

Beliefs about binge eating: The psychometric properties of the Persian version of the eating beliefs questionnaire

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Background: Metacognitive beliefs play an essential role in the maintenance of binge eating behavior. Examining the psychometric properties of tools in societies with different cultures than western societies can help with examining the external validity of those tools. This research aimed at standardization and validation of the Eating Beliefs Questionnaire (EBQ-18) in Iran. **Materials and Methods:** Persian version of the EBQ-18 was produced through forward translation, reconciliation, and back translation. A total of 302 non-WEIRD nonclinical students were selected through convenience sampling method and completed a set of questionnaires, including the EBQ-18, Eating Attitude Test-16 (EAT-16), Difficulties in Emotion Regulation Scale-16 (DERS-16), Weight Efficacy Lifestyle Questionnaire-Short Form (SF), self-esteem scale, and self-compassion scale (SCS) short-form. The construct validity of the EBQ-18 was assessed using confirmatory factor analysis and divergent and convergent validity. Internal consistency and test-retest reliability (2 weeks' interval) were used to evaluate the reliability. Data analysis was performed using LISREL (version 8.8) and SPSS (version 22) softwares. **Results:** EBQ-18 and subscales were found to be valid and reliable measures, with high test-retest reliability and good internal consistency in the nonclinical sample. Cronbach's Alpha coefficient, for the whole of scale, negative beliefs scale, Permissive Beliefs scale, and Positive Beliefs scale were gained. .96, .89, .90, and .94 respectively. Intraclass correlations coefficient, for the whole of scale, negative beliefs scale, Permissive Beliefs scale, and Positive Beliefs scale were gained. .84, .78, .75, and .87, respectively. In terms of convergent validity, EBQ-18 and subscales showed a significant positive correlation with self-report measures of EAT-16 and DERS-16 ($P < 0.01$). EBQ-18 and subscales showed a negative correlation with self-compassion, self-esteem, and eating self-efficacy, thus demonstrated divergent validity with these constructs ($P < 0.01$). The results showed that three factors of negative beliefs, positive beliefs, and permissive beliefs had the goodness of fit indices (root mean square error of approximation = 0.08, normed fit index = 0.97, nonnormed fit index = 0.98, comparative fit index = 0.98, and standardized root mean square residual = 0.04). The results of this study support the EBQ-18 three-factor model. **Conclusion:** These findings indicate that the EBQ-18 is a reliable measure of eating beliefs in the Iranian population. In addition, the study supplements the literature on the cross-cultural validity of this measure.

Key words: Eating, factor analysis, psychometric, self-report

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INTRODUCTION

Eating disorders characterized by perturbation in eating and food-related behaviors as well as a disturbance in experiencing weight and body shape. These disorders comorbid considerable physical and psychological

disorders,^[1] and accompanied with an increased risk of mortality^[2] and suicide,^[3] while imposing immense financial burdens on health-care system.^[4]

The lifelong prevalence of 0.5%–1% for Anorexia Nervosa, 1%–3% percent for Bulimia Nervosa, and

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2%–2.5% for binge eating disorder^[5] has been reported. The prevalence of recurrent binge eating in the general population ranges between 7.2% and 13%, and as reports entail, its outbreaks are increasing over time.^[6] Binge eating is of utmost importance as it is closely linked to obesity,^[7] eating disorders,^[8] and other social, physical, and mental health issues.^[9]

The known disorders that comorbid binge eating are anxiety, chronic pain, depression, substance abuse, diabetes, and obesity.^[10] Recurrent binge eating accompanies low quality of life and damages to social dynamics.^[11] This disorder is a destructive act, which is the main characteristic of binge eating and most eating disorders.^[5] In binge eating disorder and most eating disorders, courses of eating binge are accompanied by feelings of disgust, guilt, marked distress, and low mood.^[5]

In order to clarify the symptoms of eating disorder including binge eating, a number of psychological models have been presented. These models underscore the role of low self-esteem, low distress tolerance, over-evaluation of weight and body shape, and specific ineffective and unhelpful beliefs about binge eating. In order to examine each of factors, several reliable and valid measuring tools have been proposed.^[12]

With regard to the importance of binge eating and its major role in most eating disorders, and due to its destructive mental, physical, social, and financial consequences, an expanded effort in the area of pathological and treatment research to construct valid and reliable instruments seems necessary.^[13] Three instruments on beliefs about eating binge have been introduced which predict the maintenance of binge eating in those afflicted with eating disorders: Eating Disorders Thought Questionnaire (EDTQ), Eating Disorders Core Belief Questionnaire, and Eating Beliefs Questionnaire (EBQ).^[13] Contrary to the importance of metacognitive clarifications on binge eating, neither EDTQ nor EBQ is suitable to investigate the three metacognitive beliefs (positive, negative, and permissive) which maintain binge eating.^[14] EBQ includes the positive and negative metacognitive aspects. However, according to the metacognitive theory^[15] and the cognitive model of Bulimia Nervosa,^[16] the third metacognitive aspect, namely the permissive aspect, is not included.^[14] The 18-item self-report questionnaire on eating beliefs (EBQ-18) entails three subscales (negative beliefs, positive beliefs, and permissive beliefs), where each subscale measures a specific belief about eating that encourages binge eating in those suffering from eating disorders.^[17] EBQ-18 can be implemented to investigate the presence and severity of eating binge, which is linked to cognition in both clinical and nonclinical populations. In order to expand more effective treatments,

it is significant to first have a well understanding of the maintaining factors that underlie binge eating behavior.^[14]

A major proportion of studies on the relation between eating and vulnerability to psychological problems has been carried out in societies with individualistic culture, where the understanding of eating beliefs are presumably different from other communities. The psychometric characteristics and three-factor structure of EBQ-18 have been investigated and confirmed in several studies.^[14,17] Still, investigating the psychometric characteristics of this scale in other societies which comprise different cultural norms and values not only helps with improving the external validity of the instrument^[18] but also facilitate the execution of more studies in those societies. Thus, with regard to the prevalence and consequences of binge eating and the absence of a valid and reliable Persian scale, the present research aimed to investigate the psychometric characteristics of the Persian version of EBQ-18.

MATERIALS AND METHODS

Subjects and methods Sample

The current research design was descriptive cross-sectional (factor analysis). In this study, we included the undergraduate students of the University of Tehran that were studying in the academic year of 2018–2019. The recommended sample size for the confirmatory factor analysis is about 200 samples.^[19] Thus, we recruited 340 nonclinical students through convenience sampling. Thirty-eight students who did not fully complete the questionnaires were excluded. Inclusion criteria: being a student and consenting to research. Exclusion criteria: severe medical illness and substance abuse. To participate in the study, participants must had enough knowledge of the Persian language and accept to complete the self-report measures. They were assured that they could leave the research at any time. Participating in the study was completely anonymous. All individuals were asked to complete a demographic questionnaire and a set of self-report questionnaires.

Ethics

This study was approved by the Ethics Committees of Iran University of Medical Sciences (IR. IUMS. REC 1396.9421521003).

Measures

The Persian version of the eating beliefs questionnaire

The EBQ-18 is an 18-item questionnaire that measures three dimensions of negative, positive, and permissive beliefs about eating and urges to eat in the lack of hunger. Participants rate their agreement based on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). EBQ-18

showed psychometric properties. This questionnaire has been used in both clinical and nonclinical samples.^[14,17]

The comparability of EBQ-18 and the original EBQ-18 has been validated by accurate translation and back-translation procedures. The EBQ-18 was first translated into Persian independently by five PhD in clinical psychology. Afterward, the Persian EBQ-18 was back-translated by an individual bilingual in Persian and English to validate the translation, and the back-translated version was reviewed by another bilingual individual. The final version of Persian EBQ-18 was also compared to the original version by two bilingual clinical psychologists.

Self-compassion scale short form

This scale includes 12 items. Participants need to rate their agreement based on a five-point Likert scale from 1 (nearly never) to 5 (nearly always). This scale measures three bipolar components in 6 subscales, including self-compassion versus self-judgment, mindfulness versus over-identification, and common humanity versus isolation. The short form (SF) self-compassion scale was correlated with its long form ($r = 0.97$), and test-retest reliability was reported as 0.92.^[20] In Iran, the results support the three-factor structure of self-compassion in a nonclinical sample, with Cronbach's alpha of 0.78.^[21]

Self-esteem scale

The Rosenberg self-esteem scale (SES) is a 10-item questionnaire that assesses global self-worth by measuring both negative and positive feelings about the self. Factor analysis indicated a single common factor. Participants rate their agreement based on a four-point scale, from "strongly agree" to "strongly disagree." The scoring of this scale is done directly and reverses. The Rosenberg SES has shown good psychometric properties.^[22,23]

Weight efficacy lifestyle questionnaire-short form

This questionnaire was measure an individual's perceived ability to control weight by resisting eating when confronted with negative emotions, availability of food, social pressure to eat, physical discomfort, and/or positive activities. Weight Efficacy Lifestyle Questionnaire-SF (WEL-SF) is an 8-item self-report scale. Items are graded from 0 (not confident) to 10 (very confident). Therefore, the total score is in the range of 0–80. Higher score indicates higher self-efficacy to control eating behaviors. WEL-SF has good psychometric properties for assessing eating self-efficacy.^[24] The Iranian version of WEL-SF had good psychometric properties.^[25]

Difficulties in Emotion Regulation Scale-16

The DERS-16 contains 16 items, and the scale is originally designed to be a brief measure of global difficulties in emotion regulation. Respondents rated their agreement

based on a five-point Likert scale from 1 (almost never) to 5 (almost always), indicating how much each statement applied to them. The DERS-16 has been shown to have a good internal consistency ($\alpha = 0.92$ – 0.94), good test-retest reliability ($\rho I = 0.85$), and good convergent and discriminant validity. The total score is in the range of 16–80, with higher scores reflecting greater levels of emotion dysregulation.^[26] The Persian version of DERS-16 had excellent psychometric properties.^[27]

Eating attitude test-16

EAT-16 is a shortened version form of the EAT-26. The EAT-16 assesses eating thoughts and behaviors with simple statements. The 16-item EAT contains four factors: self-perception of body shape, dieting, food preoccupation, and awareness of food contents. Respondents rated their agreement based on a six-point Likert scale from "Never" (10) to "Always" (6).^[28] This scoring scheme was used in other research in nonclinical samples.^[28,29] EAT-16 has good psychometric properties.^[28,29]

Missing data were <5% of the data set; thus, list-wise deletion with no imputation of data was used in the present analyses. Removing or retaining the outliers was determined by the comparison of the original mean with the 5% trimmed mean. The assumptions of normality were checked, and skewness was not evident in the subscales and total scale score in the normative group.

Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences Statistics v. 22.0 (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp, Chicago, USA, 2013). Internal consistency, convergent validity, divergent validity, and test-retest reliability of the Persian version of the EBQ-18 were analyzed. Internal consistency was estimated using Cronbach's alpha. An alpha value between 0.70 and 0.95 indicates good internal consistency.^[30] Test-retest reliability was assessed with Pearson correlations and intraclass correlations coefficient (ICC). An intraclass correlation (ICC) ≥ 0.70 identifies acceptable reproducibility of a measure.^[30] Divergent validity and convergent validity were assessed with Pearson correlations. All reported significance values were two-tailed. In all tests, $P \leq 0.05$ was considered statistically significant.

The construct validity of the Eating Beliefs scale was evaluated using structural equation modeling. The three-factor structure of the Eating Beliefs scale, as suggested in the original version, was tested with LISREL software (version 8.8, Jöreskog K, Sörbon D. Lisrel for Windows 8.80. 2006. Scientific Software International: Lincolnwood, IL). The model parameters were estimated using maximum likelihood. Confirmatory factor analysis

indicators are more accurate when the sample is larger than 250.^[31] The evaluation of a model is based on a number of fit indices, which are briefly discussed here. The normal Chi-square should be <3 for an acceptable model.^[32] The root mean square error of approximation (RMSEA) should be <0.08 for acceptable fit, with 0.05 or lower indicating a very good fitting model.^[31] The comparative fit index (CFI) ranges from 0 to 1 with the values of 0.90 or greater indicative of good fitting models.^[19,31]

Normed fit index (NFI) ≥0.90 indicative of good fitting models.^[19] Non-Normed Fit Index (NNFI) or TLI ≥ 0.95 indicative of good fitting models.^[19] The standardized root mean square residual (SRMR) ranges from 0 to 1 and the values of 0.08 or less are desired.^[19,31] Incremental Fit Index ≥0.95 indicative of good fitting models.^[19] 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]

RESULTS

Description of the sample

The present study was conducted on a total of 302 university students, including 169 (56%) male participants with the age range of 19–46 years. Demographical features include marital status: 216 single individual (71.52%) and 86 married individual (28.47%). Educational status: 188 B.Sc. individual (62.25%), 96 MA individual (31.88%), and 18 Ph. D. individual (5.96%). The mean and standard deviation of EBQ-18 and the subscale are shown in Table 1.

Psychometric properties Eating Beliefs Questionnaire-18

Across all 302 individuals, scores on the EBQ-18 total ranged from the minimum score of 18 and maximum score of 87. With regard to the minimum and maximum, only 1.7% of individuals achieved the bottommost possible score, and 0% of individuals achieved the highest possible score of 90. Scores on the EBQ-18 subscales ranged from the bottommost feasible score of 6 (negative scale, 9.6%; permissive scale 6.3%; and positive scale 10.3%) to the highest score of 30 (negative scale, 0.3%; positive scale 2.%; and permissive scale 0.7%).

Internal consistency

Cronbach’s alphas were calculated with the full sample [$n = 302$; Table 2]. EBQ-18 subscales were found to have a good internal consistency. Thus, it meets the Terwee criteria for adequacy for internal consistency.^[30]

Test-retest reliability

Test–retest reliability was calculated for the EBQ-18 and subscales while using a sample of 31 university students

who completed the EBQ-18 a second time after an interval of 2 weeks. An intraclass correlation (ICC) ≥0.70 identifies acceptable reproducibility of a measure.^[30] Results demonstrate high test-retest reliability across the EBQ-18 and all three subscales with significant Pearson’s r and ICC between Time 1 and Time 2 scores (EBQ-18 Total: $R = 0.75$, $ICC = 0.84$, $P < 0.01$; negative beliefs scale: $R = 0.67$, $ICC = 0.78$, $P < 0.01$; Permissive Beliefs scale, $r = 0.71$, $ICC = 0.75$, $P < 0.01$; EBQ-18 Positive Beliefs scale, $r = 0.78$, $ICC = 0.87$, $P < 0.001$) [Table 3].

Convergent and divergent validity of Eating Beliefs Questionnaire-18

The convergent validity of the EBQ-18 was investigated by examining the relationship between EBQ-18 total scores and subscales with scores on self-report measures of EAT-16 and DERS-16. The results demonstrated the expected relationship between the EBQ-18, EAT-16, and DERS-16. Positive and significant correlations were found

Table 1: Mean and standard deviation of eating beliefs questionnaire-18 and the subscale in female and male

Gender	n	Mean	SD
EBQ-18 total score			
Female	133	41.23	16.54
Male	169	45.05	19.00
Negative beliefs			
Female	133	12.75	5.43
Male	169	14.02	6.04
Positive beliefs			
Female	133	14.25	6.51
Male	169	15.27	7.25
Permissive beliefs			
Female	133	14.21	6.06
Male	169	15.74	6.61

EBQ-18=Eating beliefs questionnaire-18; SD=Standard deviation

Table 2: Internal consistency (Cronbach’s alpha coefficients) for the eating beliefs questionnaire-18 score and 3 subscales

	Number of items	Cronbach’s alpha
EBQ-18 total	18	0.96
Negative beliefs	6	0.89
Positive beliefs	6	0.94
Permissive beliefs	6	0.90

EBQ-18=Eating beliefs questionnaire-18

Table 3: Means (standard deviations) and test-retest reliability of the eating beliefs questionnaire-18 and its subscales

	Time 1	Time 2	ICC	P
EBQ-18 total	43.48 (17.10)	43.32 (13.18)	0.84	<0.001
Negative beliefs	13.06 (5.65)	13.90 (4.20)	0.78	<0.001
Positive beliefs	15.00 (6.10)	14.74 (5.27)	0.87	<0.001
Permissive beliefs	15.41 (6.31)	14.67 (4.94)	0.75	<0.001

EBQ-18=Eating beliefs questionnaire-18; ICC=Intra-class correlation coefficient

between the EBQ-18 and its subscales with EAT-16 and DERS-16 ($P < 0.01$) [Table 4].

To evaluate the divergent validity of the EBQ-18, we examined the association between the EBQ-18 and three theoretically less related constructs, including self-compassion and self-esteem and self-efficacy. As expected, we found negative and significant correlations between the EBQ-18 and these three scales ($P < 0.01$) [Table 4].

To assess the construct validity of the EBQ-18 and determine the fit of the factor and subscales structure obtained by Burton et al.,^[14,17] CFA was performed. Based on the results of Eating Beliefs scale, the three-factor model was tested [Table 5]. The results of the fit indices for this model are summarized in Figure 1. As it can be observed, the three factor models fitted the data well. The results indicated a reasonable good fit.

DISCUSSION

People with binge eating disorder have a high prevalence of psychiatric and physical comorbidities. Moreover to psychiatric concerns, binge eating disorder is independently linked with increased risk of physical comorbidities including hypertension, back/neck pain, chronic diabetes, chronic headaches, and other types of chronic pain. The present study aimed to assess the psychometric properties of the Persian version of the EBQ-18 in a nonclinical population of students. The results showed that three factors of negative beliefs, positive beliefs, and permissive beliefs had the goodness of fit indices. These results are also consistent with the examination of the factor structure EBQ-18 with a nonclinical sample.^[14,17] Further, these results are in line with the results of the previous study that found an earlier, two subscale version of the EBQ with nonclinical samples.^[13,34] The normal Chi-square should be < 3 for an acceptable model.^[32] However, in our study, Chi-square/df was greater than 3 (3.79), which show a poor fit of the data to the original model as this test is very sensitive to sample size

and could overestimate the lack of model fit. With increase sample size and a fixed number of degree of freedom, the Chi-square value increases. This indicate to the problem that acceptable models might be rejected.^[35] The assessment of multiple aspects of model fit using fit statistics not biased by the high sample size. We judged that the literature-based four-factor model had an acceptable fit to our data in the CFA based on robust-variance versions of NNFI, SRMR, CFI, and RMSEA, not Chi-square tests.

The EBQ-18 demonstrated high internal consistency, and it is comparable with Burton and Abbott^[14] and Burton et al.^[17] Test-retest reliability over 2 weeks with a sample of 31 university students yielded significant ICC for the EBQ-18 and subscales.

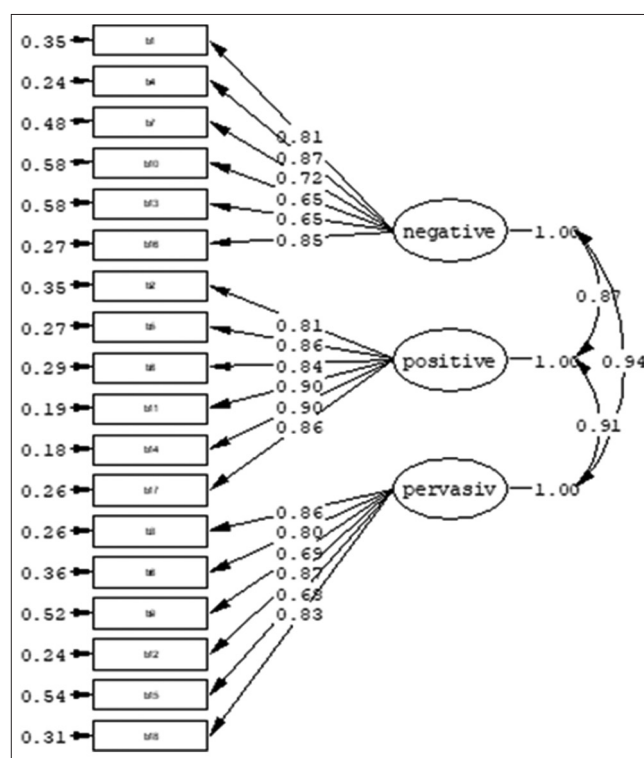


Figure 1: Construct validity of Persian Version of Eating Beliefs Questionnaire-18

Table 4: Convergent and divergent validity of the eating beliefs questionnaire-18

Scale	EBQ-18 total score	Negative beliefs scale	Positive beliefs scale	Permissive beliefs scale
EAT-16	0.58**	0.61**	0.54**	0.49**
DERS-16	0.54**	0.54**	0.50**	0.48**
SCS	-0.62**	-0.61**	-0.56**	-0.60**
SES	-0.56**	-0.55**	-0.48**	-0.54**
WEL-SF	-0.72**	-0.69**	-0.70**	-0.65**

**Correlation is significant at 0.01 level. EBQ-18=Eating beliefs questionnaire-18; EAT-16=Eating attitudes test-16; DERS-16=Difficulties in Emotion Regulation Scale-16; WEL-SF=Weight efficacy and lifestyle questionnaire-short-form; SCS=Self-compassion scale; SES=Self-esteem scale

Table 5: Goodness of fit indices for three-factor model of eating beliefs questionnaire

Fit indices	χ^2	df	P	χ^2/df	RMSEA	IFI	CFI	SRMR	NNFI	NFI	GFI	RFI	AGFI
Quantity	500/69	132	0.001	3/79	0.08	0.98	0.98	0.04	0.98	0.97	0.84	0.97	0.80

RMSEA=Root mean square error of approximation; IFI=Incremental fit index; CFI=Comparative fit index; SRMR=Standardized root mean square residual; NFI=Normed fit index; NNFI=Non-NFI; GFI=Goodness of fit index; AGFI=Adjusted GFI; RFI=Restrictive food intake

The EAT-16 and DERS-16 were used to evaluate convergent validities of EBQ-18. According to the results, it was revealed that the EBQ-18 and subscales had a positive and significant correlation with EAT-16. These results are in consistent with other studies.^[14,17,36-38] The EBQ-18 and subscales had a positive and significant correlation with DERS-16 which have been found in other studies, too.^[39-41] To explaining the result, individual with eating disorders may have some personal vulnerability such as emotional- sensitive reactivity and experience of invalid response, which cause them to apply dysfunctional emotional strategy like rumination and thought suppression in response to negative affect. The results showed that EBQ-18 and subscales had a negative and significant correlation with self-compassion,^[42,43] self-esteem,^[44,45] and eating self-efficacy.^[46,47] To explaining the result, self-efficacy is a significant factor which enable the individual to manage emotions and stressful situation successfully. It also helps to feel more effective and having more positive self-evaluation. Self-compassion can be seen as an emotional strategy in which negative feelings are viewed consciously and creates a sense of shared human experience in the individual.

The results of the CFA supported the application of the three-factor structure in nonclinical college samples. The EBQ-18 and subscales provides a scale for clinicians and researchers to assess the presence of positive, permissive, and negative beliefs about binge eating which can be used to help guide treatment or assess the change in these beliefs over the course of treatment. However, we would like to note that this research has some limitations. First, all scales included in this study were self-report questionnaires. Therefore, correlations may have been inflated by common method variance. Second, eating beliefs were measured by self-report and not verified by an assessment from a mental health professional. Third, the study sample was limited to individuals with certain demographic characteristics: They were all university students and were mostly single, young, well-educated, and male. This may lead to a problem of generalizing the results to the general population. The sample is not sufficiently diverse to be considered as a normative reference in clinical decision-making. In the present study, a short period and small sample size were used for test–retest reliability. Thus, the psychometric properties of the EBQ-18 should be assessed in other communities and related sample groups (such as people with eating disorders). Subsequent research with greater sample sizes and longer period for test–retest reliability can broaden our knowledge of the concept. Future research is required to affirm the validity of EBQ-18 across different populations.

CONCLUSIONS

The Persian version of EBQ-18 showed a good and reliable validity to measure eating beliefs in Iranian population.

In addition, the study supplements the literature on the cross-cultural validity of this measure and therefore, provides more support for the generalizability of the relation of eating beliefs and some previously studied psychopathologies. The results of this paper add to the existing literature on the relevance of eating beliefs that were measured by this questionnaire. It is recommended to use the EBQ-18 in other studies.

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Conflicts of interest

There are no conflicts of interest.

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