., 2001). ผลการใช้โปรแกรมการออกกำลังกายต่อสมรรถภาพทางกายและความพอใจของผู้สูงอายุ. วิทยานิพนธ์ปริญญาวิทยาศาสตรมหาบัณฑิต (การพยาบาลผู้สูงอายุ). มหาวิทยาลัยเชียงใหม่.



## **APPENDIX A**

### **LEARNING COURSE ON CEREBROVASCULAR DISEASE, DIET CONTROL, STRESS MANAGEMENT, AND PHYSICAL ACTIVITY**

Transient Ischemic Attack (TIA) and minor stroke are often found in the middle-aged and elderly patients. Major cause of TIA and minor stroke is a cerebrovascular disease in which the cerebral veins are clogged and narrowed leading to an interruption of the blood flow, which often results in stroke. You should learn about the symptoms and their preventions to ensure physical fitness and reduced risk factors for stroke.

#### **Definition of TIA**

TIA occurs when blood vessels are blocked or partially clotted interrupting the blood flow to an area of the brain resulting in temporary stroke. The symptoms may recur and patients often recover quickly within 24 hours. The symptoms are dysarthria, dysphasia, numbness or weakness of face, arm or both eyes, difficulty in swallowing, and syncope. An interruption to the blood flow due to a blood or fat clot can cause a decrease in brain function. If resolved, and the blood flow is uninterrupted, brain function will be restored. However, TIA is the major warning sign for cerebrovascular disease. Those who experience more than one TIA are likely to develop successive ischemic stroke; their chances are 36 percent or 10 times more than those of normal people.

#### **Definition of Minor Stroke**

Minor stroke is a neurological disorder that occurs over 24 hours and can be .....

## **APPENDIX B**

### **SELF-REGULATED EXERCISE PROGRAM**

### **FOR TRANSIENT ISCHEMIC ATTACK**

### **AND MINOR STROKE PATIENTS**

The self-regulated exercise program is derived from Pender's Health-Promoting Model (1996), Bandura's self-regulation (1977) and the new concept of physical activities. It promotes a moderate level of physical activity, both in leisure-time and in daily activities, which takes 15 minutes and occurs at a different period of time to add up to over 1,000 kcal of energy spent per week for best results (Shephard, 2001; Ainsworth, 2000). This program for TIA and minor stroke patients is divided into: 1. Basic knowledge preparation 2. Training to self-regulate 3. Application 4. Follow-up. It will encourage TIA and minor stroke patients to exercise more often to ensure their healthiness and decrease risk factors for a cerebrovascular disease. The followings are its objectives and procedures:

#### **General Objectives**

To enable patients to self-regulate themselves in participating in more and constant exercise to meet with the standard of moderate level of exercise. The duration is 15 minutes and the energy consumed is more than 1,000 kcal per week. The exercise will improve heart and blood vessel function which is a result of lowering blood pressure and heart rate. Patients are able to walk longer distances while their risks for a cerebrovascular disease are reduced once HDL-cholesterol increases and total cholesterol and fibrinogen decreases.

#### **Target Group**

TIA and minor stroke patients whose amount of exercise is below 1,000 kcal per week

---

## APPENDIX C

### HANDBOOK OF EXERCISE

#### Introduction

The handbook of exercise serves as a guideline for Transient Ischemic Attack and Minor Stroke patients. It aims at introducing principles and models of moderate exercise to increase the cardiorespiratory endurance as it improves the functioning of the heart and blood vessel. The lungs are better able to transmit oxygen to every part of the body. Results are improved health and reduced risk factors for stroke. This program is safe to practice.

Additionally, patients are provided with instructions on flexibility exercise that increase range of motion and allow more comfortable body movements and physical activeness including strength training to increase activity and energy to work.

The handbook of exercise consists of the following.

1. Principles and models of 3-6 METs moderate physical activity which can be divided into:
  - 1.1 Physical activity related to household and occupational activities
  - 1.2 Physical activities related to recreation, sports, and exercise
2. Physical exercises to increase flexibility, range of joints, and stretching which can be divided into:
  - 2.1 Exercise 1 – before getting out of bed
  - 2.2 Exercise 2 – neck and shoulder exercise
  - 2.3 Exercise 3 – before and after walk
3. Exercises to strengthen muscles for those who rarely exercise their limbs or muscles.....

## APPENDIX D

### PHYSICAL ACTIVITY QUESTIONNAIRE

**Directions:** In order to learn more the physical activities in your daily lives, we would like to know about your physical activities related to household activities, occupational activities, recreational activities, such as exercise, sports, and pleasure activities.

There are 5 pages in this questionnaire which is divided into 4 parts: Personal data, Occupational activity, Household and home care activity, and, lastly, Physical activities related to recreation, sports, exercise, and pleasure activities. Their intensity is categorized as follows:

**Light activity** refers to one that does not require any or very little effort. It does not change respiratory rate. Examples are sitting reading a book, standing talking, and strolling.

**Moderate activity** refers to one that requires medium effort causing slightly increased respiration. Examples are trotting, Chinese boxing, and low-impact aerobic dance.

**Heavy activity** refers to one that requires intense effort causing greatly increased respiration. Examples are lifting 7-kilo load, climbing up the stairs, running, and high- impact aerobic dance.

Please mark (✓) in front of the answers you wish to choose or fill in the blank.

#### Part1. Personal Data

1.1 ID number.....

1.2 Sex ( ) 1.Male ( ) 2.Female Height.....cm. Weight  
.....kg.

1.3 Age.....

.....

1.15 Smoking ( ) 1. No ( ) 2. Yes, how many per day?.....

## APPENDIX E

### Opinion about Physical Activity Questionnaire and Satisfaction with Response to Physical Activity Scale

#### Opinion about Physical Activity Questionnaire

**Directions:** We would like to know your opinion about physical activity regarding its benefits, positive and negative feelings, abnormality, problems, and suggestions.

**Please answer the questions below.**

1. Do you have any problems or obstacles that prevent you from doing exercises?

( ) No

( ) Yes (please specify in details).....

.....

What is your solution to the above?

.....

.....

.....

2. How do you feel after the exercise?

( ) I do not feel anything

( ) I feel something (please specify in details)

.....

.....

.....

.....

.....

6. Do you have any suggestions to encourage others to exercise regularly?

.....

### Satisfaction with Response to Physical Activity Scale

**Directions :** Satisfaction with response to physical activity is an overall feeling about your health that includes pleasant affect, physical activeness, decreased tension, etc.

The purpose of this scale is to assess your satisfaction with response to physical activity; “1” represents lowest satisfaction and “10” highest satisfaction.

Please circle the figure that best describes your overall satisfaction with response to physical activity.

**Highest satisfaction**

|    |
|----|
| 10 |
| 9  |
| 8  |
| 7  |
| 6  |
| 5  |
| 4  |
| 3  |
| 2  |
| 1  |

**Lowest satisfaction**

**APPENDIX F**  
**Six-minute Walk Test Record**

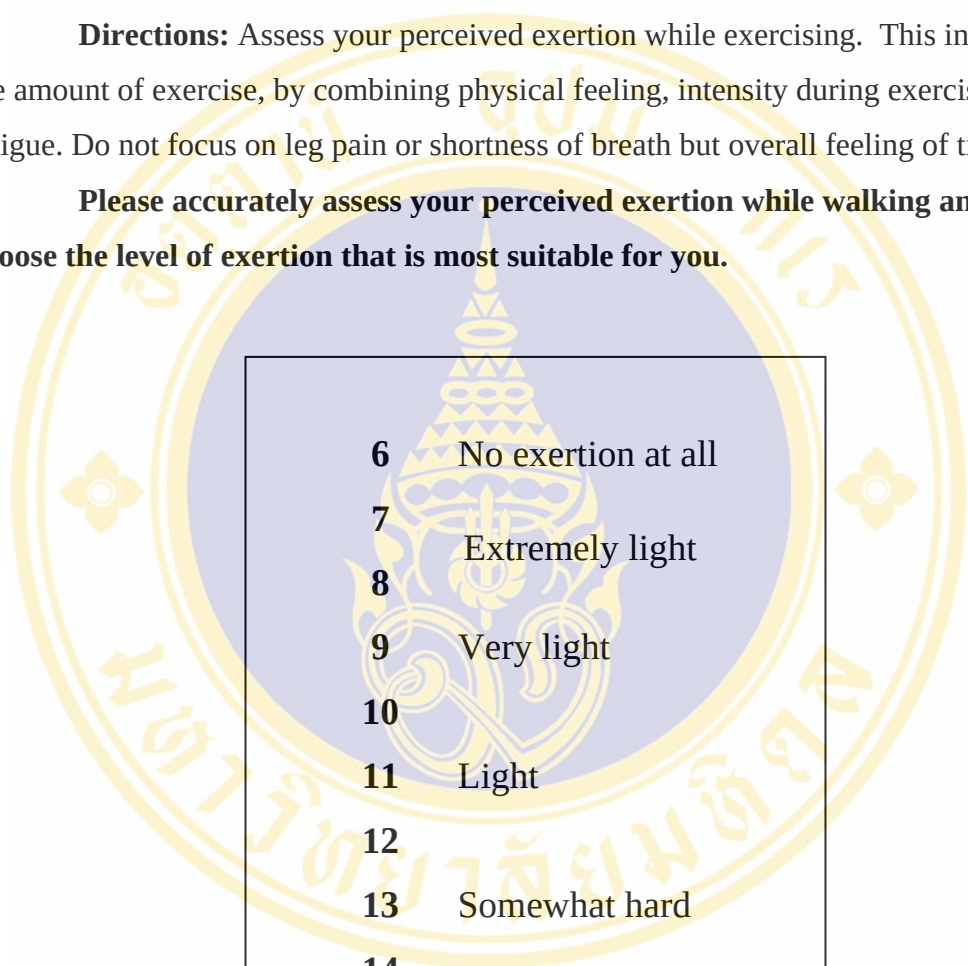
| No. | name | Pulse       |            | Level of Exertion |            | 1 Round (30m.) X<br>No. of round<br>+.....m.<br>+ .....cm. | Remarks |
|-----|------|-------------|------------|-------------------|------------|------------------------------------------------------------|---------|
|     |      | Before walk | After walk | Before walk       | After walk |                                                            |         |
| 1   |      |             |            |                   |            |                                                            |         |
| 2   |      |             |            |                   |            |                                                            |         |
| 3   |      |             |            |                   |            |                                                            |         |
| 4   |      |             |            |                   |            |                                                            |         |
| 5   |      |             |            |                   |            |                                                            |         |
| 6   |      |             |            |                   |            |                                                            |         |
| 7   |      |             |            |                   |            |                                                            |         |
| 8   |      |             |            |                   |            |                                                            |         |
| 9   |      |             |            |                   |            |                                                            |         |
| 10  |      |             |            |                   |            |                                                            |         |
| 11  |      |             |            |                   |            |                                                            |         |

## APPENDIX G

### PERCEIVED EXERTION SCALE

**Directions:** Assess your perceived exertion while exercising. This indicates the amount of exercise, by combining physical feeling, intensity during exercise, and fatigue. Do not focus on leg pain or shortness of breath but overall feeling of tiredness.

**Please accurately assess your perceived exertion while walking and choose the level of exertion that is most suitable for you.**

- 
- |    |                    |
|----|--------------------|
| 6  | No exertion at all |
| 7  |                    |
| 8  | Extremely light    |
| 9  |                    |
| 10 | Very light         |
| 11 |                    |
| 12 | Light              |
| 13 |                    |
| 14 | Somewhat hard      |
| 15 |                    |
| 16 | Hard               |
| 17 |                    |
| 18 | Very hard          |
| 19 |                    |
| 20 | Extremely hard     |
|    | Maximal hard       |

APPENDIX H

PHYSICAL ACTIVITY DIARY

\*Fill in only moderate activities performed continually for over 10-15 min.\*      Date..... Month..... Year.....

| Physical Activities | Monday |     | Tuesday |     | Wednesday |     | Thursday |     | Friday |     | Saturday |     | Sunday |     |
|---------------------|--------|-----|---------|-----|-----------|-----|----------|-----|--------|-----|----------|-----|--------|-----|
|                     | Hr:    | Min | Hr:     | Min | Hr:       | Min | Hr:      | Min | Hr:    | Min | Hr:      | Min | Hr:    | Min |
|                     | :      |     | :       |     | :         |     | :        |     | :      |     | :        |     | :      |     |
|                     | :      |     | :       |     | :         |     | :        |     | :      |     | :        |     | :      |     |
|                     | :      |     | :       |     | :         |     | :        |     | :      |     | :        |     | :      |     |
|                     | :      |     | :       |     | :         |     | :        |     | :      |     | :        |     | :      |     |
|                     | :      |     | :       |     | :         |     | :        |     | :      |     | :        |     | :      |     |
|                     | :      |     | :       |     | :         |     | :        |     | :      |     | :        |     | :      |     |

Rewards.....

Witness.....

## APPENDIX I

### THAI MENTAL STATE EXAM

| Full score | Questions                                                                                        | Answer | score |
|------------|--------------------------------------------------------------------------------------------------|--------|-------|
|            | <b>ORIENTATION (6 points)</b> Perception of time, place, and people                              |        |       |
| 1          | 1. What day is today (Monday, Tuesday, Wednesday, Thursday, etc)?                                |        |       |
| 1          | 2. What date is today?                                                                           |        |       |
| 1          | 3. What month is this month?                                                                     |        |       |
| 1          | 4. In which period of day is now (morning, noon, afternoon, evening)?                            |        |       |
| 1          | 5. Where is this place (test location)?                                                          |        |       |
| .          | .                                                                                                |        |       |
| .          | .                                                                                                |        |       |
|            | <b>ATTENTION (5 points)</b> Range of interest                                                    |        |       |
|            | Say Sunday – Saturday in retrospect for every week (one repeated answer is allowed)              |        |       |
| 1          | Friday                                                                                           |        |       |
| 1          | Thursday                                                                                         |        |       |
| .          |                                                                                                  |        |       |
|            | <b>LANGUAGE (3 points)</b>                                                                       |        |       |
| 1          | The tester points at his wristwatch and asks the testee “What do we normally call this (watch)?” |        |       |
| .          | .                                                                                                |        |       |
|            | <b>RECALL (3 points)</b>                                                                         |        |       |
|            | What are the 3 items you were told to memorize a while ago?                                      |        |       |
| 1          | Tree                                                                                             |        |       |
| 1          | Car                                                                                              |        |       |
| 1          | Hand                                                                                             |        |       |
|            | <b>CALCULATION (3 points)</b>                                                                    |        |       |
| .          | .                                                                                                |        |       |
| .          | .                                                                                                |        |       |
| .          | <b>LANGUAGE (7 points)</b>                                                                       |        |       |
| .          | .                                                                                                |        |       |
| .          | .                                                                                                |        |       |

**APPENDIX J****Video Scripts entitled “Self-regulation in Exercise”**

Length: 13 min.

| Seq. | Image                                                                     | Sound                                                                                                                                                                                                                                                                                                                                                                                                             |
|------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Fade in. Yellow title “Self-regulation in Exercise” on exercising people. | Music                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2    | Inside the physical therapy room for paralysis patients.                  | Some of these patients have suffered from TIA and minor stroke resulting in the death of some brain cells and nerve cells to control physical mobility. Severity of loss of physical mobility depends on the time and area where the blood flow to the brain is interrupted. If the blood flow is blocked for a sufficient period and in a large enough area, patients may lose their mobility or speech ability. |
| 3    | Inside the examination room for cerebrovascular patients                  | Major cause of TIA and major stroke is high cholesterol preventing the blood circulation to the brain. It must be solved now or else you are put at high risk for recurrent stroke which can worsen to paralysis                                                                                                                                                                                                  |
| 4    | .....<br>.....<br>.....                                                   | .....<br>.....<br>.....                                                                                                                                                                                                                                                                                                                                                                                           |

## APPENDIX K

### 6-Minute Walk Test

**Preparation:** Wear comfortable shoes and clothing for easy movement.

**Procedures:**

1. Conduct the test in a quiet meeting room with air-conditioning.
2. Instruct the patients to walk as far as possible along the tape until the watch stops. A break is possible if shortness breath or extreme exhaustion occurs. The walk can be resumed once the patient has adequately recovered.
3. Watch the demonstration before the test starts.
4. Start the test. Patients hold the timer in their hands. Pre-test perceived exertion is carried out by the research assistant. The walk starts on the count of three and once 6 minutes are reached, the timer will go off. The assistant who is monitoring the patients instructs them to stop walking.
5. Measure the distance, number, and duration of breaks in 6 minutes, post-test heart rate, and perceived exertion.
6. Patients are verbally encouraged upon completion of each round by saying “well done, try to walk as far as you can, you are doing well, keep trying” throughout the entire process.

## APPENDIX L

### INFORMED CONSENT FORM

#### Useful Information For Patients and Protection of Human Subjects

##### (For Experimental Group)

My name is Wallada Chanruengvanich. I am a Ph.D. candidate in Nursing, Faculty of Nursing, Mahidol University. Currently, I am conducting research on “THE EFFECT OF A SELF-REGULATED EXERCISE PROGRAM ON PHYSICAL FITNESS AND RISK FACTORS FOR STROKE AMONG CLIENTS WITH TRANSIENT ISCHEMIC ATTACK AND MINOR STROKE.” The purpose is to provide knowledge about the disease and to teach patients how to self-regulate in exercise to ensure their physical fitness and reduced risk factors for stroke.

I, therefore, would like to invite you and your family members to participate in the research project. Interested persons will be given training on exercise and self-regulation exercise that is adequate and suitable for the disease. The program takes 3 consecutive months. The entire training course takes 2 days, lasting 3 hours a day. You will be educated by the researcher and put in the group of patients to find a direction for exercise together. Also, you will be shown a “Self-regulation in Exercise” video, given a handbook of exercise, a follow-up visit at home and a weekly telephone follow up and advice.

.....

If during the program you do not feel comfortable with your continued participation, you are free to leave or stop completing the questionnaires or the examinations at any time. There are no negative implications on you. For more information, please call 02-4475767 or 06-7803211.

Thank you for your cooperation  
(Mrs.Wallada Chanruangvanich)  
Researcher

## APPENDIX M

### List of Experts for Content Validity

#### **The Content of the Self-Regulated Exercise Program, Physical Activity Questionnaire, and Exercise Handbook**

1. Assistant Professor Dr. Voramont Bamroongsuk  
Department of Rehabilitation Medicine, Faculty of Medicine,  
Siriraj Hospital, Mahidol University
2. Assistant Professor Dr. Narirat Jitramontree  
Department of Fundamental of Nursing, Faculty of Nursing,  
Mahidol University
3. Dr. Napaporn Wanitkun  
Department of Surgical Nursing, Faculty of Nursing, Mahidol University

#### **The Content of Learning Course “Cerebrovascular Disease and Diet Control”**

1. Associate Professor Dr. Orasa Panpakdee  
Department of Nursing, Faculty of Medicine, Ramathibodi Hospital  
Mahidol University
2. Assistant Professor Dr. Rungsan Chaisaewikul  
Department of Medicine, Faculty of Medicine, Siriraj Hospital,  
Mahidol University
3. Dr. Tassanee Tantilittisak  
Department of Neurology, Prasat Neurological Institute

#### **The Content of Learning Course “Stress Management”**

1. Associate Professor Dr. Orasa Panpakdee  
Department of Nursing, Faculty of Medicine, Ramathibodi Hospital  
Mahidol University
2. Associate Professor Dr. Yupapin Sirapongam  
Department of Nursing, Faculty of Medicine, Ramathibodi Hospital  
Mahidol University
3. Dr. Piyanee Klainin  
Department of Psychiatric-Mental Health Nursing, Faculty of Nursing,  
Mahidol University

### **The Content of Learning Course “Physical Activity”**

1. Assistant Professor Dr. Rungsan Chaisaewikul  
Department of Medicine, Faculty of Medicine, Siriraj Hospital,  
Mahidol University
2. Assistant Professor Dr. Voramont Bamroongsuk  
Department of Rehabilitation Medicine, Faculty of Medicine,  
Siriraj Hospital, Mahidol University
3. Dr. Tassanee Tantilittisak  
Department of Neurology, Prasat Neurological Institute

### **The Content of Satisfaction with response to physical activity Scale**

1. Assistant Professor Dr. Narirat Jitramontree  
Department of Fundamental of Nursing, Faculty of Nursing,  
Mahidol University
2. Assistant Professor Dr. Voramont Bamroongsuk  
Department of Rehabilitation Medicine, Faculty of Medicine,  
Siriraj Hospital, Mahidol University
3. Dr. Piyanee Klainin  
Department of Psychiatric-Mental Health Nursing, Faculty of Nursing,  
Mahidol University

### **The Content of Self-Regulated Exercise Video Script**

1. Associate Professor Dr. Chunhakasem Chotinaiwattarakul  
Her Majesty's Cardiac Centre, Faculty of Medicine, Siriraj Hospital,  
Mahidol University
2. Assistant Professor Bunsha Pittayawaranant  
Medical Education Technology Center, Faculty of Medicine,  
Siriraj Hospital, Mahidol University
3. Assistant Professor Dr. Narirat Jitramontree  
Department of Fundamental of Nursing, Faculty of Nursing,  
Mahidol University
4. Assistant Professor Surinda Pittayawaranant  
Medical Education Technology Center, Faculty of Medicine,  
Siriraj Hospital, Mahidol University
5. Dr. Napaporn Wanitkun  
Department of Surgical Nursing, Faculty of Nursing, Mahidol University

## APPENDIX N

### METS SCORE \*

|    | Physical activity                                                                                                                                                                                             | METS |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1  | Standing and/or walking, normal speed, carrying light objects(e.g. store representative)                                                                                                                      | 3    |
| 2  | Walking job, carrying moderately heavy objects (e.g. Parcel deliverer, participating military trainer or physical education teacher , janitor)                                                                | 4.5  |
| 3  | Standing, Walking job, carrying heavy objects, with heavy labor activities (e.g. labor workers, construction workers, carpenter, digging, wood cutting)                                                       | 7    |
| 4  | Walking to work                                                                                                                                                                                               | 3.5  |
| 5  | Moderately heavy household activities (e.g. standing or walking around with carrying weight object, laundry with machine, vacuuming, wipe or cleaning floor using mopping stick, playing with older children) | 3    |
| 6  | Housework with exertion (e.g. rubbing floor, handed laundry)                                                                                                                                                  | 4    |
| 7  | Relaxing or Pleasure Walking, comfortable pace                                                                                                                                                                | 3    |
| 8  | Fast walking for exercise, outdoor or treadmill                                                                                                                                                               | 6    |
| 9  | Jog/walk combination(jogging component of less than 10 minute)                                                                                                                                                | 6    |
| 10 | Stationary bicycling , 100watts,light effort                                                                                                                                                                  | 5.5  |
| 11 | Tai-Chi                                                                                                                                                                                                       | 4    |

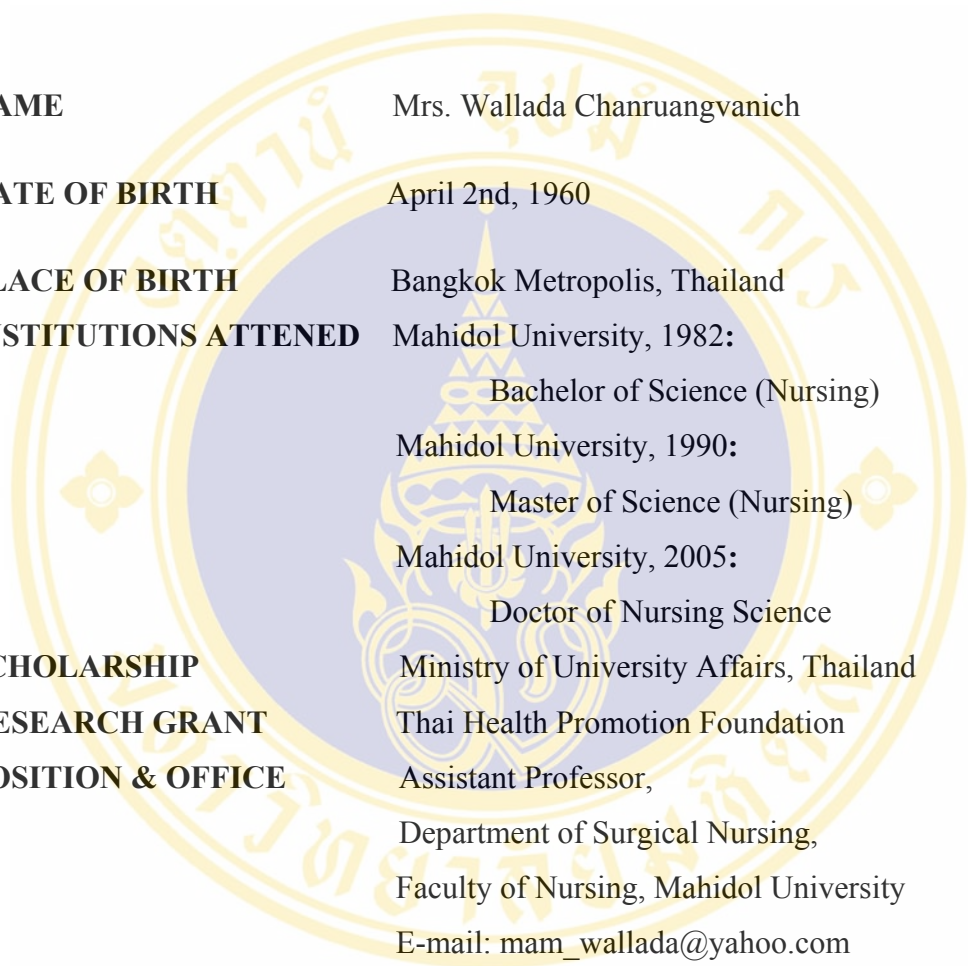
\*Adapt from Ainsworth compendium (2000) and Pongurgsorn (2001) with assistance  
from Dr. Chakarg Pongurgsorn

## APPENDIX O

### STUDY VARIABLE MEAN SCORES AND STANDARD DEVIATION

**Table 26** Study variable means scores and standard deviation between the experimental and control groups at each time point.

| Variables                                | Baseline |        | 6 <sup>th</sup> week |         | 12 <sup>th</sup> week |         |
|------------------------------------------|----------|--------|----------------------|---------|-----------------------|---------|
|                                          | Mean     | SD     | Mean                 | SD      | Mean                  | SD      |
| <b>6-minute walk distance</b>            |          |        |                      |         |                       |         |
| Experiment                               | 391.99   | 82.60  | 420.53               | 66.39   | 435.20                | 66.98   |
| Control                                  | 341.60   | 89.97  | 358.44               | 88.68   | 362.43                | 98.88   |
| <b>Heart rate</b>                        |          |        |                      |         |                       |         |
| Experiment                               | 72.39    | 12.80  | 70.16                | 13.02   | 67.71                 | 10.09   |
| Control                                  | 72.68    | 10.05  | 72.65                | 9.49    | 71.42                 | 9.55    |
| <b>Satisfaction to physical activity</b> |          |        |                      |         |                       |         |
| Experiment                               | 5.58     | 1.52   | 8.35                 | 1.36    | 9.48                  | 1.06    |
| Control                                  | 6.32     | 1.64   | 7.35                 | 2.09    | 7.42                  | 1.98    |
| <b>Systolic blood pressure</b>           |          |        |                      |         |                       |         |
| Experiment                               | 146.16   | 17.90  | 145.90               | 17.09   | 141.19                | 16.77   |
| Control                                  | 143.45   | 18.80  | 141.58               | 18.56   | 137.94                | 22.74   |
| <b>Diastolic blood pressure</b>          |          |        |                      |         |                       |         |
| Experiment                               | 80.71    | 12.36  | 80.74                | 14.98   | 77.13                 | 11.34   |
| Control                                  | 79.19    | 9.46   | 76.81                | 9.17    | 75.81                 | 11.54   |
| <b>Total cholesterol</b>                 |          |        |                      |         |                       |         |
| Experiment                               | 202.58   | 45.40  | 207.16               | 47.91   | 207.10                | 45.23   |
| Control                                  | 203.87   | 35.58  | 199.58               | 31.21   | 200.42                | 34.20   |
| <b>HDL- cholesterol</b>                  |          |        |                      |         |                       |         |
| Experiment                               | 42.26    | 12.43  | 42.03                | 11.85   | 42.94                 | 10.93   |
| Control                                  | 43.77    | 12.66  | 47.26                | 13.71   | 42.84                 | 12.34   |
| <b>Fibrinogen</b>                        |          |        |                      |         |                       |         |
| Experiment                               | 323.48   | 42.91  | 314.68               | 59.24   | 323.42                | 63.94   |
| Control                                  | 332.23   | 40.01  | 329.19               | 41.01   | 351.19                | 40.49   |
| <b>Energy expenditure</b>                |          |        |                      |         |                       |         |
| Experiment                               | 633.23   | 228.91 | 2845.78              | 1382.89 | 2892.09               | 1761.23 |
| Control                                  | 636.99   | 273.32 | 2285.10              | 9.49    | 2364.88               | 2351.55 |

**BIOGRAPHY**

|                              |                                                                                                                                                                                  |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAME</b>                  | Mrs. Wallada Chanruangvanich                                                                                                                                                     |
| <b>DATE OF BIRTH</b>         | April 2nd, 1960                                                                                                                                                                  |
| <b>PLACE OF BIRTH</b>        | Bangkok Metropolis, Thailand                                                                                                                                                     |
| <b>INSTITUTIONS ATTENDED</b> | Mahidol University, 1982:<br>Bachelor of Science (Nursing)<br>Mahidol University, 1990:<br>Master of Science (Nursing)<br>Mahidol University, 2005:<br>Doctor of Nursing Science |
| <b>SCHOLARSHIP</b>           | Ministry of University Affairs, Thailand                                                                                                                                         |
| <b>RESEARCH GRANT</b>        | Thai Health Promotion Foundation                                                                                                                                                 |
| <b>POSITION &amp; OFFICE</b> | Assistant Professor,<br>Department of Surgical Nursing,<br>Faculty of Nursing, Mahidol University<br>E-mail: mam_wallada@yahoo.com                                               |