

Research Paper

## The 36-Item Short Form Health Survey: Reliability and Validity in Chinese Medical Students

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Received: 2012.04.21; Accepted: 2012.08.19; Published: 2012.08.27

### Abstract

**Objective:** The 36-Item Short Form Health Survey (SF-36) is widely validated and popularly used in assessing the subjective quality of life (QOL) of patients and the general public. The aim of the study is to assess the psychometric properties of the 36-Item Short Form Health Survey (SF-36) in medical students in mainland of China.

**Methods:** The reliability and validity of the 36-Item Short Form Health Survey (SF-36) questionnaire were assessed by conducting a cross-sectional study of Chinese medical students in December 2011. All 1358 3<sup>rd</sup> year and 4<sup>th</sup> year medical students from 46 classes at China Medical University were investigated.

**Results:** The overall Cronbach's  $\alpha$  coefficient of the SF-36 questionnaire was 0.791, while the respective Cronbach's  $\alpha$  coefficients for each of the seven dimensions were  $> 0.70$ , except where the social function dimension was 0.631. Results showed that the SF-36 questionnaire was reliable and valid.

**Conclusion:** In general, this study provides evidence that the SF-36 questionnaire is suitable measures for assess the QOL of medical students in China.

Key words: Medical student; Quality of life; The 36-item short form health survey (SF-36); Reliability; Validity.

### Introduction

The 36-Item Short Form Health Survey (SF-36) questionnaire was developed by the Boston Health Research Institute in the United States. The SF-36 questionnaire provides a concise method that is mainly used to check the health status of members of the general population aged 14 years or over<sup>1</sup>. The SF-36 questionnaire can provide a direct quantitative indication of an individual's health status and, as it is easy to administer, it has become the most widely-used QOL evaluation tool in the world<sup>2-4</sup>. The SF-36 questionnaire was listed as an evaluation tool by an

international quality evaluation project in 1991<sup>5</sup>. Since then, the reliability and validity of the SF-36 questionnaire have been evaluated in a number of specific population world-wide<sup>6</sup>.

Quality of life (QOL) is either defined as the subjective perception of one's own well-being within socio-cultural context or as the satisfaction of desires and pleasures and the accomplishment of the ideal to a standard of perfection<sup>7</sup>. Great attention has been focused on the assessment of different populations ever since the concept of quality of life has become

widely accepted by society<sup>8</sup>. However, the SF-36 questionnaire has seldom been used to assess the quality of life of Chinese medical students.

Most medical colleges follow a traditional Flexnerian curriculum in China. Medical training lasts 5 years and is divided into 2 years of basic sciences, 2 years of clinical medicine, and 1 year of internship in the hospital. Studies have reported that medical education and training have a negative impact on students' physical and mental health. As compared to the general population, medical students are more susceptible to depression<sup>9</sup>, anxiety<sup>10</sup>, stress<sup>11</sup> and burning out<sup>12, 13</sup>. There may be a few influencing factors for this situation, such as academic courses and training<sup>14,15</sup>, curriculum which includes contact with patients, diseases and death<sup>16,17</sup>. These negative effects will affect academic performance and interpersonal relationships, as well as the performance of medical practice in the future<sup>18</sup>. Dyrbye et al thought that student distress included four factors: anxiety, depression, stress and burning out. They put forward the theory that personal factors and medical school training factors have an impact on student distress<sup>19</sup>.

With the increasing enrollment of universities in China since 1999, the enrollment number of medical students, including junior college students of medicine, has increased from 75188 in 1998 to 533618 in 2010. The nearly 7-fold increase results in a serious shortage of teaching facilities, such as inadequate teachers, laboratories, classrooms and teaching hospitals<sup>20,21</sup>. In addition, students do not have access to adequate logistical services, such as dormitories and canteens. Besides having to face those problems, Chinese medical students also face greater pressure regarding post-graduation employment<sup>22</sup>. Most graduates prefer not to work in the community or rural hospitals for lower salaries and poorer working conditions compared with those of larger hospitals. The large hospitals cannot provide enough jobs, so graduates face great employment pressure. Medical education is always long in duration and consists of great academic pressure and narrow professional employment opportunities<sup>23</sup>. Some medical students with poor academic and professional performance are demoted or failed for the above issues. It has been speculated that these problems impair students' mental and physical health.

The quality of life (QOL) of Chinese medical students is of growing concern to educators and administrators in recent years<sup>24</sup>. Assessing the quality of life of medical students can inform us of their health perspectives and health conditions and the related factors which have a impact on their quality of life (QOL). We can also take measures to increase their

spare time and learning interests to improve their health conditions by medical education reforms, including improving curriculum and teaching methods. It has been reported that an integrated curriculum such as PBL may be less stressful for students<sup>25</sup>.

The study was conducted among medical students in China Medical University in order to test the reliability and validity of the SF-36 questionnaire for measuring the QOL of Chinese medical students.

## Materials and methods

### Study Sample

In total, 1358 3<sup>rd</sup> year and 4<sup>th</sup> year medical students from 46 classes at 7 different areas of professional study were surveyed at China Medical University, using the cluster sampling method. These included 12 classes from clinical medicine, 2 classes from nursing, 2 classes from preventive medicine, 2 classes from forensic science, 2 classes from pharmacy, 2 classes from dentistry, and 1 classes from medical information management for each of the 3<sup>rd</sup> and 4<sup>th</sup> academic years. 1286 valid questionnaires were collected. The sample comprised of 599 males and 687 females. In the third and fourth years, students begin to study clinical courses, including surgery, pediatrics, obstetrics, and other disciplines. Although they have not gone into regular clinical rotations, they have begun to have some contact with patients during their clerkship courses in the hospitals.

### Data Collection

This cross-sectional study was conducted on December 9, 2011. SF-36 questionnaires were distributed to students simultaneously at the end of their first period class. The surveyors took 5 minutes to explain the purpose of the study and the students were given 10 minutes to complete the questionnaire independently. The study was anonymous, and the results remain confidential. The completed questionnaires did not contain any identifying information about the individual subjects. Participation in the study was totally voluntary, and participants had the option of declining to answer specific questions or to leave the entire questionnaire blank if they did not wish to participate. The protocol was approved by the Bioethics Advisory Commission of China Medical University. All data were kept confidential and data protection was observed at all stages of the study.

### Questionnaires

The questionnaire included socio-demographic information (gender, age, nationality, grade level, and specialty). If the students not understand any items,

the surveyors assisted them individually and recorded the relevant items for improvement if the questionnaire was used again. The SF-36 questionnaire includes 36 questions related to an individual's QOL that are summarized in two component summary scores, the Physical Component Summary (PCS) and the Mental Component Summary (MCS) scores.

### Statistical Analysis

Validity was analyzed through collective validity, divisional validity and structural validity<sup>25</sup>. After deducting the overlap between each of the 36 items and its related domain, the collective validity was considered to be good if the correlation coefficient remains  $> 0.4$ . To support the divisional validity, the items should have higher correlation with their hypothesized domains than with domains measuring other concepts. The statistical significance of the difference between the item-hypothesized domain and item-competing domain correlations was tested by the Steiger's t-test for dependent correlation<sup>26</sup>. Factor analysis is a statistical method used to test the structural validity of a scale and describes variability among observed variables in terms of fewer unobserved variables - called factors<sup>27</sup>. In the present study, factor analysis for the eight domains was used to evaluate the structural validity of the SF-36 questionnaire by testing whether the observed data for the eight domains collected during the study correlated with the hypothetical structure of the two overall component scores -- the PCS and the MCS. The Kaiser-Meyer-Olkin-Kriterium (KMO) statistic and Bartlett's spherical check were carried out to check for sample suitability for the factor analysis.

Internal reliability of the SF-36 questionnaire was measured by determining the internal uniformity, which is expressed by Cronbach's  $\alpha$  coefficient. Cronbach's  $\alpha$  coefficient was calculated for the eight domains of the SF-36 questionnaire and the reliability was considered to be adequate if the  $\alpha$  value was  $> 0.7$ <sup>28</sup>. Split-half reliability, a measure of consistency where a test is split in two and the scores for each half of the test are compared with one another, was used to check the internal stability of the questionnaire, and test-retest reliability was used to assess the consistency of the questionnaire from one time to another<sup>29, 30</sup>. In order to determine the test-retest reliability, a second round of evaluation was undertaken among 50 study subjects who were randomly selected 1 week later. The final analysis database was formed after analytical treatment for the logical error had been performed and abnormal values of the data had been obtained. The data were analyzed using SPSS® version 17.0 (SPSS Inc., Chicago, IL, USA) for Windows®.

A *P*-value of  $< 0.05$  was considered to be statistically significant.

## Results

### Characteristics of Chinese Medical Students

Of the 1358 distributed questionnaires, 1286 (94.69%) were completed. The average age of the sample was 22.3 years (SD = 2.9), with 599 (46.5%) male students and 687 (53.5%) female students. The sample includes 654 3<sup>rd</sup> year students and 632 4<sup>th</sup> year students. There are 665 students from clinical medicine, 101 students from nursing, 114 students from preventive medicine, 116 students from forensic science, 116 students from pharmacy, 117 students from dentistry, and 57 students from medical information management.

### Validity Analysis

Structural validity was evaluated by means of factor analysis, according to the degree of similarity between the hypothetical structure of the questionnaire conceived by researchers and the actual observed data. Results showed the KMO measure to be 0.786 and the Bartlett's spherical check to be  $\chi^2 = 198.11$  and  $P = 0.000$ , which taken together, indicated that the samples in this study were suitable for factor analysis. Factor analysis results indicated that when two component summary scores, the PCS and the MCS, were extracted from those of the eight domains whose characteristic roots were  $> 1$  or approaching 1, the accumulative contribution rate was up to 73.6%. As shown in Table 1, the PCS has larger factor loads on PF, RP and BP domains with high correlation, and lower factor loads on RE and MH domains with low correlation in accordance with the theoretical hypothesis. The MCS has larger factor loads on VT, RE and MH domains with high correlation, but the social function domain where the factor loads for the MCS for the observed data were slightly low and appeared as only a moderate correlation that was not identical with the hypothesis. The correlation coefficient ( $r > 0.50$ ) for each item and its related domain, obtained by the correlation coefficient model, was relatively high, indicating good structural validity (Table 1).

As can be seen from Table 2, the coefficient range of the collective validity for all the domains except for SF and RE domains was  $> 0.4$ . The collective validity and divisional validity were considered to be accepted.

### Reliability Analysis

The degree of internal uniformity among the items, namely the correlation between the items and

the eight related domains, was expressed by Cronbach's  $\alpha$  coefficient (Table 3). The overall Cronbach's  $\alpha$  coefficient of the SF-36 questionnaire was 0.791, while the respective Cronbach's  $\alpha$  coefficients for seven of the eight dimensions were  $> 0.70$ , excluding the social function dimension, which was 0.631. This met the requirement for group comparison. There was also a positive correlation between each of the eight domains of the SF-36 questionnaire ( $P < 0.01$ ; Table 3). Table 3 shows the correlation coefficients ( $r$ ) between the 36 items of the SF-36 questionnaire and the eight domains of study.

The retest of the correlation between the items showed that  $r > 0.70$  could be achieved for all eight

domains ( $P < 0.01$ ) (Table 4), demonstrating relatively good stability for the SF-36 questionnaire. The difference between the mean values for each domain after two rounds of measurements was not statistically significant.

The split-half reliability measure was determined by splitting the SF-36 items in each dimension by an odd-even split, calculating the correlation coefficient  $r_1$  for each split separately and comparing the two, thereby calculating the reliability of each part of the split questionnaire. This was corrected using the Spearman-Brown prediction formula  $r = 2r_1 / (1 + r_1)$ , which generated the value of  $r = 0.778$  ( $P < 0.001$ ), showing that this questionnaire was relatively stable.

**Table 1.** Structural validity of the SF-36: comparison of hypothetical correlation and factor analysis from data collected from Chinese medical students.

Domains	Hypothetical factor load		Practice factor load	
	PCS	MCS	PCS	MCS
PF	+	-	0.762	0.228
RP	+	-	0.786	0.186
BP	+	-	0.731	0.283
GH	*	*	0.678	0.287
VT	*	*	0.496	0.762
SF	*	+	0.621	0.612
RE	-	+	0.315	0.713
MH	-	+	0.241	0.859

Correlation coefficient ( $r$ ): \*  $r \geq 0.70$ ; \*  $0.70 > r > 0.30$ ; -  $r \leq 0.30$ .

PCS, physical component summary; MCS, mental component summary; PF, physical function; RP, role limitations due to physical problems; BP, bodily pain; GH, general health; VT, vitality; SF, social function; RE, role limitations due to emotional problems; MH, mental health.

**Table 2.** The collective validity and divisional validity of each domain on the SF-36 questionnaire.

Domain	Number	Coefficient range		Collective validity		Divisional validity	
		Collective validity	Divisional validity	Successful number	Successful rate (%)	Successful number	Successful rate (%)
PF	10	0.445-0.657	0.095-0.412	10/10	100	80/80	100
RP	4	0.579-0.756	0.142-0.387	4/4	100	32/32	100
BP	2	0.754-0.897	0.121-0.345	2/2	100	16/16	100
GH	5	0.579-0.704	0.085-0.478	5/5	100	40/40	100
VT	4	0.527-0.799	0.154-0.568	4/4	100	32/32	100
SF	2	0.279-0.461	0.128-0.367	1/2	50	16/16	100
RE	3	0.124-0.824	0.127-0.389	2/3	67	18/24	75
MH	5	0.487-0.789	0.175-0.489	5/5	100	40/40	100

PF, physical function; RP, role limitations due to physical problems; BP, bodily pain; GH, general health; VT, vitality; SF, social function; RE, role limitations due to emotional problems; MH, mental health.

**Table 3.** The internal uniform reliability and correlation coefficient of the eight dimensions of the SF-36 questionnaire for measuring quality of life of Chinese medical students.

Domain	Internal uniform reliability of SF-36 items with domains		Positive correlation between SF-36 domains						
	Test-retest reliability <i>n</i> = 50	Cronbach's $\alpha$ coefficient <i>n</i> = 1286	PF	RP	BP	GH	VT	SF	RE
PF	0.763*	0.826							
RP	0.727	0.745	0.268*						
BP	0.726*	0.793	0.302*	0.323*					
GH	0.701*	0.791	0.182*	0.271*	0.410*				
VT	0.862*	0.827	0.187*	0.197*	0.266*	0.322*			
SF	0.591	0.631	0.198*	0.282*	0.403*	0.301*	0.392*		
RE	0.701	0.732	0.274*	0.378*	0.274*	0.384*	0.370*	0.330*	
MH	0.738*	0.798	0.287*	0.184*	0.236*	0.191*	0.460*	0.321*	0.320*

\* $P < 0.01$ . PF, physical function; RP, role limitations due to physical problems; BP, bodily pain; GH, general health; VT, vitality; SF, social function; RE, role limitations due to emotional problems; MH, mental health.

**Table 4.** The correlation coefficient ( $r$ ) between individual items and the eight domains of the SF-36 questionnaire.

Dimensions	Correlation coefficient ( $r$ )	$P$ -value
PF	0.683 - 0.841	< 0.01
RP	0.712 - 0.811	< 0.01
BP	0.761 - 0.866	< 0.01
GH	0.712 - 0.842	< 0.01
VT	0.781 - 0.862	< 0.01
SF	0.598 - 0.643	< 0.01
RE	0.684 - 0.861	< 0.01
MH	0.695 - 0.813	< 0.01

PF, physical function; RP, role limitations due to physical problems; BP, bodily pain; GH, general health; VT, vitality; SF, social function; RE, role limitations due to emotional problems; MH, mental health.

## Discussion

The SF-36 is considered to be a valid, reliable, concise, and generic measure of state of health that is potentially useful for application to students<sup>31, 32</sup>. The present study was designed to test the reliability and validity of the SF-36 questionnaire in the population of Chinese medical students. Few studies have used validated instruments that reflect the multi-dimensional and subjective concept of QOL by eliciting information directly from students.

Compared with other questionnaires designed to evaluate QOL, the SF-36 questionnaire is short and flexible, which makes it much easier to administer. The SF-36 questionnaire can be completed manually or with the aid of a computer, by individuals, via a face-to-face interview or by telephone call with trained surveyors. The SF-36 questionnaire is widely used to monitor general population health status, to evaluate the efficacy of interventions, to monitor health status in patients with chronic disease and to determine the relative burdens of various diseases<sup>33</sup>,

<sup>34</sup>. Several health surveys have been evaluated in particular diseases and in special populations, such as the elderly, including populations in China<sup>35, 36</sup>.

The results obtained indicate that the SF-36 is a useful measure and had good reliability and validity in the determination of the QOL among medical students, with relatively stable function. The Cronbach's  $\alpha$  coefficients for all seven domains of the SF-36 was > 0.7, except where the coefficient for the social function dimension was 0.631. The items of the social function dimension may not be sensitive to cultural variations and may need to be modified according to the characteristics of the Chinese population. Previous study has also provided the evidence for this issue<sup>37</sup>. In all, that indicates a good internal uniformity. The structural validity was in accordance with hypothetical correlations, which indicated a good overall structural validity.

In summary, we believe that this version of the SF-36 is suitable for its intended purpose to measure health in medical students, although some items that are related to social functions require more revision.

Further research is needed to identify the determinants of the QOL in medical students and improve their QOL in medical universities.

## Conclusion

This study has provided psychometric properties of the SF-36 health survey questionnaire and it can be used to assess the quality of life of Chinese medical students.

## Abbreviations

QOL: Quality of life; SF-36: The 36-Item Short Form Health Survey.

## Acknowledgements

This study was supported by the National Natural Science Foundation of China (Grant Number 71103200 and 30700690) and the Foundation of the Educational Department of Liaoning Province of China (Grant Number L2010577). The authors would like to express their gratitude to the teachers and students from student service office and students union to participate in related field work of this research.

## Conflicts of interest

The authors have no conflicts of interest to declare in relation to this article.

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