METHODOLOGY

Psychometric Properties Of The Persian Version Of The Memory Impact Questionnaire In Older Adults

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Background and aim: Memory impairment in the elderly has a high prevalence and can affect their performance, interactions and quality of life. A valid and reliable questionnaire is required to investigate the changes in the memory of the elderly. The aim of this study was to investigate the psychometric properties of the Persian version of the Memory Impact Questionnaire (MIQ) in the elderly.

Methods: In this methodological study, 361 elderly people (181 people for exploratory factor analysis and 180 people for confirmatory factor analysis) were selected via convenience sampling. This questionnaire was translated based on the World Health Organization's (WHO) guidelines. Construct validities were assessed through exploratory and confirmatory factor analyses. Its reliability was also assessed using Cronbach's alpha coefficient.

Results: In the exploratory factor analysis, three factors of lifestyle restrictions, positive coping, and negative emotion were extracted that were able to explain 54.04% of the total variance of the impact of memory change in the elderly. Confirmatory factor analysis confirmed the goodness of fit of the three-factor model of MIQ (RMSEA: 0.083; GFI: 0.97; NFI: 0.94; IFI: 0.97; PNFI: 0.86; AGFI: 0.75). The reliability of the "lifestyle restrictions", "negative emotion" and "positive coping" factors was found to be 0.89, 0.74, and 0.67, respectively, using Cronbach's alpha coefficient.

Conclusion: The Persian version of the MIQ is simple and practical and has acceptable reliability and validity that can be used to measure memory changes in the Iranian elderly.

Keywords: psychometrics, elderly, memory

Introduction

There are five types of memories in human beings, including procedural memory, perceptual representation systems, semantic memory, working memory and episodic memory that refer to motor task performance, rapid identification of previous stimuli, general knowledge, ability to hold and manipulate information in mind and recall personal events and experiences, respectively.[1–8] Memory changes are well known in old age, whether in research and/or in popular culture, and aging has major effects on different types of memory.[9]

Subjective memory complaints (SMCS) are perceived experiences of everyday forgetting, which is a common phenomenon in young, middle-aged and elderly people.[10] SMC has a high prevalence among healthy elderly people, so that between 27% and 43% of elderly people suffer from memory problems.[11] SMC is highly prevalent among the healthy elderly population. Several studies have reported different results in this regard so that in the study of Tobiansky et al (1995), 27% of the elderly and in the study of Jonker et al (1996) 34% of healthy elderly without

depression had memory problems.[12,13] These problems increase with age so that the rate of memory problems was reported to be 47% in the elderly between 65 and 74 years and 88% among the elderly over 85 years old.[14] Memory errors also occur in the daily lives of healthy older adults. Healthy elderly are often experiencing a memory error in the field of verbal domain (such as the tip-of-the-tongue phenomenon, forgetting the names and recently learned information).[15] Other memory error is associated with forgetting what they have read recently or where they put their belongings.[16,17]

Given that memory problems are criteria for recognizing dementia, physicians and other health care providers are suspected of dementia based on mental impairment in patients.[18] The relationship between cognitive impairment and SMC has always been controversial. Some studies have also pointed to the direct relationship between SMC and cognitive impairment and the incidence of dementia.[19,20] Some other researchers believe that memory problems occur before the onset of dementia,[21,22] and some also consider the SMC as the main symptom of mild cognitive problems.[23] These disagreements show the importance of measuring SMC more than ever before.

Memory problems affect the daily performance (purchasing, financial management) and behavior and are associated with the health-related quality of life of the elderly.[24] In sum, it can be said that the memory problems affect emotions and views, social interactions and relationships, work and recreational activities of the elderly.[11] Identifying and early detection of memory problems allows us to slow down the progression of these neurodegenerative diseases through specific interventions. SMC can be measured by two methods of asking questions directly from a person and providing a questionnaire for response. These two methods of measurement, although not the same, are correlated.[25] Most studies use only one question to assess SMC (Do you have a memory problem?).[26] Also, some studies have shown that direct evaluation of memory problems is reliable by asking one question and it can identify neurodegenerative diseases.[27,28]

Reid and MacLullich (2006) reviewed 21 SMC studies. They found that in 40% of these studies, the SMC was evaluated only by asking one question about a memory complaint with a yes/no response (18).[3] Considering the problem of measuring the memory changes in the elderly due to the lack of appropriate measuring instruments, the primary objective of this study is to examine the psychometric properties of the Persian version of the Memory Impact Questionnaire (MIQ) in the elderly.

Methods
Design And Setting
The present study is a methodological and cross-sectional descriptive study that was carried out in Sanandaj, west of Iran, in 2018–2019. The sample size is estimated based on the number of items in the tool. The minimum sample size required to conduct exploratory analysis is 3 to 10 samples per item;[29] so, we chose 181 participants.

Characteristics Of Participants
In this study, 250 elderly people were selected in public places such as parks, cinemas, mosques, public stores and local markets via convenience sampling. The inclusion criteria were age over 60 and having at least reading and writing skills and the desire to complete the questionnaire. 69 questionnaires were excluded due to incompleteness. Finally, 181 completed questionnaires were analyzed.

Research Tool
The MIQ was designed by Shaikh et al (2018) and tested on the elderly. This questionnaire has 51 items with 5-point Likert responses (0 Disagree; 1 somewhat agree; 2 neither agree nor disagree; 3 somewhat agree; 4 agree). The main questionnaire has three subscales of Lifestyle Restriction (19 items), Positive Coping (19 items) and Negative Emotion (13 items). Scores of three subscales of lifestyle restriction, positive coping and negative emotion are 0 to 76, 0 to 76 and 0 to 52, respectively. Higher scores mean more effects of memory changes.[11] The average factor loading of these three dimensions was 0.57, 0.53 and 0.68, respectively. These dimensions had a total eigenvalue of 18.4, 8.3 and 3.7, respectively, which explained 2.24%, 10.9% and 4.9% of the total variance. The internal consistency of these three dimensions was 0.91, 0.87 and 0.93, respectively, and the internal consistency of the whole tool was 0.83.[11]

Translation Process
After obtaining permission from the original designer, according to the WHO guidelines and using the Forward & Backward method, the questionnaire was translated from English into Persian and then translated back into English.[30] Finally, one person coordinates Persian and English versions together and provided the final Persian

version. Finally, the research team matched the Persian and English versions and the final version was prepared.

Face And Content Validities

To evaluate the psychometric properties of the MIQ, face, content and construct validity were used. The face validity was done qualitatively. At this stage, 10 elderly patients were selected and asked to read the questionnaire carefully and give us their opinion about the appearance of questionnaire items. Content validity was assessed by both qualitative and quantitative methods. In the qualitative content validity, the final Persian version of the questionnaire was sent to 10 experts who were selected purposefully and asked them to check the content of the questionnaire in terms of Persian grammar, the use of appropriate words and the proper placement of phrases. Content validity index (CVI) was used to check content validity by a quantitative approach. We sent the questionnaire to 15 specialists who are expert in the field of memory changes and aging in order to assess the cultural relevancy of the questionnaire items and select one of the options of 1 (not relevant), 2 (requires review), 3 (it is relevant but requires partial review), 4 (it is quite relevant) for each item. To calculate the CVI score for each item, the total number of specialists who gave each item a score of 3 and 4 divided by the total number of specialists. CVI score of higher than 0.79 is considered appropriate and if it is between 0.70 and 0.79 needed to be re-checked and revised. Items that score below 0.70 are also eliminated.[31]

Data Analysis

Data analysis was done with SPSS version 18 and Lisrel software version 8.8. In order to determine the internal consistency of the MIQ questionnaire, Cronbach's alpha coefficient was used. To assess corrected item-total correlations, interitem correlations and Cronbach's alpha-if item-deleted, we performed item analysis. The corrected item-total correlations and interitem correlations 0.3 to 0.7 are satisfactory.[32] Also, the Cronbach's alpha coefficient 0.7 to 0.9 indicates appropriate reliability.[33] To evaluate the initial reliability and to determine which items affect the reliability, the item analysis was performed. For this purpose, MIQ was distributed among 30 elderly people who were selected by convenience sampling.

To investigate the construct validity, exploratory factor analysis (EFA) was used to extract latent factors. At this stage, the latent factors were extracted and the Kaiser Meyer Alkin Index (KMO) and the Bartlett test were

calculated.[29] KMO values ranging from 0.70 to 0.80 and from 0.80 to 0.90 were considered good and excellent, respectively.[34,35] We extracted the latent factors by maximum likelihood using promax rotation (assuming that the factors are dependent) and the scree plot. The minimum factorial load of 0.3 was considered.[36] It is recommended that the sample size used for confirmatory factor analysis is not less than 200 people,[29] so 200 new samples of elderly people were selected from the public places via convenience sampling. Twenty incomplete questionnaires were excluded from the analysis and confirmatory factor analyses were performed on another 180 questionnaires.

At this stage, extracted factors with confirmatory factor analysis common model fit indices, such as goodness of fit, root mean of squares of approximation, comparative index of fitness, standardized normal goodness index and goodness index of adjusted fit, were assessed. The threshold for acceptance of the fitting indicators of the model is given in Table 1.[37]

Ethical Consideration

The present article was extracted from a research project at Kurdistan University of Medical Sciences (IR.MUK. REC.1397/160). Before being included in the study, the participants were informed about the study objectives, and their verbal consents (this is accepted and approved by the Ethics Committee of Kurdistan University of Medical Sciences) were obtained. In addition, they were reassured that their personal information remained completely confidential. We already contacted Oxford University Press

Table 1 Acceptable Thresholds Of The Fit Indices In The Confirmatory Factor Analysis Model

Fit Indices	Acceptable Rate
(Chi-squared P-value) $\chi2$ P-value	>0.05
Root mean square error of approximation (RMSEA)	Good <0.05
Comparative fit index (CFI)	>0.9
Normed fit index (NFI)	>0.9
Parsimony normed fit index (PNFI)	>0. 5
Incremental fit index (IFI)	>0.8
Minimum discrepancy function by degrees of freedom divided (CMIN/DF)	Good <3, acceptable <5
Adjusted goodness of fit index (AGFI)	>0.5

and asked them for their permission, also I already had got permission for the scale designer (Dr Sheikh). We filled out an online form as their request and are waiting for their response. So, we are in the process of getting their permission.

Results

The elderly participated in the study including 66 males and 115 females with an average age of 68.88 ± 7.09 years, with a range of 60 to 94 years old. Most of the elderly were housewives and retirees (75.7%) and married (63.5%) and had high school education level (40.9%). Nearly half of them (44.8%) had a monthly income of 10 to 20 million rials, and 39.2% of them were completely dissatisfied with their income. The qualitative face and content validities were confirmed and applied after reviewing the views of the elderly and qualified specialists. The demographic characteristics of the two selected samples are presented in Table 2.

Initially, confirmatory factor analysis was performed that the model did not fit and the fit indices were not optimal. Thus, we conducted exploratory factor analysis.

The KMO indicated sampling adequacy (KMO=0.86). Bartlett's test of sphericity was statistically significant (X^2=1062.6, df =78, P=0.001). Initial exploratory analysis with likelihood maximum and PCA showed that the variety of factors is high. Some items were not included in any factor. Therefore, we performed item analysis after calculating the internal consistency, and we eliminated items that had a very low correlation (less than 0.20) with the total score and the score of the other items (items 5, 15,

21, 24, 38, 40 and 43). Factor analysis was performed again. The results showed that 10 items (47, 45, 27, 6, 31, 28, 38, 2, 18 and 8) were not included in any factor; therefore, they were eliminated (8, 18, 2, 38, 28, 31, 6, 27, 45 and 47). Finally, for the third time, factor analysis was performed and items 12, 16, 30, 10, 19 and 51 were deleted. In the exploratory factor analysis, three factors were extracted: lifestyle restrictions (items 25, 37, 46, 33, 13, 29, 9, 36, 48, 7, 14, 39, 41, 17, 44 and 1), negative emotion (items 3, 20, 22 and 34) and positive coping (items 4, 8, 11, 26 and 35), respectively, having the eigenvalues of 7.24, 2.21 and 1.65, respectively, and they were able to explain 54.04% of the total variance of the impact of memory change in the elderly (Table 3). Also the correlation between the extracted factors is presented in Table 4.

To confirm the confirmatory factor, the questionnaires were again distributed to 200 elderly people and confirmatory factor analysis was performed on 180 return questionnaires. First, the Chi-square goodness of fit test was performed (X^2=609.91, P=0.01). In order to evaluate the fitting of the model, we examined other indicators, all confirming the fitness fit for the final model: RMSEA: 0.083; CFI: 0.97; NFI: 0.94; IFI: 0.97; PNFI: 0.86; AGFI: 0.75, CMIN/df: 2.24. Overall, the results showed that the confirmatory factor analysis based on the three-factor model derived from the exploratory factor analysis has a relatively good fit with the obtained data (Figure 1).

Reliability was performed with Cronbach's alpha. The Cronbach's alpha coefficient for the whole tool was 0.87. The reliability of the "lifestyle restrictions," "negative emotion" and "positive coping" was, respectively, 0.89, 0.74 and 0.67 using Cronbach's alpha coefficient.

Discussion

This methodological study was conducted to investigate the psychometric properties of the Persian version of the questionnaire assessing the impact of memory changes in older adults. Based on exploratory factor analysis findings and in accordance with the results of Shaikh et al, three factors of lifestyle restrictions, negative emotion and positive coping were extracted. These factors were able to explain 54.04% of the total variance of MIQ in the elderly, which was more than the total variance explained in the original questionnaire (37.4%).[11]

The first factor (lifestyle restrictions) had an eigenvalue of 11.460 and explained 44.396% of the overall variance. In the original version, this factor had an eigenvalue of 18.4%

Table 2 Demographic Characteristics Of Samples

Variable		n	%
Gender	Male	66	36.5
	Female	115	63.5
Educational level	Primary	66	36.5
	High school	74	40.9
	Academic	41	22.6
Job	Employed	44	24.3
	Unemployed	137	75.7
Marital	Married	169	93.4
	Single	12	6.6
Financial satisfaction	High	10	5.5
	Medium	57	31.5
	Low	114	63

Table 3 The Results Of Exploratory Factor Analysis, Extracted Factors, Eigenvalues And Predicted Variance Percentages

Factors	Items	Factor Loading	% Variance	Eigenvalue
Lifestyle restrictions	25- Because of changes in my memory, I try not to be much close to others.	0.69	44.39	7.24
	46- Because of changes in my memory, I less communicate with others, because I am scared to repeat something, forget about their names, or forget details0.	0.65		
	9- Due to changes in my memory, I call contact less with my old friends, because I'm afraid that I have forgotten some details about them.	0.63		
	13- Sometimes others do not involve me in discussions, because of changes in my memory. am	0.62		
	37- Because of changes in my memory, I no longer feel close to my friends and family as before.	0.62		
	33- Because of changes in my memory, I am no longer interested in my favorite entertainment.	0.61		
	36- Sometimes, because of changes in my memory, I do not participate in making decisions.	0.60		
	7- As soon as my memory is diminished, I am less involved with public affairs.	0.59		
	29- Because of changes in my memory, my religious activities have been decreased in mosque.	0.57		
	48- Because of changes in my memory, I spend less time on my favorite entertainments.	0.57		
	14- Due to changes in my memory, I am less likely to participate in my previous favorite activities.	0.57		
	39- Because of changes in my memory, I am less interested in registering in formal training courses.	0.53		
	17- Because of changes in my memory, when I am with others, I do not get involved in what happens.	0.48		
	41- Because of changes in my memory, I can no longer read what I read earlier.	0.47		
	1- Because of changes in my memory, I sometimes feel that I have been left out from previous relationships.	0.47		
	44- Because of changes in my memory, I have no interest in making new friendships.	0.43		
Negative emotion	3- My memory changes make me worried.	0.79	6.51	2.21
	20- Changes in my memory make me feel less self-confident.	0.49		
	22- Sometimes my memory changes make me feel frustrated.	0.45		
	34- Changes in my memory really annoy me.	0.45		
Positive coping	4- Because of changes in my memory, I am interested in learning more about memory.	0.67	3.13	1.65
	35- Because of changes in my memory, I am working hard to play intellectual games.	0.63		
	11- I will register in certain classes to strengthen my memory	0.49		
	8- When I make memory errors, I say to myself: "Next time I can use a new method of reminder."	0.45		
	26- My life has become easier, because of what I do to compensate for changes in my memory.	0.43		

Table 4 The Correlation Of The Three Subscales

| Factors	Lifestyle Restriction	Negative Emotion	Positive Coping	Total
Lifestyle restriction	*	0.56**	0.15*	0.93**
Negative emotion	*	*	0.16*	0.70**
Positive coping	*	*	*	0.44**
Total	*	*	*	*

Notes: *p<0.05; ** p<0.001.

and explained 24.2% of the total variance of MIQ of the elderly. This item has 16 items in the Persian version and 19 items in the original questionnaire. All 16 items in the Persian version were in the original version. This dimension shows

the negative effects of memory changes on social relationships, work and activities. The results of Flöel et al (2008) showed that there was a positive and significant correlation between lifestyle index score with better memory score; this means that with the increase in the score of the lifestyle index, a better memory score was also increased.[38] In the qualitative study of Parikh et al (2015), on the elderly with memory problems, two themes of change in life activities and changes in social relationships and social interactions were extracted that are consistent with this factor.[39]

The second factor (negative emotion) had an eigenvalue of 2.222 which explained 6.512.6% of the overall variance. In the original version, this factor had a special
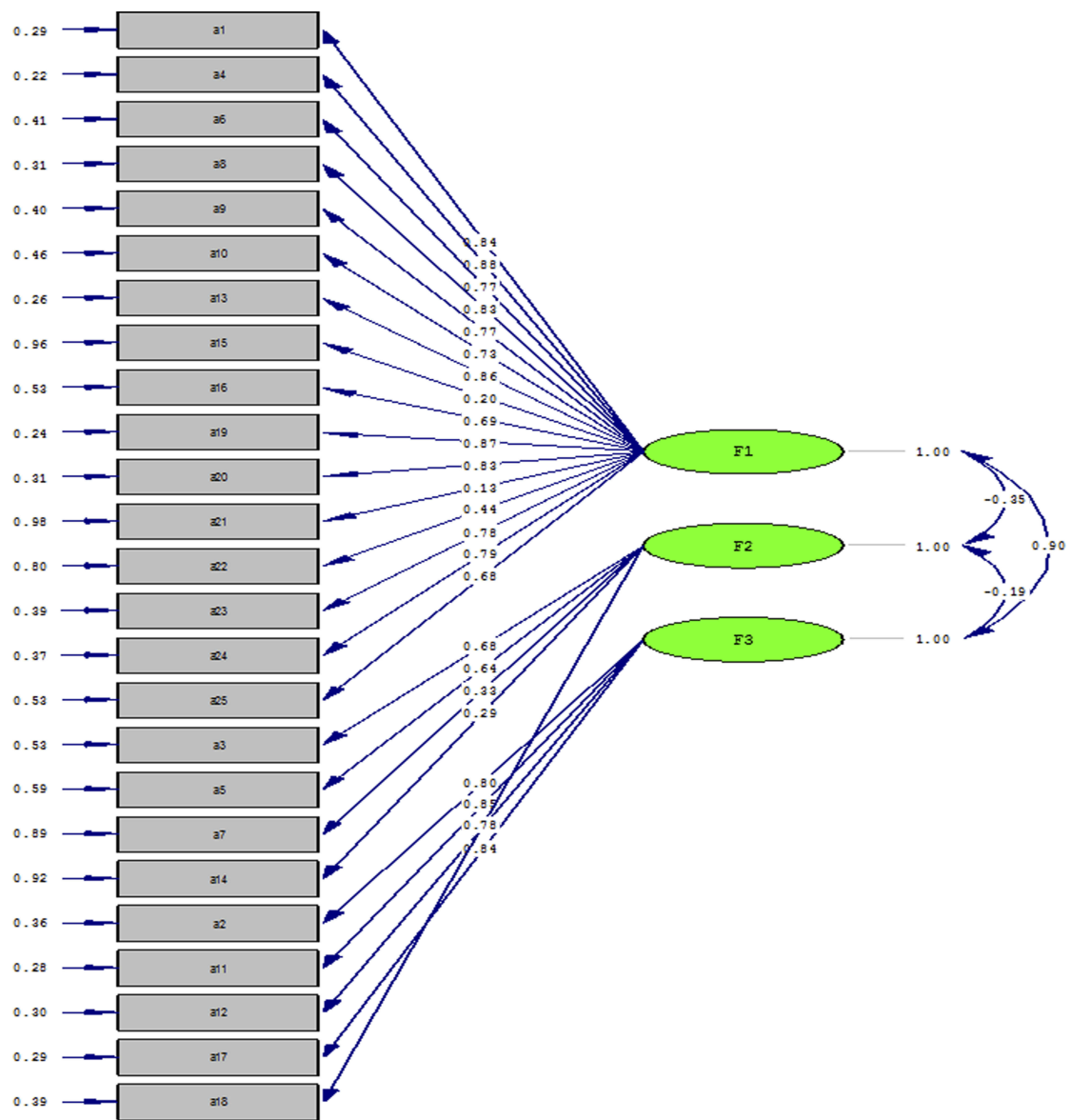
Chi-Square=609.91, df=272, P-value=0.00000, RMSEA=0.083

Figure 1 The final structure of the model.

value of 3.7% and components account for 4.9% of the variance in total scores. In the Persian version, this factor has 4 items and in the original version, it has 13 items. These items refer to negative emotions such as worries, loss of confidence, frustration and harassment that the elderly experiences due to memory changes. The third factor (positive coping) in this study had an eigenvalue of 1.289 and explained 3.136% of the overall variance. In the original version, this dimension had an eigenvalue of 8.3 and explained 10.9% of the total variance of memory impairment. In the Persian version, this factor has five items and in the original version, it has 19 items. All of these five items of the Persian version were in the same dimension of the original version. These items refer to things like the desire to learn about memory, doing mental games, enrolling in memory boost classes, and doing things to compensate for memory impairment.

In a study by Parikh et al (2015), one of the extracted themes was deliberate increases in compensatory behavior that is consistent with this factor.[39]

The Cronbach's alpha coefficient was 0.876 for the whole instrument. It was 0.892 for lifestyle restriction, 0.747 for negative emotions and 0.671 for positive coping. In the main study, Cronbach's alpha coefficient for three subscales was 0.91, 0.87 and 0.93, respectively. When comparing the internal consistency of the Persian version with the original version, it is necessary to note that the number of items in the Persian version is less than the original version. Devellis believes that the Cronbach's alpha coefficient between 0.7 and 0.9 indicates good reliability, which is almost consistent with the internal consistency of our questionnaire subscales.[33]

So far, there has not been a Persian questionnaire for evaluating the elderly's memory change and the existence of such a valid and reliable tool can be very useful in future studies. One of the limitations of this study was that the samples were not randomly selected, so this sample might not be representative of the Iranian elderly community. Given the few studies in this field, it was not possible to report the results of other studies and compare the findings. In general, the Persian version of the MIQ is simple and practical and has acceptable reliability and validity that can be used to measure memory impact changes in the Iranian elderly. Since the number of items in this questionnaire is low, Iranian elderly people who are often low educated or illiterate can more easily complete it.

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