Physical Activity Questionnaire Development and Testing among Elderly Community-Dwelling Thais

Vanida Visuthipanich, Yupapin Sirapo-ngam, Porntip Malathum, Kallaya Kijboonchoo, Thavatchai Vorapongsathorn, Kerri M. Winters-Stone

Abstract : This descriptive cross-sectional research aimed to develop and test a self-report physical activity questionnaire (SPAQ) among elderly community-dwelling Thais. The study involved two phases. Phase I, questionnaire development, consisted of six steps: 1) defining the concept; 2) generating an item pool; 3) defining the choices of responses to items; 4) reviewing items; 5) conducting a pilot study; and, 6) selecting items for analyses. Inter-rater agreement and item-level for content validity index for the first draft of the SPAQ (47 items) were .99 and .89, respectively. Face validity was conducted with the second draft of the SPAQ (48 items). A pilot study, based on the dimensions, household, occupation, leisure time, and transportation, was conducted with the third draft (77 items). To obtain the final draft of the instrument (55 items), content categorization of activities was conducted with the third draft of the SPAQ, based on the literature's descriptions of the dimensions of physical activity and the deletion of items participants, in the pilot study, did not perform.

Phase II, psychometric property evaluation, used Pearson's correlation coefficient to analyze the concurrent validity, predictive validity and test-retest reliability. An acceptable concurrent validity coefficient was obtained by examining a relationship between the SPAQ and Actigraph readings. The SPAQ presented good predictive validity, as indicated by its correlation with the six minute walk test. However, a non-significant correlation between the SPAQ and both physical function and body fat was found. The 7-day test-retest reliability coefficient of the SPAQ indicated good reliability. Although the concurrent validity presented a modest coefficient, the SPAQ was shown to be relatively convenient, simple and suitable for administration. These results were similar to those found among Western populations.

Thai J Nurs Res 2009; 13(4) 249 - 267

Keywords: elderly Thais, physical activity, questionnaire development and testing

Background and Significance of the Study

Physical inactivity has been identified as an important risk factor regarding chronic illnesses, functional limitations and disabilities among elderly Thais.[1,2] Loss of physical capability, especially among older individuals, often leads to limitations in activities

Correspondence to:* Vanida Visuthipanich**, *RN, PhD Candidate, Department of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand.* ***E-mail: *fahchua@yahoo.com*
Yupapin Sirapo-ngam, *RN, DSN. Associate Professor, Department of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand.*
Porntip Malathum, *RN, PhD. Assistant Professor, Department of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand.*
Kallaya Kijboonchoo, *PhD. Associate Professor, Institute of Nutrition, Mahidol University, Thailand.*
Thavatchai Vorapongsathorn, *PhD. Associate Professor, Faculty of Public Health, Mahidol University, Thailand.*
Kerri M. Winters-Stone, *PhD. Associate Professor, School of Nursing, Oregon Health & Science University, USA.*

of daily living and is associated with falls, nursing home admissions, hospitalizations and death.[3-5] There is growing evidence that habitual physical activity and healthy dietary habits decrease the incidence of chronic health problems.[4] In addition, habitual physical activity has been found to be associated with improvement in health, as well as longevity.[5]

Since lifestyle activities are related to cultural values,[5] selection of an appropriate, culturally-sensitive method to assess physical activity is a critical issue in an epidemiological study. For example, limitations that have been recognized, regarding assessment of physical activity among the Thai population, include, but are not limited to: physical activity scores, which may be over-estimated or under-estimated;[6] assessment methods, which may not cover the investigation of frequency and duration;[6,7] and, objective measurements, which may not be sufficient to validate a measure.[8] Such limitations may obscure the relationship between physical activity and health outcomes. Since modified instruments that measure physical activity, among the elderly, may not be culturally appropriate, when used within the context of the Thai culture, a need for development of such instruments exists.

It has been shown that a tool, such as a self-report questionnaire, is practical for use, in epidemiologic studies, to assess physical activity, when it is inexpensive, easy to administer and generally acceptable for research.[9] Therefore, the purpose of this study was to develop, and psychometrical examine, a self-report physical activity questionnaire that could assess physical activity among elderly Thais.

Conceptual Framework for this Study

The conceptual framework (see **Figure 1**), for the study, was synthesized from Nagi's model of the disablement process,[10] as well as from research linking physical activity and disability.[11] The disablement process, according to Nagi, is a thorough socio-medical model that pays attention to both medical and social aspects of disabilities. The foundation of the disablement model covers four main concepts: active pathology, impairment, functional limitation and disability.[10] Active pathology is considered a health problem (i.e. osteoarthritis) that induces functional limitations. Impairment refers to anatomical, physiological and mental abnormalities of organs or body systems, while functional limitation indicates one's ability to perform to his/her fullest capacity. Finally, disability is a limitation in performance of defined roles and tasks within a socio-cultural and physical environment.

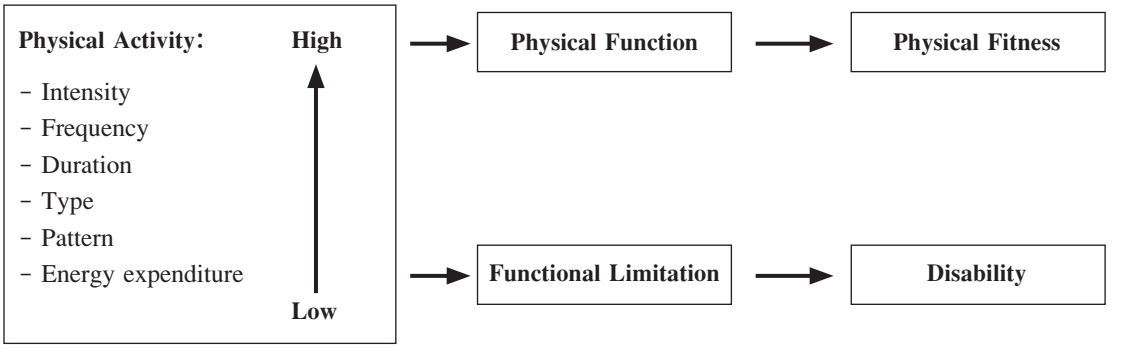

Figure 1 Conceptual framework of the study

For the purpose of this study, the conceptualization of functional limitation incorporated Nagi's[10] description of both impairment and functional limitation. The framework shows the relationship among: (a) high physical activity, physical function and fitness; and, (b) low physical activity, physical limitations and disability. Thus, the five major components in the framework, for this study, were: 1) physical activity, 2) physical function, 3) physical fitness, 4) functional limitation, and 5) disability.

Physical activity was conceptualized as comprising all physical activity, including: pattern, intensity, frequency, duration and total amount of physical activity, which result in the expenditure of energy. One's level of physical activity was defined as being on a broad continuum, from very low to very high. Physical activity plays a role, according to its pattern and level, both as a risk factor (negative effect) and a mediator (positive effect) for health-related physiological outcomes. Appropriate physical activity can improve physical function and fitness of well-functioning older adults, as well as prevent functional limitation and disability among those with a health problem.[3]

Physical function was seen as one's physical and functional capacity to perform basic conditioning activities in daily life. Physical inactivity has been found to be associated with lower levels of physical function, while physical activity has been demonstrated to be associated with higher levels of physical functioning, among older adults.[12]

Physical fitness was viewed as the positive health outcomes of physically active behavior. Older adults, who are physically fit, are known to have greater capability and endurance to accomplish activities of daily living, including personal and social activities.[13]

Functional limitation, within the context of this framework, refers to the continuum status of functional capability. Functional capability ranged from lose and/or abnormality of structure and function, at the specific organ-level, to limitations or restrictions, at the level of the whole organism, in performing fundamental physical and mental activity in daily life.

Disability refers to inability, or difficulty, in performing individually and socially defined activities and roles. As has been noted, disabilities are known to affect activities of daily living, such as personal care, household management and job (paid employment), which are necessary for survival and independent living.[10]

In addition, the conceptual and methodological issues for development and testing of the Community Healthy Activities Model Program for Seniors (CHAMPS) survey[13] were selected for use in the questionnaire development phase of this study. These issues included: 1) assessing the types and intensity levels of physical activity that are meaningful and appropriate for the elderly; 2) designing questions and methods to facilitate accurate reporting, since the elderly often have cognitive impairment; and, 3) minimizing socially desirable responses, since the elderly sometimes tend to present themselves as being active. According to the United Nations,[1] an elderly person is anyone 60 years of age or older. Such a person can be classified as being: young old (60-69), medium old (70-79) or oldest old (80 and above).[2]

Purposes of the Study

The purposes of this study were twofold. They were to: 1) develop the Self-report Physical Activity Questionnaire (SPAQ) for elderly Thais; and, 2) evaluate the psychometric properties of the SPAQ.

Method

A descriptive cross-sectional design, consisting of two phases, was used (see **Figure 2**). Phase I, questionnaire development, involved six steps: 1) defining the concept; 2) generating an item pool;

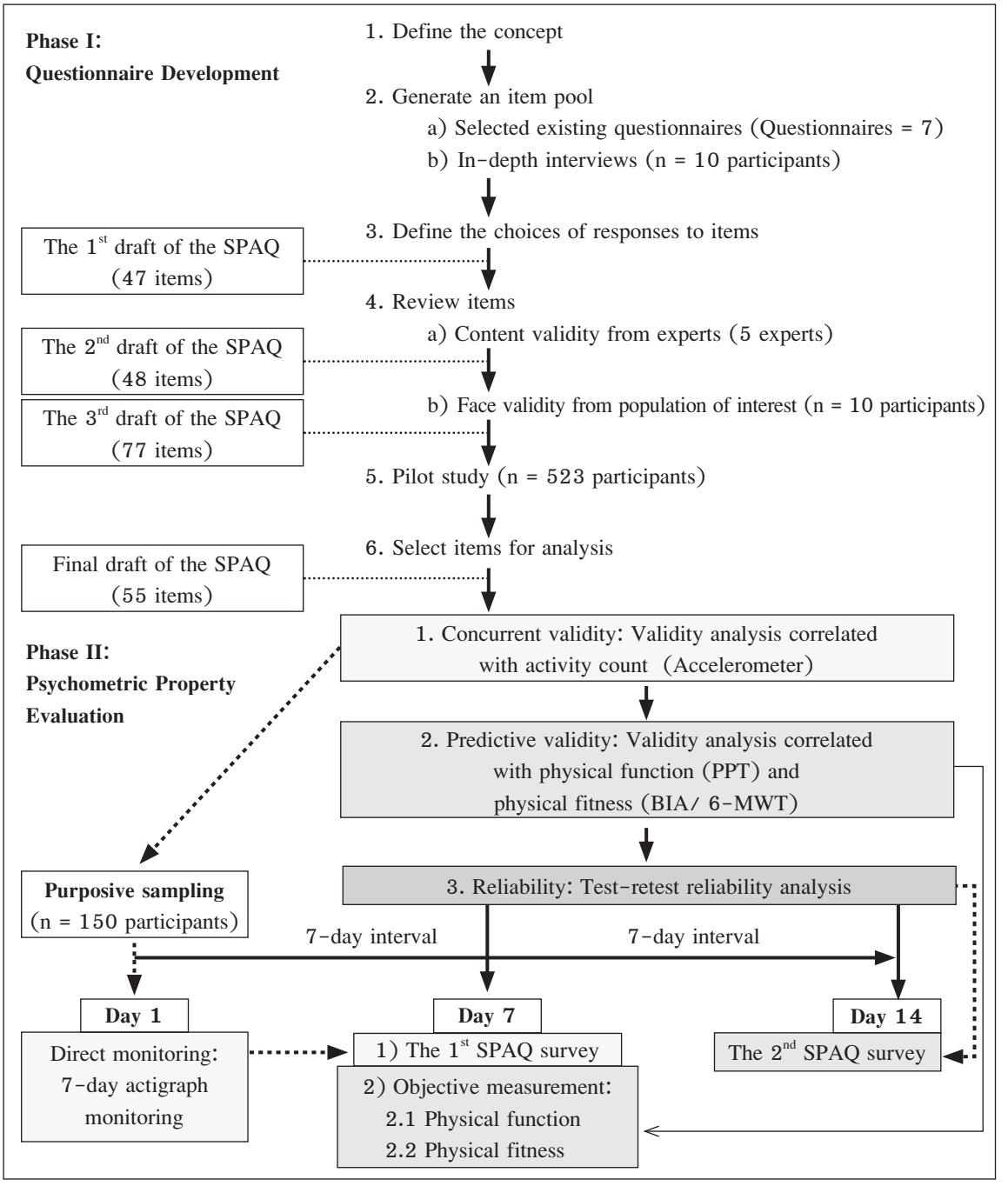

Figure 2 Overview diagram of the questionnaire construction process
Note: 6-MWT = Six-Minute Walk Test; PPT = Physical Performance Test; PA = Physical Activity; BIA = Bioimpedance Analysis; SPAQ = Self-Report Physical Activity Questionnaire

3) defining the choices of responses to items; 4) reviewing items; 5) conducting a pilot study; and, 6) analyzing item selection. Phase II, psychometric property evaluation, required determination of the instrument's concurrent validity, predictive validity and reliability.

The concurrent validity coefficient was obtained by examining the relationship between the SPAQ and Actigraph readings.[14,15] Predictive validity was indicated by its correlation with physical function, through use of the Physical Performance Test (PPT)[2,16] and cardio-respiratory fitness, as measured by a bioelectrical impedance analysis,[17,18] and the Six-Minute Walk Test (6-MWT).[19] The 7 day test-retest reliability coefficient was used to test instrument stability.

Subjects: The sample consisted of four groups: 1) 10 participants for in-depth interviews, to generate the pool of questionnaire items; 2) 10 participants to examine the face validity of the questionnaire; 3) 523 participants for pilot testing the questionnaire; and, 4) 150 participants to examine the questionnaire's psychometric properties. The total sample was purposively recruited from three health centers, in three districts, in Bangkok. The names of potential participants were obtained, from the three health centers, and divided into two groups: those who were members of the elderly club and those from the community at large. An equal distribution of potential participants was selected for each of these two groups, and approached, with the nurses' and health center volunteers' assistance, via letter, telephone or direct contact.

For the in-depth interview and face validity testing, 10 participants were recruited, for each group, from the name list, via purposive sampling. For the pilot study, a multi-stage sampling technique was used to gain 550 eligible older, male and female, adults from three representative areas (inner city, urban fringe and suburbs) in Bangkok. Twenty-seven older adults refused to participate, in the study, because of health problems and inconvenience. Therefore, after the 4.91% attrition, a sample of 523 was obtained. For the psychometric property testing, 150 participants also were recruited, by purposive sampling, from the list of names of the elderly club members, who were not part of the pilot study. The number of subjects selected for each of these groups met the statistical recommendations for instrument development and construction.[20]

Selection criteria, for this study, included individuals who were: residents of Bangkok for at least one year; 60 years of age and over; willing to participate in the study; ambulatory; able to communicate in Thai; without known cognitive impairment; and, able to achieve a score of at least 15, out of 19 points, on the Chula Mental Test (CMT).[21] Subjects who indicated having risk factors, such as a heart condition, were excluded from the study. Elderly, who had lived in Bangkok for at least one year, were selected in an attempt to control the effect that one's musculoskeletal system has on the predictive validity of the psychometric properties of the evaluation. Individuals, in the rural areas of Thailand, have been found to engage in more physical activity and have more physical strength than those in urban Bangkok.[22]

As shown in **Table 1**, participants involved in Phase I and Phase II, had a mean age of 68.03 years (SD = 5.76), with an age range of 60 - 91 years. Half were married, and most had finished primary school. The majority (80%) had common chronic health problems, such as hypertension, hyperlipidemia and diabetes mellitus. Both the men and women presented similar body mass indices. Two-thirds of them had a normal body mass index, while one-third were above the norm for their gender.

Instruments: Four sets of instruments were used. They included the: 1) guidelines for in-depth interviews; 2) Chula Mental Test (CMT);[21] 3) personal data sheet; and, 4) four psychometric property evaluation instruments [Actigraph,[14,15] Physical Performance Test (PPT),[2,16] Bioelectrical Impedance Analysis,[17,18] and the Six-Minute Walk Test (6-MWT)[19]].

Table 1 Demographic characteristics and body mass index: participants in pilot study and psychometric property testing

Characteristics	Pilot study (n = 523)		Psychometric property testing (n =150)	
	Number	%	Number	%
Age Group (Years)				
60-69	327	62.6	95	63.3
70-79	178	33.9	56	35.4
80 and over	18	3.5	2	1.3
Gender				
Female	355	67.9	110	73.3
Male	168	32.1	40	26.7
Status				
Non-member of the elderly club	320	61.2	-	-
Member of the elderly club	203	38.8	150	100.0
Marital Status				
Married	275	52.6	82	54.7
Widowed	184	35.2	48	32.0
Single	26	5.0	7	5.0
Separated	21	4.0	7	4.7
Divorced	17	3.3	6	4.0
Highest Education Completed				
Primary school	290	55.4	54	36.0
Bachelor's degree and over	67	12.8	26	17.3
Junior high school Graduate	55	10.5	21	14.0
Senior high school	50	9.6	21	14.0
Associated/technical degree	37	7.1	24	16.0
No	24	4.6	4	4.7
Health Problems History				
No	102	19.5	33	22.0
Yes	421	80.5	117	78.0
Hypertension	234	44.7	74	49.3
Hyperlipidemia	99	18.9	39	26.0
Diabetes Mellitus	98	18.7	21	14.0
Bone problem	121	23.2	40	26.7
Cardiovascular problem	57	10.9	-	-
Cancer	16	3.1	-	-
Allergy and Vision impairment	23	4.4	-	-
Body Mass Index (Kg/m^2)				
Female				
< 22.9			41	37.3
23.0 - 29.9			62	56.4
> 30.0			07	06.4
Male				
< 22.9			14	35.0
23.0 - 29.9			25	62.5
> 30.0			01	02.5

The researcher developed guidelines for in-depth interviews consisted of seven unstructured questions used to explore physical activity, including habitual activities and exercise. For example, one question was: "Describe your habitual activities regarding household work." The questions were based on the domain of activities [i.e., household, occupation, leisure time (including recreation and exercise) and transportation] of existing physical activity English language and Thai surveys, such as the CHAMPS survey,[13] and the Thai Physical Activity Questionnaire.[23]

The Chula Mental Test (CMT)[21] is a 13 item cognitive impairment screening assessment of cognitive function of illiterate, older adults with reading and writing difficulties. Responses to the items are coded on a dichotomous scale (0 = incorrect and 1= correct). The summation score of the CMT, representing each subject's cognitive function, ranges from 1 to 19. Total CMT scores of: 0-4 indicates severe cognitive impairment; 5-9 represents moderate cognitive impairment; 10-14 implies mild cognitive impairment; and, 15-19 are indicative of normal cognitive function.[21] Content validity, criterion validity and reliability coefficient of the CMT has been tested and found to be acceptable.[21] Thus, the CMT is considered to be a practical test for evaluating cognitive impairment in older Thai adults.[6,7]

Personal information was obtained through use of the researcher designed Personal Data Sheet and Physical Activity Readiness Questionnaire. The 10-item Personal Data Sheet sought information regarding age, gender, educational status, marital status and health status, of each participant, while the 6-item Physical Activity Readiness Questionnaire sought information regarding any medical conditions or cardiac risk factors a participant may have. Those who indicated having risk factors, such as heart condition, were excluded from the study.

Psychometric property evaluation, which occurred in Phase II, was accomplished through use of: an Actigraph;[14,15] a Physical Performance Test (PPT);[2,16] Bioelectrical Impedance Analysis,[17] using a Omron 300 analyzer;[18] and, a Six-Minute Walk Test (6-MWT).[19] Concurrent validity of the SPAQ was tested with the Actigraph, the gold standard for measuring physical activity.[24] The Actigraph[14,15] is a uniaxial accelerometer[15] used to monitor one's habitual physical activity and number of calories expended. It is a small, portable, lightweight and unobtrusive device that is attached to a Velcro strap belt and worn around one's hips. Physical activity step counts, and time spent in habitual activities, were used to evaluate each subject's level of physical activity. According to Freedson and Miller,[15] physical activity step counts: less than 500 steps/ minute reflects less than three metabolic equivalents (MET) of energy expenditure (light physical activity); 501 to 1951 steps/minute reflects 3 to 5.9 METs of energy expenditure (moderate physical activity); and, more than 1951 steps/minute reflect 6 or more METs (vigorous physical activity). To evaluate the accuracy of the Actigraph, prior to using it, the instrument's battery and ability to function correctly were examined. The ability to function correctly was assessed, by comparing the readings of 10 different Actigraphs, while a subject was engaged in brisk walking. If an Actigraph had a different reading from the other Actigraphs, it was not used in the study.

The Physical Performance Test (PPT)[2,16] is used to assess lower body function, in older adults, via three performance tasks: timed chair sit to stands (5 repetitions, as quickly as possible, of full stands from a seated position); timed standing balance (tandem, semi-tandem and side-by-side stand); and, completion of a normal pace, eight-foot walk. A score of zero (0) is assigned to those who cannot complete the required task, while a score of one to four (1 to 4), based on the degree of completion, is determined. A summary of performance score is created by summing all task scores. A cut-point of 10 was chosen to identify degree of functional

limitation. A total score of less than 10 is indicative of increased risk mobility and activities of daily living problems.[16]

Bioelectrical impedance analysis[17] was accomplished though use of an Omron 300 analyzer,[18] a light weight, portable, hand-held instrument that measures body fat versus lean body weight. Prior to use, input of the individual's weight, age and gender must be made. An individual is instructed to grip the analyzer's handles, stand straight and place his/her feet slightly apart. The instrument sends a low-voltage current through the body, which then is used to calculate an estimate of the total body water (TBW). The more muscle one has, the greater the quantity of water the body can hold, while the more fat that is present, the greater resistance there is to the electrical current. Body fat analysis has been used to determine how the amount of muscle, fat and body cell mass, especially body fat, affects health outcomes, such as physical function and fitness. The normal value of body fat is 15-22% for men and 27-40% for women.[18] In this study, a correlation was carried out between the mean percentage of body fat and energy expended in each dimension of physical activity.

The Six-Minute Walk Test (6-MWT)[19] is used to evaluate cardio-respiratory endurance and physical endurance. Participants walk as rapidly as possible for six minutes. The distance walked is used to rate cardio-respiratory fitness as poor (below average), normal (normal range) or good (above average).[19] The normal range of the 6-MWT is 610-735, 560-700, 545-680 and 470-640 yards for men age 60-64, 65-69, 70-74 and 75-79 years, respectively. The normal range of the 6-MWT is 545-660, 500-635, 480-615, and 435-585 yards for women age 60-64, 65-69, 70-74, and 75-79 years, respectively. In this study, a correlation was carried out between the average value of the 6-MWT and the energy expended in each dimension of physical activity.

Procedure: Phase one of the questionnaire development (see **Figure 2**) consisted of six steps, including: defining the concept; generating an item pool; defining choices of responses to the items; reviewing the items; conducting a pilot study; and selecting item analysis. The first step consisted of selection of the concept, physical activity, which was defined as any bodily movements produced by skeletal muscles that result in energy expenditure. This selection was based upon review of the literature and existing instruments which measured physical activity. As a result, the concept was divided into four physical activity domains [household, occupational, leisure time (recreation, exercise), and transportation] which address the types of daily physical activity in which an elderly person engages.

Potential participants were informed about: the purpose and details of the study; maintenance of their confidentiality and anonymity; and, their right to withdraw without repercussions. After their written consent was obtained, they were administered the Personal Data Sheet and the Chula Mental Test, to assure they met the inclusion criteria. Those who did not meet the criteria were thanked for their time and told they would not be able to participate.

The first 10 participants, who met the selection criteria, were scheduled for an in-depth interview, in a private room in their respective home, or in a private room at the Health Center or the Regional Health Promotion hospital. The interviews were conducted to obtain information to assist in generation of items for the SPAQ and were structured around the guidelines for in-depth interviews. Each participant was interviewed one to two times, over a time period of one to two hours, until no new information was obtained.

The second step began with the generation of a pool of questionnaire items, through the review of existing questionnaires on physical activity, and the examination of the habitual physical activities reported in the in-depth interviews with the 10

participants previously mentioned. A total of 23, 10, 61, and 5 items, from the 4 domains (household, occupation, leisure time, and transportation, respectively), were chosen from seven questionnaires, including the: CHAMPS Physical Activity Questionnaire;[13] Modified Baecke Questionnaire for Older Adults;[25] Questionnaire for the Assessment of Leisure Time Physical Activities;[26] Physical Activity Scale for the Elderly;[27] Thai Physical Activity Questionnaire;[23] Yale Physical Activity Survey;[28] and, Zutphen Physical Activity Questionnaire.[29] Based upon the findings of the in-depth interviews, the item pool, generated from the existing questionnaires, was reduced for the first draft of the SPAQ to a total of 47 items (7, 2, 37, and 1, respectively, for household, occupation, leisure time and transportation).

After the first draft of the SPAQ was developed, five individuals, from three areas of expertise (physical activity [2], geriatric nursing [1], and Thai measurement/development [2]), were invited to conduct content validity. The experts were asked to: (a) identify the content relevance of each item, and its related scale; (b) verify item uniqueness of each sub-scale, including physical activities related to household, occupation, leisure time and transportation; and, (c) evaluate the clarity of each item's meaning within the context of the Thai culture. Inter-rater agreement and item-level for content validity index for the first draft of the SPAQ (47 items) were .99 and .89, respectively. Based upon the experts' reviews, the second draft of the SPAQ, using the same four dimensions of physical activity, was developed by deleting, merging, adding and rearranging some items, which brought the item count to 48.

Face validity then was performed via review of the questionnaire by 10 other elderly persons. The participants were asked to complete the questionnaire and then specify: (1) items they had difficulty responding to, and why; (2) items they had questions about; (3) revisions they believed should be made; and, (4) suggestions for items they felt should be included. This resulted in the addition of 29 items. The new items were added to the three dimensions of household (n = 22), occupation (n = 4), and transportation (n = 3). Thus, the third draft of the SPAQ included the 29 new items, plus the 48 items from the 2nd draft of the questionnaire for a total of 77 items [household (n=30); occupation (n=5); leisure (n=36); transportation (n=5) and an additional item (n = 1) asking whether participants engaged in "other types of physical activities not previously mentioned?"].

After face validity was determined, a pilot test of the instrument, using 523 purposively selected participants, was conducted, to evaluate the performance of the questionnaire. The number of participants needed was calculated, based on the requirement of having 5-10 participants per item.[20] Therefore, the number of participants needed, in this study, ranged from 385 to 770. However, to conduct exploratory factor analysis over 500 subjects are required.[30]

Exploratory factor analysis was used to analyze the third draft of the SPAQ. However, findings revealed the data did not meet the statistical assumptions; therefore, exploratory factor analysis was not used again. To obtain the final draft of the instrument, content categorization of activities was conducted with the third draft, which was based on the literature's descriptions of the dimensions of physical activity and deletion of some items participants, in the pilot study, did not perform, making a total of 55 items in the final draft of the SPAQ (see **Table 2**).

Table 2 Summarization of the final version of the SPAQ's domains, related items and possible responses

A respondent was asked to indicate if he/she had engaged, over the past 7 days, in each of the activities listed below. If the respondent engaged in an activity, he/she was to indicate how many times per week (a number chosen by the respondent) and how many total hours per week (0-1 hours; more than 1-3 hours; more than 3-5 hours; more than 5-7 hours; more than 7-9 hours; or, more than 9 hours).

DOMAINS AND CORRESPONDING SPAQ ITEMS:

Household Physical Activity

1. Taking care of other people, such as cleaning, feeding or serving food and milk; taking another person for a walk for pleasure or exercise; or, taking another person to see the doctor.
2. Preparing and cooking food.
3. Cleaning dishes or other equipment.
4. Sweeping, vacuuming, mopping or cleaning the bathroom.
5. Washing clothes (by machine).
6. Washing clothes (manually).
7. Ironing.
8. Cleaning windows, gutters, a refrigerator, a bicycle or a car.
9. Cleaning a pet or pet's cage.
10. Feeding a pet.
11. Repairing electrical or other equipment or machines; or, repairing part of the house.
12. Doing light gardening, such as watering plants using a hose, dipper or bucket; trimming small tree/bush branches; pulling weeds/grass by hand; or, raking or sacking leaves.
13. Doing moderate to heavy gardening, such as cutting the grass with scissors or an electric mower; or, planting a tree.

Occupational Physical Activity

1. Engaging in a light occupation, such as an administrator or counselor.
2. Engaging in a moderate occupation, such as a teacher, merchant, hair-dresser, fortune-teller, traditional masseur or masseuse, taxi driver or photographer.
3. Engaging in a heavy occupation, such as doing strenuous physical labor (lifting/carrying heavy materials).

Leisure Time

Recreation

1. Doing volunteer work, such as serving as a leader of the community elder club or religious activities; or, being a health care or general volunteer.
2. Doing religious activities, such as attending temple/church/mosque, praying, meditating or reading a religious text.
3. Practicing religious activities, such as walking up and down or carrying out Islamic activities (standing up and sitting down many times) to pay respect to Allah/God.
4. Doing wood working, needlework, drawing, knitting, or other arts or crafts.
5. Using a computer.

6. Watching television.
7. Playing light activity games, with other people, such as cards, bingo or board games.
8. Playing moderate activity games, such as billiards.
9. Attending a concert, movie, lecture or sports event.
10. Playing a musical instrument.
11. Dancing (traditional or international).

Exercise

1. Walking leisurely for exercise or pleasure; or, walking a dog.
2. Walking fast or briskly for exercise.
3. Jogging or running.
4. Riding a bicycle or stationary cycle.
5. Doing exercise with a treadmill.
6. Using aerobic machines, other than a treadmill, such as a rowing machine or step-machine.
7. Doing general conditioning exercise, such as light calisthenics using a bamboo stick; or, doing a sword dance.
8. Carrying out stretching or flexing exercises.
9. Engaging in Yoga or Tai-chi.
10. Doing aerobic or anaerobic dancing.
11. Doing light strength training, such as using elastic bands or hand-held weights of 5 lbs. or less.
12. Doing moderate to heavy strength training, such as using hand-held weights of more than 5 lbs.; or, doing push-ups.
13. Playing Pa-tong or bowling.
14. Playing table tennis.
15. Engaging in golf or miniature golf; or, using a golf driving range.
16. Carrying or pulling golf equipment, when playing golf.
17. Riding a cart, when playing golf.
18. Playing double tennis.
19. Playing single tennis.
20. Playing badminton (pleasure or exercise).
21. Playing badminton (competition).
22. Playing basketball or football.
23. Swimming or doing water exercise.

Transportation

1. Walking to the bus, sky train or taxi; walking to do errands, such as to/from a store/bank; or, walking children to school.
2. Walking to do errands, while carrying heavy items.
3. Riding a motorcycle.
4. Riding in a car.

General Question Addressing any of the Four Domains

1. Doing other types of physical activity, not previously mentioned. If so, specify the activity.

As shown in **Table 2**, the final SPAQ addressed the frequency (number of times over the past 7 days) and duration (total number of hours per week) of physical activities related to the four domains: household physical activities (n = 13); occupational physical activities (n = 3); leisure time activities [recreation (n = 11) and exercise (n = 23)]; and, transportation activities (n =4). In addition, one (n = 1) general question was added that asked if another type of physical activity, not previously mentioned, was performed and, if so, specifically what the activity was. This question could be related to any one of the four domains, if a yes response and specific activity were listed. The number of hours involved in each respective activity was calculated using the following scale: 0-1 hours; more than 1-3 hours; more than 3-5 hours; more than 5-7 hours; more than 7-9 hours; or more than 9 hours.

To determine the participants' estimated weekly caloric expenditure measures, from the data obtained in the SPAQ, the estimated weekly duration of each activity is multiplied by the metabolic equivalent (MET) value and the results are summed across all relevant activities. Each specified activity is assigned a MET value based on values adjusted from the compendium of physical activities[31] and the CHAMPS survey.

There are seven measures, including two levels of activities (low-intensity and moderate- intensity); four dimensions of physical activity (household, occupation, leisure time and transportation); and, total calorie expenditure over seven days. Two sub-scales (recreation and exercise) of leisure time physical activity are calculated, separately, due to differences in intensity and effect of the activities. Physical activity is divided into three levels of intensity, including: low intensity activity (MET values 0 - 2.9); moderate intensity activity (MET values 3 - 5.9); and, vigorous intensity activity (MET values $\geq$ 6).

Phase two of the study (see **Figure 2**) involved 150 purposively selected subjects who were asked to wear an Actigraph, 12 hours daily, for seven consecutive days (five weekdays and two weekend days), and to complete the SPAQ survey twice (7 days apart), in order to measure the concurrent validity and test-retest reliability of the SPAQ survey. In addition, the physical function and fitness of participants was determined, via a 20 to 30 minute standard physical performance test protocol, using the PPT and 6-MWT, when the SPAQ initially was administered. All participants were supervised during their physical performance testing, given a 5 minute rest period between each test, and instructed to stop if they became too tired to complete the test, or experienced new or worsening symptoms during the test.

In addition, psychometric evaluation, consisting of criterion-related validity (concurrent, predictive validity) and reliability, of the SPAQ was accomplished. The correlation between total metabolism hour/per week (MET-Hr/Wk) and the activity count was conducted, as well as calculation of the total score from the PPT, and the concurrent validity and predictive validity, using the total distances of the 6-MWT. The reliability of the correlations, between the total MET-Hr/Wk and the two times the SPAQ was administered, was investigated.

Data analysis

Descriptive statistics was used to analyze the participants' demographics and body mass index. Pearson's product moment correlation was used to analyze the concurrent validity, predictive validity and test-retest reliability[30] of the final draft of the SPAQ.

Results

Phase I: Questionnaire Development: The first draft of the SPAQ consisted of 47 items that measured the frequency and duration of physical activity within the domains of household, occupation, leisure (recreation and exercise) and transportation.

The results from the experts' item review showed the inter-rater agreement to be .99, and the average of the content validity index to be .89. Based upon the reviewers' comments, some instrument items were deleted, merged, added and/or rearranged, causing the second draft of the SPAQ to consist of 48 items. After the face validity of the 2nd draft of the SPAQ (48 items) was determined, the instrument was expanded to 77 items. Since it was determined that using exploratory factor analysis, to make a final selection of items was inappropriate, the final draft of the SPAQ was developed, after deletion of 22 items and a content categorization of activities, based on the literature's descriptions of the dimensions of physical activity. The 22 items were deleted, from the final draft, because it was found that they were not performed by the participants. One new item ("Do you do other types of physical activity not previously mentioned?" If so, please specify the activity.) was added to the final draft. Therefore, the final draft of the SPAQ consisted of 55 items (see **Table 2**).

Phase II: Psychometric Property Evaluation: Pearson's product moment correlation was used to investigate the criterion-related validity (concurrent and predictive validity) and reliability analysis (see **Tables 3 & 4**). Significant correlations were found between both the male and female participants' MET-Hr/Wk, and their low-intensity and moderate-intensity activity. Significant correlations also were found between the activity count/wk, total household physical activity and total occupational physical activity. However, significant correlations, between the activity count/wk and household physical activity, were found only among the females. The females also presented higher correlations between activity count/wk and low intensity activity, household activity and recreational activity, than did the males. However,

Table 3 Pearson correlations between the SPAQ score and other measurements (n = 150)

Measurement	Activity count/Wk			PPT			% Body fat			6-MWT (Yard)			Total MET-Hr/Wk		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Total MET-Hr/Wk	.31**	.29**	.37*	.04	-.12.	.21	.15	.03	.15	.75*	.74*	.77*	1.00	1.00	1.00
Low intensity PA	.24**	.29**	.20	.02	-.14	.16	.21**	.06	.04	.71*	.74*	.66*	.90**	.91**	.87*
Moderate intensity PA	.31**	.23*	.44**	.05	-.07	.20	.04	-.01	.22	.61*	.57*	.68*	.87**	.89**	.86*
Household PA	.19*	.23*	.22	.06	-.08	.24	.16*	-.10	.01	.51*	.54*	.48*	.83**	.86**	.79*
Occupational PA	.19*	.15	.25	-.02	-.02	.04	-.08	.09	.21	.24*	.19*	.42*	.31**	.35**	.41*
Leisure time PA															
- Recreation	.18**	.21*	.15	-.01	-.06	.02	.13	.15	.01	.53*	.52*	.54*	.52**	.50**	.55*
- Exercise	.24**	.13*	.34*	.04	-.15	.21	.01	-.01	.15	.52*	.48*	.59*	.69**	.64**	.83*
Transportation	.20*	.13	.34*	.06	-.01	.16	.08	.11	.21	.50*	.54*	.56*	.56**	.52**	.73*

*p = .05; **p = .01

PA = Physical Activity; PPT = Physical Performance Test; 6-MWT = Six-Minute Walk Test

Table 4 Test-retest reliability of the SPAQ (n=150)

Measurement interval (SPAQ)	R value (Women)	R value (Men)	R value (Total)	95% Confidence Lower limit	95% Confidence Upper limit
Total MET-Hr/Wk	.94**	.94*	.93*	4.99	11.22
MET-Hr/Wk of low-intensity PA	.91**	.92**	.91**	-1.35	6.63
MET-Hr/Wk of moderate-intensity PA	.94**	.94**	.94**	-7.59	-3.34
MET-Hr/Wk of household PA	.91**	.88**	.90**	-6.07	-2.76
MET-Hr/Wk of occupational PA	.65**	.76**	.68**	-4.88	-2.02
MET-Hr/Wk of recreation	.84**	.92**	.87**	6.4	11.79
MET-Hr/Wk of exercise	.96**	.97**	.96**	-1.08	1.19
MET-Hr/Wk of transportation	.90*	.93*	.91*	-2.94	4.62

** p = .01; * p = .05
PA = Physical Activity

the men presented greater significant correlations between activity count/wk and moderate intensity activity, exercise, and transportation, than did the women. On the other hand, the PPT revealed no significant correlation either among the total participants or between the genders, regarding low intensity activity, moderate intensity activity, household activity, occupational activity, leisure time activity or transportation.

Body fat percentage and the 6-MWT were presented as physical fitness in this study. Body fat percentage was not significantly correlated with the physical activity measures, except for low-intensity activity and household activity. The findings showed good predictive validity, with the 6-MWT, for the total participants. The men demonstrated higher significant correlations of cardio-respiratory fitness measures (6-MWT) to total MET-Hr/wk, moderate-intensity activity, exercise activity, transportation, recreation and occupation, than did the women. However, the women demonstrated higher significant correlations, than did the men, with low-intensity activity and household activity.

Significant correlations were found between the total MET-Hr/wk and low-intensity physical activity, moderate-intensity physical activity, household physical activity, occupational physical activity, leisure time and transportation. In addition, the correlations, between MET-Hr/wk and each of the other variables, were found to be significant for men and women together, as well as individually.

The stability of the SPAQ was supported with the 7-day test-retest reliability of the: total MET-Hr/wk, low intensity physical activity, moderate intensity physical activity, household physical activity, occupational physical activity, recreation, exercise and transportation, for both the men and women, as well as for both genders together.

Discussion

Characteristics of the Participants: Participants in the first and second phases, of the study, had similar personal characteristics. They also were similar to those reported in prior studies in Thailand.[2,6,7] The findings that most older Thais were female, young older adults, who had at least one chronic health problem, may be due to the longevity of women and higher mortality rate among men.[2] The ratio of young older adults to oldest older adults revealed a gradual decrease, in this study, which most likely was due to outcomes of the ongoing aging process.

Questionnaire Development Process: The development of the questionnaire addressed conceptual and methodological assessment issues related to the reporting of accurate physical activity among older Thai adults who were not fluent in reading and writing Thai. For example, completeness of the SPAQ items was obtained by both quantitative and qualitative approaches, which proved useful in capturing the main components of habitual physical activity among the elderly. In addition, the scale's simplified format, designed for this study, enabled older adults to easily recall their physical activities. The literature indicates that satisfactory results for content validity, for a new instrument, should be greater than 0.80.[32] The SPAQ was found, by the experts, to have a good inter-rater reliability and content validity index. In addition, face validity proved to be useful in refining the content of the instrument.

Psychometric Property Evaluation Process

The modest correlation (.31) between total MET-Hr/wk and active count, among participants overall, was comparable to existing questionnaires in Western countries[33,34] and in Thailand.[23,35] For example, concurrent validity of the International Physical Activity Questionnaire[33] had a mean rho of about .30, against the reading of the accelerometer for moderate vigorous walking and sedentary behaviors, while concurrent validities, validated with the Actigraph, for the Thai Physical Activity Questionnaire[23] and the Physical Activity Questionnaire[35] were found to be between .20 - .32 and .30, respectively. In addition, findings regarding gender discrepancies, for the various forms of physical activity, were similar to prior findings.[22] This result may be because older men have greater strength than older women and, therefore, engage in higher intensity activities than do women. Since household physical activity primarily is carried out by women, it is not surprising that a significant correlation was found between activity count/wk and household physical activity among the women, but not among the men.

Although, predictive validity, in this study, was examined for both physical function (PPT) and cardio-respiratory fitness (6-MWT, body fat percentage), only the 6-MWT presented a substantial number of significant correlations. The correlation coefficients of physical function assessment could not predict or discriminate functional capacity among the older Thais in this study. The lack of a relationship between the PPT and physical activity levels might be due to lack of variability among the PPT data. All participants in Phase 2 were members of the elderly club and, thus, tended to be physically active. These results are similar to prior research[12] wherein older adults who participate in moderate-intensity exercise, most days of the week, have better physical function than do older adults who are simply active (no moderate-intensity exercise), throughout the day, or are inactive.

Body fat percentage was found to have no association with the physical activity measures, except for low intensity activity and household activity. This may be due to the fact that older adults engage in more low intensity physical activity and household activities, than activities involving moderate intensity, or ones related to an occupation, leisure time or transportation. The fact that that a slightly larger percentage of women, in this study, had a higher body mass index, compared to the men, further supports the fact that while women engage in household activities, they do not engage in moderate-intensity physical activity to the same extent men do.

The strong correlation found between the total MET-Hr/wk and the 6-MWT is congruent with prior findings.[12, 36-38] The fact that the men presented stronger correlations between the total MET-Hr/wk and the 6-MWT, than the women, suggested the men engaged in higher intensity activities than did the women.[22] Thus, the men showed greater cardio-respiratory fitness than did the women. The fact that the Thai women demonstrated higher correlations between the 6-MWT and energy expenditure measures for low intensity activity and household activity, compared to the men, also is similar to prior findings [6,7,22] and further suggests that women engage in lower intensity activities, as well as lower amounts of physical activity, than do men.

Reliability of the SPAQ was supported by the 7-day test-retest reliability assessment, which was found to be somewhat higher than reliabilities found among other physical activity surveys for older adults.[12, 27, 28, 33-35] Evidence from the test-retest reliability assessment suggests good reliability for both the low- and moderate- intensity activities subscales. In addition, the literature indicates correlations of .70 are sufficient, in the early stages of development, for group studies.[32] All but four of the correlations, in this study, were found to be at or above .90.

Limitations and Recommendations

A major limitation of this study was the homogeneity of the sample and small size of the area for administering the 6-MWT. Homogeneity of the sample, in the phase of psychometric property testing, occurred because this study recruited only members of the elderly club. The sample was not diverse enough to test the scales separately for those who were physically active and physically inactive. A 50 by 40 foot course used for the 6-MWT was too small for participants to walk as fast as possible in 6 minutes. Thus, the participants' total walking distance may have been decreased, since they had to turn around a number of times, which also may have reduced the velocity of their walking.

The SPAQ, although found to be relatively convenient, simple and suitable for administration, among the elderly in this study, needs examination with a more heterogeneous sample. In addition, the area used to examine the 6-MWT needs to be adequate in size, so as to prevent participants from having to turn around frequently and, thus, lower their walking velocity.

Acknowledgements

The authors thank the Institute of Nutrition, Mahidol University for their support in the use of the instrument, Actigraph and body fat analysis. In addition, the authors thank the Borommarajonnani College of Nursing, Nopparat Vajira, Ministry of Public Health and Commission of Higher Education, Ministry of Education, and Thai Council of Nursing and Midwifery for their financial support.

References

1. Ministry of Public Health. Thailand Health Profile 1997-1998. Bangkok (Bangkok). Express Transportation Organization; 1999. p. 83-4.

2. Jitapunkul S, Chayowan N, Yodphet S, Chunsirikarn S, Intharasombat P, Pananiramai M, *et al.* Elderly in Thailand: Review, knowledge, current situation and recommendations for health policy and research study. Bangkok (Bangkok): Geriatr Med Depart, Faculty Med, Chulalongkorn Univ. 2002; 1: 1-10.
3. Guralnik JM, Ferucci L, Simonsick EM, Salive ME, Wallace RB. Lower extremity function in persons over the age of 70 years as a predictor of subsequent disability. N Engl J Med. 1995; 332(9): 556-61.
4. US Department of Health and Human Services. Healthy People 2010: National health promotion and disease prevention objectives; 2000. [cited 2009, Feb 22]. Available from: http:www.healthypeople. gov/Document/ html/uih/ uih_bw/uih_2.htm.
5. Harris SB, Zinman B. Primary prevention of type 2 diabetes in high-risk populations. Diabetes. 2000; 23: 879-81.
6. Binhosen V, Panuthai S, Srisuphun W, Chang E, Khanokporn S, Cioffi J. Physical activity and health related quality of life among the urban Thai elderly. Thai J Nurs Res. 2003; 7(4): 231-42.
7. Chinuntuya P. A causal model of exercise behavior of the elderly in the Bangkok metropolis. [dissertation]. Bangkok (Bangkok): Mahidol Univ.; 2001.
8. Wanitkun N. Validation of questionnaires for exercise research among Thai middle-aged and older adults with coronary artery disease. [dissertation]. Portland (OR): Oregon Health & Science Univ.; 2003.
9. Caspersen CJ. Physical activity epidemiology: Concepts, methods and applications to exercise science. Exerc Sports Sci Rev. 1989; 17: 423-73.
10. Verbrugge LS, Jette AM. The disablement process. Society Sci Med. 1994; 38(1): 1-14.
11. Stewart AL. Conceptual challenges in linking physical activity and disability research. Am J Prev Med. 2003; 25(Suppl 2): 137-40.
12. Brach JS, Simonsick EM, Kritchevsky S, Yaffe K, Newman AB. The association between physical function and lifestyle activity and exercise in the health, aging and body composition study. J Am Geriatr Soc. 2004; 52: 502-9.
13. Stewart AL, Mills KM, King AC, Haskell WL, Gills D, Ritter PL. CHAMPS physical activity questionnaire for older adults: Outcomes for interventions. Med Sci Sports Exerc. 2001; 33(7): 1126-41.
14. Chen KY, Bassett DR. The technology of accelerometry-based activity monitors: Current and future. Med Sci Sports Exerc. 2005; 37(11): S490-500.
15. Freedson PS, Miller K. Objective monitoring of physical activity using motion sensors and heart rate. Res Q Exerc Sport. 2000; 71(2): 21-9.
16. Guralnik JM, Simonsick EM, Ferucci L, Glynn RJ, Berkman DG, Scherr PA, et al. A short physical performance battery assessing lower extremity function association with self-reported disability and prediction of mortality and nursing home admission. J Gerontol. 1994; 49(2): M85-94.
17. Dittmar M. Reliability and validity of bioimpedance measures in normal adults: effects of age, gender and body mass. Am J Phys Anthropol. 2003; 122: 361-70.
18. Koulmann N, Jimemez C, Regal D, Bolliet P, Launay J, Savourey G, et al. Use of bioelectrical impedance analysis to estimate body fluid compartments after acute variations of the body hydration level. Med Sci Sports Exerc. 2000; 32, 857.
19. Rikli RE, Jones CJ. Senior fitness test manual. Champaign (IL): Human Kinetics Publishers; 2001.
20. Hair JF, Anderson RE, Tatham RL, Black WG. Multivariate data analysis. 5th ed. Upper Saddle River (NJ): Prentice Hall; 1998.
21. Jitapunkul S, Lailert C, Worakul P. Chula Mental Test: A screening test for elderly people in less developed countries. Int J Geriatr Psychiatry. 1996; 11: 715-20.
22. Phokakul W, Chomwattanachai S, Ounmanich P, Suwanachod W, Promhan W, Promsena L. National survey of the health status and physical activity in older people. Bangkok (Bangkok): Geriatric Medicine Institute, Medicine Department, Ministry of Public Health; 2004.
23. Pongurgsorn C. A questionnaire for assessment of physical activity in Thailand. [dissertation]. Urbana-Champaign (IL): Univ. Illinois; 2001.
24. American College of Sports Medicine. Guidelines for exercise testing and prescription.7th ed. Philadelphia (PA): William & Wilkins; 2006.

25. Voorrips LE, Ravelli AC, Dongelmans PC, Deurenberg P, Van Staverem WA. A physical activity questionnaire for the elderly. Med Sci Sports Exerc. 1993; 23: 974-9.
26. Taylor HL, Jacob DR, Schucker B, Knudsen J, Leon AS, Debacker G. A questionnaire for the assessment of leisure time physical activities. J Chronic Dis. 1978; 31: 741-55.
27. Washburn RA, Smith KW, Jette AM, Janney CA. The physical activity scale for the elderly (PASE): Development and evaluation. J Clin Epidemiol. 1993; 46(2): 153-62.
28. DiPieto L, Caspersen CJ, Ostfeld AM, Nadel ER. A survey for assessing physical activity among older adults. Med Sci Sports Exerc. 1993; 25(5): 628-42.
29. Caspersen CJ, Bloembergm BPM, Saris WHM, Merritt RK, Kromhout D. The prevalence of selected physical activities and their relation with coronary heart disease risk factors in elderly men: The Zutphen study. Am J Epidemiol. 1991; 133: 1078-92.
30. Burn N, Grove SK. The practice of nursing research conduct, critique and utilization. 5th ed. Philadelphia (PA): WB Saunders; 2005.
31. Ainsworth BE, Haskell WL, White MC, Irwin ML, Stwartz AN, Stranth SJ. *et al.* Compendium of physical activities: An update of activity codes and MET intensities. Med Sci Sports Exerci. 2000; 32(9): S498-516.
32. Nunnally JC, Bernstein IH. Psychometric theory. 3rd ed. New York (NY): McGraw-Hill; 1994.
33. Booth M. Assessment of physical activity: An international perspective. Res Q Exerc Sport. 2000; 71: S114-20.
34. Armstrong T, Fiona B. Development of the World Health Organization Global Physical Activity Questionnaire (GPAQ). J Public Health. 2006; 14: 66-70.
35. Kijboohchoo K, Thasanasuwan W. Development and testing of lipid assessment, Physical Activity Questionnaire and BMI for young Thai adults. (in press).
36. Blair SN, Connelly JC. How much physical activity should we do? The case for moderate amounts and intensities of physical activity. Res Q Exerc Sport. 1996; 67: 193-205.
37. Blair SN, LaMonte MJ, Nichaman M.Z. The evolution of physical activity recommendations: How much is enough? A J Clin Nutr. 2004; 79: S913-20.
38. Brown DW, Balluz LS, Heath GW, Moriarty DG, Ford ES, Giles WH, et al. Associations between recommended levels of physical activity and health-related quality of life findings from the 2001 Behavioral Risk Factor Surveillance System (BRFSS) survey. Prev Med. 2003; 37: 520-8.

การพัฒนาและการทดสอบแบบสอบถามกิจกรรมการเคลื่อนไหวออกแรงและการออกกำลังกายสำหรับผู้สูงอายุไทยในชุมชน

วนิดา วิสุทธิพานิช, ยุพาพิน ศิรโพธิ์งาม, พรทิพย์ มาลาธรรม, กัลยา กิจบุญชู, ธวัชชัย วรพงศธร, Kerri M. Winters-Stone

บทคัดย่อ: การศึกษาวิจัยเชิงบรรยายนี้มีวัตถุประสงค์เพื่อพัฒนาและทดสอบคุณภาพของแบบสอบถามกิจกรรมการเคลื่อนไหวออกแรงและการออกกำลังกายสำหรับผู้สูงอายุไทยในชุมชน แบ่งออกเป็น 2 ระยะ โดยระยะที่ 1 คือการพัฒนาแบบสอบถาม ซึ่งมี 6 ขั้นตอนคือ 1) การให้ความหมาย 2) การสร้างข้อคำถาม 3) การกำหนดตัวเลือก 4) การตรวจสอบความตรงตามเนื้อหา 5) การนำไปทดลองใช้ และ 6) การวิเคราะห์จำแนกข้อคำถาม ผลการพัฒนาได้ค่าความสอดคล้องและค่าดัชนีความตรงของแบบถามฉบับร่างที่ 1 (47 ข้อ) เท่ากับ .99 และ .89 ตามลำดับ นำแบบสอบถามฉบับร่างที่ 2 (48 ข้อ) ไปตรวจความตรงเฉพาะหน้าและนำแบบสอบถามฉบับร่างที่ 3 (77 ข้อ) ตามเนื้อหา 4 กลุ่ม คืองานบ้าน การทำงาน กิจกรรมในเวลาว่าง รวมทั้งการเดินทาง ไปทดลองใช้กับผู้สูงอายุในชุมชน รวมทั้งการวิเคราะห์จำแนกข้อคำถามของแบบสอบถามฉบับร่างที่ 3 ตามกลุ่มกิจกรรมการเคลื่อนไหวออกแรงจากการค้นคว้าและการลดจำนวนข้อที่ผู้สูงอายุไม่ได้ทำ ในขั้นตอนการทดลองใช้ เพื่อให้ได้แบบสอบถามฉบับสมบูรณ์ (55 ข้อ)

ระยะที่ 2 คือการทดสอบคุณภาพแบบสอบถามด้วยสถิติสัมประสิทธิ์สหสัมพันธ์เพียร์สันเพื่อหาค่าความสัมพันธ์กันทางสถิติ ประกอบด้วยความตรงตามสภาพ ความตรงเชิงทำนาย และความเชื่อมั่น ได้ค่าความสัมพันธ์ที่ยอมรับได้ระหว่างแบบสอบถามกับเครื่องวัดกิจกรรมการเคลื่อนไหวออกแรง และแบบสอบถามมีค่าความตรงเชิงทำนายอยู่ในเกณฑ์ดีเกี่ยวกับความสมบูรณ์ของร่างกายด้วยความสัมพันธ์กับการทดสอบความอดทนของร่างกาย อย่างไรก็ตามไม่พบความสัมพันธ์เชิงสถิติเกี่ยวกับความแข็งแรงและเปอร์เซ็นต์ไขมันของร่างกาย ค่าสัมประสิทธิ์ความเชื่อมั่นของแบบสอบถามที่วัดห่างกัน 7 วันอยู่ในระดับดี การศึกษานี้แสดงว่าแบบสอบถามที่สร้างขึ้นมีความสะดวก ง่ายและเหมาะสมต่อการใช้ได้ดี ถึงแม้ว่าค่าสัมประสิทธิ์ความตรงตามสภาพของแบบสอบถามนี้จะไม่สูงนัก แต่ก็สอดคล้องกับผลการศึกษาในต่างประเทศ

วารสารวิจัยทางการพยาบาล 2009; 13(4) 249 - 267

คำสำคัญ: ผู้สูงอายุไทย กิจกรรมการเคลื่อนไหวออกแรงและออกกำลังกาย การพัฒนาและทดสอบคุณภาพแบบสอบถาม

ติดต่อที่: วนิดา วิสุทธิพานิช, *PhD Candidate, ภาควิชาพยาบาลศาสตร์ คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล กรุงเทพฯ ประเทศไทย.* ***E-mail:*** *fahchua@yahoo.com*

ยุพาพิน ศิรโพธิ์งาม, *RN, DSN. รองศาสตราจารย์ ภาควิชาพยาบาลศาสตร์ คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล กรุงเทพฯ ประเทศไทย.*

พรทิพย์ มาลาธรรม, *RN, PhD. ผู้ช่วยศาสตราจารย์ ภาควิชาพยาบาลศาสตร์ คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล กรุงเทพฯ ประเทศไทย.*

กัลยา กิจบุญชู, *PhD. รองศาสตราจารย์ หัวหน้าหน่วยสรีรวิทยาออกกำลังกาย สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล กรุงเทพฯ ประเทศไทย.*

ธวัชชัย วรพงศธร, *PhD. รองศาสตราจารย์ คณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล กรุงเทพฯ ประเทศไทย.*

Kerri M. Winters-Stone, *PhD. School of Nursing, Oregon Health & Science University, OR, USA.*