

# Psychometric Properties of the Abbreviated Version of the Health-Related Quality of Life (SF-8) Among Diabetes and Non-Diabetes Iranian Old People

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## Research

**Keywords:** Psychometrics, Quality of life, SF-8 Reliability, SF-8 Validity, Iranian elderly, Elderly diabetes

**Posted Date:** February 4th, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-166641/v1>

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# Abstract

## Background

The current study aimed to evaluate the psychometric properties of the Iranian version of SF-8 using a large sample of elderly in two different groups (diabetes and non-diabetes elderly).

## Method

1901 older adults were recruited through a two-level clustered random sampling method, according to WHO STEP guidelines. In order to test reliability, the internal consistency and test\_re\_test were used. Convergent validity was evaluated by the Pittsburgh Sleep Quality Index [PSQI]. An independent sample t-test was used to assess the significance of differences across demographic groups.

## Findings

The Cronbach for SF-8 and its subscales were between 0.79 to 0.85 (physical and mental health). Result of test\_re\_test indicated appropriate reliability of SF-8. The result of CFA indicated that the 2-factor model had a good fit to the data for diabetes and non-diabetes groups of older people (GFI=0.936, CFI=0.940, NFI=0.938, IFI=0.941, RMSEA=0.1). The SF-8 also had acceptable convergent validity.

## Conclusion

The present study is the first to confirm the traditional 2-factor structure of SF-8 using a large sample of Iranian older individuals. The results showed that the Iranian version of SF-8 is a reliable and valid tool for measuring HRQOL among Iranian older adults (including diabetes and non-diabetes elderly).

# Introduction

Health-related quality of life is as an aspect of quality of life (QOL), directly or indirectly related to health[1], and defined as “the perception of individuals about their position in life, in the cultural context and in the value system in which they live, and in relation to their goals, expectations, standards and concerns”[2]. It is a new concept that helps health care researchers to study the health status of different populations and also evaluate the effects of care intervention programs[3]. Assessing health-related QOL needs valid and reliable instruments to give a correct and exact picture of what is going on in the community and health care system; A valid tool assists health care policymakers and providers to promote their functions in delivering health care services to the needful populations [4, 5].

The study of health-related quality of life, as an outcome, has grown over the past few decades, and various questionnaires have been designed and used to assess it. The health-related quality of life tools can be divided into two categories: the general questionnaires (Generic) and the special questionnaires (Specific) for quality of life assessment[6]. By using the general questionnaires, the quality of life can be measured in a large population consisting of different groups, such as cardiovascular, lung, AIDS, and

cancer patients or even non-diabetes individuals[7, 8]. The most known of these questionnaires are Health Survey Questionnaire [SF-36] and WHO Quality of Life-BREF (WHOQOL-BREF). There are also more specialized questionnaires, examining the dimensions of quality of life only in specific diseases or groups, such as health-related quality of life questionnaire for people with diabetes or hearing deficiency[9].

As earlier mentioned, "the Health Survey Questionnaire (SF-36)", has been widely used among different groups [10, 11]. SF-36 has 36 items, with 8 subscales, included general health perceptions (GH), physical functioning (PH), role limitations due to physical problems (RP), bodily pain (BP), vitality (VT), social functioning (SF), mental health (MH), and role limitations due to emotional problems (RE). SF-36 has been translated into many languages and validated all around the world; however, despite its popularity, its use is limited due to a large number of questions and a long time taken to be completed (17 minutes), which is boring and can lead to fatigue, especially in the more debilitated participants and surveys with a lot of questions [12-16].

Even though, some questionnaires have been designed in Iran to assess the health-related quality of life over the past decades, most of them are not popular due to their specific nature (assessing QOL exclusively in people with diabetes or coronary artery disease), too many items, or the long time taken to be completed[9, 17].

The number of older people in the world is growing fast. research showed that health problems are prevalent among the geriatric population and making them the major consumers of health care services[18-20]. Multiple losses and reduced sources of income and social support expose the elderly to too much stress, which, in turn, causes the elderly to suffer from many psychological problems [21]. The physical and psychological problems of old age can considerably affect the quality of life of the elderly[22]. So, the measurement of quality of life in older adults, as an index of overall health, needs more consideration.

Old age is considered as a period of gradual decline in abilities and functioning. Therefore, older individuals are physically and mentally more prone to fatigue, and they may not tend to fill in questionnaires that are too long or complicated. Thus, valid questionnaires with a low number of items not only save time and money but also are better accepted by the older participants[23-25] .

Among the briefer questionnaires of QOL, SF-8 which is an abbreviated version of the original 36-item health survey is one of the most widely used QOL worldwide. It is easy to be completed, and requiring little time to fill in [10, 13, 23]. This questionnaire is a survey tool to be used regardless of age, illness or treatment, and the level of education [25, 26]. As many agreed upon, adapting the original high-quality questionnaires and validating them in a culturally different population is more practical and economical than designing and validating a new one[24, 27]. So, in this study, we tried to evaluate the psychometric properties of the Iranain version of SF-8 scale. To see whether it can be used in just general populations or inspecific groups too, or in both two different groups based on their health conditions and different

validity and reliability procedures were used. The main research question was is SF-8 a proper instrument for assessing health related quality of life among older Iranian adults?

This study was approved by the ethics committee of the University of Social Welfare and Rehabilitation Sciences (IR.USWR.REC.1398.006) and Shahid Sadoughi University of Medical Sciences (No.17/1/73941).

All subjects provided written informed consent after explaining the confidentiality of their responses, identity, and also the right to withdraw from the study at any stage without the necessity to give reasons. The YaHS experiment protocol for involving human data was in accordance to guidelines of national human ethics (available at: [www.ethics.research.ir](http://www.ethics.research.ir)) and with the Helsinki Declaration of 1964, as revised in 2000.

## Methods

### *Participants and procedures:*

This is a cross sectional study. The study data obtained from the Yazd Health Study (YaHS). YaHS is a prospective cohort study started in 2014 to investigate chronic diseases' incidence and prevalence, as well as the factors affecting them in the Yazd Greater Area, located in the center of Iran with 582682 population. The sampling method of the study was multi-stage stratified so that in the first stage 200 clusters were randomly selected from the different areas of Yazd Greater Area including Yazd city, three annexed cities and annexed villages. Then, based on the household postcodes, the heads of the clusters were selected and the questionnaires were completed. Details of YaHS was published elsewhere[28].

Ten thousand people lived in Yazd in the age range of 20 to 70 years participated in this study. Among them, 1901(696 with diabetes and 1205 healthy old people) were elderly  $60 \geq$ , and the data gathered from them were used to assess the psychometrics of the SF-8 scale. In this study, we tried to select the number of women and men in the same age groups [28]. The inclusion criteria were an age of 60 years and above at the time of the interview, as well as informed consent to participate in the study. The participants unable to answer questions (e.g., due to hearing deficits, aphasia, cognitive impairment, mental disorder) were excluded.

### Measurements

#### *Health-related quality of life [SF-8]:*

The SF-8 is a short version of an original 36-item health survey or health-related quality of life (SF-36). It has eight domains, including general health (GH), physical functioning (PF), role limitations due to physical problems (RP), bodily pain (BP), vitality (VT), social functioning (SF), mental health (MH), and role limitations due to emotional problems (RE). It is a generic multipurpose short-form quality of life instrument developed by the RAND Corporation and the Medical Outcomes Study (MOS) in the 1980

s[24], with two physical (PCS) and mental (MCS) dimensions. Each item of the SF-8 is assessed using a 5 point Likert scale.

### ***Pittsburgh Sleep Quality Index [PSQI]:***

The Pittsburgh Sleep Quality Index (PSQI) is an instrument used to measure the quality and patterns of sleep in older adults. It differentiates "poor" from "good" sleep by measuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, and sleep disturbances, use of sleep medication, and daytime dysfunction over the last month. The subject self-rates each of these domains. Scoring the answers is based on a 0 to 3 scale, whereby 3 reflects the negative extreme on the Likert Scale [29]. The overall score of this questionnaire is 21, and the overall score of 6 or above indicates that the quality of sleep is poor [29-31]. Reliability of the PSQI was assessed in previous study in terms of internal consistency and corrected item-total correlation. Internal consistency analysis[0.77] showed that Persian version of PSQI is acceptable in term of reliability and validity[32].

### **Scale preparation steps**

#### ***Translation procedure:***

Several steps were taken to translate the SF-8 instrument based on international guidelines to assure the accuracy of the translation procedure: (1) forward translation: two bilingual native Iranians with background of social science and gerontology translated SF-8 from English into Persian, independently. (2) Both translators and a project manager compared the translated versions and discussed the controversies to unify the two translated versions. (3) Backward translation: two professional English language translators back translated this Persian version into English.

The translators of the second step were not aware of the original English version of the SF\_8 questionnaire. This step was conducted to identify conceptual inconsistencies between the translated and original versions of the questionnaire. (4) Each item and the entire questionnaire were reviewed by the research team, and finally the questionnaire was approved with the consensus of all members. (5) The 8 item of health related quality of life was implemented on 50 old people to understand how they interpret the items on the questionnaire. (6) In the last step: all the necessary changes were applied based on the suggestions obtained from the initial stages as well as the pilot study on the final version of the questionnaire and finally it was implemented on 1901 old people.

#### ***Content validity:***

The prepared questionnaire was sent to the experts (6 expert) of different disciplines including gerontology, social welfare, epidemiology, and health education for review of content validity. They were asked to comment on the relevancy, clarity and simplicity of the items. To analyze the data regarding the content validity, two indicators including content validity ratio (CVR) and content validity index (CVI) were used.

### ***Assessment of internal consistency, reliability, and stability:***

In order to determine the questionnaire's internal consistency, Cronbach's alpha and to evaluate the questionnaire stability test-retest method were used and intra-class correlation index, also, calculated. Minimum Cronbach's alpha (0.7) and intra-class correlation index (0.6), were considered as acceptable [17].

### ***The construct validity of the questionnaire***

Discriminant validity, Convergent validity, and Confirmatory factor analysis [CFA] were used to determine the structural validity.

### ***Confirmatory factor analysis:***

There are various indices to evaluate the model, each of which considers a certain aspect of suitability. The comparative fit index (CFI), incremental fit index (IFI), the root mean square error of estimation (RMSEA), and the goodness of fit index (GFI) all were used to calculate the model fit. If indices IFI, GFI, and CFI were between 0 to 1, and the values obtained were closer to one, the suitability of the model to data was better [33]. RMSEA values between 0.08 to 0.1 showed moderate fitness and lower than 0.08 showed a good fit model [33].

### ***Discriminant validity:***

For discriminant validity, the known group was assessed by comparing the SF-8 scores between groups with Student's t-tests, 2-tailed,  $P < 0.05$ .

### ***Convergent validity:***

Because many studies have examined the relationship between health related quality of life with mental health and sleep quality but not specially in the elderly, As well as due to inconsistencies in the results of previous studies[34-36]; the Pittsburgh Sleep Quality Index was used to assess convergent validity.

### ***Data analysis:***

A significance level of 0.05 was considered, and statistics software SPSS version 24 and AMOS version 24 were used.

## **Results**

This study included 1901(1205 non-diabetes and 696 diabetes) respondents, of which 963 [50.7%] were males. Among all the respondents, 61.1% were Primary school and less and 87% were married (Table 1).

Content validity index (CVI) and content validity ratio (CVR) were calculated based on the experts' opinions on the relevancy of the questionnaire's items (CVI 0.97 and CVR 0.95).

The internal consistency of total score (Cronbach's alpha coefficients, ranging from 0.87 to 0.80 for subscales (PCS and MCS) in diabetes elderly and 0.83 to 0.78 for subscales in non-diabetes elderly) was acceptable. To measure the test-retest reliability, 20 olders people recruited to complete SF-8 questionnaire twice with the interval of 14 - 16 days. Test\_retest correlation coefficients of the PCS and MCS of the SF-8 were 0.97 and 0.98 respectively.

Results from CFA showed good fitness for two factors of SF-8 in the two groups (Table 2). The fitness indicators were almost the same in both groups, indicating the applicability of the questionnaire in different groups, as well as, general population of older adults ; the items were examined in terms of factor load and regression coefficients in two non-diabetes and diabetic groups (the results are shown in Table 3).

According to the results, there was no relationship between MCS and PCS with gender and the literacy status in diabetic older people [this relationship was examined as the main effect and interactive effect]. In the non-diabetes elderly group, there was a significant relationship between gender with PCS ( $P = 0.035$ ) and MCS ( $P = 0.006$ ); however, no significant relationship between any aspects of health-related quality of life and education were seen. On the other hand, the interactive effect of these two variables on the both dimensions of quality of life was not significant in the non-diabetes group.

Based on the independent t-test, there was a statistically significant difference ( $p=0.015$ ,  $t=2.48$ ) between MCS in diabetic elderly ( $SD = 3.13$ ,  $M = 15.58$ ) and non-diabetes ones ( $SD = 2.91$ ,  $M = 15.94$ ); however, the difference ( $p=0.75$ ,  $t=32$ ) between PCS in diabetic ( $SD = 3.56$ ,  $M = 14.72$ ) and non-diabetes elderly was not significant ( $SD = 3.32$ ,  $M = 14.44$ ).

The results of Pearson correlation to assess convergent validity showed that lower health related quality of life score(lower health related quality of life score indicates a better condition) was associated with better mental health status (the results are provided in Table 4).

A comparison of known groups to determine discriminant validity showed that the mean score of health-related quality of life in the elderly group with diabetes was  $18.01 \pm 6.37$  and in non-diabetes individuals was  $17.19 \pm 5.84$ . The lower scores on the scale indicated a better status of health-related quality of life. The results showed a statistically significant difference ( $p\text{-value} = 0.006$ ). Therefore, it can be concluded that the tool has an appropriate discriminant validity (Table 5).

## Discussion

It is necessary to evaluate questionnaires in terms of validity and reliability before using it in another community with a different culture. This study aimed to assess the psychometric properties of the SF-8 and hopefully introduce a short appropriate tool for measuring health-related quality of life among Iranian elderly. To the best of the authors' knowledge, this is the first study with a large sample size and different groups on this questionnaire.

In this study, content validity, factor analysis, discriminant validity, and convergent validity were used to evaluate the validity of the SF-8 questionnaire. Also, internal consistency was used to assess the reliability.

The results indicated the desired reliability capability by high levels of internal consistency, which was consistent with the studies of Lang (with Cronbach's alpha 0.82)[10] and Onagbiye (with Cronbach's alpha 0.87)[23]. Various studies mentioned the ineffectiveness of the literacy level on the completion of the questionnaire. The results of the present study confirmed this finding, too[25, 26].

The results of the confirmatory analysis, in the elderly with diabetes, non-diabetes elderly, and also the whole sample, showed that the presumed two-dimensional model of the SF-8 had acceptable similar structural validity, which was consistent with the results of other previous studies[10].

The convergent validity confirmed the significant and direct correlation of Sf-8 with depression, anxiety, and stress, as well as sleep quality[37]. The correlation coefficient ( $r$ ) of the scores of the Sf-8 questionnaire with the sleep quality had the desired amounts in both diabetes and non-diabetes groups.

The lower score of the Sleep Quality Questionnaire was significantly associated with a better quality of life. Sleep quality in old age decreases due to biological and physiological changes, and the disorders prevalent in the elderly such as cardiovascular and/or urinary problems, may lead to a lower quality of life of affected people [38]. This finding is consistent with the results of Gheshlagh et al. (2016)[39], Safa A et al. [40], and Iliescu EA et al. [41] studies.

The results of the current study, similar to Lee's research, showed no significant relationship between the dimensions of SF-8 with gender and level of education in the elderly with diabetes[42]. However, a significant relationship between gender and quality of life was seen among non-diabetes older individuals, which was consistent with various studies [43-45]. The reasons for differences in the overall study results on the gender variable can be related to culture, environment, and sample size. Many studies have shown that the quality of life was higher in men compared to women [46-49].

The results of the present study showed that the two models of sf-8 are the best model for assessing the health related of quality life, while some studies have introduced one-factor[13] or three-factor model[10] as the best model for their community. Sample size, cultural differences and heterogeneity of participants in different age groups can be the reason for differences in the results of exploratory factor analysis in different societies.

## Conclusion

According to the findings of the present study, it can be concluded that the Sf-8 questionnaire has acceptable validity and reliability and can be used reliably in the Iranian elderly.

## Abbreviations

Full term	Abbreviation
health-related quality of life	SF_8
Physical health	PSC
Mental health	MSC
Vitality	VT
Social functioning	SF
Role emotional	RE
Mental health	MH
General health	GH
Physical functioning	PF
Role functioning	RP
Bodily pain	BP
Pittsburgh Sleep Quality Index	PSQI
Confirmatory Factor Analysis	CFA
Comparative fit index	CFI
the Incremental Fit Index	IFI
Root Mean Square Error of Examination	RMSEA
goodness of fit index	GFI
Content validity index	CVI
content validity ratio	CVR

## Declarations

### Disclosure statement:

The authors reported no potential conflict of interest

### Funding

This article is part of a Ph.D thesis in gerontology, which was supported and approved by the university of social welfare and rehabilitation sciences, Tehran, Iran. All subjects provided written informed consent after explaining the confidentiality of their responses and the funders had no role in study design, data collection and analysis, decision to publish, or in the preparation of the manuscript.

## Availability of data and materials

The data collected by Yazd Health Study are not open access but can be shared under conditions of collaboration and endowment. Collaborative research projects are encouraged, and enquiries and queries can be submitted to the first author at (mmirzaei@ssu.ac.ir), noting that there is a specific protocol for applications related to data sharing.

Collaborative research projects will be discussed informally in the first instance, with the final decision on data sharing decided by the YaHS steering committee which will evaluate all proposals related to data sharing. For further information, please visit YaHS website at ([www.yahs.ir](http://www.yahs.ir) / [yahs.ssu.ac.ir](http://yahs.ssu.ac.ir)).

## Ethic approval

This article is part of a Ph.D thesis in gerontology, which was supported and approved by the university of social welfare and rehabilitation sciences, Tehran, Iran. All subjects provided written informed consent after explaining the confidentiality of their responses and the funders had no role in study design, data collection and analysis, decision to publish, or in the preparation of the manuscript.

## Author contributions

SN, MF, MM and GH.GH.H designed the study. MM collected survey data. SN, MF, MM and GH.GH.H analyzed and presented the statistical results. SN, MF, MM and GH.GH.H were major contributors in writing the manuscript. SN, MF and MM edited the manuscript. All authors read and approved the final manuscript.

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## Tables

**Table 1: The socio-demographic characteristics of the respondents [1901]**

Variables		n	%
Gender	Female	938	49.3
	Male	963	50.7
Educational level	Primary school and less	1165	61.3
	Secondary	416	21.9
	Diploma	249	13.1
	Masters and Ph.D.	71	3.7
Marital status	Single	20	1.1
	Married	1660	87.3
	widow	217	11.4
	Divorced	4	.2

**Table 2: Goodness-of-fit indicators of models for two groups and the total participants**

RMSEA	IFI	NFI	CFI	GFI	Groups
<b>0.1</b>	0.944	0.938	0.944	0.928	Diabetes
<b>0.1</b>	0.933	0.928	0.932	0.932	Non-diabetes
<b>0.1</b>	0.941	0.938	0.94	0.936	Total

Notes: GFI= goodness of fit index [good fit:  $\geq 0.9$ ]; CFI = Comparative Fit Index [good fit:  $\geq 0.9$ ]; IFI= the Incremental Fit Index [good fit:  $\geq 0.9$ ]; NFI = Normative Fit Index [good fit:  $\geq 0.9$ ] RMSEA = Root Mean Square Error of Approximation [good fit:  $< 0.08$ ; fair fit: 0.08–0.10]

**Table 3: The results of the confirmatory factor analysis of the quality of life measurement model in the elderly by two groups and the whole sample.**

Item	Component	Factor loadings [Beta]		
		Diabetics	Non-diabetes	Total sample
PSC	<--- QoL	0.510*	0.521*	0.447*
MSC	<--- QoL	0.526*	0.475*	0.492*
VT	<--- Mental	0.607*	0.532*	0.565*
SF	<--- Mental	0.760*	0.759*	0.760*
RE	<--- Mental	0.640*	0.665*	0.658*
MH	<--- Mental	0.834*	0.819*	0.825*
GH	<--- Physical	0.664*	0.656*	0.656*
PF	<--- Physical	0.850*	0.833*	0.840*
RP	<--- Physical	0.904*	0.864*	0.881*
BP	<--- Physical	0.757*	0.661*	0.701*

\*p-value <0.001

**Table 4: Pearson's correlation coefficients of convergent validity**

[n=696]diabetes group		Non-diabetes group[1205]		Correlated
MCS	PCS	MCS	PCS	
0.386*	0.449*	0.331*	0.347*	Sleep quality

\*p-value<0.001

**Table 5: Discriminate validity of SF-8 by using known groups**

Result		Non-diabetes elderly N[1205]	Diabetes elderly N[696]	Factor
p-value	t	Mean±S.D	Mean±S.D	Health-related quality of life
0.006	2.759	18.015±6.37	17.193±5.84	