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Original Article

Translation and validation of the Taiwanese SarQoL, a quality of life questionnaire specific to sarcopenia

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KEYWORDS
Sarcopenia;
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ABSTRACT *Background:* The Sarcopenia Quality of Life (SarQoL) questionnaire has been translated into various languages. This study validated the Taiwanese version of the SarQoL (SarQoL-TW) questionnaire.
Methods: Forward–backward translation was conducted, along with a test of the prefinal version of the translated questionnaire. To validate the psychometric properties of the questionnaire, 50 older adults with sarcopenia and 50 older adults without sarcopenia completed the SarQoL-TW, the Short Form12 Health Survey (SF-12), and the EQ-5D-3L questionnaire. Participants with sarcopenia were asked to complete the SarQoL-TW questionnaire once more after 2 weeks. Validating the psychometric properties of the SarQoL-TW questionnaire involved assessing its discriminative power, internal consistency, construct validity, test–retest reliability, and potential floor and ceiling effects.
Results: The SarQoL-TW questionnaire was translated without major difficulties. The psychometric analysis revealed that older adults with sarcopenia scored significantly lower on the SarQoL-TW, both overall and in some of the domains. The Cronbach's alpha of 0.846 indicated high internal consistency. The SarQoL-TW questionnaire correlated well with similar constructs on the SF-12 and EQ-5D-3L for convergent validity and correlated weakly with distinct domains for divergent validity, confirming its favorable construct validity. The test–retest reliability was excellent (intraclass correlation coefficient: 0.970). Neither floor nor ceiling effects were

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observed.
Conclusion: The SarQoL-TW questionnaire is a reliable and valid questionnaire, useful for assessing quality of life in older adults with sarcopenia in clinical practice and research.

Introduction

Sarcopenia is a geriatric syndrome characterized by the loss of muscle mass and strength as well as compromised muscle function. Possible causes include the gradual decline of physiological function and reduced physical activity in older adults with aging.[1] Sarcopenia is associated with numerous adverse health outcomes, including falls, disability, hospitalization, placement in long-term care facilities, poorer quality of life, and high mortality.[2]

Quality of life refers to people's emotional, social, and physical well-being as well as their ability to perform activities of daily living (ADLs).[3] Studies have reported that older adults with sarcopenia have lower quality of life than do older adults without sarcopenia,[4] particularly in physical domains.[5] In older adults with sarcopenia, poorer quality of life is associated with older age, a history of falls,[6] poorer balance performance, a greater level of frailty, and difficulty in performing ADLs.[5] However, a systematic review noted inconsistent findings regarding quality of life in this population.[7] Sarcopenia appears to affect only certain (e.g., physiological) aspects of quality of life; thus, generic quality-of-life questionnaires may be insufficient for detecting minor effects, especially when the aim is to observe longitudinal changes or determine the effects of treatment on quality of life. Some disease-specific quality-of-life instruments have been developed, including the Stroke-Specific Quality-of-Life Scale[8] and the European Organization for Research and Treatment of Cancer Quality-of-Life Questionnaire.[9] To understand the needs of older adults with sarcopenia, a questionnaire specific to this condition is essential.

The Sarcopenia Quality-of-Life (SarQoL) questionnaire, the first disease-specific questionnaire for sarcopenia, was first developed and validated in French[10] and has since been translated into and validated in various languages, including English,[11] Korean,[12] Croatian,[13] and Greek.[14] Previous validated studies showed the consistent results that the SarQoL questionnaire has favorable validity and reliability such as good discriminative power, high internal consistency, consistent construct validity and excellent test-retest reliability. No floor or ceiling effects were observed.[11–14]

According to the National Development Council, Taiwan became an aging society in 1993 and was an aged society in 2018. It is projected to become a superaged society by 2026, in which at least 20% of the population would be 65 years or older.[15] Health concerns among older adults are growing in urgency such as sarcopenia. The prevalence of sarcopenia among community-dwelling older adults aged 65 years and older was 6–10%. It is less prevalent in females than in males and increases with age.[16–18] Experts in China and Singapore have developed a simplified Chinese version of the SarQoL questionnaire. However, language use in and the cultural background of Taiwan are different from those in China and Singapore. For example, people in Taiwan speak Taiwanese Mandarin and use traditional Chinese characters. Therefore, this study developed and validated the Taiwanese version of the SarQoL (SarQoL-TW) questionnaire.

Methods

Permission to develop and validate the SarQoL-TW questionnaire was granted by Dr. Beaudart, the developer of the SarQoL. The two stages of this study, translation and validation, were performed according to the guidelines presented by Dr. Beaudart. The first stage involved the translation and cross-cultural adaptation of the questionnaire, and the second stage involved psychometric assessment. The study protocol was approved by the Institutional Review Board of Taipei Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation (approval no. 10-XD-065) and the Ethics Committee of Taipei Hospital, Ministry of Health and Welfare (registration no. TH-IRB-0021-0028).

Translation and cross-cultural adaptation

Translation and cultural adaptation were conducted in five phases as follows:

1. ***Initial translation.*** Translation from English to Traditional Chinese was made independently by two bilingual individuals whose first language was Taiwanese Mandarin. One of these individuals had a medical background, whereas the other did not and did not have previous knowledge of the subject of the questionnaire.
2. ***Synthesis.*** The two translators compared their translations and produced a single version of the SarQoL-TW, designated as version 1.
3. ***Backward translation.*** Two bilingual translators, whose first language was English, who had no medical background, and were blind to the original version of the SarQoL questionnaire, independently translated version 1 back into English.
4. ***Expert committee review.*** The expert committee, comprising two methodologists, one health-care professional, one expert in Taiwanese Mandarin, and the four translators, compared the back translations with the original questionnaire to produce the prefinal version of the SarQoL-TW questionnaire.
5. ***Testing of the prefinal version.*** The prefinal version was administered to 10 older adults with sarcopenia to test the comprehensibility of the questions. Each

respondent was asked about any difficulties they experienced in completing the questionnaire or in understanding the purpose or meaning of each question. Following the interview process, the expert committee discussed the respondents' feedback to produce the final version of the SarQoL-TW questionnaire.

Psychometric assessment of the SarQoL-TW questionnaire

Participants

As suggested by Terwee and colleagues,[19] the study sample size should consist of at least 50 sarcopenic patients and 50 non-sarcopenic subjects for validation. Therefore, we followed the guideline presented by Dr. Beaudart and recruited 50 older adults with sarcopenia and 50 older adults without sarcopenia residing in community centers in Taipei and Taichung between October 2021 and March 2022 to validate the psychometric properties of the SarQoL-TW questionnaire. To be included, individuals must be community-dwelling older adults aged 65—99 years who were able to stand independently. Individuals who were on hemodialysis, fitted with implanted electronic devices, or had neurological disorders such as stroke or Parkinson disease were excluded. A well-trained researcher with healthcare background explained the purpose and content of the study to potential participants in community centers and screen those who were interested in the study. Eligible participants were then assessed their sarcopenia status to see if the required sample size was achieved before entering the study and receiving other assessments. Prior to study commencement, written informed consent was obtained from participants.

Procedure

Demographic data, specifically information on age, sex, education level, height, body weight, and morbidity, were collected from the participants. Height and weight were used to calculate body mass index (kg/m^2) categorized as underweight (<18.5), normal weight (18.5—24.9), and overweight (≥ 25). Next, all participants were instructed to complete the SarQoL-TW questionnaire, the generic Short Form-12 Health Survey (SF-12),[20,21] and the EQ-5D-3L.[22,23] Only the sarcopenia group was required to complete the SarQoL-TW questionnaire once more after 2 weeks. Validating the psychometric properties of the SarQoL-TW questionnaire involved assessing its discriminative power, internal consistency, construct validity, test—retest reliability, and potential floor and ceiling effects.

Assessment of sarcopenia

Sarcopenia was diagnosed according to the 2019 Consensus of the Asian Working Group for Sarcopenia (AWGS).[24] Low muscle mass was defined as ≤ 7.0 kg/m^2 for men and ≤ 5.7 kg/m^2 for women through bioelectrical impedance analysis (BIA). Low muscle strength was defined as <28 kg for men and <18 kg for women through grip strength measurement, and poor physical performance was defined as performance of ≥ 12 s on the Five Times Sit-to-Stand (FTSTS) test, a walking speed of ≤ 1 m/s on the 6-Meter Walk Test (6MWT), or ≤ 9 points on the Short Physical Performance Battery (SPPB). The participants with low muscle strength or poor physical performance were designated as having probable sarcopenia; those with low muscle strength or poor physical performance as well as low muscle mass were designated as having sarcopenia; and those with low muscle strength, poor physical performance, and low muscle mass were designated as having severe sarcopenia. The tests are described as follows.

(1) Muscle mass: Appendicular skeletal muscle mass (kg/m^2) was evaluated through BIA by using an instrument that applies the principle of bioelectrical impedance to detect body composition (MC-780, TANITA, Japan).[25] The device consists of an operating panel and eight stainless steel electrodes distributed on the handle and the base of built-in weight sensors. During the measurement process, each participant was instructed to stand on the base and hold the handle.
(2) Muscle strength: Grip strength (kg) was measured using a dynamometer (Item No.T.K.K.5001 GRIP-A, TAKEI, Japan). The participants were instructed to stand with their arms at their sides, holding the dynamometer and generating the maximum grip force three times for 6 s at a time. The average value from three trials was designated as the muscle strength.[26]
(3) Physical performance: Physical performance was examined using the FTSTS test, 6MWT, and SPPB. All participants need to complete all three tests and any abnormality indicated low physical performance. For the FTSTS test, the participants were seated in a chair with their arms folded in a chair without a back or armrests, and they were instructed to move from a sitting position to a standing position as quickly as possible without assistance. The time taken to complete the task (s) was recorded using a stopwatch.[27] For the 6MWT, the participants were asked to walk straight along an 8-m walkway at a comfortable pace. The initial 1 m and the final 1 m of the walkway were used for acceleration and deceleration. Only the time spent traveling across the middle 6 m of the walkway was recorded, and walking velocity (m/s) was calculated by dividing the walking distance by the walking time.[28] The SPPB comprises three tasks: a hierarchical balance task, a short walk at the participants' usual pace, and five repetitive chair stands. Each component is scored from 0 to 4 points, with scores of 0 and 4 representing an inability to perform the task and the optimal performance on the task, respectively. A summary performance score (0—12 points) was obtained by summing the scores corresponding to each component.[29]

Discriminative power

The ability of the SarQoL-TW questionnaire to differentiate between participants with sarcopenia and those without sarcopenia was assessed by comparing the total scores of the sarcopenia and nonsarcopenia groups with the scores corresponding to individual domains.

Internal consistency

Internal consistency refers to the estimation of item homogeneity.

Construct validity

Construct validity was examined as convergent validity and divergent validity, which measures how well a tool measures the concept it was designed to evaluate. All participants were instructed to complete the SF-12 and EQ-5D-3L aside from the SarQoL-TW questionnaire to enable the testing of construct validity. The questionnaires administered are described as follows.

(1) SF-12: This 12-item, self-report measure is the short version of the Short Form-36 questionnaire (SF-36).[30,31] The SF-12 is widely used because it takes a shorter time to complete but produces comparable results with respect to physical component scores (PCS) and mental component scores (MCS).
(2) EQ-5D-3L: This measure records respondents' self-reported problems in five dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression), with each dimension having three levels: no problems, some problems, and extreme problems.
(3) SarQoL-TW: The self-report questionnaire comprises 22 questions and 55 items rated on a 4-point Likert scale of frequency (often, sometimes, rarely, and never) and intensity (a lot, moderately, a bit, and not at all). The items are organized into seven domains: physical and mental health, locomotion, body composition, functionality, ADLs, leisure activities, and fears. Scores on the SarQoL questionnaire range from 0 (worst imaginable health state) to 100 (best imaginable health state). It takes approximately 10 min for persons to fill in the questionnaire.

To examine convergent validity, we used the PCS from the SF-12 and some corresponding dimensions on the EQ-5D-3L (mobility and usual activities) for comparisons with total scores on the SarQoL-TW. To examine divergent validity, we compared the MCS from the SF-12 and some dimensions on the EQ-5D-3L (self-care, pain/discomfort, and anxiety/depression) for comparisons with total scores on the SarQoL-TW.

Test–retest reliability

To analyze the test–retest reliability of the SarQoL-TW questionnaire, the sarcopenia group was instructed to complete the questionnaire a second time 2 weeks after the first time. This test was only administered to individuals whose general health had not changed over the 2-week period. In sum, the analysis served to assess the consistency of responses made by the same individual over a period.

Floor and ceiling effects

A ceiling or floor effect is usually defined as 15% of individuals in a sample achieving the best or the worst level of the score (0 or 100, respectively).[32,33]

Statistical analysis

Analyses were performed using IBM SPSS Statistics for Windows, version 19 (IBM Corp., Armonk, NY, USA). The significance level was set to $p < 0.05$. Data are presented as means (standard deviations) and as numbers (percentages). The chi-squared test for categorical variables was conducted to compare participants' characteristics. To examine the discriminative power of the SarQoL-TW, analysis of covariance (ANCOVA) with adjustment for participants' characteristics was performed to compare the total and domain-specific scores of older adults with and without sarcopenia. Moreover, ANCOVA with post hoc Bonferroni test after adjustment for participants' characteristics was to further examine the total and domain scores of the SarQoL-TW among older adults with non-sarcopenia, probable sarcopenia, sarcopenia and severe sarcopenia. Internal consistency reliability was determined with reference to Cronbach's alpha coefficient, with values >0.70 indicating a high level of internal consistency. The impact of each domain on reliability was also tested. Using Spearman's correlation coefficients, the correlations of scores of each domain with scores of the SarQoL-TW questionnaire were tested. Correlations exceeding 0.81, between 0.61 and 0.80, between 0.41 and 0.60, and between 0.21 and 0.40 are considered excellent, very good, good, acceptable, and insufficient, respectively.[34] To evaluate construct validity, Spearman's rank correlation coefficients were employed in measure correlations between the SarQoL-TW questionnaire and other questionnaires (the SF-12 and EQ-5D-3L). The intraclass coefficient correlation (ICC) was applied to examine the test–retest reliability between the first and second total scores of the SarQoL-TW questionnaire and between the scores of individual domains. The correlation coefficient model used in the current study was $ICC_{(2,1)}$: a two-way random effects model with absolute agreement and average measurements. An ICC exceeding 0.7 indicates acceptable reliability.[19] We also assessed the associations of quality of life with sarcopenia-related parameters such as grip strength, muscle mass, FTSTS, gait speed, and SPPB. Univariate analyses with Spearman's rank correlation coefficients were conducted to examine the correlations between these parameters and the total and domain-specific scores on the SarQoL-TW. Subsequently, the associations among significant parameters and the total score of the SarQoL-TW questionnaire were assessed through multivariate linear regression analysis with adjustment for participants' characteristics.

Results

Translation and cross-cultural adaptation

The SarQoL-TW questionnaire was translated without major difficulty. The minor discrepancies found reflected the cultural context of Taiwan or semantic issues specific to Taiwanese Mandarin. Discussion was mainly related to the choice of words used, such as "energy" in question 1 and "DIY" in question 3. All differences were resolved through a consensus among the committee members. The pretest was initially administered to 10 older adults with sarcopenia.

Table 1 Demographic data of the participants (N = 100).

	No sarcopenia (n = 50)	Sarcopenia (n = 50)	X^2	*p* values
Age (yrs)			39.831	**<0.001**
65–74	39 (78%)	9 (18%)		
75–84	11 (22%)	26 (52%)		
85+	0 (0%)	15 (30%)		
Sex			0.198	0.824
Male	13 (26%)	15 (30%)		
Female	37 (74%)	35 (70%)		
Body Mass Index			16.472	**<0.001**
Underweight	0 (0%)	14 (28%)		
Normal	31 (62%)	24 (48%)		
Overweight	19 (38%)	12 (24%)		
Education			19.856	**<0.001**
Elementary School and under	4 (8%)	24 (48%)		
High school	29 (58%)	16 (32%)		
College and above	17 (34%)	10 (20%)		
Morbidity			13.279	**<0.001**
0–2	48 (96%)	34 (68%)		
3+	2 (4%)	16 (32%)		

Data are presented as numbers and percentages. Bold font indicates significance at $p < 0.05$.

Minor changes were made and presented in the final version, but these modifications did not alter the meaning or essence of the sentences.

Psychometric assessment of the SarQoL-TW questionnaire

Characteristics of participants

Compared with the non-sarcopenia group, the sarcopenia group was significantly older, significantly more likely to have an abnormal body mass index (i.e., to be overweight or underweight), had a significantly lower education level, and had significantly greater morbidity (all $p < 0.001$). No significant between-group difference in sex was noted ($p = 0.824$; Table 1).

Discriminative power

Compared with the non-sarcopenia group, the sarcopenia group scored significantly lower on the SarQoL-TW, both overall ($p < 0.001$) and in domains 2, 4, and 5, namely locomotion ($p < 0.001$), functionality ($p = 0.005$), ADLs ($p = 0.004$), respectively. Nonsignificant between-group differences in scores of the other domains were observed, but the mean values in the sarcopenia group remained lower than those in the non-sarcopenia group. Further analysis revealed that the severity of sarcopenia significantly affected the total score (p = 0.005) as well as scores of domains 2, 4, and 5 ($p = 0.008$, $p = 0.027$, and $p < 0.001$ for locomotion, functionality, and ADLs, respectively; Table 2).

Internal consistency

The Cronbach's alpha value of 0.846 indicated that the SarQoL-TW questionnaire had high internal consistency. Deleting one domain at a time resulted in the Cronbach's alpha varying between 0.874 (when domain 6, leisure activities, was deleted) and 0.793 (when domain 4, functionality was deleted), indicating that no domain had a disproportionate impact on the homogeneity of the questionnaire. Comparing the scores of each domain with the total score of the SarQoL-TW questionnaire revealed a significantly positive and strong correlation among all domains (all $p < 0.001$; Table 3).

Construct validity

Strongly significant correlations were found between the total score of the SarQoL-TW questionnaire and the PCS of the SF-12 ($r = 0.734$, $p < 0.001$) and corresponding dimensions of the EQ-5D-3L, namely mobility ($r = -0.544$, $p < 0.001$) and usual activities ($r = -0.605$, $p < 0.001$). Moreover, significant correlations were found among total scores of the SarQoL-TW questionnaire, the MCS of the SF-12 ($r = 0.290$, $p = 0.004$), and distinct dimensions of the EQ-5D-3L, namely self-care ($r = -0.392$, $p < 0.001$), pain/discomfort ($r = -0.377$, $p < 0.001$), and anxiety/depression ($r = -0.225$, $p = 0.025$; Table 3).

Test–retest reliability

All 50 participants with sarcopenia completed the SarQoL questionnaire twice over a 2-week period. An ICC of 0.970 (95% confidence interval: 0.946–0.983) was found for the total score of the SarQoL-TW questionnaire, indicating excellent agreement between the test and the retest. As presented in Table 4, the ICC ranged from 0.721 to 0.967, indicating that reliability between domains was from acceptable to excellent.

Floor and ceiling effects

No one in the sarcopenia group scored 0 or 100 points on the total score of the SarQoL questionnaire.

Table 2 Discriminative power of the SarQoL-TW questionnaire.

	No sarcopenia (n = 50)	Sarcopenia (n = 50)	*p* values	Non-sarcopenia (n = 30)	Probable sarcopenia (n = 20)	Sarcopenia (n = 14)	Severe sarcopenia (n = 36)	*p* values	*Post hoc test*
D1-Physical and mental health	81.48 (11.62)	67.42 (18.82)	0.058	79.00 (11.94)	81.95 (14.41)	68.99 (19.94)	66.76 (17.83)	0.546	
D2-Locomotion	90.06 (8.93)	62.98 (22.62)	**< 0.001**	90.28 (9.01)	85.02 (14.4)	75.00 (20.22)	58.80 (22.57)	**0.008**	p^1 = **0.005**
D3-Body composition	80.22 (13.38)	73.01 (20.86)	0.259	78.69 (12.96)	80.61 (15.97)	76.13 (23.06)	71.41 (19.67)	0.825	
D4-Functionality	90.92 (6.66)	71.26 (20.82)	**0.005**	90.98 (6.42)	86.93 (10.72)	85.08 (18.08)	67.84 (20.13)	**0.027**	P^1 = **0.012** P^3 = **0.012**
D5-Activities of daily living	83.30 (11.43)	55.79 (24.73)	**0.004**	83.00 (11.76)	80.79 (13.45)	74.84 (23.65)	48.87 (21.61)	**< 0.001**	P^1 = **0.003** P^2 = **0.003** P^3 = **0.003**
D6-Leisure activities	62.84 (17.22)	48.80 (22.82)	0.192	65.39 (15.08)	57.10 (24.47)	54.41 (16.77)	45.74 (21.17)	0.462	
D7-Fears	92.50 (15.56)	86.41 (12.86)	0.076	91.67 (18.95)	92.39 (10.48)	81.82 (19.66)	87.84 (8.70)	0.257	
Total score	85.64 (6.61)	64.59 (18.01)	**< 0.001**	85.27 (6.81)	82.81 (10.61)	76.28 (18.16)	60.70 (16.46)	**0.005**	P^1 = **0.008** P^2 = **0.024**

Data are presented as means and standard deviations. *p* values were adjusted for age, sex, body mass index, education level, and morbidity. Bold font indicates significance at $p < 0.05$. p^1, p^2 and p^3 represent differences between individuals with severe sarcopenia and individuals without sarcopenia, with probable sarcopenia, and with confirmed sarcopenia.

Table 3 Internal consistency and construct validity of the SarQoL-TW questionnaire.

	Total SarQoL-TW score, *r* values	*p* values
Internal consistency		
D1-Physical and mental health	0.800	**< 0.001**
D2-Locomotion	0.885	**< 0.001**
D3-Body composition	0.592	**< 0.001**
D4-Functionality	0.889	**< 0.001**
D5-Activities of daily living	0.914	**< 0.001**
D6-Leisure activities	0.514	**< 0.001**
D7-Fears	0.584	**< 0.001**
Convergent validity		
SF-12		
PCS	0.734	**< 0.001**
EQ-5D-3L		
Mobility	−0.544	**< 0.001**
Usual activity	−0.605	**< 0.001**
Divergent validity		
SF-12		
MCS	0.290	**0.004**
EQ-5D-3L		
Self-care	−0.392	**< 0.001**
Pain/discomfort	−0.377	**< 0.001**
Anxiety/depression	−0.225	**0.025**

MCS, mental component score; PCS, physical component score; SF-12, Short Form-12 Health Survey. Bold font indicates significance at $p < 0.05$.

Table 4 Test–retest reliability of the SarQoL-TW questionnaire.

	ICC (95% CI)
D1-Physical and mental health	0.820 (0.678–0.899)
D2-Locomotion	0.954 (0.918–0.974)
D3-Body composition	0.762 (0.578–0.866)
D4-Functionality	0.934 (0.882–0.963)
D5-Activities of daily living	0.967 (0.941–0.982)
D6-Leisure activities	0.721 (0.511–0.841)
D7-Fears	0.737 (0.531–0.853)
Total score	0.970 (0.946–0.983)

Correlations between the SarQoL-TW questionnaire and sarcopenia-related parameters

Significant correlations were detected between the total score of the SarQoL-TW questionnaire and all sarcopenia-related parameters. The FTSTS score, walking speed, and SPPB score were associated with all domain scores. Grip strength was correlated with domains 2, 4, 5, and 6 (locomotion, functionality, ADLs, and leisure activities, respectively), and muscle mass was correlated with domains 2, 4, and 5 (Table 5). In the multivariate analysis, only the SPPB score remained significantly associated with the total SarQoL score (Table 6).

Table 5 Correlations between the scores on the SarQoL-TW questionnaire and clinical parameters.

	Grip strength	Muscle mass	FTSTS	Walking velocity	SPPB
D1-Physical and mental health	0.169	0.062	**−0.328**	**0.336**	**0.342**
D2-Locomotion	**0.381**	**0.212**	**−0.488**	**0.537**	**0.571**
D3-Body composition	0.009	−0.036	**−0.239**	**0.231**	**0.262**
D4-Functionality	**0.398**	**0.268**	**−0.590**	**0.522**	**0.629**
D5-Activities of daily living	**0.453**	**0.291**	**−0.530**	**0.598**	**0.631**
D6-Leisure activities	**0.277**	0.154	**−0.337**	**0.347**	**0.338**
D7-Fears	0.194	0.142	**−0.240**	**0.233**	**0.277**
Total score	**0.424**	**0.254**	**−0.558**	**0.573**	**0.619**

Data are presented as Spearman's rank correlation coefficients. FTSTS, Five Times Sit-to-Stand; SPPB, Short Physical Performance Battery. Bold font indicates significance at $p < 0.05$.

Table 6 Linear regression between the total scores on the SarQoL-TW questionnaire and clinical parameters.

	Unstandardized Coefficients		*p* values
	B	SE	
Constant	42.234	9.582	<0.001
Grip strength	0.152	0.248	0.541
Muscle mass	−0.556	1.747	0.751
FTSTS	0.035	0.159	0.826
Walking velocity	−0.767	4.149	0.854
SPPB	0.669	0.747	**<0.001**

p values were adjusted for age, sex, body mass index, education level, and morbidity. FTSTS, Five Times Sit-to-Stand; SPPB, Short Physical Performance Battery. Bold font indicates significance at $p < 0.05$.

Discussion

The translation and cross-cultural adaptation of the SarQoL questionnaire proceeded without major problems, and the SarQoL-TW questionnaire is thorough, complete, and comprehensible. The SarQoL-TW questionnaire is available at and downloadable from http://www.sarqol.org/sites/sarqol/files/SarQoL%20Taiwanese_0.pdf. The psychometric analysis revealed that the SarQoL-TW questionnaire is reliable and valid. It can be employed in clinical practice and research in Taiwan to better understand the impact of sarcopenia on quality of life in older adults.

Compared with those without sarcopenia, the participants with sarcopenia were older and more likely to be overweight or underweight. They also had lower education levels and greater morbidity. These findings are in line with those of relevant investigations.[35,36] No significant between-group difference was observed in sex, with both groups having a preponderance of female participants. Compared with those without sarcopenia, the participants with sarcopenia had a significantly reduced quality of life, as indicated by the difference in their total SarQoL-TW scores (85.64 vs. 64.59). In all domains, the sarcopenia group scored lower than the nonsarcopenia group. However, the differences noted for domains 1, 3, 6, and 7 (physical and mental health, body composition, leisure activities, and fears, respectively) were nonsignificant, which have been reported previously.[11,37] The ability of the questionnaire to differentiate between individuals with and without sarcopenia apparently corresponded to the total score and the domain-specific scores. Our participants were high-functioning, community-dwelling older adults with social participation and their quality of life was likely more favorable than that of their low-functioning, isolated counterparts. Notably, considerable variations in the total score of individuals with sarcopenia on the SarQoL questionnaire have been observed, ranging from 36 on the Chinese version to 71 on the Spanish version.[38,39] This reflects the between-country heterogeneity in the perception of quality of life.

Analyzing the impact of sarcopenia by severity on quality of life, we observed no significant reduction in quality of life until sarcopenia become severe. This was noted for quality of life overall as well as for the domains of locomotion, functionality, and ADLs. Similar results were noted in a relevant study.[40] A possible explanation for our finding is that our participants were all community dwelling and thus had their daily needs met.

The SarQoL-TW questionnaire exhibited a high degree of internal consistency (0.846), which is comparable with that presented in the original, validated SarQoL questionnaire (0.87).[41] Moreover, when one domain was deleted at a time, favorable reliability was noted. The intercorrelations of the total and domain-specific scores of the SarQoL-TW questionnaire were all positive and ranged from favorable to excellent., with the weakest and strongest correlations being observed for domains 6 and 5 (leisure activities and ADLs), respectively. These results are in line with previous validations.[11,41]

Regarding construct validity, convergent validity analyses revealed significantly favorable correlations between the SarQoL-TW questionnaire and the corresponding constructs of the SF-12 and EQ-5D-3L, such as PCS and the mobility and usual activities dimensions. In divergent validity analyses, the total score of the SarQoL-TW questionnaire was weakly correlated with scores of distinct constructs of SF-12 and EQ-5D-3L, namely the MCS, self-care, pain/discomfort, and anxiety/depression. These results are comparable to those reported in studies validating the English, Romanian, Dutch, and Greek versions of the SarQoL.[11,14,42,43] Notably, we used the SF-12 instead of the SF-36 to examine construct validity because of time limitations. Both the general population and individuals with various medical conditions have scored comparably on the

SF-12 and the SF-36.[20,44,45] In a study validating the Polish version of the SarQoL, the SF-36 was employed, but only the PCS and MCS scores were reported; no results for individual domains were provided.[37] In sum, favorable construct validity has been confirmed in both the literature and the present study regardless of whether the SF-12 or SF-36 was used for validation.

An ICC of 0.970 for the total score and an ICC between 0.721 and 0.967 for individual domains indicate the stability of the SarQoL-TW questionnaire across time, although the ICC values were lower than those reported previously.[11,37,46] As mentioned, all 50 participants with sarcopenia completed the SarQoL-TW questionnaire twice, with a 2-week interval. By comparison, other studies have reported dropout rates corresponding to the retest ranging from 7%[46] to 37%.[37] The investigation validating the Romanian version of the SarQoL questionnaire did not examine test–retest reliability.[42] Herein, lower ICCs were mainly observed in dimensions 3, 6, and 7 (body composition, leisure activities, and fears, respectively), which have been also observed in other studies, are partly attributable to the low number of items in these domains.[14,39,41] Consistent with relevant evidence, no floor or ceiling effects corresponding to the SarQoL-TW questionnaire were detected in the present study.[11,41,43]

Regarding the association between quality of life and sarcopenia-related parameters, univariate analyses revealed an association between lower quality of life with lower physical performance measured using the FTSTS test, 6MWT, and the SPPB. This was the case not only for the total score but also for all individual domains of the SarQoL-TW. Further multivariate analyses demonstrated that only physical function was significantly associated with quality of life; no significant associations were found for strength or muscle mass. Similar findings have been reported in studies validating the Romanian[42] and Spanish[47] versions of the SarQoL. Specifically, quality of life appears to be more strongly correlated to muscle function than to muscle mass.

A notable strength of the current study is that we used up-to-date criteria, specifically the 2019 Consensus of the AWGS, to assess sarcopenia under a standard diagnostic procedure. Furthermore, the sarcopenia group (n = 50) was larger than those in other validation studies although our total sample size was relatively smaller. This study also has some limitations. First, we were unable to evaluate appendicular skeletal muscle mass through dual-energy X-ray absorptiometry (DXA) because the study was conducted in a community setting rather than in a laboratory. Although the accuracy of BIA is lower than that of DXA in this context, it is a valid tool for examining muscle mass, with advantages including portability, rapidity, and noninvasiveness. Second, cognitive function was not measured in the current study. Poor cognitive function may compromise respondents' ability to complete questionnaires; however, our participants regularly engage in social activities and were able to provide informed consent on their own behalf. They should be able to express their opinions and fill out the questionnaire correctly. Third, our participants were high-functioning, community-dwelling older adults, which may not be fully representative of this population, and thus our results could likely only be generalizable to this group of people. Validation studies conducting in daycare centers or long-term care institutions targeting older adults with dementia or disability, who may have higher prevalence of sarcopenia, are needed in the future. Finally, our findings confirm the reliability and validity of the SarQoL-TW questionnaire for administration to Taiwanese older adults, but the results may not be generalizable to other populations using Traditional Chinese characters (e.g., people in Hong Kong and Macau) due to grammatical and sociocultural differences.

In conclusion, the SarQoL-TW questionnaire is reliable and valid, as indicated by its discriminative power, internal consistency, construct validity, test–retest reliability, and lack of floor and ceiling effects. It can be used for the assessment of quality of life in older adults with sarcopenia in both clinical practice and academic research in Taiwan.

Declarations of interest

None.

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