ORIGINAL ARTICLE

Psychometric properties of Persian version of five facets of mindfulness questionnaire

Sajad Khanjani[1], Ali-Akbar Foroughi[2], Meysam Bazani[3], Sahar Rafiee[4], Shima Tamannaeifar[5], Mojtaba Habibi[6,7,8]

[1]Research Center for Behavioral and Cognitive Science in Police, Directorate of Health, Rescue and Treatment, Police Force, Tehran, Iran, [2]Department of Clinical Psychology, Kermanshah University of Medical Sciences, Kermanshah, Iran, [3]Department of Clinical Psychology, Faculty of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran, [4]Ph.D Candidate of Psychology, Department of Psychology, Razi University, Kermanshah, Iran, [5]Department of Psychiatry, Roozbeh Psychiatry Hospital, Tehran University of Medical Sciences, Tehran, Iran, [6]Health Promotion Research Center, Iran University of Medical Sciences, Tehran, Iran, [7]Department of Health Psychology, School of Behavioral Sciences and Mental Health (Tehran Institute of Psychiatry), Iran University of Medical Sciences, Tehran, Iran, [8]Department of Psychology, Norwegian University of Science and Technology, Trondheim, Norway

Background: Many tools have been designed to measure mindfulness. Five Facets of Mindfulness Questionnaire (FFMQ) is one of the most widely used tools. This study was done to investigate psychometric properties FFMQ in Iranian students. **Materials and Methods:** FFMQ was translated into Persian and administered in 571 students of Shahid Beheshti University of Medical Sciences and Tehran University of Medical Science. Samples were selected using convenience sampling method. A battery including Difficulty in Emotion Regulation Scale (DERS), Emotion Regulation Questionnaire (ERQ), Spielberger's Trait Anxiety Questionnaire, and Affect Control Scales was used in studies for examining divergent, convergent, and discriminant validity. Data were analyzed using Cronbach's alpha, test–retest reliability, and confirmatory factor analysis. **Results:** Results of this study supported the five-factor structure of FFMQ (root mean square error of approximation = 0.06, Comparative Fit Index = 0.81 Goodness of Fit Index = 0.91, and Normed Fit Index = 0.87). There was a significantly negative correlation between the FFMQ with DERS, Trait Anxiety, Affect Control, suppression sub-scale of ERQ, and there was a positive correlation with reappraisal subscale of ERQ. The Cronbach's alpha for the FFMQ was. 78. **Conclusion:** FFMQ have good psychometric properties in Iranian student sample, and it can be used in studies on student populations.

Key words: Mindfulness, psychometric properties, reliability, validity

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INTRODUCTION

Mindfulness is awareness of the events and experiences in the present moment and paying attention to them.[1] Over the past years, mindfulness has been widely studied. According to the Black,[2] just in 2012, the number of published researches on mindfulness were 500. Because of increasing importance of mindfulness, many studies have tried to validate this construct. They studied different self-report scales of mindfulness.[2,3] These tools are the Fairburg Mindfulness Questionnaire,[4] the Kentucky Mindfulness Skills Questionnaire,[5] Mindful Attention Awareness Scale,[1] the Cognitive-Affective Mindfulness Scale,[6] and Southampton Mindfulness Questionnaire.[7] However, no consensus has been reached on the conceptualization of mindfulness, and there were differences such as generalizability, content, and structure problems.[8] On the other hand, most of these self-report scales do not measure different dimensions of mindfulness.[9] Thus, Baer *et al*. studied the various items of different instruments that designed to measure mindfulness in a sample of students. The results of this research showed that the mindfulness has five distinct facets, (1) observation, (2) describing, (3)

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Address for correspondence: Dr. Ali-Akbar Foroughi, Department of Clinical Psychology, Kermanshah University of Medical Sciences, Kermanshah, Iran.
E-mail: foroughi_2002@yahoo.com
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acting with awareness, (4) nonjudgment about internal experiences, and (5) nonreactivity.[2]

Recent studies have shown the validity of the Five Facets of Mindfulness Questionnaire (FFMQ) in evaluating mindfulness in various cultural contexts.[3,8,10-17] Several studies have investigated the psychometric properties of FFMQ in Iranian students. In the first study, proper validity and reliability was reported for FFMQ.[18] Another study showed that the FFMQ has six facets in Iranian students.[19] Finally, Tamannaeifar *et al*., also confirmed the five-factor structure of FFMQ and showed fitness in all its indicators. In addition, the coefficient of reliability of subscales was 0.76–0.86.[20]

Although some psychometric studies have been conducted in Iranian population, these studies have limitations include using inappropriate statistical method, failure to test the factor structure of FFMQ,[18] use of inappropriate sampling method, not examining validity, discrepancy between factor structure, and factors of original version of FFMQ.[19,20] On the basis of the international research literature on the FFMQ and initial evidence from prior Iranian studies about FFMQ, the current study aimed to examine the five-factor structure of the Persian version of FFMQ with a sample of Iranian students using by confirmatory factor analysis (CFA). This study provides an additional finding about FFMQ and its construct validity and reliability.

MATERIALS AND METHODS

Participants

This study was done in 2016–2017. The reliability and validity of the FFMQ were evaluated, using a sample of 571 students of Shahid Beheshti University of Medical Sciences (SBMU) and Tehran University of Medical Sciences (TUMS). Subjects were selected for study by multistage cluster sampling and completed the following tools. Ethical code of this study is IR.SBMU.SM.REC.2016.181 that was registered by ethical committee of School of Medicine.

Measures

Five-facet of Mindfulness Questionnaire

The FFMQ is self-report questionnaire with 39 items that was developed by Baer *et al*.[3] This questionnaire evaluates five facets of tendency to be mindful in daily life (i.e., observing, describing, acting with awareness, nonreactivity, and nonjudging). FFMQ is scored on a five-point Likert scale. The internal consistency of the factors was good, and the alpha coefficient for the nonreactivity, description, observation, action with mindfulness, and the nonjudgmental was 0.75, 0.91, 0.83, 0.87, and 0.87, respectively.[3] Furthermore, in a study conducted on the validation and reliability of this questionnaire in Iran, the test–retest correlation coefficients of the FFMQ were between $r = 0.57$ and $r =. 084$ was observed.[18]

Spielberger Trait Anxiety Inventory

The Spielberger state-trait anxiety inventory was developed by Spielberger.[21] for measuring state and trait anxiety. In this research, only trait anxiety subscale has been used. The reliability of Spielberger Trait Anxiety Inventory (STAI) in anxiety trait section was. 90 using Cronbach's alpha. Cronbach's alpha was. 90 in a study on Iranian sample.[22]

Affect Control Scale

This scale measures the level of individuals control on their emotions and includes 42 items with four subscales that measure fear of emotions and attempt to control emotional experiences. Sub-scales include: (1) fear of anxiety, (2) fear of depression, (3) fear of anger, and (4) fear of positive emotions. The internal consistency and retest of Affect Control Scales (ACS) were 0.94, 0.78 for the total scale, and for fear of anger scale, 0.72, 0.73, fear of depression, 0.91, 0.76, fear of anxiety 0.89, 0.77, and fear of positive emotion has been reported 0.84 and 0.64.[23] In Iran, this scale was examined by Dehsah, and Cronbach's alpha for the whole scale was reported 0.84 and for fear of anger 0.53, fear of positive emotion 0.66, fear of depression 0.76, and fear of anxiety 0.64.[24]

Difficulty in Emotion Regulation Scale

This scale consists of 36 items, which are scored based on 5-degree Likert scale. Higher scores suggest more difficulties in emotional regulation.[25] The results of the exploratory factor analysis in the Iranian sample revealed eight factor for this scale, six of which were subordinate to the subscales in Difficulty in Emotion Regulation Scale (DERS), and the other two factors were omitted due to the loading of only one item. Furthermore, the results of the criterion validity of DRES with Beck Depression and Anxiety Inventory indicated that this scale has a positive correlation with depression and anxiety (P <.05).[26]

Emotion Regulation Questionnaire

The Emotion Regulation Questionnaire (ERQ) was developed by Gross and John in 2003 to review and evaluate emotion regulation process strategies. ERQ consists of 10 items that have two subscales of cognitive reappraisal and suppression. Subjects respond to items based on a 7-point Likert scale. Cronbach's alpha coefficient for cognitive reappraisal is 0.79 and for suppression is 0.73 and the reliability of test–retest after 9 months has been reported for the whole scale 0.61.[27] In a study conducted by Hassani[28] on the psychometric properties of the Iranian version of this questionnaire, the results of exploratory and CFA supported

the two-factor model of ERQ (factor loads between 0.32 and 0.67). The reliability of the subscales was satisfactory so that the internal consistency was between 0.81 and 0.91 and the test–retest correlation was high despite a 5-week interval between 0.51 and 0.77.

Procedure

In our translation and preparation of the FFMQ, we took the following steps: (1) Translation of the FFMQ from English into Persian by group of professors in clinical psychology. (2) Backward translation from Persian into English by another two mental health practitioners who were fluent in Persian and English independently. (3) The final translation revised by the first author. (4) A pilot study conducted with a sample of fifty Persian students of SBMU and TUMS to whether the FFMQ was understandable for them. Participants, in the present study, completed the FFMQ, STAI, ACS, DERS, and ERQ.

The ethical approval was obtained from the university's research committee (IR.SBMU.SM.REC.1394.181). The study was advertised at the university campus, and students were invited to participate. They were informed that their participation was voluntary and they could discontinue at any time. Furthermore, participants informed about confidentiality. Subjects were selected by multistage cluster sampling, 25 males and 25 females completed the FFMQ twice with a 4-week interval for test-retest reliability purposes.

Face validity and content validity

The face validity and content validity were assessed by sending FFMQ to five experts in the field of clinical psychology. In the qualitative method of face validity, the experts confirmed that the questions with the facets of questionnaire are appropriate and related and the words also reflect the concept of mindfulness. Accordingly, experts affirmed that FFMQ cover the concept of mindfulness.

Data analyses

Missing data were _5% of the data set (List-wise deletion method was used for Handling the Missing Data). The assumption of normality was checked, and skew was evident in the subscales of the FFMQ but not on the total score. The construct validity of the FFMQ was evaluated using structural equation modeling. The five-factor structures of the FFMQ, as suggested in the original version, were tested with LISREL software version 8.80.[29] The model parameters were calculated using maximum likelihood. The model's fit was examined using multiple indices, including the Chi-square statistic, the Comparative Fit Index (CFI), Normed Fit Index (NFI), Non-NFI (NNFI), root mean square error of approximation (RMSEA), and standardized root mean residual (SRMR). CFI, NFI, and NNFI values >0.90 were judged to indicate acceptable fit, as were RMSEA and SRMR values <0.08.[30,31]

The normal Chi-square should be <3 for an acceptable model.[32] Incremental Fit Index ≥0.95 was indicative of good fitting models.[30] The Goodness of Fit Index (GFI) and adjusted GFI, which adjust for the number of parameters, were estimated, ranging from 0 to 1 with the values of 0.90 or greater indicating a good fitting model.[33]

Internal consistency and test–retest reliability were used to evaluate the reliability of FFMQ. Internal consistency of FFMQ was calculated using Cronbach's alpha. A Cronbach's alpha within 70–95 represents a desirable internal consistency.[34] Test–retest reliability was measured with ICC. An ICC ≥0.70 identifies acceptable reproducibility of a measure.[34] To assess the divergent and convergent validity of the FFMQ, STAI, ACS, DRES, and ERQ were used. Pearson correlation coefficient was calculated between the scores of these measures and the FFMQ. All significant values for two ranges were reported, and a level of 0.05 was considered for all the tests. Data analysis was conducted using the Statistical Package for the Social Sciences Statistics (SPSS (version 24.0)).[35]

RESULTS

Description of the sample

The sample consisted of 571 students (299 male, 52.4% and 272 females, 47.6%) with age range of 18–38 years old with a mean of 22.3 ± 3.53 years old. 255 (44.7%) from the faculty of medicine, 141 (24.7%) from the faculty of dentistry, 30 (5.3%) from the faculty of Pharmacy, 85 (14.8%) from the faculty of par medicine, and 60 (10.5%) from the Faculty of Basic Sciences.

Confirmatory factor analysis

CFA was performed on the covariance matrix of the FFMQ items [Table 1]. The results of the model fit indexes are presented in Table 2. As you can see in the table indexes confirm the suitability of the five-factor model.

Internal consistency

Internal consistency of FFMQ was calculated by Cronbach's alpha coefficient. Cronbach's alpha coefficient for mindful observing, mindful describe, mindful nonjudgment, mindful nonreactivity, mindful act, and total were 0.69, 0.76, 0.76, 0.63, 0.76, and 0.78, respectively, which indicates FFMQ has excellent internal consistency.[34]

Test–retest reliability

Test–retest reliability was calculated for the FFMQ by a sample of 50 students who completed the FFMQ again after

Table 1: Construct validity of Persian version of Five Facets of Mindfulness Questionnaire

FFMQ	Items according to (Baer *et al.*, 2006)	PE
Mindful observing	1. When I'm walking, I deliberately notice the sensations of my body moving	0.47
	6. When I take a shower or bath, I stay alert to the sensations of water on my body	0.61
	11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions	0.51
	15. I pay attention to sensations, such as the wind in my hair or sun on my face	0.82
	20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing	0.64
	26. I notice the smells and aromas of things	0.63
	31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow	0.67
	36. I pay attention to how my emotions affect my thoughts and behavior	0.44
Mindful describe	2. I'm good at finding words to describe my feelings	0.79
	7. I can easily put my beliefs, opinions, and expectations into words	0.74
	12. It's hard for me to find the words to describe what I'm thinking	0.69
	16. I have trouble thinking of the right words to express how I feel about things	0.78
	22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words	0.57
	27. Even when I'm feeling terribly upset, I can find a way to put it into words	0.68
	32. My natural tendency is to put my experiences into words	0.54
	37. I can usually describe how I feel at the moment in considerable detail	0.80
Mindful nonjugement	3. I criticize myself for having irrational or inappropriate emotions	0.51
	10. I tell myself I shouldn't be feeling the way I'm feeling	0.75
	14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way	0.72
	17. I make judgments about whether my thoughts are good or bad	0.32
	25. I tell myself that I shouldn't be thinking the way I'm thinking	0.78
	30. I think some of my emotions are bad or inappropriate and I shouldn't feel them	0.61
	35. When I have distressing thoughts or images, I judge myself as good or bad depending what the thought or image is about	0.30
	39. I disapprove of myself when I have irrational ideas	0.45
Mindful nonreactivity	4. I perceive my feelings and emotions without having to react to them	0.37
	9. I watch my feelings without getting lost in them	0.47
	19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it	0.30
	21. In difficult situations, I can pause without immediately reacting	0.45
	24. When I have distressing thoughts or images, I feel calm soon after	0.58
	29. When I have distressing thoughts or images, I am able just to notice them without reacting	0.60
	33. When I have distressing thoughts or images, I just notice them and let them go	0.58
Mindful act	5. When I do things, my mind wanders off and I'm easily distracted	0.78
	8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted	0.84
	13. I am easily distracted	0.84
	18. I find it difficult to stay focused on what's happening in the present	0.65
	23. It seems I am "running on automatic" without much awareness of what I'm doing	0.60
	28. I rush through activities without being really attentive to them	0.56
	34. I do jobs or tasks automatically without being aware of what I'm doing	0.57
	38. I find myself doing things without paying attention	0.63

FFMQ=Five Facets of Mindfulness Questionnaire

Table 2: Goodness of fit indices for fivefactor model of

Fit indices	χ^2/df	RMSEA	SRMR	IFI	RFI	GFI	NFI	CFI	NNFI
Quantity	2.28	0.06	0.07	0.91	0.90	0.91	0.87	0.81	0.90

χ^2/df=Chi-square/degree freedom; RMSEA=Root mean square error of approximation; SRMR=Standardized root mean residual; IFI=Incremental fit index; RFI=Relative fit index; GFI=Goodness of Fit Index; NFI=Normative Fit Index; CFI=Comparative Fit Index; NNFI=Nonnormed Fit Index

4 weeks. The results showed good test–retest reliability across the FFMQ with significant ICC between Time 1 and Time 2 scores that the range of ICC of FFMQ subscales was between 0.77 and 0.88 and reliability of total FFMQ also was 0.91 [Table 3].

Divergent and convergent validity

To assess the divergent and convergent validity of FFMQ, the ACS, DRES, ERQ (reappraisal and suppression subscales) and Spielberger's trait anxiety were used. Pearson correlation coefficient was calculated between the scores of these tools and FFMQ, and the results are presented in Table 4. As you can see in Table 4, the correlation between FFMQ scores and difficulties in emotion regulation, affect control, trait anxiety, and suppression is negative and significant (indicating high divergence validity) and also was positive and significant with reappraisal strategy (indicating good convergent validity) $P < 0.05$ [Table 4].

Table 3: Internal consistency and testretest reliability

Reliability	FFMQ	Mindful observing	mindful describe	Mindful nonjugement	Mindful nonreactivity	Mindful act
Cronbach's alpha	0.78	0.69	0.76	0.76	0.63	0.78
Testretest (ICC)	0.91	0.81	0.88	0.79	0.77	0.83

FFMQ=Five Facets of Mindfulness Questionnaire; ICC=Intraclass Correlation Coefficient

Table 4: Convergent and divergent validity of Five Facets of Mindfulness Questionnaire

Scale	Difficulty in emotion regulation	Trait anxiety	Affect control	Suppression	Reappraisal
FFMQ	−0.68**	−0.54**	−0.52**	−0.28**	0.11*

**P<0.01, *P<0.05

DISCUSSION

Over the past decades, increasing interest to mindfulness and its application in various therapeutic settings has encouraged. FFMQ is one of the most widely used measures for evaluating the mindfulness. Considering the fact that mindfulness had been embraced in Iran and numerous studies have been carried out in this field. The present study examined the psychometric properties of this tool in Iranian population.

The results of CFA supported the factor structure provided by Baer *et al*.[2] In a number of countries such as Spain,[36] Italy,[17] the Netherlands,[10] Japan,[37] Hong Kong,[38] and Iran,[18,20] the five-factor structure of this questionnaire has been confirmed, and the results of this study are consistent with them. However, in the study of Dehghani *et al*., FFMQ has six factors.[19] In this study, exploratory factor analysis was used, while in most of mentioned studies, CFA method had been used. Perhaps this difference in the statistical methods, it has led to different factors. In general, it seems that the mindfulness is a validated multifacets structure.

Generally, the mindfulness was associated with higher levels of adaptiveness and lower levels of maladaptiveness. Convergent and divergent validity of FFMQ showed that this questionnaire has a negative and significant correlation with the affect control, anxiety, difficulty in emotional regulation, and suppression strategies and has a positive and significant correlation with the reappraisal. These results are in line with previous researches. In the research of Sugiura *et al*., FFMQ was negatively correlated with affect control and alexithymia and positively correlated with acceptance and action scale.[37] The standardization of FFMQ in Italy also showed that the Italian version of this scale had a negative correlation with the difficulties of emotion regulation and suppression and anxiety scale.[17] Previous researches have shown that nonjudgmental awareness facilitate the healthy response to emotions[6] and allows people to experience and express their emotion[39] without having to engage in unhealthy strategies such as experiential avoidance[40] and inhibition of thought[41] or excessive engagement[42] and ruminating[43] with these emotions. It seems that if a person has good relationship with his inner experiences, it will lead to high mental health.[44]

Cronbach's alpha coefficient for the whole scale was 0.78 and for its subscales was from 0.63 to 0.76. These findings are lower than the results for the original version of the questionnaire.[2] Williams and others reported the internal consistency of this questionnaire from 0.77 to 0.93.[45] The Italian version of FFMQ also had a Cronbach's alpha of 0.86 for the whole questionnaire and 0.44 to 0.89 for sub-scales.[17] However, the findings of the current study are more similar to those of the eastern cultures. In Japan, FFMQ obtained 0.80 of coefficient alpha for the whole scale and 0.67 to 0.85 for the five subscales,[37] and in Hong Kong, it was 0.83 for the whole scale and 0.69 to 0.91 for subscales.[38] In three conducted studies in Iran, FFMQ has an internal consistency of 0.79, 0.85, and 0.80, which is consistent with the current research. The lower internal consistency of FFMQ in eastern cultures, especially Iran, can be explained by the importance of cultural factors, which emphasize the need for attention to cultural literature and the selection of appropriate items in designing mindfulness questionnaires.

Overall, results of the current study showed FFMQ has good psychometric properties in Iranian sample.

Limitations

The present study has some limitations that considering them can be useful in future researches. First, the student sample limits the possibility of generalizations, and surveying FFMQ validity can be helpful in clinical samples (for example, GAD and other anxiety disorders) as well as among those with meditation experience. Second, the values of CFI and NFI fit indices were 0.81 and 0.87, respectively, which is an adequate but marginal fitting range (0.80 to 0.89).

CONCLUSION

Overall, the results confirmed the multifacets model of mindfulness provided by Baer *et al*. and showed that the FFMQ is a valid tool for measuring this construct in the Iranian students.

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Conflict of Interest
The authors declares that there is no conflict of interest

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