Psychometric Performance of Meaning in Life Questionnaire Chinese Version for the Elderly in Guangdong

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Abstract

Objective To analyze the psychometric performance of Meaning in Life Questionnaire Chinese Version (C-MLQ) for the elderly in Guangdong Province, China.

Methods A stratified random sampling was used to select 1109 old people from 5 cities in Guangdong province, and C-MLQ was used to investigate them. The floor and ceiling effects were used to analyze the sensitivity of C-MLQ. And then, Cronbach's α coefficient was used to analyze the internal consistency of the questionnaire, and Convergent validity, discriminant validity and factor analysis were used to evaluate its structural validity. Finally, the total score of the Geriatric Depression Scale Short Form (GDS-15) was used as the calibration criterion to verify the simultaneity calibration validity of C-MLQ.

Results The total score and the scores of two dimensions of life meaning experience (LME) and life meaning pursuit (LMP) were governed by the normal distribution, without any floor or celling effect. The Cronbach's α coefficient of the total questionnaire was 0.810, and the Cronbach's α coefficients of LME and LMP were 0.739 and 0.775 respectively, which met with the requirements of the group comparison. The calibration success rates of convergent and discriminant validity of LME and LMP were all 100%. Two components obtained from factor analysis, with a cumulative variance contribution rate of 51.261%, which were basically consistent with the theoretical conception of C-MLQ. The total score of C-MLQ was significantly negatively correlated with the total score of GDS-15 (β=- 0.323, P<0.001), only score of LMP in two dimensions significantly negatively predicted the total score of GDS-15 (β=- 0.345, P<0.001).

Keywords: *Meaning in life; Validity; Reliability; Sensitivity; The elderly*

1. Introduction

There is no consensus on the definition of sense of meaning in life, but the most widely accepted one is Steger's definition, which states that the sense of meaning in life is the degree to which people understand and comprehend the meaning of their lives, as

well as their awareness of the purpose, mission, and primary goals of their lives [1].

The sense of meaning in life is an important experience in life, and its acquisition and maintenance are one of the basic motivations of human beings [2], as well as a relatively comprehensive psychological capital [3]. From an individual perspective, the sense of meaning in life is closely related to positive psychological function [4], and is an important protective factor for individual survival [5], which helps individuals actively cope with and adapt to difficulties in life [6]. People who have long lost the sense of meaning in life cannot meet their psychological needs in real life. They are more likely to achieve "pathological compensation" [7] through excessive use of the Internet or drug dependence, increase the risk of "hollow disease" [8] and depression [5], and reduce the level of psychological well-being [9]. At the social level, the sense of meaning in life helps to rejuvenate an individual's collectivist perspective, enabling them to practice prosocial behavior and promote social harmony and development [10]. In recent years, the research on the sense of meaning in life has gradually increased due to two reasons: first, the rise of positive psychology, and second, the increasingly fierce social competition, which has led to a sharp increase in stress on many people, gradually losing themselves, losing their sense of meaning in life, and resulting in various social issues such as Internet addiction, reckless killing and suicide.

The clarification of content structure and the development of evaluation tools are the focus of research on the sense of meaning in life. There are three theories regarding the dimensions of the sense of meaning in life: two dimensions, three dimensions, and six dimensions. Steger et al. [1] first synthesized and defined the sense of meaning in life from the dimensions of cognition and motivation. He believed that the sense of meaning in life includes the pursuit of meaning at the motivational level and the experience of meaning in life at the cognitive level. The former is the individuals' effort to find the meaning and goals of their lives, while the latter is the reason and purpose for individuals to identify with life and understand their own existence. Martela et al. [11] believe that the sense of meaning in life includes three components: significance, purpose, and coherence. Purpose generally refers to an individual's perception of the core goals or direction of life; Importance refers to an individual's perception of their intrinsic value or importance of existence; Understandability/consistency refers to the ability to understand one's own life and the world around them, and integrate one's life (including past, present, and future) into a coherent whole. Taiwanese scholar He Yingqi [12] divides the sense of meaning in life into six dimensions: the will to seek meaning, the fulfillment of existence, the purpose of life, life control, acceptance of suffering, and acceptance of death. Based on these three structural theories, scholars have developed measurement tools such as the one-dimensional Life Purpose Scale [13] and Consistency Scale [14], two-dimensional Meaning in Life Questionnaire (MLQ) [1], three-dimensional Meaning in Life Scale (MLS) [15], and six-dimensional Personal Meaning Profile (PMP) [12]. From the perspective of connotation structure, He Yingqi's PMP covers the widest range and fully conforms to the theoretical foundation of the sense of meaning in life - the three basic beliefs of freedom of will, will to meaning, and meaning of life in the Theory of Meaning Therapy [16, 17]. Single dimensional scales can reflect one of the three basic beliefs of Meaning Therapy Theory in detail, which well meets certain specific research requirements. However, these two types of scales are limited in their use due to their wide or narrow coverage, outdated content, and lack of sufficient recent reliability and validity report. Relatively speaking, the two-dimensional Meaning in Life Questionnaire (MLQ) [1] and the three-dimensional Meaning in Life Scale (MLS) [15] are more widely used. Among them, the two-dimensional Meaning in Life Questionnaire (MLQ) is most widely used internationally because it largely covers the content of other scales of meaning in life, has a concise structure, and timely updates the reliability and validity data. The application frequency and scope of MLQ in China are increasing day by day, but in the past 14 years, the domestic reliability and validity data of MLQ have not been updated.

2. Objects and Methods

2.1. Objects

2.1.1. Sample size estimation

G* Power 3 is used to calculate the minimum sample size [18], and the prevalence rate of depression among the elderly is adopted to calculate the sample size. Previous studies have shown that the incidence of depression among the elderly in China is 6.50% to 63.50%, with a medium test effect value[19-21], which means d value is 0.50 to 0.80 [22]. In this study, with the effect value d = 0.70, the statistical test power of 1-β=0.80, the type I error probability α= 0.05, and the minimum sample size is calculated as 786. The minimum sample size is determined as 943 due to a 20% of possible follow-up loss rate.

2.1.2. Sampling

A stratified random sampling was used to select 1200 elderly people from 5 cities in Guangdong Province including Shenzhen, Dongguan, Zhuhai, Shanwei, and Heyuan from January 2023 to March 2023. Among them, there are 600 elderly residents in nursing homes and 600 elderly residents at home. Inclusion criteria: Over 60 years old, with normal mental and intellectual health, and elderly residents living in nursing homes for more than six months. Exclusion criteria: Those who are unable to complete the scales due to dementia, severe physical illness, mental disorders, or other reasons. A total of 1149 people actually met, with a visit rate of 95.8%. Eight people (0.6%) were excluded from mental disorders and positively tested for the Mini-Mental State Examination (MMSE). Twenty people (1.7%) found it impossible to answer questions due to severe hearing and visual impairments, as well as 12 (1.1%) reported discomfort and unwillingness to cooperate with the survey. A total of 1109 people completed various surveys, with a survey efficiency of 92.4%. Among them, there are 297 in Dongguan, 330 in Shenzhen, 172 in Zhuhai, 159 in Shanwei, and 151 in Heyuan; 545 elderly residents (290 males and 255 females) in nursing homes, 564 elderly residents (285 males and 279 females) at home; The average age is (68.6 ± 8.92) years old, with 560 people aged 60-70, 472 people aged 70-80, and 77 people aged 80-90; 84 unmarried, 479 widowed, 546 married with surviving spouses; Average education years (9.75 ±3.89), with 133 illiterate, 379 primary school graduates, 327 junior high school graduates, 173 high school or technical secondary school graduates, 49 junior college graduates, 36 undergraduate graduates, and 12 master's or above graduates; 404 people in cities, 394 in towns, and 311 in rural areas; 53 people live alone, 360 live with their spouses, 134 live with their children, 208 live with their spouses and children; 354 people live in nursing homes. The main source of income is as following: 482 retirees, 307 savings, 166 child providers, 98 other family members, 26 subsistence allowances, and 30 commercial insurance.

2.2. Tools

2.2.1. Meaning in Life Questionnaire Chinese Version, C-MLQ

MLQ is Compiled by Steger et al. (2006) [1], and revised by Liu Sisi et al. (2010) [23] into the Chinese version (C-MLQ). It consists of 9 items, divided into two dimensions, namely experience of meaning in life (MLE) and pursuit of meaning in life (MLP). The Likert 7-point scoring method is used to score from 1 to 7 points corresponding to "very disagree" to "very agree". The higher the total score, the more positive the meaning in life.

2.2.2. Geriatric Depression Scale Short Form, GDS-15

GDS-15 is compiled by Burke et al. (1991) [24], revised by Mei JR (1999) [25] into Chinese version, and used for screening depression in the elderly. There are 15 items, including thoughts of low mood, reduced activity, irritability, withdrawal and pain, as well as negative evaluations of the past, present, and future. The 2-level scoring method is used to score from 0 to 1 point corresponding to "no" and "yes". The highest score is 15, generally speaking, 0-7 points indicate normal (without depression), 8-11 points indicate mild depression, and 12-15 points indicate moderate to severe depression. In this study, the Cronbach's α coefficient of the scale is 0.887.

2.2.3. Mini-Mental State Examination, MMSE

Also known as the simplified mental state checklist, MMSE is compiled by Folstein et al. (1975) [26] and revised by Zhang Mingyuan (2003) [27] into the Chinese version, it is mainly used for measuring cognitive function such as orientation, memory, language, computation, and attention. There are 5 items in total, including time and place orientation, language (i.e. retelling, naming, understanding instructions), mental arithmetic, immediate and short-term auditory word memory, and visual structure imitation. The highest total score is 30, with a cutoff value of ≤17 points for the illiterate group, ≤20 points for the primary school group, and ≤ 24 points for the middle school group or above. A score below the cutoff value indicates cognitive impairment. The scale has high reliability, validity, specificity, and sensitivity. In this study, the Cronbach's α coefficient of MMSE is 0.813.

2.2.4. A self-compiled questionnaire on general personal information

It includes 8 items, namely gender, age, the city and area where you reside, marital status, elderly care methods, education level, source of income.

2.3. Collection and organization of data

Before the investigation, the researchers who participated in the survey were given unified training, and the survey process and rating standards were also unified. The consistency test (Kappa=0.81 to 0.90) was conducted to meet the requirements of psychological measurement.

Through the checking way of meeting at home, questionnaires were given out by investigators and the elderly were invited to fill in by themselves. For those who cannot complete the questionnaires alone due to illiteracy or other reasons, investigators would read out the questions in a uniform way and make objective records according to answers.

The questionnaires with answers of more than 50% of the items missing were eliminated. The missing values of the valid questionnaires were estimated and filled with the average values. Two researchers independently input the same data using Epidata3.0 software and conduct a unified logic check so as to ensure the accuracy of the data.

2.4. Data processing

Data was exported from Epidata3.0 to SPSS 20.0 software for statistics and analysis. In the first step, the original scores of 9 items were calculated based on the answers. In the second step, the total score and the average score and standard deviation of each dimension were calculated. In the third step, the Cronbach's α coefficients were used to evaluate the internal consistency reliability. In the fourth step, the convergent and discriminant validity were calculated. In the fifth step, principal component factor analysis was performed on 24 items. Finally, with the total score of GDS-15 as the calibration criterion, the simultaneity calibration validity of C-MLQ was calculated.

3. Results

3.1. The distribution of C-MLQ scores

The ceiling/floor effect is one of the psychological testing effects, which refers to the phenomenon that when the scores of most participants approach or reach the upper/lower limits of the scores when a task or test is too simple/complex, resulting in a decrease in the evaluation and prediction performance of the test [28]. Table 1 shows that the total score of C-MLQ and the scores of the two dimensions tend to be normally distributed because the Skewness coefficients range from 0.191 to 0.423, Kurtosis coefficients range from 0.035 to 0.466, and the absolute values of these coefficients are significantly less than 1. Therefore, there is no floor effect or ceiling effect.

Table 1. Descriptive statistics of C-MLQ (n = 1109)

Dimension	Item number	X±s	Min	Max	P25	P50	P75	Floor[n(%)]	Celling[n(%)]
LME	5	16.98±2.69	10.00	25.00	15.00	17.00	19.00	0(0)	0(0)
LPF	4	13.40±2.43	8.00	20.00	12.00	13.00	15.00	0(0)	0(0)
C-MLQ	9	30.38±4.57	20.00	45.00	27.00	30.00	33.00	0(0)	0(0)

3.2. Internal consistency reliability of C-MLQ

The Cronbach's α coefficient is used to measure the internal consistency reliability of total scale and 2 dimensions. It is generally believed that When the Cronbach's α coefficient is greater than 0.70, the internal consistency reliability is better. As shown in Table 2, the Cronbach's α coefficient of the total scale is 0.810, and those of the two dimensions are 0.739 and 0.775, respectively. There is a moderate correlation between the two dimensions.

Table 2. Cronbach's α coefficients of and correlation coefficient between two dimensions

Dimension	Cronbach's α	1	2
1.LME	.739		
2.LMP	.775	.593[**]	
3.MLQ	.810	.904[***]	.881[*]

[**] $P<0.01$

3.3. Validity of C-MLQ

3.3.1. Convergent and discriminant validity

Convergent validity refers to the degree of similarity in measurement results when using methods to measure the same latent trait (construct), or the fact that indicators for measuring the same latent trait (construct) fall on the same common factor. Divergent validity, also known as discriminant validity, indicates that there should not be too much correlation between measurement results of different concepts [28].

The correlation coefficient (R) between each item and its dimension (factor) is used to represent the convergent validity. Usually, when R ≥ 0.4, it can be considered that the convergent validity is better. The discriminant validity is represented by the correlation coefficients between the item and other dimensions (factors). It is generally believed that if these correlation coefficients are lower than the correlation coefficient between the item and its dimension (factor), the discriminant validity is better [28]. The analysis results show that 100% of correlation coefficients between MLE and its items, 100% of correlation coefficients between MLP and its items are≥ 0.4. The correlation coefficients between 100% of MLE items, and 100% of MLP items with other dimensions are smaller than the correlation coefficient between this item and the dimension it is located in. That is to say, the success rates of the convergent validity calibration of MLE and MLP are 100%, and the success rates of the discriminant validity calibration of MLE and MLP are 100%, too. See Table 3.

Table 3. Convergent and discriminant validity of C-MLQ

Dimension/ number Domain of items		Convergent validity			Discriminant validity		
		range of R	success	success rate(%)	range of R	success	success rate(%)
LME	5	.495 to .721	5/5	100	.131 to .593	5/5	100
LMP	4	.691 to .786	4/4	100	.383 to .463	4/4	100

3.3.2. Construct validity

The KMO value is 0.812, and Bartlett's spherical test value is 2170.639 (df=36), with $P<0.001$. Therefore, the data is suitable for factor analysis. Two principal components are extracted from 9 items based on the eigenvalues greater than 1, with a cumulative contribution rate of 51.261%, which basically reflects the theoretical concept of the original scale. The loadings of two factors are shown in Table 4.

Table 4. principal component analysis of C-MLQ and loadings of each factor (> 0.4)

1st principal component		2nd principal component	
item	factor load	item	factor load
2	.710	1	.638
4	.655	3	.516
7	.429	5	.727
8	.701	6	.635
9	.768		

3.3.3. Simultaneity calibration validity

First, taking the total score of C- MLQ as the predictor variable and the total score of GDS-15 as the dependent variable, linear regression analysis is conducted within a 95% confidence interval. The results show that the total score of C-MLQ significantly negatively predicts that of GDS-15 (β= -0.323, $P<0.001$). Then, taking scores of two dimensions of C-MLQ simultaneously as the predictor variables and the total score of GDS-15 as the dependent variable, linear regression analysis is conducted within a 95% confidence interval. The results show that only MLP significantly negatively predicts the total score of GDS-15 (β= -0.345, $P<0.001$). The results are shown in Table 5.

Table 5. The predictive effects of C-MLQ scores on GDS-15

Step	Dependent variable	Independent variable(s)	B	SE	β	t	P	R^2	R_{adj}^2
1	GDS-15	C-MLQ	-.195	.017	-.323	-11.342	<.001	.104	.103
2	GDS-15	MLP	-0.393	.032	-.345	-12.246	<.001	.119	.119

4. Discussion

This study finds that the reliability and validity of C-MLQ applied to elderly people in Guangdong are good, consistent with the results of previous literature [29-32], indicating that C-MLQ is suitable for evaluating the sense of meaning in life of elderly people in Guangdong Province.

First, the ceiling/floor effect test indicates that the total score of C-MLQ and the scores of two dimensions tend to be normally distributed, with no floor or ceiling effects. It is suggested that the content selection of C-MLQ is reasonable and can reflect the main connotation and hierarchical structure of meaning in life, which can reflect the main concerns and common issues of the majority of elderly people in Guangdong Province about the meaning in life, and there is no content deviating from the measurement purpose. On the other hand, the sampling of this study is scientific and representative, and the statistical methods based on normal distribution is also appropriate.

Second, C-MLQ has good internal consistency reliability, manifested in the Cronbach's α coefficient of the total scale is 0.810, and the Cronbach's αcoefficients of MLE and MLP are 0.739 and 0.775, respectively, which is consistent with the results of previous studies [29-32]. It is suggested that the internal consistency reliability of C-MLQ applied to elderly people with different demographic characteristics such as different regions, education levels, and health conditions is within an acceptable range, and this conclusion can be verified through different statistical methods. However, the Cronbach's α coefficient of total scale and those of two dimensions obtained in this study are all lower than the results of previous studies [29-32], which is likely due to differences in sample composition. The previous studies all used convenient sampling methods to select elderly people from certain communities or groups in a certain city. For example, some studies selected elderly women who are widowed or elderly patients with a serious physical disease. Therefore, the high homogeneity of the objects greatly improved the Cronbach's α Coefficients. Relatively speaking, this group of elderly people was selected by stratified random sampling from Guangdong Province, and can reflect the complex social stratification of the elderly population. It is precisely this complex and diverse social stratification that leads to high heterogeneity among the elderly in this group. They have significant individual differences in economic ability, health status, social contact, social participation, and life content, which results in inconsistent understanding of the meaning in life.

Third, the test results of structural validity including convergent validity, discriminant validity, and principal component analysis indicate that C-MLQ has good psychometric performance.

On one hand, the success rates of calibration of the convergent and discriminant validity of the two dimensions of C-MLQ are all 100%. It can be seen that C-MLQ has good convergent and discriminant validity, and can effectively include test indicators that measure the same latent traits (constructs) on the same common factors, while excluding irrelevant indicators.

On the other hand, the principal component analysis was conducted on C-MLQ, and extracted 2 principal components from 9 items with a cumulative contribution rate of 51.261%, which is consistent with the research results of Liu Sisi [23] and basically reflects the theoretical concept of the original scale. There are various methods for dividing the dimensions of the sense of meaning in life, including single dimensional method [13-14], two-dimensional method [1], three-dimensional method [11], and six dimensional method [12]. The one-dimensional method is considered to only evaluate the experience of meaning in life, while ignoring the pursuit of meaning in life, so its use is greatly limited. Both the three-dimensional and six dimensional methods are extensions of the two-dimensional method. Although they have richer connotations and better reflect contemporary people's concerns about the meaning in life, the scales developed based on the three-dimensional and six dimensional method lack sufficient reliability and validity data. It is especially important that although these scales have added items and dimensions, their structural validity such as the cumulative explanatory variation of dimensions has not been significantly improved. Compared to other scales of meaning in life, C-MLQ has good structural validity, with a cumulative explained variance of 51.261% in both dimensions. Moreover, its structure is concise with fewer entries and dimensions, making it easy to apply. Therefore, this study believes that the two-dimensional method best reflects the structure of the sense of meaning in life in the current cultural context.

Finally, the total score of C-MLQ significantly negatively predicts the total score of GDS-15, but only MLP significantly negatively predicts the total score of GDS-15. This result not only suggests that C-MLQ has good simultaneity calibration validity, but also confirms Steger's viewpoint that the pursuit of meaning in life is a core component of the sense of meaning in life, and its effectiveness determines the experience of meaning in life, which also greatly affects an individual's mental health status.

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