Brazilian Journal of Psychiatry. 2019;41:66–69
Brazilian Psychiatric Association
Revista Brasileira de Psiquiatria
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BRIEF COMMUNICATION

Exploring the structural and construct validity of the Brazilian Food Cravings Questionnaire-Trait-reduced (FCQ-T-r)

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Objective: Food cravings play an important role in the neurobiology of appetitive behavior, being positively associated with negative feelings, eating disorders, and obesity. This study aimed to assess the psychometric properties of the Brazilian Food Cravings Questionnaire-Trait-reduced (FCQ-T-r), a short version of the most widely used measure of this behavior.
Methods: Undergraduate students (n=505) completed the full version of the FCQ-T and the Three-Factor Eating Questionnaire. Respondents' height and weight were also measured. Exploratory factor analyses were performed.
Results: The FCQ-T-r exhibited a single-factor structure and satisfactory internal consistency ($\alpha > 0.80$). A positive correlation was observed between FCQ-T-r scores and those of the original version. Furthermore, FCQ-T-r scores correlated positively with uncontrolled eating and emotional eating behaviors. No correlation was found between body mass index and FCQ-T-r scores. Considering our sample characteristics, we suggested specific FCQ-T-r cutoff points for males and females in the Brazilian population.
Conclusion: Our results support the structure of the Brazilian adaptation of the FCQ-T-r, which seems to be a viable instrument to investigate food cravings, particularly in time-constrained settings. Further studies are needed to verify these findings in other age ranges and clinical samples.

Keywords: Eating behavior; psychometric; food craving

Introduction

Food craving is defined as an intense desire to consume a particular food item (or food group) which is difficult to resist.[1,2] Although not yet completely understood, it is believed to have a multifactorial etiology and play an important role in the neurobiology of appetitive behavior.[1]

An increased intensity and frequency of food cravings is often observed in patients with eating disorders[3] and in response to dysphoric mood or emotional arousal.[1] It has even been suggested that evaluation of chocolate cravings during states of emotional dysregulation can be very useful for the classification of atypical depressive syndrome.[4]

The Food Cravings Questionnaire-Trait (FCQ-T) was developed to assess food-craving behavior as a multidimensional construct.[2] It has been validated in several countries,[2,5,6] including under clinical conditions.[3] This instrument consists of 39 items, grouped into nine dimensions: anticipation of positive reinforcement from eating; anticipation of relief from negative states and feelings as a result of eating; intentions and plans to consume food; cues that may trigger food cravings; thoughts or preoccupation with food; craving as hunger; lack of control over eating; emotions that may be experienced before or during food cravings or eating; and guilt from cravings and/or giving in to them.[2]

Recently, the Food Cravings Questionnaire-Trait-reduced (FCQ-T-r),[7] a short-form alternative that demands less time for completion than the full version, was developed. Expedient completion of psychometric instruments is a desirable characteristic of clinical and research protocols, which often require multiple steps to be accomplished. The FCQ-T-r presented satisfactory psychometric properties in studies conducted in German,[7] Cuban,[5] Italian,[8] and American[9] populations.

Although the full version of the FCQ-T has already been validated for Brazilian Portuguese,[10] there have been no studies using the reduced version. Thus, the present study aimed to evaluate the psychometric properties and validity of the Brazilian version of the FCQ-T-r.

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Submitted Oct 16 2017, accepted Feb 13 2018, Epub Oct 11 2018.

How to cite this article: Queiroz de Medeiros AC, Pedrosa LFC, Yamamoto ME. Exploring the structural and construct validity of the Brazilian Food Cravings Questionnaire-Trait-reduced (FCQ-T-r). Braz J Psychiatry. 2019;41:66-69. http://dx.doi.org/10.1590/1516-4446-2017-0019

Methods

Participants

The study sample consisted of 505 undergraduate students (50.1% males) from the Universidade Federal do Rio Grande do Norte, recruited through advertisements placed on campus. The study proposal was approved by the local Ethics Committee. The inclusion criteria for participants were being Brazilian and age 18 years or older. Exclusion criteria included any self-reported diagnosis of chronic disease or eating disorders, as well as current dieting.

Sociodemographic/anthropometric data

Age and gender were self-reported by participants, while height and weight were measured by trained assistants. The body mass index (BMI) was calculated, and those with a BMI $\geqslant$ 25 kg/m^2 were classified as overweight.

Measures

FCQ-T and FCQ-T-reduced

The Brazilian version of the FCQ-T[10] was applied. The FCQ-T-r is composed of 15 items from the original questionnaire. Responses were recorded on a Likert scale, ranging from 1 (never or not applicable) to 6 (always), referring to the frequency with which each statement applies to the participant.[2] FCQ-T-r scores were available for all participants who were included in our analysis (n=505).

Three-Factor Eating Questionnaire (TFEQ)

The Brazilian version of the TFEQ provides measures of three eating behaviors: cognitive restraint, emotional eating, and uncontrolled eating.[11] According to previous validation studies,[3,9] moderate to strong correlations between FCQ-T-r scores and the emotional eating and uncontrolled eating scales of the TFEQ were expected. Regarding discriminant validity, no correlation was expected between FCQ-T-r scores and the cognitive restraint scale of the TFEQ. Internal consistency of the subscales ranged between 0.76 to 0.91 in the current study. TFEQ scores were available for most participants (cognitive restraint, n=497; emotional eating, n=504; uncontrolled eating, n=499), and no imputation was performed for the missing data.

Statistical analysis

Exploratory factor analysis (EFA) was performed in FACTOR (version 9.2) software.[12] The number of factors was determined with optimal implementation of parallel analysis (with the mean eigenvalue criterion[13]) and the unweighted least squares factor extraction method. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity were used to verify whether the data were suitable for EFA. The internal consistency of the FCQ-T-r was assessed by standardized Cronbach's α coefficient.

Because of the Kolmogorov-Smirnov test revealed a non-normal data distribution, nonparametric tests were used. In order to examine the construct validity, Spearman correlations between the FCQ-T-r scores and other variables were calculated. Group comparisons were performed using the Mann-Whitney test. Pearson chi-square tests were used to verify associations between categorical variables. These procedures were performed in SPSS version 20. Results are expressed as means (standard deviations).

Results

The mean age of the sample was 21.7 (3.88) years. Among the 482 participants whose weight and height was measured, the prevalence of overweight (BMI $\geqslant$ 25 kg/m^2) was 28.3% (n=143).

After evaluation of the KMO coefficient (0.93) and Bartlett's test ($\chi^2_{(105)}$ = 4,238.0; $p < 0.001$), the data were considered suitable for EFA.

Table 1 lists detailed scores and item factor loadings for the FCQ-T-r, which exhibited a single-factor structure (explaining 57.8% of the construct variance) and satisfactory internal consistency (α = 0.95). All answer options were selected, by a number of respondents ranging from 4 to 354, suggesting that the FCQ-T-r can be used to explore the food cravings construct.

A positive correlation was found between the FCQ-T-r and the TFEQ scales for uncontrolled eating (r_s = 0.65; $p < 0.001$) and emotional eating (r_s = 0.64; $p < 0.001$), but none with the cognitive restraint dimension (r_s = 0.01; p = 0.82). Also, a strong correlation was observed between the overall FCQ-T score and its reduced version (r_s = 0.97; $p < 0.001$). All correlations between FCQ-T-r and the nine dimensions of the full FCQ-T were significant ($p < 0.001$), with coefficients ranging from 0.65 to 0.89.

The mean overall FCQ-T-r score was 30.9 (13.2). As females (33.1 [13.5]) scored higher than males (28.6 [12.4]; $p < 0.001$) and the prevalence of overweight was higher among males (39.5% vs. 20.1% for females; $\chi^2_{(1)}$ = 21.8, $p < 0.001$), correlations between BMI and questionnaires scores were calculated according to gender. No correlation was identified between BMI and FCQ-T-r scores in males (r_s = 0.08; p = 0.22) or females (r_s = 0.04; p = 0.55). However, females presented a positive correlation between BMI and the FCQ-T dimensions of guilt (r_s = 0.26; $p < 0.001$) and lack of control (r_s = 0.13; $p < 0.001$).

Discussion

As in previous studies conducted in other settings,[5,8,9] the Brazilian reduced version of the FCQ-T exhibited a single-factor structure and good internal consistency ($\alpha \geqslant 0.80$). The item factor loadings ranged from 0.64 to 0.82, indicating that all items were strongly loaded in the dimension.

Just as the Italian FCQ-T-r,[8] the Brazilian version correlated with the original FCQ-T overall, as well as for each dimension separately.

The three TFEQ scales were used to assess the construct validity of the FCQ-T-r. According to the literature,[1,14] uncontrolled and emotional eating behaviors correlate with food craving. For example, both emotional

Table 1 Factor loadings and general statistics for the Food Cravings Questionnaire-Trait-reduced (FCQ-T-r), Brazilian version

Factor loading	Item	Original factor	Mean (SD)	r*	Skewness	Kurtosis
0.72	2 When I crave something, I know I won't be able to stop eating once I start. (*Quando tenho um desejo forte de comer algo, sei que não vou conseguir me controlar, uma vez que começar a comer, não consigo parar.*)	Lack Co	1.97 (1.09)	0.64	1.20	1.26
0.65	3 If I eat what I am craving, I often lose control and eat too much. (*Frequentemente, quando como algo que estou desejando, perco o controle e a acabo comendo demais.*)	Lack Co	2.44 (1.24)	0.59	0.77	0.29
0.71	5 Food cravings invariably make me think of ways to get what I want to eat. (*A vontade de comer uma determinada comida, invariavelmente, me faz pensar em como vou conseguir comer aquilo que estou desejando.*)	Plan	2.29 (1.25)	0.66	0.77	-0.09
0.80	6 I feel like I have food on my mind all the time. (*Sinto que é como se eu pensasse em comida o tempo inteiro.*)	Thoughts	1.88 (1.28)	0.71	1.62	2.10
0.75	8 I find myself preoccupied with food. (*Às vezes me pego pensativo, preocupado com comida.*)	Thoughts	1.85 (1.16)	0.65	1.60	2.36
0.68	18 Whenever I have cravings, I find myself making plans to eat. (*Sempre que eu começo a desejar uma determinada comida, começo a fazer planos para conseguir comê-la.*)	Plan	2.35 (1.44)	0.62	1.05	0.34
0.69	20 I crave foods when I feel bored, angry, or sad. (*Quando estou chateado, com raiva ou triste, eu tenho desejos por determinados alimentos.*)	Emotion	2.22 (1.48)	0.62	1.13	0.31
0.77	25 I have no will power to resist my food crave. (*Não tenho força de vontade para resistir à minha vontade de comer alimentos que estou desejando muito.*)	Lack Co	2.13 (1.33)	0.70	1.12	0.56
0.77	26 Once I start eating, I have trouble stopping. (*Uma vez que começo a comer, tenho dificuldade de conseguir parar.*)	Lack Co	1.87 (1.17)	0.67	1.57	2.26
0.81	27 I can't stop thinking about eating no matter how hard I try. (*Não consigo parar de pensar em comer, não importa o quanto eu me esforce.*)	Thoughts	1.55 (1.06)	0.68	2.28	5.19
0.78	29 If I give in to a food craving, all control is lost. (*Se eu me deixo levar pela vontade de comer alguma coisa que estou desejando muito, perco todo o controle.*)	Lack Co	1.53 (0.97)	0.63	2.25	5.58
0.76	32 Whenever I have a food craving, I keep on thinking about eating until I actually eat the food. (*Quando estou desejando muito uma comida, fico só pensando em comer aquilo, até que finalmente consiga comer.*)	Thoughts	2.05 (1.22)	0.69	1.31	1.51
0.82	33 If I am craving something, thoughts of eating it consume me. (*Se eu estou desejando uma comida, os pensamentos sobre isso ficam me consumindo.*)	Thoughts	1.70 (1.06)	0.73	1.78	3.09
0.72	34 My emotions often make me want to eat. (*Minhas emoções geralmente me fazem querer comer.*)	Emotion	2.11 (1.33)	0.66	1.27	0.94
0.64	36 It is hard for me to resist the temptation to eat appetizing foods that are in my reach. (*É difícil, para mim, resistir à tentação de comer comidas apetitosas que estejam ao meu alcance.*)	Cues	2.93 (1.54)	0.60	0.48	-0.71

In this study, items were presented to participants in Portuguese.
Lack Co = lack of control over eating; Plan = intentions and plans to consume food; Thoughts = thoughts or preoccupation with food; Emotion = emotions that may be experienced before or during food cravings or eating; Cues = cues that may trigger food cravings.
* Item-total correlation.

eating and food craving tend to increase in the context of emotional distress, whereas food craving and uncontrolled eating may be triggered by environmental cues.[1] On the other hand, the cognitive restraint construct, which refers to the conscious restriction of food intake aimed at controlling body weight, has little or no relationship to the food craving concept.[14] Thus, the correlations observed between the TFEQ dimensions and FCQ-T-r scores are a good indication of construct validity.

Another finding that supports the construct validity of the TFEQ was the higher craving score for females, which is in line with previous studies[2,3,5,14] and can be related to hormone profile and social aspects, such as feelings of guilt concerning weight.[10]

One limitation of the FCQ-T-r construct validity was its lack of correlation with BMI scores. A similar result was found by Hormes & Meule[9] in a study using the U.S. version of the FCQ-T-r; the authors suggested that this finding may be due to the relative youth and low prevalence of overweight individuals among the studied population, which was similar to the sample of the present study.

Another point to be considered is that the FCQ-T-r does not include items from the Guilt subscale of the original version, which was most strongly correlated with BMI in the present study. Thus, despite evidence for the FCQ-T-r having good psychometric properties, this finding may be indicative of an important limitation of its use in predominantly young and healthy populations as compared to the full FCQ-T.

To better contextualize our findings referring to FCQ-T-r scores, we compared them to those of similar studies. The mean FCQ-T-r scores for the Brazilian version were lower than those found in German[7] (males = 33.2 [11.3], females = 39.5 [13.2]; age = 24.4 [5.6]) and Cuban[5] (males = 40.7 [17.6], females = 47.1 [20.4]; age = 32.6 [12.9]) populations.

These findings suggest that respondent characteristics (e.g., home country and age) could have an influence on FCQ-T-r scoring patterns, which is in agreement with the probable biopsychosocial etiology of food cravings.[1] They also indicate that it may be useful and pertinent to define specific cutoff points adapted to the characteristics of each population. Thus, we suggest the median split as a cutoff point for the FCQ-T-r in Brazilian males (25.0) and females (30.5).

In summary, despite certain limitations, the present investigation provides evidence of the adequate structural and construct validity of the Brazilian version of the FCQ-T-r, which performed as well as versions adapted for other languages.[5,8,9] Thus, the Brazilian FCQ-T-r seems to represent a viable alternative for investigation of food cravings, particularly in time-constrained settings.

Future research should investigate FCQ-T-r scores across different life stages and pathological conditions, such as eating disorders and depression.

Disclosure

The authors report no conflicts of interest.

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