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Validation of the Thai QOL-AD version in Alzheimer's patients and caregivers

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RESEARCH

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ABSTRACT

Background

Quality of life (QOL) plays an important role in determining the improvement of patient care in Alzheimer's disease (AD). The simple and easily used Thai instrument for measuring QOL is still limited.

Aims

This study aimed to translate the Quality of Life–Alzheimer's Disease (QOL-AD) scale original version into a Thai version and test its psychometric properties.

Method

A Thai version of QOL-AD was translated following the sequential method. The validation was tested in 136 pairs of patients and their caregivers. Mild to moderate Alzheimer's patients were recruited from outpatient clinics at Chiang Mai Neurological Hospital and Chiang Mai Psychiatry Hospital from April to September 2012. Internal consistency, factor analysis, and construct validity were evaluated.

Results

Internal consistency of Thai QOL-AD version was good for both patients (0.82) and caregivers (0.82). The results of factor analysis indicated three factors (physical and psychological well-being, social well-being, and close interpersonal relationships) in the patient group, while four factors were found (social well-being, functional ability, psychological well-being, and physical well-being) in the caregiver group. The scaling success in the patient group was around 80–83 per cent for convergent validity, and 70–83 per cent for discriminant validity. The caregiver group showed higher scaling success in convergent validity except for the psychological well-being domain. The scaling success of discriminant validity was around 44–83 per cent for caregivers.

Conclusion

The findings of the study demonstrate a good reliability of a Thai QOL-AD version for both patient and caregiver groups. Validity, especially in the caregiver group, might need to be re-examined.

Key Words

Quality of life; Alzheimer's disease; Thai version; Reliability; Validity

What this study adds:

1. What is known about this topic?

QOL-AD is the instrument measuring quality of life of Alzheimer's patients. It has been translated into several languages but not into the Thai language.

2. What new information is offered in this study?

The psychometric property, especially the reliability of a Thai QOL-AD version is good, but the validity in the caregiver group is still of concern.

3. What are the implications for research, policy, or practice?

There is a simple and easy to use Thai QOL-AD version. It is a useful QOL instrument that allows healthcare practitioners to measure Thai Alzheimer's patients.

Background

Dementia is a chronic disease, which causes the defect of the memory and self-care of patients, and incurs significant healthcare expenditure.[1-3] The high incidence and prevalence of dementia stems from the rising trend of aging populations in many countries, and the

increasingly advanced treatment that prolongs life.[4] The prevalence of dementia doubles every five years for those aged 65 years and older.[5]

Improvement in dementia can be determined by using several clinical and behavioural outcomes such as improving cognitive status, delaying the onset of more severe symptoms, maximising day-to-day functioning, and reducing behavioural problems.[6]

Since dementia is an incurable disease, quality of life (QOL) as one humanistic outcome plays an important role in determining the improvement of patient care.[7] Several instruments were developed to measure QOL in dementia patients[8] by three channels[9]:

1) patient self-report;
2) proxy-report by caregiver; and
3) direct observation of patients' behaviours.

However, direct self-report of QOL by dementia patients is still questionable due to their declining capacity to discern the true nature of their health deficits. However, several studies showed that demented patients with mild to moderate dementia could provide reliable and valid self-reports.[6, 10-13]

The Quality of Life-Alzheimer's Disease (QOL-AD) scale was developed to measure QOL in dementia patients[10] as either a patient self-report or a proxy-report by caregivers. QOL-AD was translated into several languages, including Portuguese,[14] Japanese,[11] Mandarin,[15] French,[12] Spanish,[16] and Turkish,[17] and the reliability and validity of the translated versions tested. However, to the best of our search, a Thai version of the QOL-AD until now has not been established. Hence, we aimed to develop a Thai QOL-AD version to assess QOL of Thai Alzheimer's patients with mild to moderate severity, and to test the psychometric properties of the developed Thai version of this scale in outpatients with AD and their caregivers.

Method

Subjects

The sample consisted of 136 pairs of Alzheimer's patients and caregivers visiting outpatient clinics at two hospitals (53 pairs at Chiang Mai Neurological Hospital and 83 pairs at Chiang Mai Psychiatry Hospital) from April to September 2012. All patients were diagnosed with mild to moderate Alzheimer's, based on DSM IV criteria,[18] had MMSE-Thai 2002[19] score of at least 10. All caregivers aged 20 years and older had lived daily at least during the daytime with patients. Patients were excluded if:

1) neurological disease other than AD were presented;
2) there was a previous history of severe mental illness; or
3) patients or caregivers were addicted to alcohol or drugs.

The Ethics Committee of Chiang Mai Neurological Hospital and Chiang Mai Psychiatry Hospital approved the study protocol. All participants were informed about the purpose and procedures of the study before they signed the consent form. For a total of 136 Alzheimer's patients, 66.91 per cent were female with a mean age of 76.43 years (SD = 6.72), and mean MMSE-Thai 2002 score of 16.88 (SD = 4.62). Approximately 68 per cent of caregivers were patients' relatives. A total of 72.06 per cent of 136 caregivers were female with a mean age of 51.79 years (SD = 12.70).

Process

This study was conducted into two steps:

1) translation of QOL-AD from the original English version to a Thai version; and
2) validation of reliability and validity of the developed Thai version.

Translation of QOL-AD

The original QOL-AD[10] is a 13-item questionnaire to assess the quality of life of Alzheimer's patients from the perspectives of patients and their caregivers. It covers several aspects, for example, the perception of health status, mood, functional capacity, personal relationships and leisure, financial situation, and life as a whole. Each item is quantified using a Likert scale with score one classified as poor, and score four as excellent where total scores range from 13 to 52. The questions are written in simple and straightforward language that benefits AD patients who have cognitive impairment. It also provides a detailed useful instruction for the interviewers.

With the permission of the original author (RG Logsdon), a Thai version was developed. We followed the sequential method for the translation.[20] First, two independent translators translated the original English version into Thai. Then, the two Thai translations were compared. If there was any discrepancy, we sought out the opinion of a third translator. Following this, the initial preliminary Thai version was obtained. Second, two independent translators who were blinded to the original version translated the initial preliminary Thai version back into English. Any discrepancies of the back-translated versions were examined and resolved with the assistance of RG Logsdon. A three expert committee panel—comprising a

neurologist, a psychiatrist specialised in Alzheimer care, and an educator specialised in Thai language—checked for cultural appropriateness and content validity of the scale. A final Thai QOL-AD version was produced.

Validation

All the AD patients and their caregivers were administered the Thai QOL-AD questionnaire at the outpatient clinics of the two hospitals. The AD patients responded to the evaluation in the form of an interview in accordance with the instructions of the original version. If they showed any sign of misunderstanding, an interviewer would explain without pointing to an answer. The interview would stop when patients did not respond to more than two questions. An interviewer would pose all events in the interview format. Each caregiver was also handed and instructed to complete the QOL-AD questionnaire for the AD patient. The total score was calculated separately for the AD patient and caregiver versions. The scores ranged from 13 to 52. The total scoring weight was calculated by multiplying the AD patient score by two and adding the caregiver score, then dividing the result by three. Reliability and validity were tested.

Statistical analysis

We evaluated internal consistency and validity of the developed scale. Internal consistency was estimated by determining Cronbach's alpha coefficients. Cronbach's alpha coefficients above 0.7 are indicative of a good internal consistency.[21] We calculated the correlation of each item score with the total score, each item score with the 13th item "life as a whole" and Cronbach's alpha coefficient if item deleted. Validity was examined in terms of concurrent validity and construct validity. Concurrent validity was determined by the correlation between the patients' responses and the caregivers' responses in both the total score and the score for each item. Construct validity was verified through factor analysis using principal components method on the assessments of only 12 items (discard item 13 "life as a whole") of both the patients' responses and the caregivers' responses. The factors obtained were rotated by the Varimax method.

Results

Reliability

Table 1 presented that Cronbach's alpha coefficient for the patients' responses was similar to that of caregivers' responses (0.82). This value indicated good internal consistency. The correlations between the scores of each of the first 12 questions and the total score were all within an acceptable range for both the patients (r = 0.40-0.68) and caregivers (r = 0.35-0.71). However, the correlations of individual items with the thirteenth item "life as a whole" were lower in both the patients (r = 0.13-0.35) and caregivers (r = 0.20-0.52). Table 2 shows Cronbach's alpha coefficient if item 13 is deleted for both patient and caregiver dimensions. It was found that Cronbach's alpha coefficient between the item and its dimension when excluding item 13 was lower than Cronbach's alpha coefficient of its dimension for patient responses. Furthermore, caregiver responses demonstrated the similar trend except for item 5 "memory," which had higher Cronbach's alpha coefficient than its dimension.

Construct validity

Kaiser-Meyer-Olkin test values were 0.80 and 0.74 for patients' responses and caregivers' responses, respectively, and Bartlett's tests of sphericity of both groups were significant ($p < 0.001$). This ensured the adequacy of the samples of both patients and caregivers for factor analyses. The 12 items scale for patients' responses was eventually reduced to three factors, with eigenvalues greater than one, which explained 53.10 per cent of the total variance. The first factor named physical well-being (PW) composed of six questions (questions 1, 2, 3, 5, 10, and 11). The second factor corresponded to social well-being (SW), which included five questions (questions 4, 6, 8, 9, and 12). The third factor, close interpersonal relationships (CI) represented the marriage question (question 7). For the caregivers' responses, factor analysis obtained four factors with eigenvalues greater than one, which explained 63.89 per cent of the total variance. Those factors were interpreted as follows:

1) social well-being (SW) four questions;
2) functional ability (FA) three questions;
3) psychological well-being (PsW) three questions; and
4) physical well-being (PW) two questions (Table 3).

This study showed that most items had correlation with its domain greater than 0.4 in both patient and caregiver groups, except for two items (question 11, r = 0.36; question 12, r = 0.37) in patient group and two items (question 5, r = 0.24; question 9, r = 0.37) in caregiver group (Tables 4 and 5). A patient group had around 80–83 per cent scaling success of convergent validity and 70–83 per cent for discriminant validity. A caregiver group, however, presented 100 per cent scaling success of convergent validity in all factors except for psychological well-being factor (33 per cent). For discriminant validity, the scaling success was around 44–83 per cent (Table 6).

Discussion

The original QOL-AD was translated into a Thai QOL-AD version and then tested for their psychometric properties. The findings indicated that the Thai QOL-AD version had an appropriate reliability in both patient and caregiver groups with similar Cronbach's alpha coefficient of 0.82. This finding was slightly lower than the original version,[10] but close to other studies.[11, 12, 14]

The correlation of each item with total score ranged between 0.40–0.68 and 0.35–0.71 in patient and caregiver groups, respectively. Our finding was consistent with the results reported by Logsdon et al.,[10] which indicated the correlation of 0.41–0.67 and 0.34–0.63, respectively. However, the correlation of each item with the question 13 "life as a whole" in this study was slightly lower than the findings from the study by Logsdon et al.[10]. For a patient group, the correlation was 0.13–0.35 compared to 0.24–0.59 as reported in the previous study,[10] and 0.21–0.52 vs. 0.13–0.55 in a caregiver group, respectively.

The results of factor analysis revealed that the Thai QOL-AD version for a patient group composed of three factors (physical and psychological well-being, social well-being, and close interpersonal relationships), which was relevant to the previous studies.[13,22] However, the items, which fell in each factor, were somewhat different among the studies. This might be due to the difference in target population. Revell et al.[22] included healthy elderly samples with high education, but Gómez-Gallego et al. [13] and this study recruited AD patients with lower education. Another potential factor might be the diversity of living culture between the western and eastern world. Revell et al. [22] conducted the study in the USA, Gómez-Gallego et al.[13] in Spain, and this study in Thailand. The caregiver group, however, showed four factor components (physical well-being, social well-being, functional ability, and psychological well-being). We did not find any studies performing factor analysis in a caregiver group.

Convergent validity indicated satisfactory scaling success in both patient and caregiver groups (80–100 per cent) except for the psychological well-being factor (33 per cent) while discriminant validity was likely to be lower scaling success (44–83 per cent) for both groups. The moderate discriminant validity in this study might be attributable to several reasons. Firstly, there is a problem related to the language itself. When using word-by-word translation from English to Thai language, the translated Thai language is quite awkward for Thai people to understand. It might be more appropriate to keep exactly the original meaning with modified Thai language. The second problem is the difference between western and Thai cultural backgrounds. We found that it is hard for Thai participants to discern between question 9 "self as a whole" and question 13 "life as a whole." Both questions seemed to be alike for Thais. Finally, the situation "losing face" played an important role in the validity of data. To provide frank information to the interviewer who was a stranger for patients and caregivers might be inappropriate, especially when quality of life was likely to be worse.

Several limitations needed to be taken into consideration in this study. First, the study planned to recruit samples from one setting. Due to the low number of patients and longer period of data collection, we decided to recruit more samples from another setting. Some bias may have occurred between the different settings. We addressed this problem by comparing the scores obtained from the two groups. The results showed no significant difference. Compared with other studies[23–25] using the multi-trait scaling analysis, this study included 2 to 10 less sample sizes. Small sample sizes lead to high standard error,[26] which might subsequently result in the moderate construct validity. Second, due to the fact that most patients in this study lived in another district and took at least a whole day to visit the hospital, making a special appointment with them would become burdensome to their family. Hence, we alleviated this issue by collecting the individual data only one time using the QOL-AD questionnaire. This approach might not be able to be reproducible by a test-retest comparison. Thirdly, our aim focused on translation and psychometric test of a Thai QOL-AD version among patients with mild to moderate AD. This is because the original study (Logsdon et al.[10]) and other studies (Logsdon et al.[6]; Novelli et al.[14]; Matsui et al.[11]; Yap et al.[15]; Wolak et al.[12]; Gomez-Gallego et al.[13]) indicated that QOL-AD was useful in measuring QOL in patients with mild to moderate AD. Therefore, we did not conduct a discriminant validity comparing between mild and moderate AD patients. Furthermore, this study focused only on AD patients in the hospital; therefore, the generalisability of this questionnaire to those living in nursing homes or residential facilities needs to be considered. Based on our mentioned limitation above, there might be gap for future study and further analyses regarding a Thai QOL-AD version.

Conclusion

The Thai QOL-AD version showed the appropriate reliability. However, validity still needs to be reconfirmed before wider use of this questionnaire in the general Thai population.

References

1. Alloul K, Sauriol L, Kennedy W, Laurier C, Tessier G, Novosel S, Contandriopoulos A. Alzheimer's disease: a review of the disease, its epidemiology and economic impact. Arch Gerontol Geriatr. 1998 Nov-Dec;27(3):189–221.
2. Walker MD, Salek SS, Bayer AJ. A review of quality of life in Alzheimer's disease. Part 1: Issues in assessing disease impact. Pharmacoeconomics. 1998;14(5):499–530.
3. Alzheimer's Association. 2012 Alzheimer's disease facts and figures [Internet]. Alzheimers Dement. 2012 [cited 2012 Sept 15];8(2):1–67. Available from: http://www.alz.org/downloads/facts_figures_2012.pdf
4. Reiman EM, Caselli RJ. Alzheimer's disease. Maturitas. 1999;31(3):185–200.
5. Jorm AF, Korten AE, Henderson AS. The prevalence of dementia: a quantitative integration of the literature. Acta Psychiatr Scand. 1987;76(5):465–79.
6. Logsdon RG, Gibbons LE, McCurry SM, Teri L. Assessing quality of life in older adults with cognitive impairment. Psychosom Med. 2002;64(3):510–9.
7. Merchant C, Hope KW. The Quality of Life in Alzheimer's Disease Scale: direct assessment of people with cognitive impairment. J Clin Nurs. 2004;13(6B):105–10.
8. Ready RE, Ott BR. Quality of Life measures for dementia. Health Qual life outcomes. 2003;1:11.
9. Naglie G. Quality of life in dementia. Can J Neurol Sci. 2007;34 Suppl 1:S57–61.
10. Logsdon RG, Gibbons LE, McCurry SM, Teri L. Quality of life in Alzheimer's disease: patient and caregiver reports. J Ment Health Aging. 1999;5:21–32.
11. Matsui T, Nakaaki S, Murata Y, Sato J, Shinagawa Y, Tatsumi H, Furukawa TA. Determinants of the quality of life in Alzheimer's disease patients as assessed by the Japanese version of the quality of life Alzheimer's disease scale. Dement Geriatr Cogn Disord. 2005;21:182–91.
12. Wolak A, Novella JL, Drame M, Guillemin F, Di Pollina L, Ankri J, Aquino JP, Morrone I, Blanchard F, Jolly D. Transcultural adaptation and psychometric validation of a French-language version of the QoL-AD. Aging Ment Health. 2009;13(4):593–600.
13. Gómez-Gallego M G-AJ, Gómez-García J. Validation of the Spanish version of the QoL-AD Scale in alzheimer disease patients, their carers, and health professionals. Neurologia. 2012;27(1):4–10.
14. Novelli MM, Dal Rovere HH, Nitrini R, Caramelli P. Cross-cultural adaptation of the quality of life assessment scale on Alzheimer disease. Arq Neuropsiquiatr. 2005;63(2A):201–6.
15. Niti M, Yap KB, Kua EH, Tan CH, Ng TP. How do Chinese patients with dementia rate their own quality of life? Int Psychogeriatr. 2008;20(3):482–93.
16. Rosas-Carrasco O, Torres-Arreola Ldel P, Guerra-Silla Mde G, Torres-Castro S, Gutierrez-Robledo LM. Validation of the Quality of Life in Alzheimer's Disease (QOL-AD) scale in Mexican patients with Alzheimer, vascular and mixed-type dementia. Rev Neurol. 2010;51(2):72–80.
17. Akpinar B, Küçükgüçlü Ö. The validity and Reliability of The Turkish Version of The Quality of Life Scale For Patients With Alzheimer's Disease (QOL-AD). J Neurol Sci Turk. 2012;29(3):554–65.
18. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders.4th ed. Washington, DC: American Psychiatric Press; 1994.
19. Institiute of Geriatric Medicine. Comparative Study of Mini-Mental State Examination-Thai 2002 (MMSE-Thai 2002) and Thai Mini-Mental State Examination (TMSE) for Screening Dementia in Elderly. Nonthaburi: CG Tool; 2008.
20. Bullinger M, Power MJ, Aaronson NK, Cella DF, Anderson RT. Creating and Evaluating Cross-Cultural Instruments. 2nd ed. Philadelphia: Lippincott-Raven; 1996.
21. Nunnally JC. Psychometric Theory. 2nd ed. New York: McGraw-Hill; 1978.
22. Revell AJ, Caskie GI, Willis SL, Schaie KW. Factor structure and invariance of the Quality of Life in Alzheimer's Disease (QoL-AD) Scale. Exp Aging Res. 2009;35(2):250–67.
23. Loge JH, Kaasa S, Hjermstad MJ, Kvien TK. Translation and performance of the Norwegian SF-36 Health Survey in patients with rheumatoid arthritis. I. Data quality, scaling assumptions, reliability, and construct validity. J Clin Epidemiol. 1998;51(11):1069–76.
24. Aaronson NK, Muller M, Cohen PD, Essink-Bot ML, Fekkes M, Sanderman R, Sprangers MA, te Velde A, Verrips E. Translation, validation, and norming of the Dutch language version of the SF-36 Health Survey in community and chronic disease populations. J Clin Epidemiol. 1998;51(11):1055–68.
25. Fukuhara S, Bito S, Green J, Hsiao A, Kurokawa K. Translation, adaptation, and validation of the SF-36 Health Survey for use in Japan. J Clin Epidemiol. 1998;51(11):1037–44.
26. Ware JE, Jr., Gandek B. Methods for testing data quality, scaling assumptions, and reliability: the IQOLA Project approach. International Quality of Life Assessment. J Clin Epidemiol. 1998;51(11):945–52.

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PEER REVIEW

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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ETHICS COMMITTEE APPROVAL

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Table 1: Item-total correlation and Cronbach's alpha coefficient of QOL-AD Thai version

Items	Patients		Caregivers	
	Total	"Life as a whole"	Total	"Life as a whole"
1) Physical health	0.59**	0.34**	0.52**	0.27**
2) Energy	0.52**	0.15	0.46**	0.20*
3) Mood	0.65**	0.22**	0.58**	0.40**
4) Living situation	0.53**	0.34**	0.49**	0.34**
5) Memory	0.68**	0.18*	0.35**	0.21*
6) Family	0.53**	0.31**	0.67**	0.52**
7) Marriage	0.40**	0.13	0.54**	0.38**
8) Friends	0.52**	0.30**	0.63**	0.38**
9) Self as a whole	0.62**	0.22*	0.65**	0.49**
10) Ability to do chores around the house	0.63**	0.35**	0.55**	0.28**
11) Ability to do things for fun	0.50**	0.27**	0.56**	0.28**
12) Money	0.55**	0.30**	0.56**	0.45**
13) Life as a whole	0.56**	–	0.71**	–
Cronbach's alpha coefficient	0.82		0.82	

* $p < 0.05$, **$p < 0.01$

Table 2: Cronbach's coefficient alpha if item deleted for patients and caregivers

Dimensions	Alpha for dimension	Items	Alpha if item deleted
Patients			
Physical well-being (PW)	0.76	1) Physical health	0.72
		2) Energy	0.73
		3) Mood	0.72
		5) Memory	0.69
		10) Ability to do chores around the house	0.72
		11) Ability to do things for fun	0.76
Social well-being (SW)	0.70	4) Living situation	0.63
		6) Family	0.62
		8) Friends	0.66
		9) Self as a whole	0.65
		12) Money	0.69
Close interpersonal relationships (CI)	n/a	7) Marriage	n/a
Caregivers			
Social well-being (SW)	0.69	4) Living situation	0.67
		6) Family	0.53
		7) Marriage	0.62
		12) Money	0.68
Function ability (FA)	0.71	8) Friends	0.67
		10) Ability to do chores around the house	0.61
		11) Ability to do things for fun	0.57
Psychological well-being (PsW)	0.56	3) Mood	0.19
		5) Memory	0.63
		9) Self as a whole	0.45
Physical well-being (PW)	0.69	1) Physical health	n/a
		2) Energy	n/a

Table 3: The factor loading of patients and caregivers' responses

Items	Patients' factors			Caregiver's factors			
	PW	SW	CI	SW	FA	PsW	PW
1) Physical health	0.68	0.07	0.12	0.15	–0.03	0.28	0.80
2) Energy	0.73	–0.03	0.03	0.02	0.23	0.01	0.85
3) Mood	0.56	0.24	0.43	0.15	0.11	0.73	0.21
4) Living situation	0.10	0.75	–0.03	0.49	0.09	0.38	–0.08
5) Memory	0.72	0.25	0.13	–0.26	0.38	0.56	0.00
6) Family	–0.07	0.74	0.40	0.85	0.10	0.11	0.20
7) Marriage	0.12	0.03	0.91	0.78	0.10	–0.08	0.16
8) Friends	0.20	0.65	–0.09	0.44	0.63	0.11	0.04
9) Self as a whole	0.42	0.55	0.05	0.38	–0.01	0.63	0.35
10) Ability to do chores	0.64	0.21	0.11	0.04	0.82	0.01	0.28
11) Ability to do things for fun	0.48	0.27	–0.14	0.15	0.76	0.25	–0.05
12) Money	0.26	0.47	0.24	0.52	0.20	0.40	–0.18

Table 4: Item-scale correlation for patients

Component	Items	Item-scale correlation		
		PW	SW	CI
Physical well-being (PW)	1) Physical health	0.51	0.30	0.16
	2) Energy	0.50	0.23	0.13
	3) Mood	0.51	0.42	0.33
	5) Memory	0.61	0.43	0.18
	10) Ability to do chores around the house	0.52	0.35	0.22
	11) Ability to do things for fun	0.36	0.30	0.05
Social well-being (SW)	4) Living situation	0.30	0.49	0.02
	6) Family	0.22	0.54	0.33
	8) Friends	0.32	0.42	0.08
	9) Self as a whole	0.47	0.47	0.12
	12) Money	0.37	0.37	0.16
Close interpersonal relationships (CI)	7) Marriage	0.27	0.21	–

Table 5: Item-scale correlation for caregivers

Component	Items	Item-scale correlation			
		SW	FA	PsW	PW
Social well-being (SW)	4) Living situation	0.40	0.25	0.27	0.13
	6) Family	0.63	0.35	0.33	0.27
	7) Marriage	0.49	0.25	0.21	0.19
	12) Money	0.41	0.33	0.31	0.06
Functional ability (FA)	8) Friends	0.45	0.48	0.37	0.17
	10) Ability to do chores around the house	0.22	0.53	0.24	0.33
	11) Ability to do things for fun	0.29	0.56	0.36	0.11
	3) Mood	0.31	0.31	0.51	0.28
Psychological well-being (PsW)	5) Memory	0.06	0.27	0.24	0.12
	9) Self as a whole	0.46	0.28	0.37	0.41
Physical well-being (PW)	1) Physical health	0.25	0.17	0.41	0.52
	2) Energy	0.14	0.28	0.26	0.52

Table 6: **Multi-trait scaling of patients and caregivers**

Component	Number of items	Correlation of item with own scale	Correlation of item with other scale	Convergent validity (%)	Discriminant validity (%)
Patients					
Physical well-being (PW)	6	0.36–0.61	0.05–0.43	5/6 (83.33)	10/12 (83.33)
Social well-being (SW)	5	0.37–0.54	0.02–0.47	4/5 (80.00)	7/10 (70.00)
Close interpersonal relationships (CI)	1	–	–	–	–
Caregivers					
Social well-being (SW)	4	0.40–0.63	0.06–0.35	4/4 (100.00)	8/12 (66.67)
Functional ability (FA)	3	0.48–0.56	0.11–0.45	3/3 (100.00)	7/9 (77.78)
Psychological well-being (PsW)	3	0.24–0.51	0.06–0.46	1/3 (33.33)	4/9 (44.44)
Physical well-being (PW)	2	0.52	0.14–0.41	2/2 (100.00)	5/6 (83.33)