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Validation of a Chinese Version of the Freiburg Mindfulness Inventory–Short Version

Si-Yi Chen · Ren-Lai Zhou

Abstract The present study aimed to investigate the psychometric properties of the Freiburg Mindfulness Inventory (FMI) in a nonclinical Chinese college student sample. Effective data were collected from 718 students of four distinct universities in north, northwest, southeast, northeast China, and 124 of them were retested after 2 weeks. The Chinese version of Freiburg Mindfulness Inventory (FMI-13) had acceptable internal consistency and test–retest reliability. Confirmatory factor analysis showed that the two-factor solution was better than one-factor solution. The scores of revised FMI-13 had significant negative correlation with the trait of anxiety and depression, and positive correlation with self-esteem, and relations between mindfulness and anxiety, depression, and self-esteem were more due to the *acceptance* factor than the *presence* factor. The Chinese version of FMI-13 has acceptable psychometric quality and it can be used to measure mindfulness in Chinese population.

Keywords Mindfulness · Freiburg Mindfulness Inventory (FMI) · Presence · Acceptance · Reliability · Validity

Introduction

The concept of mindfulness was originally derived from Buddhist psychology, in which mindfulness has been described as an awareness of moment by moment experience arising from purposeful attention, along with a nonjudgmental acceptance of these present-moment experiences (Kabat-Zinn 2003). The concept of mindfulness in modern western society follows the Buddhist tradition. A large amount of research has shown that the enhancement of mindfulness through training (i.e., mindfulness mediation) could reduce psychological symptoms (Baer 2011; Kohls et al 2009a, b; Roemer and Orsillo 2003; Segal et al. 2002; Teasdale et al. 2001) and increase health and well-being (Brown and Ryan 2003; Davidson et al. 2003).

In recent times, there is a growing interest to incorporate mindfulness into interventions in medicine and stress management. A number of different self-report instruments have been developed for the assessment of mindfulness, reflecting the widespread research interest (Sauer et al. 2012a). The Mindful Attention Awareness Scale purports to measure a conceptualization of mindfulness as "the presence or absence of attention to, and awareness of, what is occurring in the present moment" (Brown and Ryan 2003). The Kentucky Inventory of Mindfulness Skills (Baer et al. 2004) measures four distinct components of mindfulness: observing, describing, acting with awareness, and accepting without judgment. The Five-Facet Mindfulness Questionnaire (FFMQ; Baer et al. 2006) taps into five aspects: observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience. The Cognitive and Affective Mindfulness Scale (Feldman et al. 2007) evaluates attention, awareness, present-focus, and acceptance/nonjudgment with respect to thoughts and feelings in daily experience. The Toronto Mindfulness Scale (Lau et al. 2006) measures two concepts related to mindfulness, namely curiosity and decentering, investigating the state of meditation. The Philadelphia Mindfulness Scale (Cardaciotto et al. 2008) is a two-

S.-Y. Chen · R.-L. Zhou (✉)
Beijing Key Lab of Applied Experimental Psychology,
School of Psychology, Beijing Normal University,
Beijing 100875, China
e-mail: rlzhou@bnu.edu.cn

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dimensional measure assessing present-moment awareness and acceptance.

These scales of mindfulness are proved to have acceptable psychometric quality in different samples and we can see the uni-/multidimensional nature of mindfulness in different scales is not consistent. The exploration of the relationships between the existing scales of mindfulness and several measures of psychological constructs showed positive correlations with healthy psychological and behavioral functioning indicators and negative correlations with neuroticism and emotional disturbance measures (Baer et al. 2006; Brown and Ryan 2003; Govern and Marsch 2001; Lau et al. 2006; Walach et al. 2006). To the best of our knowledge, of all the existing questionnaires, only the FFMQ has been validated in Chinese (Deng et al. 2011).

The Freiburg Mindfulness Inventory (FMI; Buchheld et al. 2001) has been developed qualitatively out of the original Buddhist concept of mindfulness, assessing nonjudgmental present-moment observation and openness to negative experience in meditators. Initial FMI has four interpretable factors and 30 items (Buchheld et al. 2001). Walach et al. (2006) presented a one-dimensional short form (FMI-14), which remains all aspects of the long form and is semantically independent from a Buddhist or meditation context and is applicable to all population groups. Ströhle (2006) claimed a two-factorial solution of the short form. Kohls et al. (2009a, b) also identified two factors (i.e., "*presence*" and "*acceptance*") of the short form and indicated that the negative correlation observed with anxiety and depression is entirely due to the acceptance factor of mindfulness (Kohls et al. 2009a, b). FMI-14 has been validated in different populations and demonstrated to possess good psychometric qualities (Heidenreich et al. 2006; Leigh et al. 2005; Trousselard et al. 2010). Some research has proved that a two-factorial solution with the subfacets "*presence*" and "*acceptance*" provided a better overall fit than the unidimensional solution for the FMI-13 (excluding one particular misfitting item, number 13; Sauer et al. 2011, 2012).

The FMI-14 was chosen for translation because the FMI may capture the essence of mindfulness more adequately for the reason that it is based on Buddhist psychology (Grossman 2008). It is meaningful to revise Chinese version of the scale as Chinese culture has a long history of Buddhist tradition. Although the FMI-14 may be more difficult for nonmeditators as other mindfulness scales, the FMI-14 could also investigate the trait to be mindful in daily life for people with little or no experience of meditation (Walach et al. 2006). Meanwhile, the uni-/multidimensional nature of mindfulness and its relation to other variables require further investigations involving different languages and cultures.

Therefore, the current study aimed to further investigate the psychometric properties of the FMI-14 in Chinese culture. First, a carefully translated version of the FMI was prepared and administered to college students in China. Effective data were collected from four distinct universities in north, northwest, southeast, northeast China, and 124 of them were retested after 2 weeks. Second, we used exploratory factor analysis and confirmatory factor analysis to explore and validate the factor structure of Chinese version of the FMI. Third, we examined the internal consistency and test–retest reliability of the Chinese FMI version. Finally, the correlations between mindfulness and other relevant constructs (i.e., depression, anxiety, and self-esteem) were investigated. We also examined whether the trait of mindfulness was related to the meditative training duration. We expected that mindfulness was negatively correlated with anxiety and depression, but positively correlated with self-esteem and meditative training duration.

Method

Procedure and Participants

The Chinese translation process of the FMI was completed in two steps. Firstly, a committee of two collaborators who were fluent in both Chinese and English revised a first translation of the scale, resolving translation difficulties by consensus. The initial translation (English to Chinese) was followed by the back-translation (Chinese to English) done by one bilingual English native speakers without using the original version. At each stage, two experts in the field of psychological assessments (Chinese and English experts) were asked to examine the translation of each specific item. The final Chinese version of the FMI was included in a set of self-report questionnaires composed of two parts. The first part included questionnaires assessing common sociodemographic data and FMI. The second part was composed of three psychological questionnaires, including the Self-rating Depression Scale, the Trait Subscale of the State-Trait Anxiety Inventory, and the Self-Esteem Scale.

The first pretest of the Chinese version of the FMI, based on a structured interview, was with six undergraduates (three males, three females) from a university in China. They were interviewed to determine the difficulty level of the items, ease of understanding of concepts in the items, any discomfort when responding, and the appropriate length of the instrument. With this information, the instrument was revised and pretested again on a second group of 10 undergraduates (five males, five females). Feedback was solicited on the difficulty level of its items, clarity of written instructions and response alternatives, and the instrument's formatting style. The feedback was used to further revise the instrument.

Participants included 729 undergraduates from the public psychology courses of four distinct universities in north,

northwest, southeast, and northeast China. Participants took part in the study in exchange for credit in their class. All participants filled in the questionnaires in quiet classrooms. 11 undergraduates did not complete the questionnaires. Therefore, we only included data from 718 participants for statistical analyses (295 men, 423 women; *M* age, 21.51 years; SD=2.27). One hundred twenty-four participants were randomly selected to retake the Chinese version of the FMI-14 after 2 weeks. The ethnic breakdown of the sample was 94.7 % Han, 0.4 % Tibetan, 0.1 % Korean, 1 % Hui, 3.2 % Manchu, 0.4 % Mongolian, 0.1 % Xibo, and 0.1 % Zhuang. Of the sample, 24.0 % had meditation-practicing experiences (including vipassana, yoga, tai chi, and zen), among whom 21 participants did not state their meditative training duration. Of the sample, 76.0 % had no meditation experiences.

Measures

The Sociodemographic Information The sociodemographic data included age, ethnicity, gender, and educational level. Subjects were also questioned about the presence (response yes) or not (response no) of meditation practice experience (including vipassana, yoga, tai chi, zen, and qigong) and meditative training duration. All measures reported were part of the study.

The Freiburg Mindfulness Inventory-14 (Walach et al. 2006) The Freiburg Mindfulness Inventory-14 is a short form with 14 items. It constitutes a consistent and reliable scale evaluating several important aspects of mindfulness, which is considered as one-dimensional for practical purposes and is also identified two factors (i.e., "*presence*" and "*acceptance*"; Kohls et al. 2009a, b). Each self-descriptive statement is evaluated using a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). In the present study, the short form was used for measuring mindfulness trait (α (total FMI score)=0.76; α (presence)=0.72, α (acceptance)=0.62).

Self-rating Depression Scale (Zung 1976) The present study used Self-Rating Depression Scale (SDS) to measure subjects' depression feelings. The Chinese version of SDS has well-established validation and reliability (Wang 1993; α= 0.89 in this study). The inventory uses 20 items that a participant rates on a scale from 1 ("almost never") to 4 ("almost always"). Higher score means higher degree of depression.

Trait Subscale of the State-Trait Anxiety Inventory (Spielberger 1983) The STAI has two subscales measuring state and trait anxiety independently. In this study, only the trait scale of the STAI was used. The inventory includes 20 items which adopt a four-level scoring method: 1 means almost never, 4 means almost always. Chinese version of the State-Trait Anxiety Inventory (STAI-T) has well-established validation and reliability (Wang 1993; α=0.90 in this study).

The Self-Esteem Scale (Rosenberg 1965) The Rosenberg Self-Esteem Scale is a self-report questionnaire designed to measure self-esteem. Nine items are rated on a scale from 1 (very strongly disagree) to 4 (very strongly agree). Higher score means higher self-esteem. The Chinese version of the Rosenberg Self-Esteem Scale has been widely used (Wang 1993; α=0.90 in this study).

Statistical Analysis

Prior to conducting data analyses, continuous and noncontinuous variables were examined for their skewness, kurtosis, and missing data. All demographic variables were normally distributed. Continuous variables were not skewed and met the assumptions of normality. We used SPSS 16.0 for the descriptive analysis, reliability, and correlations as well as the exploratory factor analysis. For the confirmatory factor analysis, AMOS 4.0 was used.

Results

Descriptive Statistics

The means of all the 14 items varied between 1.82 (SD=0.79) and 2.80 (SD=0.94). The analysis of item total correlations showed that all the correlations were above 0.3 except for item 13 (r=0.077, p>0.1). Excluding item 13, this scale had relatively high item total correlations of 0.38–0.61, p<0.001. An independent-samples t test was calculated to assess whether the scores obtained by the FMI varied between the high- and low-score groups (27 % of the total sample respectively), men and women, meditation practitioners, and nonmeditation practitioners (Table 1). Significant differences on FMI total, *presence*, and *acceptance* factors were found between the high- and low-score group (ps<0.001). No significant differences were found between the FMI total or two subfactor scores of men and women (ps>0.05), indicating that measured mindfulness levels were independent of gender. Meditation practitioners had significantly higher scores than non meditation practitioners on the FMI total, *presence*, and *acceptance* factors (ps<0.01).

Factor Analysis

Exploratory Factor Analysis An exploratory principal component factor analysis with oblique rotation was applied on the 14 items using the database (n=718). Results revealed that the Kaiser–Meyer–Olkin measure of sampling adequacy (0.84)

Table 1 Scores (standard deviations) of the Chinese FMI version for the nonclinical college student sample (n=718)

Variable		FMI		Presence		Acceptance	
		M (SD)	*t* (*df*)	*M* (SD)	*t* (*df*)	*M* (SD)	*t* (*df*)
Group	High score (n=195) Low score (n=195)	42.08 (3.14) 27.98 (3.08)	*t* (388)= −44.77*	18.88 (2.23) 12.49 (2.53	*t* (388)=−26.48*	23.19 (2.20) 15.50 (2.25)	*t* (388)=−34.14*
Gender	Men (n=295) Women (n=423)	34.44 (5.83) 35.19 (5.89)	*t* (716)=1.68	15.49 (3.19) 15.76 (3.27)	*t* (716)=1.09	18.96 (3.53) 19.43 (3.61)	*t* (716)=1.76
Meditation experience	No (n=546) Yes (n=172)	34.47 (5.68) 36.20 (6.29)	*t* (716)=3.39**	15.41 (3.13) 16.38 (3.47)	*t* (716)=3.45**	19.06 (3.53) 19.81 (3.69)	*t* (716)=2.53**

*p<0.001, **p<0.01

and the Bartlett test of sphericity statistic (X^2=1,918.52, *df*= 91, p< 0.001) were suitable for the factor analysis. The results suggested a three-factor solution with 47.43 % explanation of variance. The first factor had an eigenvalue of 3.80 and explained 27.17 % of the variance. Subsequent two factors had eigenvalues of 1.67 and 1.16, explaining 11.95 and 8.31 % of the variance, respectively. Items 4, 9, 11, 12, and 14 had rotated loadings of 0.46–0.78 on the first factor. And items 1, 2, 3, 5, 7, and 10 had rotated loadings of 0.59–0.75 on the second factor. As Kohls et al. (2009a, b) presented, a model consisting of two subfactors, *presence* (items 1, 2, 3, 5, 7, and 10) and *acceptance* (items 4, 6, 8, 9, 11, 12, 13, and14), in the analysis the first factor can be labeled "*acceptance*", embracing an emotionally neutral, nonjudgmental stance, and the second factor can be labeled "*presence*", describing the present moment attention (Kohls et al. 2009a, b; Sauer et al. 2011). Items 6, 8, and 13 had rotated loadings of 0.43–0.69 on the third factor. All of the items had loadings less than 0.4 on the other factor except for item 8, which also loaded on the first factor. These results replicate prior findings in part (Kohls et al. 2009a, b; Sauer et al. 2011, 2012a, b; Ströhle 2006). But items 6, 8, and 13 did not duplicate one of the depicted subfactors (*acceptance* or *presence*) in the two-factor alternative solution.

Confirmatory Factor Analysis Confirmatory Factor Analysis (CFA) was used to examine the factor structure of the FMI. Two CFA using maximum likelihood were undertaken: one for the one-factor solution structure (Walach et al. 2006) and an alternative for the two-factor solution structure (Kohls et al. 2009a, b). Model fit was assessed using four indices: chi-square/degree of freedom ratio (CMINI/df), Bentle–Bonett Normed Fit Index (NFI), Incremental Fit Index (IFI), Tucker–Lewis index (TLI), Comparative Fit Index (CFI), and root mean square error of approximation (RMSEA). Criteria for adequate model fit were as follows: NFI, IFI, TLI, and CFI ≥0.90, CMINI/*df*≤3, and RMSEA≤0.08 (Bollen 1989; Medsker et al. 1994). The results are shown in Table 2. Both the one- and two-factor solutions yielded good fit indices for IFI, CFI, and RMSEA. But, indices for CMINI/*df* for the one-factor model were slightly above 3, and indices for NFI and TLI for the one-factor model were slightly below 0.90. All items loaded >0.4 onto the single factor for the one factor solution except items 6 and 13. For the two-factor solution, all items loaded >0.4, except items 6 and 13 (subfactor *acceptance*). As can be derived from the results, a two-factorial solution with the subfacets "*presence*" and "*acceptance*" provided better fit indices than the unidimensional solution.

Reliability

Internal consistency coefficients (Cronbach's alphas) were computed to estimate reliability. Total FMI score (α=0.76) and the two subfactor scores (α (*presence*)=0.72; α (*acceptance*)=0.62) all evidenced acceptable to good reliability. As item 13 did not appear to contribute significantly to internal consistency, when item 13 was deleted, total FMI score (α=0.80) and *acceptance* score (α (*acceptance*)= 0.71) greatly improved the reliability. The temporal stability of the scale over a period of 2 weeks was examined in a sub sample of the participants with 61 males and 63 females average aged 21.73 (SD=2.33). The coefficient for the total scale was 0.67 (p<0.001), 0.50 (p<0.001) for the *presence*, and 0.62 (p<0.001) for the *acceptance*, indicating an acceptable reliability for this Chinese version.

Correlations were computed between the one- and the two-dimensional (*presence* and *acceptance*) Chinese FMI solutions. Results showed positive correlations between the FMI one-dimensional solution and the FMI subfactor *presence* and *acceptance* (r=0.80, p<0.001 and r=0.89, p<0.001, respectively). The subfactor *presence* was positively correlated to the subfactor *acceptance* (r=0.43, p<0.001).

Correlations with Other Constructs

FMI-13 (FMI-14 without item 13) was used in this analysis. Correlations and partial correlations between the one-/two-dimensional FMI solutions and related measures were

Table 2 Goodness-of-fit indices for the Chinese version of the FMI

Model	CMINI/*df*	NFI	IFI	TLI	CFI	RMSEA
One factor	205.110/61=3.36	0.894	0.923	0.883	0.922	0.057
Two factors	135.011/59=2.28	0.940	0.959	0.936	0.959	0.042

computed to explore the relationships between FMI scores (including subfactor scores) and the psychological symptoms, as well as meditative training duration (Table 3). The results suggested that FMI score, *presence*, and *acceptance* scores exhibited significant negative correlation with STAI-T and SDS, significant positive correlation with self-esteem. Partial correlations indicated that after controlling for *presence* or *acceptance*, the significant correlations were shown to remain significant, except the correlation between the FMI subfactor *presence* and self-esteem after controlling for *acceptance* (Table 3). Meditative training duration seemed to be only positively correlated with factor *acceptance* and total FMI score.

Discussion

The present study assessed the psychometric properties of a Chinese translation of the 14-item FMI in a Chinese college student sample and explored the relationships between mindfulness and other related psychological constructs. The alpha coefficients of the FMI demonstrated acceptable internal consistency. But the internal consistency showed a borderline value. We found that item 13 did not appear to contribute significantly to internal consistency. If item 13 was deleted, the FMI showed better internal consistency for both total FMI score and *acceptance* score, and closely comparable to results of the original short version. The item 13 concerns the ability to confront impatience. Several studies claimed that item 13 threatens the reliability and validity of the FMI (Sauer et al. 2011, 2012a, b; Trousselard et al. 2010) and suggested that this item should be deleted or replaced (Sauer et al. 2011, 2012). One plausible argument for the "misbehavior" of item 13 is that it is the only item of the scale which is coded negatively (e.g., towards "mindlessness") and it is also placed at the end of the scale (Sauer et al. 2011). Likely, that is one reason were problems stem from.

Test–retest coefficients indicated acceptable test–retest reliability and thus the temporal reliability of the scale was confirmed. Results showed positive correlations between the FMI one-dimensional solution and the FMI subfactor *presence* and *acceptance*. The subfactor *presence* was positively correlated to the subfactor *acceptance*. Measured mindfulness levels were independent of gender, but varied according to the meditation experiences. Meditation practitioners had significantly higher scores than nonmeditation practitioners on the total FMI, *presence*, and *acceptance* factors. The difference may reflect the validity to measure mindfulness trait using the FMI, but it may also result from their different comprehensions of the items of the FMI. Belzer et al. (2013) recently demonstrated that an adequate comprehension may depend on one's mindfulness experience and there is insufficient construct validity to use the current FMI in mindfulness-naïve samples, which challenged the view by Walach et al. (2006) that FMI-14 could measure mindfulness for people with no experience of meditation.

Exploratory factor analyses yielded a reduced three-factor solution, and items 6, 8, and 13 did not duplicate one of the depicted subfactors (*acceptance* or *presence*) in the two-factor alternative solution. The results of confirmatory factor analysis in our study provided support for the two-factor structure in a Chinese college student sample. All indices showed that the two-factor structure solution was

Table 3 Pearson's correlation coefficients between FMI (one- and two-dimensional: subscales *presence* and *acceptance*) and the selected psychological constructs and meditative training duration

Scales and subscales	STAI-T	SDS	Self-esteem	Meditative training duration
FMI *total*	−0.43*	−0.34*	0.26*	0.18**
FMI *presence*	−0.33*	−0.25*	0.19***	0.14
FMI *presence* (controlled by the subfactor *acceptance*)[a]	−0.22***	−0.19**	0.09	0.06
FMI *acceptance*	−0.40*	−0.32*	0.26*	0.17*
FMI *acceptance* (controlled by the subfactor *presence*)[b]	−0.34*	−0.22***	0.17**	0.12

*$p<0.001$, **$p<0.05$, ***$p<0.01$

[a] Partial correlations between FMI *presence* and the selected psychological constructs with controlling for the subfactor *acceptance*

[b] Partial correlations between FMI *acceptance* and the selected psychological constructs with controlling for the subfactor *presence*

better than the single factor structure solution and yielded good fit. All items had high factor loadings on the factor *presence* and *acceptance*, except for items 6 and 13. The *presence* facet substantially accords with the definition of Brown and Ryan (2004) that mindfulness consists of a single factor described as attention to and awareness of what is taking place in the present. The items allocated to the *acceptance* facet encompass a non-evaluative, open, and curious attitude towards consciousness content (Sauer et al. 2012b). Kolhs et al. (2009a, b) investigated the structure of FMI and demonstrated that while a one-dimensional approach was statistically valid and more practical for most purposes, it was conceptually more stringent to distinguish a component of presence from acceptance. Sauer et al. (2012a) reviewed commonly used measurement approaches of mindfulness and held that conceptual consensus may be emerging suggesting that mindfulness is not unidimensional but may actually consist of two inter-related facets, present-moment attention and acceptance to the experience. Sauer et al. (2012b) performed a Rasch model analysis of the psychometric properties of the FMI-14 and also found that a two-factorial solution provided a better overall fit than the unidimensional solution.

In addition, regarding the items that did not replicate prior findings, there may be possible differences between the English and the Chinese version. Item 6 describes seeing mistakes and difficulties without judging them, but Chinese people may think it is not appropriate to treat mistakes without personal judging and evaluation, which will make things worse; thus ignoring that it mainly assesses whether keeping an emotionally neutral, non-judgmental stance when facing mistakes and difficulties. Item 8 simply describes accepting unpleasant experiences, and people may have different judgment rules according to their specific or common experiences.

FMI-13 (FMI-14 without item 13) was used in the correlation analysis. The two-factor solution did not differ from the one-factor solution, except for the correlation between the FMI subfactor *presence* and the meditative training duration. Kohls et al. (2009a, b) observed differences between the one- and the two-factor differences using anxiety and depression scales for investigating the factorial structure and further suggested that individuals who were more mindful experience significantly less depression and anxiety, seems to be mainly due to acceptance. The results of partial correlations in our study also indicated that *acceptance* maybe an important component of mindfulness which likely is the result of the practice of being present, as meditative training duration seemed to be no longer positively related to factor *acceptance* after controlling factor *presence*. Moreover, FMI total, *presence*, and *acceptance* scores all showed significant negative correlations with trait anxiety and depression, significant positive correlation with self-esteem. After controlling for *presence* and *acceptance* factors, respectively, these correlations decreased, but *acceptance* remained larger correlations with trait anxiety, depression, and self-esteem than *presence*. These results indicate that both *acceptance* and *presence* factors may play an important role on the psychological variables such as anxiety, depression, and self-esteem; the *acceptance* factor contributes more to these psychological variables than the *presence* factor.

There is an obvious connection between voluntarily being present and the attitude of acceptance, but it should not be assumed that the two components are inextricably linked. Cardaciotto et al. (2008) argued that one cannot assume that increased present-focused awareness will necessarily occur with an attitude of enhanced acceptance, and conversely that enhancing one's stance of acceptance will necessarily lead to increased awareness. The study by Hayes et al. (1996) indicated that in the absence of an accepting stance, when the awareness was increased on the particular distressing private experiences, the participants would be unwilling to remain in contact with their negative feelings, which referred to as experiential avoidance. Experiential avoidance has been shown to be associated with a range of psychological distress, including posttraumatic symptomology (Plumb et al. 2004), depression, anxiety, and other signs and symptoms of mental ill-health (for a review, see Hayes et al. 2006). Therefore, acceptance in the context of heightened awareness of unpleasant internal or external stimuli may be essential to psychological well-being.

Finally, the results of the present research provided preliminary data regarding the psychometric properties of the Chinese version of the FMI. However, the replication of the present findings in larger samples, and also in meditation practitioners and clinical populations, is warranted. Some items of the Chinese FMI version need to be further considered and revised by avoiding misunderstanding of the language meaning. On the basis of these promising findings, it can be concluded that the Chinese translation of the FMI-13 has acceptable psychometric properties, and the FMI-13 is recommended to be used to measure mindfulness in Chinese population.

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