Psychometric properties of the reduced version of the Food Cravings Questionnaire-Trait in Farsi

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Abstract

Background: It has been shown that food craving contribute to the development of weight and food-related pathologies. Thus, an accurate measurement of food craving is important for clinical and research purposes.

Aim: We aimed to evaluate the psychometric properties of the reduced version of the Food Craving Questionnaire-Trait (FCQ-T-r), an internationally validated tool, in Farsi.

Methods: For this cross-sectional study, 153 students of the University of Tehran were recruited between February and March 2019. Study measures included demographic characteristics, the Farsi version of FCQ-T-r, food craving questionnaires, Depression, Anxiety and Stress Scale (DASS-21), and the Quality of Life questionnaire (WHOQOL-BREF). Confirmatory factor analysis using *SPSS AMOS* (version 21) failed to support the one-factor structure of FCQ-T-r in Farsi, so we conducted an exploratory factor analysis to investigate the factor structure of the questionnaire.

Results: Exploratory factor analysis found a 3-factor structure: factor 1 “preoccupation with food”, factor 2 “lack of control over eating” and factor 3 “emotional eating” explaining 73.3% of the variance. Internal consistency of the FCQ-T-r was excellent (McDonald’s ω = 0.950). The FCQ-T-r scores were correlated with body mass index, DASS-21, and WHOQOL-BREF values, which supports concurrent validity of the tool.

Conclusion: The Farsi version of FCQ-T-r is a reliable and valid self-administrated tool to measure food craving traits among Iranian university students. Given the unstable factor structure of the questionnaire in different studies, further research to explore the factor structure of the tool is warranted.

Keywords: food craving, self-assessment, psychometrics, Iran

Citation: Vaziri A; Selehi M; Hassani-Abharian P; Shariatirad S; Mahjoub A; Dehjalali RN, et al. Psychometric properties of the reduced version of the Food Cravings Questionnaire-Trait in Farsi. East Mediterr Health J. 2021;xx(x):xxx–xxx. https://doi.org/10.26719/emhj.21.066

Received: 29/01/20; accepted: 16/06/21

Introduction

The rising prevalence of overweight and obesity has been described as a global pandemic (*1,2*). In 2017, high body mass index (BMI) was estimated to cause 4.72 million deaths, and 148 million disability-adjusted life years globally (*3*). Obesity has now become a common health problem and its prevalence continues to increase in both developed and developing countries (*4,5*). Socioeconomic status and demographic factors, such as education, occupation, place of residence, sex, age and marital status have been reported to be associated with excess weight (*6,7*).

Craving is defined as an intense desire, urge or yearning to use a substance, and is an important component of the current conceptualization of addictive disorders (*8,9*). Craving could predict relapse or may negatively affect individuals' decisions for change (*10*). It has been added as a key symptom to the latest edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (*11*). However, the term craving refers not only to substance use but also to impulses to do other addictive behaviours, e.g. gambling, binge-eating, shopping and gaming (*12*).

Food craving is characterized by a strong desire for eating a particular type of food and is associated with higher levels of weight and eating psychopathologies (*13,14*). It has been shown that food cravings could predict a lower success rate for weight-loss interventions (*15,16*). Furthermore, there are interventions designed to positively affect eating behaviours by reducing food craving (*17,18*). These data show food craving is an important construct to understand and develop interventions for weight- and eating-related disorders (*8*).

Several self-reported measures have been developed to assess food craving using a single question or multi-dimensional questionnaires (*19*). Some questionnaires measure craving for special kinds of foods (e.g. sweet, chocolate, savoury and rich foods) or foods in general as a trait, while others assess craving for foods as a state (*13,20–24*).

The food craving questionnaire (FCQ) is one of the most used general food craving measures employed to assess cognitive, physiological, emotional and behavioural dimensions of food craving experience, both as a state and a trait. The trait version of FCQ (FCQ-T) is a 39-item questionnaire having 9 subscales: intentions and plans to consume food, outcome expectancy of positive reinforcement, outcome expectancy of relief from negative states, anticipated lack of overeating control, preoccupation with food, physiological deficits and responses which may elicit craving, emotions experienced during food craving, external and internal cues that trigger cravings, and guilt (*21*).

Nine-factor structures of the FCQ-T have been replicated in several studies (*13,21,25*), however, some studies report fewer factors (*26,27*). The unstable factor structure and the length of the self-report questionnaire have been described as disadvantages of the FCQ-T (*19*). Thus, a reduced version of the FCQ-T (FCQ-T-r) was developed and validated (*23*).

The FCQ-T-r consists of 15 items of the German version of the FCQ-T, with the highest item-total correlations measuring craving trigged by emotional cues, intentions to consume food, and loss of control over eating. It was found to have a one-factor structure, high internal consistency, and acceptable 6-month retest reliability (r = 0.74) in the initial validation studies on large samples of German university students (*23,26*). The one-factor structure of the FCQ-T-r was replicated in some studies (*28,29*). Furthermore, it has been shown that the FCQ-T-r scores are associated with weight and symptoms of eating disorders in a number of studies (*22,23,28–30*).

Given the increasing trend of obesity in the Islamic Republic of Iran (*2,31*) and the lack of screening questionnaires for food cravings in Farsi, this study aimed to measure the psychometric properties of the Farsi version of the FCQ-T-r among Iranian university students.

Methods

Participants

This was a cross-sectional study conducted from February to March 2019 among university students of technical schools at the University of Tehran.

Inclusion criteria were: being a student of the University of Tehran, both sexes, and providing informed consent to participate in the study. The only exclusion criterion was not to provide informed consent or declining to complete study assessments. Participants were 153 university students (50.3% female) of technical majors of the University of Tehran studying at associate (5.2%), bachelor (77.1%), and masters or doctoral (17.6%) levels. The response rate was high, 153 out of 160 students (95.6%) approached agreed to participate in the study. The missing responses on the study measures were very low, ranging from 0% to 2.6%. Missing values were replaced with series means.

Measures

The reduced version of Food Craving Questionnaire-Trait (FCQ-T-r) is a self-administrated questionnaire consisted of 15-items scored using a Likert-type scale (1 = never, 2 = rarely, 3 = sometimes, 4 = usually, 6 = always), for possible total scores ranging from 15 to 90. The FCQ-T-r is available in the English language; this was translated from the original German version by the questionnaire developers (*23*) and has shown good reliability and validity (*22*). It was translated into Farsi by one member of the research team, a bilingual expert in the field of addiction research (SS). The Farsi translation was back-translated to English by another bilingual expert in addiction psychiatry (PHA). The back-translation and the English version were compared, and inconsistencies were resolved through discussions between the developer of the questionnaire (Adrian Meule), the translators and the research team.

The Farsi version of the Orientation towards Chocolate Questionnaire (*32*), measuring participants' attitude towards chocolate during the previous month, and the single-item visual analogue scale assessing the severity of food craving on a range from 0 to 100 were used to test the concurrent validity of FCQ-T-r in Farsi. We also developed a checklist to measure craving in general for highly tempting Persian foods. The Craving for Highly Tempting Persian Foods checklist consisted of 5 items measuring participants' craving for eating 5 Persian foods: kebab with rice, a creamy sweet, *Ghoemeh Sabzi* stew (a traditional Persian stew with fried vegetables and meat), *Fesenjan* stew (a traditional Persian stew with ground walnut, pomegranate sauce and meat) and *Kaleh pacheh* ("head and hooves" a traditional Persian food with sheep's feet and heads, including the coveted eyes, tongue and brain). Each item was scored from 1 to 6 (1: never, 2: rarely, 3: sometimes, 4: usually, 5: mostly, 6: always). The 5 items were selected based on a survey among 53 university students at the University of Tehran using a list of 21 common palatable Iranian foods.

We also used Iranian validated versions of the Depression, Anxiety, Stress Scale (DASS-21) (*33*) and the World Health Organization's Quality of Life Questionnaire (WHOQOL-BREF) (*34*) to test the concurrent validity of the Farsi version of FCQ-T-r. The DASS-21 is a set of 3 self-report scales designed to measure the negative emotional states of depression, anxiety and stress (*35*). The WHOQoL-BREF is an abbreviated version of the WHOQOL-100 quality of life assessment. It is a self-administered tool with 26 questions, and it produces scores for 4 domains related to quality of life: physical health (PH, 7 questions), psychological health (PS, 6 questions), social relationships (SR, 3 questions) and environment health (EH, 8 questions). It also includes one facet on overall quality of life and general health (*36*).

Procedure

Study participants were randomly selected from the list of all students studying in technical schools of the University of Tehran. After giving oral consent to participate in the study, they

were asked to self-rate the questionnaires in a private place. Completion of the study assessments took about 25–30 minutes. To avoid the effect of tiredness on the part of the participants in responding to all questionnaires, we prepared study assessment packages in 4 different random orders. Each participant received one of 4 versions of study measures based on a blocked randomization list in which versions of the study assessments (A, B, C or D) were randomly permuted in blocks of 4. The first 30 participants were invited to complete FCQ-T-r after 3 weeks, to investigate the test–retest reliability of the Farsi version of the questionnaire. Data on height and body weight were gathered through self-report.

The study protocol and questionnaires were approved by the ethics committee of the Vice-Chancellor for Research, Tehran University of Medical Sciences (Approved ID: IR.TUMS.VCR.REC.1398.136).

Data analysis

We used *SPSS*, version 22, for descriptive analysis. Given that the factor structure of the FCQ-T-r has already been proposed to be unidimensional, we conducted confirmatory factor analysis using *SPSS AMOS* (version 21). Adequate sample size to conduct psychometric studies is subject to debate. The ratio of 10 for respondents to the questionnaire items was introduced as a rule of thumb for calculating adequate sample sizes for factor analysis studies (*37*). The FCQ-T-r has 15 items, so the sample size of our study (n = 153) was considered sufficient. Before confirmatory factor analysis, Kaiser–Meyer–Olkin analysis was conducted to measure sampling adequacy. The Kaiser–Meyer–Olkin index of sampling adequacy was 0.906, and Barlett's test of sphericity was statistically significant indicating the suitability of data for factor analysis (χ^2 = 1862.663, P < 0.001).

The single-factor structure failed to meet the recommended criteria for a good fit [χ^2 = 1949.743, P < 0.001, non-normed fit = 0.785, comparative fit index = 0.822, adjusted goodness of fit index = 0.858, root mean square error of approximation = 0.157 (90% confidence interval: 0.142–0.172), Tucker–Lewis index = 0.785, Akaike information criterion = 6841.235]. Therefore, we conducted an exploratory factor analysis to investigate the factor structure of the questionnaire. To check the suitability of data for factor analysis, we used the Kaiser–Meyer–Olkin measure of sampling adequacy and Barlett's test of sphericity. Given the problems with Cronbach's α to assess the internal reliability of the questionnaire (38), we reported McDonald's ω using *JASP* software (version 0.11.1) in addition to Cronbach's α. McDonald's ω provides a more accurate approximation of internal consistency for scales with heterogeneous items (*39*).

We used Pearson correlations between scores at the first and second measurement for the FCQ-T-r to measure test–retest reliability. Pearson's correlation was also used to explore the association between FCQ-T-r and scores on the Orientation towards Chocolate Questionnaire,

the Craving for Highly Tempting Persian Foods checklist, DASS-21, WHOQOL-BREF, visual analogue scale, BMI and weight dissatisfaction.

Results

The mean [standard deviation (SD)] age of participants was 22.07 (SD 3.18), in a range from 18 to 37 years. A history of diet for weight loss was reported by 22.8% of participants. The sex ratio was almost equal (50.3% female and 49.7% male). The FCQ-T-r scores were not significantly different between female (38.38, SD 18.52) and male (37.58, SD 18.52) participants. The mean BMI of participants was 22.85 (SD 3.82; range 17.80–41.50) kg/m^2. Other demographic characteristics and weight- and diet-related data are presented in Table 1.

The range of the factor loadings for the items, their variances and eigenvalues are presented in Table 2. Three components had eigenvalues greater than 1.00 and these explained 73.3% of the variance. The first factor explained a high proportion of the variance (29.2%) and comprised 6 items. This factor was referred to as “thoughts or preoccupation with food”. The second factor explained 23.4% of the variance and comprised 6 items asking questions regarding “lack of control over eating”. The third factor comprised 3 items and explained 20.6% of the variance measuring “emotional eating”. The results of factor analysis with a varimax rotation for the items in the FCQ-T-r are shown in Table 3. The rotated component matrix helps determine what the components represent. It contains estimates of the correlations between each of the variables and the estimated components.

Internal reliability of the FCQ-T-r was excellent with both McDonald’s ω (0.950) and Cronbach’s α (0.949) statistics. Means for FCQ-T-r items, McDonald’s ω and Cronbach’s α for the questionnaire for the item deleted and total-item correlations are presented in Table 4. Total-item correlations were all statistically significant ($P < 0.01$). The FCQ-T-r scores at the second measurement had a significant, strong positive correlation with the first-time measurement ($r = 0.82$, $P < 0.001$), which indicates a high 3-week retest reliability for the questionnaire.

A statistically significant, positive correlation was found between FCQ-T-r scores and body weight ($r = 0.23$, $P = 0.008$), BMI ($r = 0.14$ $P = 0.002$) and age ($r = 0.28$, $P = 0.001$). The FCQ-T-r scores indicated significant, strong, positive correlation with severity of food craving measured by a visual analogue scale ($r = 0.66$, $P < 0.001$), the Craving for Highly Tempting Persian Foods checklist ($r = 0.62$, $P < 0.001$) and the Orientation towards Chocolate questionnaire ($r = 0.59$, $P < 0.001$). The FCQ-T-r scores had a significantly moderate and positive correlation with DASS-21 scores ($r = 0.38$, $P < 0.001$), and showed a significant weak correlation with anxiety sub-scales scores ($r = 0.27$, $P = 0.001$), however a significant, positive and moderate correlation was found between FCQ-T-r scores and depression ($r = 0.32$, $P < 0.001$) and stress ($r = 0.42$, $P < 0.001$). The FCQ-T-r scores showed a significantly and negatively weak correlation with WHOQOL-BREF scores ($r = -0.23$, $P = 0.004$).

The FCQ-T-r scores were positively correlated with number of failed dieting attempts (r = 0.23, P = 0.007) and total number of dieting attempts (r = 0.15, P = 0.05). The correlation between the reported number of successful dieting attempts and FCQ-T-r was not significant (r = –0.10, P = 0.229).

Discussion

In this study, we measured the psychometric properties of the FCQ-T-r (15-items) in Farsi. The FCQ-T-r is a short form of the FCQ-T questionnaire (39-items) which was previously validated in different languages (*19*). The full version of the FCQ-T has previously been validated in Farsi (*40*). The items on the FCQ-T-r ask about cravings for eating and foods in general, which could be the strength of this questionnaire over other questionnaires that have focused on a specific kind of food.

The confirmatory factor analysis did not support a single factor structure, which is consistent with the results of a study reporting psychometric properties of FCQ-T-r in the English language (*22*). In this study, confirmatory factor analysis showed poor fit with one-factor structure, however, parallel analyses and visual inspection of the scree plot for the principal component analysis supported a single-factor model. A study among overweight and obese Iranian women in the Islamic Republic of Iran reported that a 3-factor structure for FCQ-T-r cumulatively explains 63.14% of the variance (*41*). Our results were not consistent with studies in original German (*23*), Italian (*28-29*), Portuguese (*42*), Spanish (*43*) and French (*44*) versions of the questionnaire, which supported a single factor structure. The unstable factor structure of FCQ-T-r in different studies warrants further research to determine the factor structure of the Farsi FCQ-T-r among general and clinical populations.

Our results showed that the Farsi version of FCQ-T-r had excellent internal consistency, which was consistent with the high internal reliability reported in the FCQ-T-r in German (*23*) and other languages (*22,29,42–44*). The FCQ-T-r scores also had a high 3-week retest reliability. This is in line with the finding of high half-year retest reliability (r = 0.74) in the initial validation study assessing food cravings in a large sample of German university students (*45*).

Significant positive correlations of FCQ-T-r scores with body weight, BMI, and food craving questionnaires, DASS-21 and WHOQOL-BREF, support the concurrent validity of the questionnaire. However, the correlations with BMI and body weight were weak. These findings were consistent with international studies reporting significant correlations between FCQ-T-r scores and negative effect and distorted eating (*23,28,43,44*).

To better understand the nature of food addiction, further research on correlations of food craving with weight-related disorders and psychiatric disorders, including, eating, mood, impulse control and substance-related and addictive disorders are suggested.

Our study had some limitations, including small sample size and recruiting young participants with low variability in weight and BMI, which limited the generalizability of our results to the broad population. To increase the generalizability of findings, further studies are needed on larger and more representative samples in terms of age and BMI.

Conclusion

We found that the Farsi version of the FCQ-T-r is a valid and reliable tool to measure trait food craving among university students in the Islamic Republic of Iran. It is an easy-to-use, brief, self-administrated questionnaire that seems to be a viable instrument to investigate food cravings, particularly in time-constrained settings. Further studies are needed to investigate its suitability to use in more diverse populations and clinical samples.

Acknowledgements

The authors would like to warmly thank Adrian Meule, the study participants and the staff of the University of Tehran for their kind collaboration. We would also like to acknowledge the staff of the Students Research Centre of International Campus and Vice-Chancellor for Research, Tehran University of Medical Sciences for their support.

Funding: Students Research Centre of International Campus, Tehran University of Medical Sciences.

Competing interests: None declared.

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Table 1. Demographic characteristics of 153 university students, Tehran 2019

Characteristic	No.	%
Sex		
Female	77	50.3
Male	76	49.7
Marital status		
Single	138	90.2
Married	15	9.8
No. of children		
0	148	96.7
1	4	2.6
2	0	0.0
3	1	0.7
No of pregnancies, female participants (n = 77)		
0	73	94.8
1	3	3.9
2	0	0.0
3	1	1.3
Employment		
Unemployed	145	94.8
Employed	8	5.2
Satisfaction with body weight		
Yes	92	60.1
No	61	39.9
Satisfaction with body shape		
Yes	105	68.6
No	48	31.4
History of dieting		
Yes	35	22.8
No	118	77.2
	Mean	**SD**
Age	22.07	3.18
Height (cm)	172.30	9.24
Body weight (kg)	67.76	14.16
Body mass index (kg/m$^{2)}$	22.85	3.82

No. of people in family (including participant)	4.52	1.45
No. of times participants eat in fast-food restaurants/month	2.48	2.70
No. of times participants eat in restaurants other than fast-foods/month	1.80	3.29
Total no. of times participants eat in restaurants/month	3.79	4.18
No. of times participants go to the cinema, theatre or museum/month	1.16	2.01
No. of successful dieting attempts	1.76	0.44
No. of failed dieting attempts	0.69	2.33
Longest period of dieting (months)	0.84	2.59
Greatest weight loss achieved with dieting (kg)	1.67	4.38

SD = standard deviation.

Table 2. Eigenvalues and percentage of variances explained with each component, Tehran 2019

Component	Sum of squared loadings					
	Extraction			Rotation		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	8.851	59.005	59.005	4.386	29.242	29.242
2	1.092	7.282	66.288	3.517	23.448	52.690
3	1.052	7.013	73.300	3.091	20.610	73.300

Component 1: “thoughts or preoccupation with food” consisted of 6 items that explained 29.2% of the variance referred.

Component 2: “lack of control over eating” consisted of 6 items that explained 23.4% of the variance.

Component 3: “emotional eating” consisted of 3 items and explained 20.6% of the variance.

Table 3. Rotated component matrix for items on the reduced version (in Farsi) of the Food Craving Questionnaire-Trait (FCQ-T-r), Tehran, 2019

Item	Estimate of correlation Component		
	1	**2**	**3**
1. When I crave something, I know I won't be able to stop eating once I start.		0.804	
2. If I eat what I am craving, I often lose control and eat too much.		0.814	
3. Food cravings invariably make me think of ways to get what I want to eat.	0.706		
4. I feel like I have food on my mind all the time.	0.798		
5. I find myself preoccupied with food.	0.735		
6. Whenever I have cravings, I find myself making plans to eat.	0.782		
7. I crave foods when I feel bored, angry, or sad.			0.593
8. I have no willpower to resist my food craving.		0.624	
9. Once I start eating, I have trouble stopping.		0.563	
10. I can't stop thinking about eating no matter how hard I try.		0.578	
11. If I give in to a food craving all control is lost.		0.797	
12. Whenever I have a food craving, I keep on thinking about eating until I actually eat the food.	0.721		
13. If I am craving something, thoughts of eating it consume me.	0.747		
14. My emotions often make me want to eat.			0.671
15. It is hard for me to resist the temptation to eat appetizing foods that are in my reach.			0.600

Component 1: "thoughts or preoccupation with food" consisted of 6 items that explained 29.2% of the variance referred.

Component 2: "lack of control over eating" consisted of 6 items that explained 23.4% of the variance.

Component 3: "emotional eating" consisted of 3 items and explained 20.6% of the variance.

Table 4. Correlation statistics for items on the reduced version of the Food Craving Questionnaire-Trait (FCQ-T-r) in Farsi (*n* = 153), Tehran, 2019

Item	Mean (SD)	ω	Item loading	α	Total correlation
1. When I crave something, I know I won't be able to stop eating once I start.	2.95 (1.56)	0.947	0.798	0.848	0.737*
2. If I eat what I am craving, I often lose control and eat too much.	2.96 (1.46)	0.948	0.773	0.846	0.844*
3. Food cravings invariably make me think of ways to get what I want to eat.	3.32 (1.44)	0.948	0.700	0.916	0.703*
4. I feel like I have food on my mind all the time.	2.66 (1.52)	0.945	0.801	0.895	0.859*
5. I find myself preoccupied with food.	2.56 (1.55)	0.946	0.737	0.903	0.800*
6. Whenever I have cravings, I find myself making plans to eat.	2.77 (1.47)	0.947	0.706	0.911	0.743*
7. I crave foods when I feel bored, angry, or sad.	2.41 (1.50)	0.951	0.553	0.904	0.507*
8. I have no willpower to resist my food craving.	2.24 (1.42)	0.945	0.722	0.911	0.737*
9. Once I start eating, I have trouble stopping.	2.51 (1.48)	0.946	0.691	0.869	0.722*
10. I can't stop thinking about eating no matter how hard I try.	2.03 (1.42)	0.945	0.769	0.860	0.783*
11. If I give in to a food craving all control is lost.	1.93 (1.30)	0.945	0.836	0.852	0.844*
12. Whenever I have a food craving, I keep on thinking about eating until I actually eat the food.	2.46 (1.53)	0.945	0.785	0.903	0.802*
13. If I am craving something, thoughts of eating it consume me.	1.93 (1.53)	0.949	0.710	0.879	0.664*
14. My emotions often make me want to eat.	2.33 (1.43)	0.946	0.737	0.862	0.770*
15. It is hard for me to resist the temptation to eat appetizing foods that are in my reach.	2.91 (1.55)	0.947	0.676	0.844	0.784*

ω = McDonald's ω if item deleted.

α = Cronbach's α if item deleted

*$P < 0.01$.