Development, Reliability and Validity of the Thai Healthy Aging Survey

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ABSTRACT

We describe the development of a healthy aging survey for older Thai adults. Domains of physical, psychological, social and spiritual health were identified as relevant based on focus groups of older Thai adults and a synthesis of Western and Thai literature on aging. A 4-phase approach was employed. First, for each domain, we selected measures that had been used in Thailand and/or in other countries, and adapted them for older Thai adults. Second, 2 forward translations from English to Thai and 1 back translation were conducted. Third, the survey was pretested by using a general debriefing pretest and cognitive interviewing. Last, the final scales were selected based on factor analysis and psychometric properties assessed in a sample of 350 older Thai community-dwelling adults. Factor analysis explained 61.8 - 74.5 % of the variance within each domain. The final survey consisted of 72 items with 16 scales. Most scales achieved good reliability; 13 scales had a Cronbach's alpha greater than 0.70 (range 0.48 and 0.93). A 2-week test-retest reliability showed acceptable Pearson correlations. The first-generation survey demonstrates good psychometric properties and provides the basis for measuring healthy aging in the older Thai adult population. The survey may also be applicable to other cultures.

Keywords: Healthy aging, development, older adults, survey, Thai, validity, reliability

INTRODUCTION

Population aging in Thailand is happening faster than in Western developed countries. The Thai population aged 60 and older comprised 10.94 % of the whole population in 2005, and will represent 15.28 % by 2020 [1]. With increasing age, 1/4 Thai people aged 60 and older reported disability, 1/5 reported long-term disability, 1/20 were homebound and 1/100 were bed-bound [2].

The most important challenge related to the aging population is to consider how to increase the quality and years of healthy life. Therefore, healthy aging is emerging as a vital key concept. This concept is primarily concerned with increasing the quantity and quality of life of older people and implies a focus on the maintenance of health, often through lifestyle choices and preventive measures [3]. Keeping seniors healthy and functioning will have a significant economic impact. In addition to reducing long-term care costs, healthier older adults are more likely to remain productive members of society.

Healthy aging has been described as a lifelong process optimizing opportunities for improving and preserving health; physical, social and mental wellness, independence, quality of life and successful life-course transitions [4]. Although this definition depicts healthy aging in positive terms, most empirical research on aging including Thai research has focused on negative aspects such as mortality, morbidity, and disability. Descriptive and evaluative research of older people based on biomedical models neglects the vast heterogeneity in health status and cannot adequately address the concept of healthy aging [5]. However, there is no single existing healthy aging measure or instrument that is appropriate for older Thai adults. A standard and culturally sensitive instrument that covers diverse domains of healthy aging relevant to the Thai population is needed. The subsequent information could be used as the scientific basis for systematic assessment and interventions designed to enhance the health of older Thai people.

CONCEPTUAL FRAMEWORK OF THE THAI HEALTHY AGING SURVEY

Healthy aging is influenced by historical and cultural factors, as well as physical, cognitive, psychological, social, spiritual, and economic resources. It is a concept that has had a variety of definitions, most of which are from Western culture. Because the culture of aging in Thailand likely differs, a conceptual framework is needed that will be appropriate to the Thai context. Although we expected that many domains would be similar to those from Western cultures, such as physical and social health, we thought that psychological/mental health and spiritual health would differ. Clarifying the concept of Thai healthy aging is an essential preliminary step towards achieving a definition and attributes for survey development.

The conceptual framework for the Thai healthy aging survey was developed from results of focus groups and qualitative studies examining older Thai adults'

perceptions [6] and a synthesis of a Thai and Western literature review examining healthy aging. We reviewed MEDLINE and CINAHL databases, and conducted a manual review of reference lists. Results of this review suggest that although some healthy aging concepts were similar, many definitions and attributes developed in a Western context were inappropriate for older Thai adults, where culture, belief, environment and religion differ.

Health has been defined as a complete state of physical, mental, social and spiritual well-being [7]. A person achieving "healthy aging" would be an older adult who perceives himself/herself as healthy, but not necessarily free from chronic disease or disability. He/she is able to improve and preserve his/her physical, social, spiritual, and mental health. Health is defined as the balanced interaction between the mind and the body as well as between one's life and environment [8]. In Thai, the word "health" means a state of happiness, thus it is more like "wellness" from a Western perspective, and Thai people think of health in a holistic manner [9]. They believe that health is a reflection of many things such as basic needs, culture, knowledge, family, spirituality, economics, and community [10].

As the basis for the healthy aging survey, we identified 4 domains of indicators of Thai healthy aging: physical health, psychological/mental health, social health, and spiritual health [11-17]. An overview of the components of each of these is presented in **Table 1**.

Physical health was indicated by having good health perceptions and optimal changes in health, having good physical functionality and mobility, being satisfied with physical activity, having energy (vitality), having good vision and hearing, and not falling. Psychological/mental health was indicated by having psychological well-being including harmony, interdependence, acceptance, respect, and enjoyment. Having good cognitive functioning, no fear of falling, and being satisfied with life are also identified as aspects of psychological/mental health. The attributes of social health focus on the individual, defined in terms of having social contact and participation, receiving assistance in basic needs from family members and others, and having enough money for basic needs. Spiritual health was defined in terms of having meaning, peace and purpose in life, having faith and belief in self and others, having compassion and practicing religious activities.

Table 1 Conceptual framework of the Thai healthy aging survey.

	Indicators of the Thai healthy ager
	Domain 1 Physical health
Concept 1	Having good health perception
Concept 2	Having good changes in health
Concept 3	Having good physical functionality
Concept 4	Having mobility
Concept 5	Being satisfied with physical activity
Concept 6	Having energy (vitality)
Concept 7	Having good vision and hearing
Concept 8	Having no falls
	Domain 2 Mental/Psychological health
Concept 9 - 13	Having psychological well-being including harmony, interdependence, respect, acceptance, and enjoyment
Concept 14	Having good cognitive functioning
Concept 15	Having no fear of falling
Concept 16	Being satisfied with life
	Domain 3 Social health
Concept 17	Having visits with friends/relatives and visits to home of friends/relatives (social contact)
Concept 18	Having attendances in groups or clubs (social participation)
Concept 19	Receiving assistance in basic needs from family members and others (tangible social support)
Concept 20	Having enough money for basic needs (financial sufficiency)
	Domain 4 Spiritual health
Concept 21	Having meaning, peace, and purpose in life
Concept 22	Having faith and belief
Concept 23	Having compassion
Concept 24	Practicing religious activities

METHODS

Survey Development

To develop a healthy aging survey to reflect these concepts, we proceeded through 4 phases: 1) item selection; 2) translation into the Thai language from English versions and back translation into English; 3) pretest of translated survey; and 4) psychometric testing.

Item Selection

We created the Thai healthy aging survey using 2 methods. For most concepts, we identified measures that had been used in Thailand and/or in other countries including the U.S. Some of these were thought to be relevant and appropriate and were used "as is." For others, the items needed to be adapted or modified to be appropriate for older Thai adults.

First, physical health, items concerning health perception, perceived change in health, physical functioning, mobility, satisfaction with physical activity and vitality were selected from both the SF-36 version 2.0 [18-20] and the MOS physical functioning measures [21]. Sensory adequacy items were selected from the OECD Long-Term Disability Questionnaire [22]. The Thai Fall Risk Assessment Tool was used to measure risk of falling [23].

Second, mental/psychological health, the Thai psychological well-being instrument [24] was used which measures harmony, interdependence, respect, accepting life and enjoyment in life. The Chula Mental test [25] was used to measure cognitive functioning, the Falls-Efficacy Scale-International (FES-I) [26] was used to assess fear of falling. Satisfaction with life items were selected from the Life Satisfaction Index Z (LSI-Z) [27].

Third, social health, social contacts and participation items were selected from the Rand Social Health Battery [28], tangible support items were selected from the MOS social support survey [29] and financial sufficiency items were selected from a study of women's health and aging [30].

Last, spiritual health, the Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale (FACIT-Sp version 4) [31] was used, which measures meaning, peace, purpose in life, faith and belief. Compassion items were selected from the Ironson-Woods SR index [32], and religious items were selected from the private religious practice scale [33]. The resulting first draft of this survey included 4 domains, 127 items with 24 separate hypothesized scales, and 14 possible instruments as shown in **Appendix 1**.

Item Translation

In the first draft, some items were already translated or had been developed in Thailand. The remaining items were translated into the Thai language with permission. The translation process included forward translation and back translation [34]. Two forward translations were made of the survey from English to Thai separately. The 2 translators were bilingual translators who were experienced in the research process and whose first language was Thai. Next, the 2 Thai versions were compared by the first

author. This identified some ambiguous wording in the original items and discrepancies in the translation process. Differences from the original and between the 2 translations were resolved through discussion with the 2 translators.

Back translation was conducted from the resulting Thai version of the survey. A bilingual professional translator translated the questionnaire back from Thai to English. The 2 English versions were compared for inconsistencies by the first author. If there were inconsistencies, the author compared the themes and items and rewrote the items. Because the back-translation of the survey indicated the need for minor revisions, some items were modified further so that items were easier to understand by older Thai adults. Most items did not have major differences in meaning and a few items were modified to improve the semantic meaning.

Pretest of Translated Survey

Pretest Design

The 127-item survey was administered in a pretest with a convenient sample of 31 older Thai adults who were drawn from a target population in Songkhla province in the south of Thailand. Most of them completed all questionnaires by self administration and some were by personal interview.

Pretest Methods

For each hypothesized scale, we examined the percentage of missing data and score distributions including the mean, standard deviation, observed and possible score ranges, and percentage at the floor/ceiling. Item analysis was completed to determine whether to retain scales and items. Two criteria were used in the decision process: (a) a minimum corrected item-total correlation coefficient of 0.30; and (b) a minimum Cronbach's reliability of 0.70 [35].

The survey was also pretested by using a general debriefing pretest and cognitive interviewing with probe questions [36]. These techniques were designed to obtain feedback on question suitability, wording, and comprehension, as well as on overall survey design [37]. They help researchers understand how participants interpret questionnaire items in order to develop more comprehensible questions and response choices. In addition, researchers ask participants to explain problems with particular questions and to suggest resolutions to the problems [24,38]. The general debriefing pretest comprised 7 open-ended questions about the appropriateness of content, wording, format instructions, response scales, such as "Which words were hard to understand?" and "Could you tell me in your own words what the question is asking you?". Cognitive interviewing comprised 15 probe questions. For example, participants were asked "What does the phrase 'voluntary groups' mean to you?". Also, participants were asked to state how they decided on an answer, e.g., "I asked you whether you are a relaxed person and are not easily worried, and you answered…, what were you thinking when you answered?".

Pretest Results

According to the criteria noted above, 2 hypothesized scales and 22 items were dropped. The mobility scale (1 item) and the sensory adequacy scale (5 items) were dropped because the mean score of the mobility scale (4.94 ± 0.36) and the sensory adequacy scale (14.42 ± 1.03) were almost at the ceiling of the scales, indicating that participants tended to have almost no problems with mobility and sensory deprivation. Seven items on the fear of falling scale were deleted because they were less conceptually homogeneous than the remaining items. Four items on the satisfaction with life scale, 1 item on the social contact scale, 3 items on the meaning, peace and purpose in life, and 1 item on the religious practice scales were excluded from these scales. One item on the harmony scale and 1 item on the interdependence scale were taken out to be part of a new scale named 'neighborhood' and the harmony scale and the interdependence scale were merged together named 'family harmony and interdependence'. Both new scales met all criteria.

Participants indicated that some words or phrases were hard to understand such as "productive" and "a sense of harmony". They also sometimes suggested wording changes. Items that had a negative term (e.g. "My life lacks meaning") appeared to be particularly confusing to participants. Some similar words were perceived as being redundant. They also noted that some questions were too long. Participants did not know the answers to some questions such as "I get down in the dumps too often" and asked for clarification of some questions. Several participants provided valuable suggestions. Some participants commented on the survey layout and noted that some response choices were confusing.

The pretest results showed that most of scales in this survey achieved good levels of reliability, with Cronbach's alpha coefficients between 0.56 and 0.94. The low reliabilities (less than 0.7) are tolerable for scales that are in a developmental stage. All results were used to revise the survey. The second draft of the survey consisted of 103 items and 22 hypothesized scales.

Fielding the Survey

A cross-sectional study was conducted with 350 participants to test the scaling properties of the second draft. After obtaining oral consent, each participant completed all questionnaires by self administration and some by personal interview. Two weeks later, the survey was administered a second time to 30 convenient participants to enable examination of test-retest reliability.

PARTICIPANTS AND SETTINGS

The population of this study consisted of Thai people aged 55 years and older living in southern Thailand. Three hundred and fifty participants were randomly selected from 8 districts for psychometric testing. Sample size was based on a recommendation of at least 300 for a factor analysis [39]. Inclusion criteria were as

follows: 1) aged 55 years and older; 2) understands Thai language; and 3) willing to participate in this survey.

METHODS OF ANALYSIS

Before conducting the factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test were conducted to evaluate whether the sample was large enough to perform a satisfactory factor analysis. KMO values greater than 0.5 indicates that the sample size is adequate for factor analysis and Bartlett's tests were significant ($p < 0.05$) indicates that all variables were uncorrelated.

For scales that were confirmed through factor analysis, we conducted internal consistency reliability analysis and test-retest reliability. Internal consistency was assessed with Cronbach's alpha formula and item analysis [40]. Item analysis was also completed and 2 criteria were used: a minimum corrected item-total correlation coefficient of 0.30; and a minimum Cronbach's reliability of 0.70 [41]. Two-week test-retest reliability was calculated using Time 1 and Time 2 data with Pearson's product correlation. The Statistical Package for the Social Sciences (SPSS) version 15 was used for all analyses.

RESULTS

There was no missing data and no particular response patterns were observed in the data. Among the 350 participants, the mean age was 70.37 (± 7.82) years, ranging from 55 - 96. Most of them were female (62.9 %) and 217 (62 %) were married. They were fairly well educated; over half of them had a primary school education (73.4 %) which is the highest grade completed by the majority of older Thai people [23]. Most participants had financial problems sometimes (54.9 %). Over half (68 %) of the participants reported living with a spouse and children.

The KMO was between 0.78 - 0.84, indicating that the sample was large enough to perform a satisfactory factor analysis and that the sample size was sufficient for psychometric testing of a 103-item scale.

Physical health

Physical health consisted of 19 items, a PCA revealed 4 factors with an eigenvalue higher than 1 (**Table 2**). The factor loadings were all above 0.40, and ranged from 0.54 to 0.86. The first factor was defined by all 10 physical functioning items. The second factor was defined by all 5 health perception items. The third and fourth factors were defined by 2 fatigue items and 2 energy items. The 4 factors together explained 63.39 % of the variance.

Table 2 Final factor analysis of 19 physical health items (n = 350).

Item*	Physical functioning	Health perceptions	Fatigue	Energy
3h. Walking 4-5 electrical stilts	0.801			
3g. Walking a kilometer	0.789			
3i. Walking to the neighbor's home	0.776			
3f. Bending, kneeling or stooping	0.707			
3b. Moderate activities such as moving a table, cleaning the house	0.681			
3a. Vigorous activities such as running, lifting heavy objects, participating in strenuous sports	0.648			
3c. Lifting or carrying groceries	0.644			
3d. Climbing several flights of stairs	0.644			
3e. Climbing one flight of stairs	0.590		0.480	
3j. Bathing or dressing	0.536			
2c. I expect my health to get worse		0.731		
2a. I seem to get sick a little easier than other people		0.715		
1. In general, would you say your health is (excellent, very good, good, fair, poor)		0.694		
2d. My health is excellent		0.679		
2b. I am as healthy as anybody I know		0.592		
4c. Did you feel worn out?			0.859	
4d. Did you feel tired?			0.813	
4a. Did you feel full of pep?				0.854
4b. Did you have a lot of energy?				0.844

Note: * Paraphrased

Although energy and fatigue items split into 2 factors, we combined these into 1 scale for conceptual meaningfulness, because this vitality scale is part of the standard SF-36 version 2.0. The scales of health perceptions, physical functioning, and vitality were thus adopted without modification.

Table 6 summarizes all final scales. For the physical health scales, Cronbach's alpha coefficients and the corrected item-total correlations exceeded the standard criteria, except the vitality scale. The means for all 3 physical health scales were just above the possible scale midpoint, indicating a nearly normal distribution for all scales. The correlations between the physical health scales ranged from 0.35 - 0.39 ($p < 0.01$), demonstrating that they were moderately interrelated. The 2-week test-retest reliability (n = 30) using Pearson correlation ranged from 0.22 - 0.48; only 1 of the 3 was > 0.40, indicating somewhat low test-retest reliability.

Table 3 Final factor analysis of 23 mental/psychological health items (n = 350).

Item*	Fear of falling	Respect	Enjoy-ment	Satisfac-tion with life	Accept-ing life	Satisfac-tion with life
6g. Walking on an uneven surface	0.861					
6f. Going to a place with crowds	0.851					
6c. Going up or down stairs	0.847					
6d. Walking around outside	0.841					
6h. Walking up or down a slope	0.837					
6b. Going to the store	0.818					
6i. Going out to a social event	0.799					
6e. Walking on a slippery surface	0.781					
6a. Cleaning the house	0.555					
5b. Younger people talk and behave politely toward you		0.883				
5c. Younger people treat you with respect		0.876				
5a. Younger people obey you		0.861				
5h. You laugh easily			0.892			
5g. You have a good sense of humor			0.882			
5i. You have a good time with other people			0.632			
7a. I am just as happy as when I was younger				0.820		
7b. These are the best years of my life				0.717		
7e. I've gotten pretty much what I expected out of life				0.680		
5e. When you have small problems, you can let go of your worries					0.865	
5d. You are a relaxed person and are not easily worried	0.429				0.656	
5f. When something bad happens to you, you can accept it					0.655	
7d. I didn't get most of the important things I wanted						0.826
7c. I have made plans for the future						0.727

Note: ***** Paraphrased

Psychological/Mental Health

Psychological/mental health consisted of 23 items; a PCA revealed 6 factors with factor loadings ranging from 0.55 - 0.89 (**Table 3**). The first factor was defined by strong loadings of all 9 fear of falling items. The second, third and fifth factors were defined by respect, enjoyment, and accepting life items, respectively. The satisfaction with life items split across the fourth and 6 factors, the 6 factors together explained 70.5 % of the variance. The correlation among the factors ranged from −0.12 to 0.44.

Although the satisfaction with life scale was split into 2 factors, we combined these into 1 scale for conceptual meaningfulness and because this scale was selected from the Life Satisfaction Index Z (LSI-Z) [42].

As shown in **Table 6**, Cronbach's alpha coefficients and the corrected item-total correlations of scales in psychological/mental health exceeded the standard criteria, except the satisfaction with life scale. The means of the respect scale, the acceptance scale, and the enjoyment scale were all near the high side of these ranges, suggesting that participants tended to report a high level of all of these. The fear of falling scale mean score (20.97 ± 7.72) was below the midpoint of the observed scale indicating that participants tended not to have a great fear of falling. The mean of the satisfaction with life scale (17.17 ± 2.59) was at the midpoint. The correlations between the scales in psychological/mental health ranged from −0.12 to 0.44 ($p < 0.01$), indicating that these are somewhat independent. The test-retest reliability of each scale using Pearson correlation ranged from 0.15 to 0.95; 4 of the 6 coefficients were > 0.40 indicating moderate reliability.

Social Health

Social health consisted of 14 items; a PCA revealed 4 factors with factor loadings ranging 0.61 to 0.93 (**Table 4**). The 4 factors together explained 74.47 % of the variance. The correlations among the factors ranged from −0.01 to 0.29. As seen in **Table 6**, Cronbach's alpha coefficients and the corrected item-total correlations of scales in social health exceed the criteria. The mean of the harmony and interdependence in family and neighborhood scale (20.73 ± 2.10) indicated that participants tended to report high levels of harmony and interdependence in family and neighborhood. The means of the social contact scale and the tangible social support scale were near the high side of the possible scales suggesting that participants had a high level of social contact and tangible social support. The mean of the financial sufficiency scale (10.85 ± 2.01) was above the midpoint indicating that participants tended to have financial sufficiency. The correlations between the scales in social health ranged from −0.01 to 0.29, suggested that they were independent. The test-retest reliability of each scale using Pearson correlation ranged from 0.21 to 0.98; 2 of the 3 were > 0.40, indicating moderate test-retest reliability.

Table 4 Final factor analysis of 14 social health items (n = 350).

Item*	Harmony and interdependence in family and neighborhood	Financial sufficiency	Tangible social support	Social participation
8b. In your family, people can depend on each other for help	0.855			
8c. People in your family take care of you	0.829			
8a. Members of your family, care about each other	0.824			
8e. People in your neighborhood depend on each other	0.786			
8d. In your neighborhood, people are friendly to each other	0.781			
11b. Have enough money to meet daily needs		0.900		
11a. Have enough money for food		0.898		
11c. Have enough money for medical care		0.829		
12. How do your finances usually work out at the end of the month?		0.619		
10b. Someone to take you to the doctor if you needed it			0.929	
10c. Someone to prepare your meals if you were unable to do it yourself			0.896	
10a. Someone to help you if you were confined to bed			0.870	
9b. Visited with friends at their homes				0.904
9a. Had friends over to home				0.868

Note: * Paraphrased

Spiritual Health

Spiritual health consisted of 16 items; a PCA revealed 4 factors with factor loadings ranging from 0.60 to 0.87 (**Table 5**). The 4 factors together explained 61.76 % of the variance. As shown in **Table 6**, Cronbach's alpha coefficients and the corrected item-total correlations of scales in spiritual health exceeded standard criteria, except meaning, peace and purpose in life. The mean of the meaning, peace, and purpose in life scale (11.79 ± 0.88) was slightly above the midpoint suggesting that participants tended to report a moderately high level of meaning, peace, and purpose in life with the items

in this scale. The faith and belief scale and the compassion scale means were both well above the midpoints indicating that participants tended to have fairly high levels of faith and spiritual belief and compassion. The religious practice scale mean score (14.93 ± 5.64) was at the midpoint of the possible scale (4 to 24), indicating a normal distribution. The correlations between the scales in spiritual health range from −0.03 to 0.43, suggesting that these scales were fairly independent. The test-retest reliability of each scale using Pearson correlation ranged from 0.12 to 0.48; 2 of the 4 scales coefficients were > 0.40.

Table 5 Final factor analysis of 16 spiritual health items (n = 350).

Item*	Compassion	Religious practice	Faith and spiritual belief	Meaning, peace, purpose in life
14c. I have responsibility to help others	0.751			
14d. My beliefs increase my acceptance and tolerance of others	0.734			
14e. I feel I am concerned to all humanity	0.702			
14a. My beliefs teach me to help other people who are in need	0.668			
14b. My beliefs help me feel compassion/love/respect for others	0.664			
15b. How often do you take to meditate?		0.867		
15d. How often do you make merit?		0.824		
15c. How often do you watch or listen to religious programs on TV or radio?		0.791		
15a. How often do you pray privately in places other than at church or synagogue?		0.727		
13f. My illness has strengthened my faith or spiritual beliefs			0.793	
13g. I know that whatever happens with my illness, things will be okay			0.776	
13e. I find strength in my faith or spiritual beliefs			0.723	0.423
13d. I find comfort in my faith or spiritual beliefs			0.680	0.435
13a. My life has been extremely productive				0.644
13b. I feel a sense of purpose in my life				0.643
13c. I am able to reach down deep into myself for comfort				0.604

Note: * Paraphrased

The correlations between the 16 final scales ranged from −0.48 to 0.69. The strongest correlation was the respect scale and the harmony and interdependence in family and neighborhood scale (**Table 7**).

DISCUSSION

This study reported the development of the Thai healthy aging survey. Many of the selected scales were developed and had been used successfully in older adults in other studies. In this field test among community-dwelling older adults, this survey demonstrated promise as a tool for measuring healthy aging specific to older Thai adults. Most of the scales in the survey had adequate internal consistency reliability. The survey required on average less than 25 min to administer and there was no item-level missing data. The final decisions regarding which items were to be retained were based both on empirical data of how the items performed in the item-level statistics [40] and on theoretical conceptualization.

Although health is a universal concept and we expected that most of the domains would be similar between Thai and Western perspectives, the results suggest that the domains of psychological/mental health, social health and spiritual health from a Thai perspective are different. Since Thailand has never been occupied by a Western power, then the views and values of Thai people may be little influenced by Western thought [43]. In addition, culture, belief, environment and religion are also different.

Social health from a Thai perspective is different from a Western perspective because the self is viewed as interdependent, and people are mutually responsible for one other. In contrast, the Western concept considers self as autonomous and independent [24]. Measurement of social health was focused on the individual both in subjective and objective constructs. In the Thai perspective, spiritual health may be viewed to be the ability to attain harmonious living with the universe by following the Dharma path that promotes a good relationship between oneself and others [16], and leads to peace, happiness, and ultimate salvation.

We retained the scales of vitality, satisfaction with life, and meaning, peace and purpose in life because they were important elements of the Thai healthy aging concept [14]. Researchers planning on using this survey should be aware that these 3 scales had somewhat low reliability.

There are 2 limitations of this study. First, the survey was done in the older Thai adults recruited from only 1 province in Thailand. Following refinement of the survey it is planned to conduct a study of a large sample of older Thai adults from various regions. Second, the concurrent validity was not examined in this study and should be conducted in future investigations.

Although the Thai healthy aging survey should be useful to measure health in older Thai people, a shorter version could be developed. This study provides the basis for measuring health, which covers 4 broad domains, in older Thai community-dwelling adults. The survey can help health care providers to acquire information that should be beneficial in terms of screening and creating a greater understanding of healthy aging.

Table 6 Psychometric properties of the Thai healthy aging survey (n = 350).

Scale	number of items	Mean	SD	Observed range	Possible range	% at floor	% at ceiling	Skewness statistics	Skewness SE	Range of ITC	Cronbach's alpha	2 week test-retest (n = 30)
Domain 1. Physical health												
1. Health perception	5	15.73	2.98	6 - 25	5 - 25	0	0.3	−0.43	0.13	0.54 - 0.57	.78	.48
2. Physical functioning	10	21.61	4.93	10 - 30	10 - 30	2.3	4.0	−0.34	0.13	0.52 - 0.75	.89	.22
3. Vitality	4	12.85	2.27	6 - 19	4 - 20	0	0	−0.12	0.13	0.22 - 0.45	.57	.24
Domain 2. Mental/ Psychological health												
4. Respect	3	12.34	1.43	6 - 15	3 - 15	0	14.3	−0.09	0.13	0.77 - 0.80	.89	.27
5. Accepting life	3	11.89	1.30	6 - 15	3 - 15	0	3.1	−0.59	0.13	0.48 - 0.75	.75	.15
6. Enjoyment in life	3	11.67	1.39	6 - 15	3 - 15	0	3.7	−0.98	0.13	0.42 - 0.79	.80	.95
7. Fear of falling	9	20.97	7.72	9 - 44	9 - 45	3.4	0	0.62	0.13	0.53 - 0.81	.93	.66
8. Satisfaction with life	5	17.17	2.59	9 - 24	5 - 25	0	0	−0.30	0.13	0.29 - 0.46	.65	.81
9. Harmony and interdependence in family and neighborhood	5	20.73	2.10	5 - 25	5 - 25	0	9.1	−0.18	0.13	0.65 - 0.78	.86	.53
Domain 3. Social health												
10. Social contact	2	8.12	2.76	2 - 12	2 - 12	1.7	14.6	−0.24	0.13	0.63	.77	.98
11. Tangible social support	3	12.21	2.26	3 - 15	3 - 15	0.6	15.4	−1.52	0.13	0.78 - 0.83	.90	.21
12. Financial sufficiency	4	10.85	2.01	4 - 15	4 - 15	2.0	5.4	−0.75	0.13	0.45 - 0.79	.84	.59
Domain 4. Spiritual health												
13. Meaning, peace and purpose in life	3	11.79	0.88	9 - 15	3 - 15	0	0.9	−0.76	0.13	0.25 - 0.34	.48	.48
14. Faith and spiritual belief	4	15.70	1.66	8 - 20	4 - 20	0	3.1	−0.29	0.13	0.58 - 0.70	.82	.12
15. Compassion	5	19.02	2.22	10 - 25	5 - 25	0	0.9	−0.93	0.13	0.51 - 0.64	.79	.46
16. Religious practice	4	14.93	5.64	4 - 24	4 - 24	1.4	3.1	−0.68	0.13	0.52 - 0.76	.82	.33

Table 7 Correlations among Thai healthy aging survey scales.

Scale	Physical health			Psychological/Mental health					Social health				Spiritual health			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Health perception	-															
2. Physical functionality	.39**	-														
3. Vitality	.37**	.35**	-													
4. Respect	.30**	.09	−0.01	-												
5. Accepting life	.28**	.21**	.21**	.44**	-											
6. Enjoyment in life	.16**	.03	.18**	.15**	.43**	-										
7. Fear of falling	−0.31**	−0.48**	−0.29**	−0.14**	−0.24**	−0.10	-									
8. Satisfaction with life	.25**	.08	.26**	.21**	.27**	.23**	−0.12	-								
9. Harmony and interdependence	.28**	.07	−0.02	.69**	.48**	.20**	−0.10	.13**	-							
10. Social contact	.17**	.19**	.16**	.16**	.12*	.12*	−0.11*	.15**	.18**	-						
11. Tangible social support	.15**	.12**	.00	.29**	.16**	.12**	.07	.13**	.29**	.20*	-					
12. Financial sufficiency	.20**	.12*	.20**	.16**	.11*	.09	−0.12*	.06	.19**	−0.01	.13*	-				
13. Meaning, peace and purpose in life	.27**	.14*	.29**	.16**	.28**	.17**	−0.01	.38**	.34**	.19**	.11*	.23**	-			
14. Faith and spiritual belief	.06	−0.03	.22*	.10	.20**	.23**	.05	.36**	.11	−0.09	.20**	.13*	.43**	-		
15. Compassion	.10	.01	.16**	.11*	.21**	.26**	.16**	.45**	.11**	.09	.19**	.11*	.38**	.51**	-	
16. Religious practice	.15**	.14**	.10	.02	−0.01	−0.00	.04	−0.09	.06	.56**	.01	.02	.09	−0.03	.06	-

Note: Pearson product-moment coefficients, **$p < 0.01$, *$p < 0.05$

Hypothesized scales and instruments selected for the initial Thai healthy aging survey.

Domain	Hypothesized Scales	Possible Instrument	Modifications	Number of Items	Thai Version	Comment
Physical health	Health perception	SF -36 version 2.0 (Ware *et al*, 2000)	-	5	Yes	-
	Change in health	SF -36 version 2.0 (Ware *et al*, 2000)	-	1	Yes	Dropped all items
	Physical Functionality	SF-36 version 2.0 (Ware *et al*, 2000)	-	10	Yes	-
		MOS Physical Functioning Chapter (Stewart, 1992)	-	2	No	Dropped all items
	Vitality	SF-36 version 2.0 (Vitality) (Ware *et al*, 2000)	-	4	Yes	-
	Mobility	MOS Physical Functioning Chapter (Stewart, 1992)	-	1	No	Dropped all items
	Satisfaction with PA	MOS Physical Functioning Chapter (Stewart, 1992)	-	1	No	Dropped all items
	Sensory adequacy	The OECD Long-Term Disability Questionnaire (McWhinnie, 1981)	Selected 5 of 16 items	5	No	Dropped all items
	Risk to falls	Thai Fall Risk Assessment Tool (Thai FRAT) (Thiamwong *et al*, 2001)	New tool	6	Yes	Dropped all items
Mental health	Harmony	Measuring psychological well-being: insights from Thai elders (Ingersoll-Dayton *et al*, 2004)	New tool	3	Yes	Merged items and dropped 1 item
	Interdependence		New tool	3	Yes	
	Respect		New tool	3	Yes	-
	Accepting life		New tool	3	Yes	-
	Enjoyment in life		New tool	3	Yes	-
	Cognitive functioning	Chula Mental Test (Jitapunkul *et al*, 1996)	-	13	Yes	Dropped all items
	Fear of falling	The Falls-Efficacy Scale-International (FES-I) (Yardley *et al*, 2005)	-	16	No	Dropped 8 items
	Satisfaction with life	The Life satisfaction Index Z (LSI-Z) (Wood *et al*, 1969)	-	13	No	Dropped 8 items
Social health	Social contact	The Rand Social Health Battery (Donald & Ware, 1984)	-	3	No	Dropped 1 item
	Social participation	The Rand Social Health Battery (Donald & Ware, 1984)	Selected 4 of 20 items	2	No	Dropped 2 items
	Tangible social support	The MOS Social Support Survey (Sherbourne & Stewart, 1991)		4	No	Dropped 1 item
	Financial sufficiency	Questions from a study of women's health and aging (Klesges *et al*, 2001)	Survey questionnaires	4	No	Added 1 item after pretest and dropped 1 item
Spiritual health	Meaning, peace, purpose in life	The functional Assessment of Chronic Illness Therapy- Spiritual Well-Being Scale (FACIT-Sp Version 4) (Peterman *et al*, 2002)	-	8	No	Dropped 5 items
	Faith, belief	The Ironson-Woods SR index (Ironson *et al*, 2002)	-	4	No	-
	Compassion	The Ironson-Woods SR index (Ironson *et al*, 2002)	5 of 25 items	5	No	-
	Religious practice	Private religious practice (Levin, 1999)	-	5	No	Dropped 1 item

APPENDIX 2

Scales and final items sources for the final Thai healthy aging survey.

Domain	Scale	Selected Instrument	number of Items
Physical health	Health perception	SF -36 version 2.0 (Ware *et al*, 2000)	5
	Physical Functioning	SF-36 version 2.0 (Ware *et al*, 2000)	10
	Vitality	SF-36 version 2.0 (Ware *et al*, 2000)	4
Mental health	Respect	Modified from Measuring psychological well-being: insights from Thai elders (Ingersoll-Dayton *et al*, 2004)	3
	Accepting life	Modified from Measuring psychological well-being: insights from Thai elders (Ingersoll-Dayton *et al*, 2004)	3
	Enjoyment in life	Modified from Measuring psychological well-being: insights from Thai elders (Ingersoll-Dayton *et al*, 2004)	3
	Fear of falling	Modified from The Falls-Efficacy Scale-International (FES-I) (Yardley *et al*, 2005)	9
	Satisfaction with life	Modified from The Life satisfaction Index Z (LSI-Z) (Wood *et al*, 1969)	5
Social health	Harmony and interdependence in family and neighborhood	Modified from Measuring psychological well-being: insights from Thai elders (Ingersoll-Dayton *et al*, 2004)	5
	Social contact	Modified from The Rand Social Health Battery (Donald & Ware, 1984)	2
	Tangible social support	Modified from The MOS Social Support Survey (Sherbourne & Stewart, 1991)	3
	Financial sufficiency	Questions from a study of women's health and aging (Klesges *et al*, 2001)	4
Spiritual health	Meaning, peace, and purpose in life	Modified from The functional Assessment of Chronic Illness Therapy- Spiritual Well-Being Scale (FACIT-Sp Version 4) (Peterman *et al*, 2002)	3
	Faith and spiritual belief	Modified from The functional Assessment of Chronic Illness Therapy- Spiritual Well-Being Scale (FACIT-Sp Version 4) (Peterman *et al*, 2002)	4
	Compassion	Modified from The Ironson-Woods SR index (Ironson *et al*, 2002)	5
	Religious practice	Modified from Private religious practice (Levin, 1999)	4
Total	16 scales	11 selected instruments	72

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บทคัดย่อ

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การพัฒนาและทดสอบความตรงความเที่ยงของแบบสำรวจการสูงวัยอย่างมีสุขสำหรับผู้สูงอายุไทย

ในการพัฒนาแบบสำรวจการสูงวัยอย่างมีสุขสำหรับผู้สูงอายุไทย ประกอบด้วยสื่องค์ประกอบ ได้แก่ สุขภาพกาย สุขภาพจิต สุขภาพสังคม และสุขภาพจิตวิญญาณซึ่งได้จากการสนทนากลุ่มในผู้สูงอายุไทยร่วมกับการสงเคราะห์งานวิจัยทั้งในประเทศไทยและประเทศตะวันตก การพัฒนามีสี่ขั้นตอนได้แก่ 1) คัดเลือกเครื่องมือที่ใช้อยู่ทั้งในประเทศและต่างประเทศและนำไปปรับให้เหมาะสมกับผู้สูงอายุ 2) แปลจากภาษาอังกฤษเป็นภาษาไทยโดยผู้แปลสองท่าน และแปลกลับจากภาษาไทยเป็นภาษาอังกฤษโดยผู้แปลหนึ่งท่าน 3) ทดสอบนำร่องโดยการสัมภาษณ์และซักถามความเข้าใจในข้อคำถาม และ 4) ทดสอบคุณสมบัติและวิเคราะห์ปัจจัยโดยเก็บข้อมูลจากผู้สูงอายุไทยที่อาศัยอยู่ในชุมชนจำนวน 350 คน ผลการวิเคราะห์ปัจจัยพบว่าแต่ละองค์ประกอบอธิบายได้ 61.8 - 74.5 เปอร์เซ็นต์ แบบสำรวจประกอบด้วย 72 ข้อคำถามใน16 สเกล สเกลส่วนใหญ่มีค่าความตรงที่ดีโดย 13 สเกลมีค่าคอนบาคอัลฟามากกว่า 0.70 (0.48 - 0.93) ค่าความตรงทดสอบก่อนหลังสองสัปดาห์แสดงค่าความสัมพันธ์เพียรสันที่ยอมรับได้แบบสำรวจนี้มีคุณสมบัติที่ดีและสามารถนำไปใช้สำรวจการสูงวัยอย่างมีสุขในประชากรสูงอายุไทย และอาจนำไปประยุกต์ใช้ในวัฒนธรรมอื่นๆ ได้เช่นกัน

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