



Original Article

## Psychometric Properties of a Taiwanese Attitude toward Aging Questionnaire-Short Form Used in the Taiwan Longitudinal Study on Aging

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### SUMMARY

**Background:** One's attitude toward aging (ATA) is not only associated with one's current health but also influential in future functioning and health. Individuals with a negative ATA tend not to participate in health promotion or interventions, leading to poor health outcomes and failed health promotion efforts. To further study and understand this issue, a psychometrically sound assessment tool is a prerequisite. The purpose of this study was to investigate the psychometric properties of the Taiwan Attitude toward Aging Questionnaire-Short Form (TAAQ-SF).

**Methods:** This cross-sectional study was a secondary analysis using data collected in the Taiwan Longitudinal Study on Aging (TLSA) conducted in 2011. The data of 3054 participants without missing data on the TAAQ-SF and with normal cognitive function were used in this study. The construct validity, internal consistency, and criterion-related validity of the TAAQ-SF were assessed.

**Results:** Factor analysis revealed two factors, namely, negative and positive self-perceived aging (NSPS, PSPA), which explained 24.7% and 23.8% of the variance, respectively. The internal consistency was 0.81 for the total score (0.75 for negative and positive subscales). The TAAQ-SF total score and two subscale scores were significantly associated with health criteria. People with higher PSPA showed better physical and psychological health, better self-efficacy in self-management of disease control.

**Conclusions:** Our results indicate that the TAAQ-SF is a psychometrically sound tool for assessing ATA in middle- to old-aged community-dwelling Taiwanese adults.

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## 1. Introduction

Despite knowing the beneficial effects of adopting a healthy lifestyle, many people are unwilling to make such changes.<sup>1–3</sup> People with negative attitudes toward aging (ATA) have low motivation to participate in health promotion, intervention and rehabilitation efforts, thereby reducing the efficacy of such efforts.<sup>2,4</sup> A focus on participants' ATA is very much needed to complement current initiatives that facilitate successful aging.<sup>4</sup> Before we can further explore on this issue, a psychometrically sound assessment tool is a prerequisite.

The Taiwan Attitude toward Aging Questionnaire (TAAQ) was first developed and validated in a group of people in the year 2016 to meet the need for evaluating attitude toward aging in Taiwan.<sup>5</sup> The TAAQ consists of 16 items and reflects two domains, namely, positive and negative self-perception of aging (PSPA and NSPA, respectively). The TAAQ has good internal consistency, test-retest reliability, and criterion-related validity.<sup>5</sup> Individuals with higher PSPA scores also

have better function and less depression.<sup>5</sup> Since this study included 255 participants from a comprehensive geriatric assessment outpatient study, the generalizability of the results to the general population was therefore worthy of substantiation.

The Taiwan Longitudinal Study on Aging (TLSA) is a population-based national survey of health and living status on a nationally representative population in Taiwan aged 58 years and older. It has been conducted every 3 to 4 years since 1989. There were 11 items used in the TLSA 2011 to measure ATA. These 11 items were first developed by the Ministry of Health and Welfare of Taiwan through collaboration with the University of Michigan and Princeton University. Unfortunately, no psychometric testing was conducted at the time of their development. These 11 items were then combined with the other items to develop the Taiwan Attitude toward Aging Questionnaire (TAAQ), which was psychometrically tested in a previous study.<sup>5</sup> The TLSA is an important and valuable national database for research to provide evidence-based knowledge so that health-care practice and policy making in Taiwan can be improved. Thus, it is important to examine if these 11 TAAQ items (the TAAQ short form, TAAQ-SF) have sufficiently sound psychometric properties for assessing ATA in the Taiwanese population. The purpose of this study was to investigate the construct validity, internal consistency, and criterion-related (concurrent) validity of the TAAQ-SF.

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## 2. Method

### 2.1. Study design and participants

This was a cross-sectional study. Data used in this study were from the TLSA conducted in 2011 (the TLSA 2011). We selected those without missing data on the 11 TAAQ items. To ensure the accuracy of participants' responses on the 11 TAAQ items, we further excluded those with cognitive impairment (defined as a score of < 6 on the nine-item Short Mental Status Questionnaire, SPMSQ).<sup>6</sup>

The current study was approved by the Institutional Review Board of Health Promotion Administration of the Ministry of Health and Warfare (Approval No. 5 BHP-2007-002). Before recruitment, all participants received a proper explanation of the study and provided consent for inclusion in the study.

### 2.2. Measurements

Demographic variables were age, sex, marital/cohabitation status (living alone or not), education (illiterate or literate, 1–6 years, 7–12 years, > 12 years), and ethnicity (Fukienese, Hakka, Mainlander, Aborigines). The TAAQ-SF consists of eleven TAAQ items, each rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). A higher score indicates a higher degree of agreement.

Health indicators consisted of: (1) Comorbidities (hypertension, diabetes mellitus, cardiovascular disease, arthritis, and cataract), (2) Depression score (as measured by the 10-item short form of the Center for Epidemiological Studies Depression Scale, CES-D, 10-SF),<sup>7</sup> (3) Physical function was assessed with three scales: mobility (lift/carry 12 kilograms, walk 200 to 300 meters, and climb stairs to second or third floor), IADL (shopping for personal items, ability to handle finances, mode of transportation, heavy house-work, house-keeping, ability to use telephone, food preparation, responsibility for own medications, and laundry), and ADL (bathing, dressing, feeding, transfer, mobility, and toilet use). Based on their perceived difficulty while performing each item (0: without difficulty, 1: a little difficulty, 2: great difficulty, and 3: inability to perform), the total score for each scale was summed. Higher scores indicated poorer physical function. (4) Self-efficacy in self-management of chronic diseases, participants were asked to rate their confidence in managing their chronic disease and health such as 1) taking medicine on time, 2) doing exercise as scheduled, 3) controlling your diet as scheduled, 4) discussing your illness with a physician, and 5) maintaining your mood from the influence of your illness? on a Likert-type scale, from very confident (1) to mostly unsure (5). The total score range was from 5 to 25, and a higher score indicated less efficacy in self-management skills for chronic disease.<sup>8</sup>

### 2.3. Statistical analysis

Participants' demographic and health variables are reported in descriptive statistics, with mean (standard deviation) for normally distributed variables and median (inter-quartile range, IRQ) for skewed variables. The construct validity of the TAAQ-SF was assessed by factor analysis employing Principal Component Analysis. To determine the latent factors, we used the Varimax rotation method, an Eigenvalue  $\geq 1$ , a scree plot, and factor loading  $> 0.4$ .<sup>9</sup> A Kaiser-Meyer-Olkin measure (KMO) value  $> 0.7$  was considered acceptable<sup>10</sup> and Bartlett's test of sphericity needed to be significant to ensure the appropriateness of the factor analysis. Cronbach's alpha was used to estimate the internal consistency reliability.

The criterion-related validity of the TAAQ-SF was investigated by its association with various health indicators criteria. The associations of the TAAQ-SF with depression (CES-D, 10-SF), physical function (mobility, IADL, and ADL), self-efficacy for self-management of chronic diseases, self-efficacy for health promotion behaviors, and exercise parameters (frequency, time, and intensity) were assessed by Spearman's rho correlation coefficient ( $r_s$ ), but participants with five chronic diseases were assessed by point biserial correlation coefficient ( $r_{pb}$ ). Correlations ranging from 0 to 0.25 indicate little to no relationship; those from 0.25 to 0.50, a fair relationship; values of 0.50 to 0.75, moderate to good; values above 0.75, good to excellent.<sup>11</sup>

## 3. Results

In total, 3727 participants were interviewed in the TLSA 2011 survey. We deleted those with missing data on the 11 ATA items ( $n = 455$ ) and those with SPMSQ scores of less than 6 ( $n = 206$ ). Thus, in total, 3054 participants' data were used in this analysis. The majority of our participants were men (50.5%), had an elementary school education (46.1%), were Fukienese (70.9%), and lived with partners (70.9%) (Table 1).

### 3.1. Construct validity

Two factors were extracted from the factor analysis and explained 48.5% of the variance. All items demonstrated moderate to strong loading ( $> .40$ ) (Table 2). Factor 1, labeled NSPA, consisted of 5

**Table 1**  
Participants' characteristics ( $n = 3054$ ).

Variable	Values <sup>a</sup>
Age (years)	69.1 $\pm$ 9.0
Sex	
Men	1543 (50.5%)
Women	1511 (49.5%)
Education	
Illiterate/literate	504 (16.5%)
Elementary school (1–6 years)	1408 (46.1%)
High school (7–12 years)	803 (26.3%)
College and above (> 12 years)	339 (11.1%)
Ethics ( $n = 3052$ )	
Fukienese	2164 (70.9%)
Hakka	547 (17.9%)
Mainlander	293 (9.6%)
Aborigines	48 (1.6%)
Marital/cohabitation status ( $n = 3008$ )	
Without partner	844 (28.1%)
With partner	2164 (70.9%)
<b>Health indicators</b>	
Depression (CES-D, 10-SF), ( $n = 3052$ )	2 (0, 6)
Physical function	
Mobility ( $n = 3046$ )	0 (0, 1)
IADL ( $n = 3053$ )	0 (0, 1)
ADL	0 (0, 0)
Co-morbidities	
Hypertension	1403 (45.9%)
Cataract	1153 (37.8%)
Arthritis	636 (20.8%)
Cardiovascular disease	605 (19.8%)
Diabetes	558 (18.3%)

<sup>a</sup> Values are mean  $\pm$  SD, frequency, or median (inter-quartile range).

Abbreviation: ADL, activities of daily living; CES-D, 10-SF, 10-item short form of Center for Epidemiological Studies Depression Scale; IADL, instrumental activities of daily living.

items and explained 24.7% of the variance. Factor 2, labeled PSPA, consisted of 6 items and explained 23.8% of the variance.

The possible score ranges were 11 to 55 for the TAAQ-SF total score, 5 to 25 for the NSPS, and 6 to 30 for the PSPA. The means (and standard deviations) of the TAAQ-SF total score, NSPS, and PSPA were 40.6 (6.0), 12.0 (3.4), and 22.7 (3.5), respectively.

### 3.2. Internal consistency reliability

Cronbach's alpha was 0.81 for the total scale, 0.75 for NSPA, and 0.75 for PSPA, indicating good internal consistency reliability for all of them.

### 3.3. Criterion-related (concurrent) validity

For this analysis, we used the total score and two subscale scores (NSPA, PSPA) of the TAAQ-SF. The TAAQ-SF total score was moderately correlated with the CES-D (10-SF) ( $r_s = -.58, p < .0001$ ), fairly associated with the three physical function scales ( $r_s = -.29$  to  $-.47, p < .0001$ ) and self-efficacy in self-management of chronic disease ( $r_s = -.33, p < .0001$ ), and little associated with all five chronic diseases ( $r_{pb} = -.12$  to  $-.22, p < .0001$ ) (Table 3). Similar results were found between indicators with the two ATTQ-SF subscales (NSPA, PSPA).

The TAAQ-SF total and PSPA scores were both negatively associated with depression symptoms (CES-D, 10-SF) (moderate relationship,  $r_s = -.54, -.58, p < .0001$ ), the three physical function scales

(mobility, IADL, and ADL) (fair relationship,  $r_s = -.26, -.47, p < .0001$ ), self-efficacy in self-management of chronic disease (fair relationship,  $r_s = -.31, -.33, p < .0001$ ), and all five chronic diseases (little relationship,  $r_{pb} = -.07$  to  $-.47, p < .0001$ ), indicating that individuals with more positive attitudes (higher TAAQ-SF total or higher PSPA scores) were associated with less depression (lower CES-D, 10-SF score), better physical function, greater confidence in self-management of chronic disease, and absence of chronic diseases.

The three physical function scales (mobility, IADL, ADL) and five chronic diseases had stronger relationships with NSPA ( $r = .14$  to  $.52, p < .0001$ ) than with PSPA ( $r = -.07$  to  $-.29, p < .0001$ ). Worse physical function or chronic diseases exerted a stronger influence on increasing NSPA than on decreasing PSPA.

Self-efficacy in self-management of chronic disease, self-efficacy of health promotion behaviors, and exercise (frequency) had stronger associations with PSPA ( $r_s = .19$  to  $.31, p < .0001$ ) than with NSPA ( $r_s = -.09$  to  $.25, p < .0001$ ). People with more self-efficacy (in self-management of chronic diseases and health promotion behaviors) were associated with a more positive attitude (TAAQ-SF total score), primarily from the higher PSPA.

Among all the indicators, depressive symptoms (CES-D, 10-SF), the three physical function scales, and self-efficacy in self-management of chronic disease showed stronger relationships (fair to moderate) with the TAAQ-SF total score and two subscale scores (NSPA, PSPA). The five chronic diseases had little relationship ( $r < 0.25$ ) with the three TAAQ-SF scores, except cataract, which showed a fair relationship with the NSPA score ( $r_{pb} = .29, p < .0001$ ).

**Table 2**

Exploratory factor analysis for the Taiwan Attitude toward Aging Questionnaire-Short Form (TAAQ-SF): Varimax rotated factor loadings for the two factors (n = 3054).

Items	Factor 1	Factor 2
	Negative self-perception of aging	Positive self-perception of aging
You feel that you are frail.	<b>.763</b>	-.249
You feel that you cannot take care of yourself.	<b>.722</b>	-.222
You feel that you are old.	<b>.660</b>	-.015
You feel your mind is not clear.	<b>.649</b>	-.075
You feel that you could help your family.	<b>-.621</b>	.222
You feel satisfied with your current life.	-.123	<b>.789</b>
You feel you are pleasant and joyful.	-.351	<b>.726</b>
You feel it is a privilege to grow old.	.033	<b>.662</b>
You feel you are kind and warm.	-.078	<b>.564</b>
You feel unsafe.	.353	<b>-.534</b>
You feel you have time to pursue your own interests.	-.322	<b>.504</b>
Variance (%)	24.7	23.8

**Table 3**

Associations between the Taiwan Attitude toward Aging Questionnaire-Short Form (ATTQ-SF) (total score and two subscale scores) with health indicators (n = 3054).

	ATTQ-SF total score	ATTQ-SF (Positive self-perception of aging)	ATTQ-SF (Negative self-perception of aging)
CES-D (10-SF) <sup>a</sup>	-.58*	<b>-.54*</b>	<b>.46*</b>
Mobility <sup>a</sup>	-.47*	-.29*	<b>.52*</b>
IADL <sup>a</sup>	-.46*	-.26*	<b>.52*</b>
ADL <sup>a</sup>	-.29*	-.19*	<b>.31*</b>
Hypertension <sup>b</sup>	-.14*	-.07*	<b>.17*</b>
Cataract <sup>b</sup>	-.22*	-.08*	<b>.29*</b>
Arthritis <sup>b</sup>	-.18*	-.12*	<b>.19*</b>
Cardiovascular disease <sup>b</sup>	-.20*	-.12*	<b>.23*</b>
Diabetes <sup>b</sup>	-.12*	-.07*	<b>.14*</b>
Self-efficacy in self-management of chronic disease <sup>a</sup>	-.33*	<b>-.31*</b>	<b>.25*</b>

\*  $p < 0.001$ ; <sup>a</sup> Spearman's correlation coefficient, <sup>b</sup> Point biserial correlation coefficient.

Abbreviation: ADL, activities of daily living; CES-D, 10-SF, 10-item short form of Center for Epidemiological Studies Depression Scale; IADL, instrumental activities of daily living.

#### 4. Discussion

The purpose of this study was to investigate the construct validity, internal consistency reliability, and criterion-related (concurrent) validity of the TAAQ-SF used in the TLSA 2011. Our results indicated that the TAAQ-SF consisted of two factors (PSPA, NSPA) and had sufficient internal consistency and criterion-related (concurrent) validity.

Consistent with Wu and colleagues' study, our results supported the psychometric properties of the TAAQ-SF.<sup>5</sup> Factor analysis revealed two factors, namely, NSPA and PSPA, which respectively contained five and six items and explained 24.7% and 23.8% of the variance. Together, they explained 48.5% of the total variance. Unlike Wu's study, our study found that two items (items 5 and 10) with negative loading were grouped into different factors in this study. Item 5 (You feel that you could help your family) was grouped in NSPA in the current study but in PSPA in the previous study.<sup>5</sup> Similarly, item 10 (you feel unsafe) was grouped in PSPA in this study but in NSPA in the previous study.<sup>5</sup> This difference might be explained by the differences in the two study populations. Wu et al.'s study<sup>5</sup> recruited a group of outpatients who had received geriatric comprehensive assessment, whereas the current study was based on a nationally representative middle- to older-aged population. The inclusion criteria for participants in Wu's study were older adults aged 80 years or older who were experiencing functional decline, cognitive impairment, depression, mobility difficulty, falls in the recent year, feeding problems, unintentional weight loss, more than 5 comorbidities, polypharmacy in the recent 3 months, hospitalization at least once in the recent year, or use of emergency medical service at least twice in the recent year.<sup>5</sup> Thus, the study population in Wu's study was older, sicker, and more fragile than the participants in the TLSA 2011. It is possible that populations of different ages and health statuses would respond differently to certain items. An older, sicker and frailer population tends to respond more consistently on both the positively- and negatively-stated attitude on aging items. In Wu's study, for example, people with positive ATA were also more likely to agree with a positively-stated item (item 5, being able to help their family), while people with negative ATA were more likely to agree with a negatively-stated item (item 10, feel unsafe). In contrast, a general population tends to respond positively on certain negative items or negatively on certain positive items. In the current study, people with negative ATA were less likely to agree with the positively-stated item (item 5, being able to help their family), and people who with positive ATA were less likely to agree with the negatively-stated item (item 10, feel unsafe).

The TAAQ-SF total score was significantly associated with all health indicators. Among all the indicators, depression (CES-D, 10-SF) demonstrated the strongest association (fair to moderate) with the TAAQ-SF, followed by the three physical function scales (fair to moderate), self-efficacy in self-management of chronic disease (fair), and the other indicators (little relationship). Consistent with previous studies, depression significantly influenced ATA.<sup>12–14</sup> Hypertension and arthritis were also found to be significantly associated with ATA.<sup>13</sup>

Regarding the associations with the TAAQ-SF subscales (NSPA, PSPA), it was found that the three physical function scales (mobility, IADL, ADL) and five chronic diseases had stronger associations with NSPA than with PSPA. A stronger relationship means greater influence. These results indicate that, in individuals with worse physical function (mobility, IADL, and ADL) or with chronic diseases, NSPA will be influenced (increasing negative attitude) more than PSPA will (decreasing positive attitude), leading to a lower TAAQ-SF total score. Among the five chronic diseases, cataract and cardiovascular disease

had relatively more influence than others on increasing NSPA ( $r_{pb} = .23$  to  $.29$ ,  $p < .0001$ ). Self-efficacy in self-management of chronic disease showed stronger relationships with PSPA than with NSPA. These results indicated that stronger self-efficacy in self-management of chronic disease had greater influences on increasing PSPA than on decreasing NSPA.

The relationships of the TAAQ-SF with health indicators found in the current study were similar to results reported in the literature.<sup>2,15–20</sup> People with positive ATA are associated with less depressive symptoms, better physical function, absence of chronic disease, higher self-efficacy in self-management of chronic disease. These associations of ATA with any issues of interest in health care for middle- and old-aged adults can be explored by using the TAAQ-SF total score or subscale scores (NSPA, PSPA). Using subscale scores could help to clarify the sources of change in the total score.

This study was a secondary analysis using a national longitudinal survey database (TLSA), we were unable to examine the content validity or test-retest reliability of the TAAQ-SF. However, these psychometric properties are important aspects of an assessment tool, and they are worthy of further investigation. Our results revealed that people's responses on certain items may be influenced by their age or health status. Literature has also reported that one's ATA may be affected by one's living environment and societal culture. Thus, it is recommended the psychometric properties of the TAAQ-SF be examined in study populations of interest, such as people of different ages, health conditions, living environments or cultures.

#### 5. Conclusions

Our results support the psychometric properties of the TAAQ-SF, for they indicate high internal consistency reliability and good construct and criterion-related (concurrent) validity. This study revealed two factors, namely, NSPA and PSPA. Based on these findings, the TAAQ-SF has sufficient psychometric properties for assessing the ATA in the middle- to old-aged Taiwanese population.

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#### Declaration of any potential financial and non-financial conflicts of interest

The authors declare no conflicts of interests.

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