

Intense craving for eat: standardization of the Food Cravings Questionnaire-State in Mexico

Deseo intenso de comer: estandarización del Food Cravings Questionnaire-State en México

María D. Marín-Soto¹, Gerardo Leija-Alva², Deyarek Campuzano-Reyes³, Margarita Castillo-Ramírez⁴, Itzihuari I. Montufar-Burgos², and Víctor R. Aguilera-Sosa^{2*}

¹Professional Interdisciplinary Unit in Engineering and Advanced Technologies, Instituto Politécnico Nacional, Mexico City; ²Interdisciplinary Center for Health Sciences Santo Tomás Unit, Instituto Politécnico Nacional, Mexico City; ³Atotonilco de Tula Higher School, Universidad Autónoma del Estado de Hidalgo, Tula, Hidalgo; ⁴Secretariat of Health of Mexico City, Mexico City. Mexico

Abstract

Background: Food craving is an intense-compulsive response to eating highly appetizing foods. The Food Cravings Questionnaire-State (FCQ-S) is the most used instrument for its diagnosis. It is a multidimensional instrument, sensitive and adaptable to contextual and cultural changes. **Objective:** To standardize the FCQ-S in the adult population of Mexico City. **Method:** Non-experimental, cross-sectional, at convenience design, with 1059 adults of both sexes, aged 18-84 years. It is highlighted that 71.9% of the participants were women. **Results:** A reliability coefficient of 0.95 was obtained, the correlations between the items were from $r = 0.598$ to $r = 0.793$. With the exploratory factorial analysis, an MKO of sampling adequacy of 0.943 was obtained, and with the Bartlett sphericity test a $p = 0.000$. The factors explain 78.61% of the total variation of the data. The RMSEA was 0.068, which indicates an acceptable fit. The CFI was 0.974, considered good, and NNFI was 0.969, good fit. The correlations ranged from $p < 0.05$ to $p < 0.01$, showing a connection between the different dimensions. **Conclusions:** The FCQ-S is valid and adaptable in the Mexican population.

Keywords: FCQ-S. Validation. Standardization. Food craving. Obesity.

Resumen

Antecedentes: El food craving es un deseo intenso y compulsivo de comer alimentos altamente apetecibles. El Food Cravings Questionnaire-State (FCQ-S) es el instrumento más utilizado para su diagnóstico. Es un instrumento multidimensional, sensible y adaptable a cambios contextuales y culturales. **Objetivo:** estandarizar el FCQ-S en población adulta de la Ciudad de México. **Método:** Diseño no experimental, transversal y a conveniencia por método de bola de nieve, con 1059 adultos ambos sexos y de 18-84 años. Se destaca que el 71.9% de los participantes fueron mujeres. **Resultados:** Se obtuvo un coeficiente de fiabilidad de 0.95 y las correlaciones entre los ítems fueron de $r = 0.598$ a $r = 0.793$. Con el análisis factorial exploratorio se obtuvo una MKO de adecuación de muestreo de 0.943, y con la prueba de esfericidad de Bartlett una $p = 0.000$. Los factores explican el 78.61% de la variación total de los datos. La RMSEA fue 0.068, lo cual indica ajuste aceptable. El CFI fue 0.974, considerado bueno, y el NNFI fue 0.969 (buen ajuste). Las correlaciones fueron de $p < 0.05$ a $p < 0.01$, lo que muestra una conexión entre las diferentes dimensiones. **Conclusiones:** El FCQ-S es válido y adaptable en población mexicana.

Palabras clave: FCQ-S. Validación. Estandarización. Food Craving. Obesidad.

*Correspondence:

Víctor R. Aguilera-Sosa
E-mail: vaguilera@ipn.mx

Date of reception: 11-07-2022

Date of acceptance: 28-02-2023

DOI: 10.24875/CIRUE.M23000709

Cir Cir (Eng). 2023;91(6):780-785

Contents available at PubMed

www.cirurgiaycirujanos.com

2444-0507/© 2023 Academia Mexicana de Cirugía. Published by Permanyer. This is an open access article under the terms of the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Food craving is a psychophysiological response of intense desire towards consuming highly palatable foods¹⁻³. It is a component of addiction to fatty, sweet, or salty foods and is also related to overeating, and therefore, to overweight and obesity⁴. To identify and establish diagnostic criteria, Cepeda-Benito et al.⁵ designed the Food Cravings Questionnaire-State (FCQ-S) and -Trait (FCQ-T) in the United States, which the following year were validated in a Spanish population⁶ in a sample of 271 college students. Both instruments demonstrated high internal consistency and appropriate fit for all factors.

The next validation took place in the Netherlands⁷ in a sample of 227 undergraduate students, yielding an overall α of 0.92, with subscales ranging from 0.80 up to 0.91. The factor analysis showed a Kaiser-Meyer-Olkin (KMO) measure of 0.87, and Bartlett's test of sphericity found $p < 0.001$. Similar to the Spanish validation, this study also retained the 5 factors of the original version, the 15 items, with an explained variance of 80.02%. In Germany, the FCQ-S was validated with 133 college students, but it was designed in 2 phases, including food deprivation at the beginning and end of the semester; a reliability coefficient of $\alpha = 0.94$ was found.⁸

The first study conducted in South America was in Brazil⁹, again among undergraduate students ($n = 611$). In this validation, they obtained an $\alpha = 0.82$, maintaining the 5 subscales. In a different study, 2 phases were conducted, with the first involving 492 university students responding to both questionnaires (FCQ-T-r and FCQ-S), but with items related to chocolate. Specifically, in the FCQ-T, they found $\alpha = 0.94$, with 2 subscales identifying lack of control over chocolate intake ($\alpha = 0.91$) and thoughts related to chocolate ($\alpha = 0.91$). In the FCQ-S, they obtained $\alpha = 0.87$ with 2 subscales, one for the desire to eat chocolate ($\alpha = 0.90$) and the other for hunger level ($\alpha = 0.85$). The scores positively correlated with self-reported chocolate consumption frequency and scores on the Chocolate Attitudes Questionnaire, indicating that the FCQ-S has convergent validity. In the second phase, participants ($n = 76$) were exposed to chocolate, which generated high scores on both instruments and positively correlated with salivation. The authors concluded that the instruments represent reliable and valid self-report measures for assessing chocolate craving⁸⁻¹⁰.

However, despite the diversity of validations around the world, all the samples in the studies described involved fewer than 1000 participants, were conducted in university populations, and lacked confirmatory analyses. Notably, of the few standardizations done worldwide, we conducted one for the FCQ-T¹¹, but not for the FCQ-S. Therefore, the objective of this research was to validate and standardize the FCQ-S in the Mexican population. Our hypothesis is that α will be > 0.90 , with good fit in the confirmatory analyses, allowing its standardization in the Mexican population, similar to the FCQ-T.

Method

The design was non-experimental, cross-sectional, and convenience-based, conducted in 2018-2019 with 1059 adults attending first- and second-level clinics of the Secretaría de Salud de la Ciudad de México, aged 18-84 years.

Instrument

We used the original version of the FCQ-S⁶, with a reliability coefficient of 0.94, and subscales ranging from 0.74 up to 0.88. It includes 5 factorial dimensions: 1) intense desire to eat, 2) anticipation of positive reinforcement that may result from eating, 3) anticipation of relief from negative states and feelings as a result of eating, 4) lack of control over eating, and 5) craving as a physiological state. It consists of 15 items rated on a Likert scale, with 1 = strongly disagree, 2 = slightly disagree, 3 = neutral, 4 = slightly agree, and 5 = strongly agree.

Procedure

We collected the overall sample from March 2018 through February 2019. Within the first few months of 2018, we conducted a pilot test with 50 adult subjects from the open population of Instituto Politécnico Nacional, Unidad Lázaro Cárdenas, using a convenience sampling method. We asked them to provide feedback on the wording of the items. Subsequently, we conducted a reliability analysis and adapted the wording to Mexican regionalisms. In the second phase, another group of participants responded to the modified questionnaire, and we again performed a reliability analysis, resulting in the final version of the questionnaire in its Mexican version. In a third

phase, we randomly selected three out of 16 boroughs in Mexico City for the application of the questionnaire: Miguel Hidalgo, Azcapotzalco, and Cuauhtémoc, where health centers from the Secretary of Health are located. We administered the questionnaire in the outpatient clinic area with prior authorization from the authorities of the Secretary of Health of Mexico City. The interviewers approached clinic attendees and invited them to participate; those who agreed were read the informed consent form and proceeded to sign it. This is how we gathered 1059 participants.

We entered the data into Excel, reviewed for errors and inconsistencies, and transferred the database to SPSS version 26.0 (IBM).

Ethical criteria

This research was conducted in full compliance with the Ethical Principles for Medical Research Involving Human Subjects and posed minimal risk to the participants.

Statistical analysis

Various statistical tests were used to verify reliability and validity. The former was assessed using Cronbach's alpha test to evaluate the internal consistency of the test. The latter was assessed with exploratory and confirmatory factor analyses with orthogonal varimax rotation.

Results

Statistical analysis

A total of 1059 participants were included, 71.9% of whom were women, with a mean age of 39.9 years (range, 18-84). The reliability coefficient was 0.951, and the item correlations ranged from $r = 0.598$ up to $r = 0.793$, indicating high association. For the exploratory factor analysis, we obtained a KMO sampling adequacy of 0.943, and Bartlett's test of sphericity found $p = 0.000$.

Factor extraction was performed using the variance percentage criterion, which indicated that they explain 78.61% of the total data variation. The varimax method was used with a fixed number of four factors that explain the total variability. The items were distributed in these factors:

- Pleasurable emotions: evidence that food consumption is associated with pleasurable states, emotions, and an increased sense of well-being.
- Loss of control: the intense desire to consume highly palatable foods triggers a search and ends in uncontrolled consumption.
- Intense desire: urgency and desire to consume one or several specific foods are experienced.
- Physiological response: craving arises as a conditioned physiological response to physical stimuli, or the evocation of memories related to consumption.

It is important to note that the original questionnaire contains 15 items, but in this analysis, item #4 loaded onto two factors with similar factor loadings, so it was decided to eliminate it. We redid both the reliability and factor analysis (Table 1), which showed that the KMO sampling adequacy was 0.935, and Bartlett's test of sphericity found $p = 0.000$. Also, the percentage of variance increased up to 81.5% of the total data. We redid the reliability analysis, and the results, both for the total and for each factor, are also shown in Table 1.

We conducted the confirmatory factor analysis using IBM SPSS Amos 26.0 software, based on the results obtained in the exploratory factor analysis, to identify the model fit with the four correlated latent factors. Factor 1, "Pleasurable Emotions," consists of five items; Factor 2, "Loss of Control," consists of three items; Factor 3, "Intense Desire," consists of three items; and Factor 4, "Physiological Response," consists of two items. Figure 1 illustrates a diagram of the factor structure. The confirmatory factor analysis was performed using the maximum likelihood estimation method and applying Structural Equation Modeling (SEM) methodology to assess construct validity. To determine how well the observed covariance matrix was predicted, we considered the root mean squared error of approximation (RMSEA), which was 0.068, indicating an acceptable fit. The analysis also included the comparative fit index (CFI), which was 0.974, considered good. The non-normed fit index (NNFI) analysis yielded 0.969, which is considered a good fit. All correlations were significant at the 0.05 level, with many at the 0.01 level, demonstrating a connection between the different dimensions. In summary, the model presented very adequate levels of fit to the data, confirming the factor structure obtained in the exploratory analyses.

Table 1. Rotated component matrix for 14 items and general and factor-specific reliability results

Items	Factors			
	Pleasurable emotions	Loss of control	Intense desire	Physiological response
1) I have an intense desire to eat one or more specific foods			0.778	
2) I'm craving one or more specific foods			0.782	
3) I have an urge for one or more specific foods			0.644	
5) If I were to eat what I am craving, I am sure my mood would improve	0.768			
6) Eating one or more specific foods would feel wonderful	0.705			
7) If I ate something I wouldn't feel so sluggish and lethargic	0.750			
8) Satisfying my craving would make me feel less grouchy and irritable	0.698			
9) I would feel more alert if I could satisfy my craving	0.699			
10) If I had one or more specific foods, I could not stop eating them		0.817		
11) My desire to eat one or more specific foods seems overpowering		0.854		
12) I know I'm going to keep on thinking about one or more specific foods until I actually have it		0.785		
13) I am hungry				0.856
14) If I ate right now, my stomach wouldn't feel as empty				0.839
Factor reliability	$\alpha = 0.910$	$\alpha = 0.913$	$\alpha = 0.903$	$\alpha = 0.861$
Overall reliability	$\alpha = 0.945$			

Results of confirmatory factor analysis.

Discussion

The internal consistency in this validation varies little compared to the reliability coefficients reported in other countries: in the original version $\alpha = 0.94^5$, in the Spanish version $\alpha = 0.94^6$, in the Netherlands $\alpha = 0.92^7$, in Germany $\alpha > 0.901^2$, and in Brazil $\alpha = 0.86^9$. Therefore, the coefficient obtained from the analyses confirms that this instrument is adaptable and sensitive to contextual and cultural changes.

For the factorial analysis of this questionnaire, it can be observed that, while previous validations have maintained the 15 original items and factors, this particular validation eliminated one item (the fourth) and regrouped the items into different factors, similar to the German version: Desire/lack of control, Hunger, and Reinforcement¹².

The Desire/lack of control factor in this validation included six items, sharing items 10, 11, and 12 with the original and Spanish versions, although items 1, 2, and 3 were not included in this version^{5,6}. On the other hand, the Hunger factor in the German version

and the Intense desire to eat factor obtained in this study have items 13 and 14 in common. However, this factor includes the same items as the original and Spanish versions.

In the study conducted by Meule et al.¹², the subscales Anticipation of positive reinforcement that may result from eating and Anticipation of relief from negative states and feelings as a result of eating were merged, resulting in a final subscale called Reinforcement. In both studies, the same items were included after rotation: 4, 5, 6, 7, 8, and 9. However, in this specific validation, the factor Anticipation of relief from negative states and feelings as a result of eating included item 15 ("I feel weak for not eating"), while the subscale Anticipation of positive reinforcement that results from eating included the items as in the original and Spanish versions. It is important to note that item 4 was not included in the final version of this study.

In summary, the four factors identified in this validation (pleasant emotions, loss of control, intense desire, and physiological response) provide a suitable explanation of food craving as a state in the Mexican population.

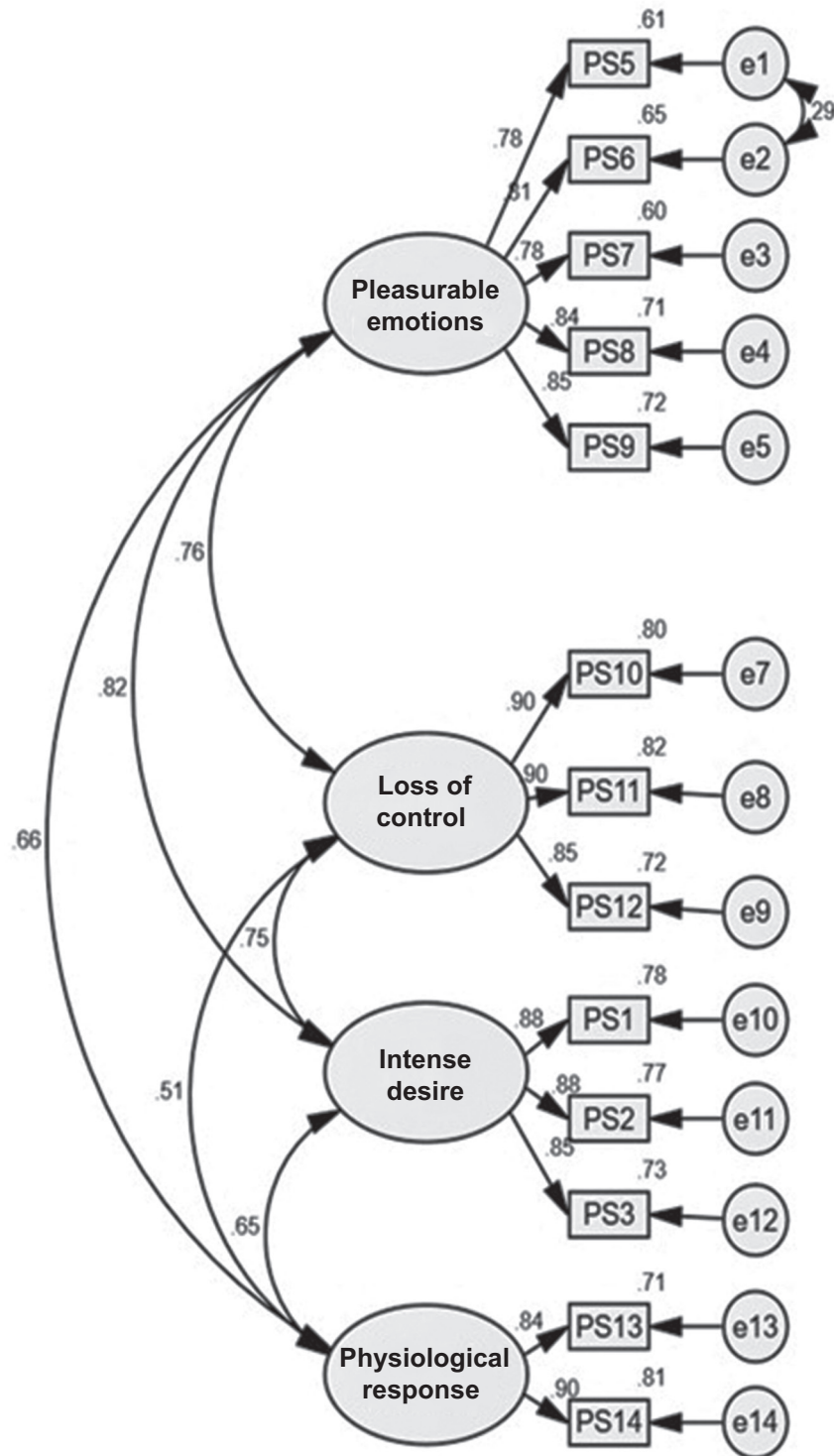


Figure 1. Confirmatory analysis.

Conclusions

The FCQ-S, which measures the intensity of the desire to consume a specific food, is an adaptable,

valid, and reliable instrument for the Mexican population. The 4 factors it comprises help explain food craving as a state. It has been confirmed that the FCQ-S is suitable for use in both clinical and research

settings within the adult Mexican population. For future research, it is suggested to correlate it with other instruments that measure food craving and to conduct validations in child and adolescent populations.

Acknowledgments

We wish to thank the participants and the Secretary of Health of Mexico City for their support while conducting this research.

Funding

None declared.

Conflicts of interest

None declared.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained approval from the Ethics Committee for analysis and publication of routinely

acquired clinical data and informed consent was not required for this retrospective observational study.

References

1. Iani L, Barbaranelli C, Lombardo C. Cross-validation of the reduced form of the Food Craving Questionnaire-Trait using confirmatory factor analysis. *Front Psychol.* 2015;6:433.
2. Pelchat ML. Of human bondage: food craving, obsession, compulsion, and addiction. *Physiol Behav.* 2002;76:347-52.
3. Tiggemann M, Kemps E. The phenomenology of food cravings: the role of mental imagery. *Appetite.* 2005;45:305-13.
4. Pérez-Vielma NM, Miliar-García A, Gómez-López M, Marín Soto MD, Leija-Alva G, Aguilera Sosa VR. Food craving en sujetos obesos: su correlación con índice aterogénico, conducta de ingesta y expresión génica. *Acta Inv Psicol.* 2021;11:5-16.
5. Cepeda-Benito A, Gleaves HD, Williams LT, Erath AS. The development and validation of the state and trait food-cravings questionnaires. *Behav Ther.* 2000;31:151-73.
6. Cepeda-Benito A, Gleaves DH, Fernández MC, Vila J, Williams TL, Reynoso J. The development and validation of Spanish versions of the State and Trait Food Cravings Questionnaires. *Behav Res Ther.* 2000;38:1125-38.
7. Nijs IM, Franken IH, Muris P. The modified Trait and State Food-Cravings Questionnaires: development and validation of a general index of food craving. *Appetite.* 2007;49:38-46.
8. Meule A, Holmes JM. Chocolate versions of the Food Cravings Questionnaires. Associations with chocolate exposure-induced salivary flow and ad libitum chocolate consumption. *Appetite.* 2015;91:256-65.
9. Queiroz de Medeiros AC, Campos Pedrosa LF, Hutz CS, Yamamoto ME. Brazilian version of food cravings questionnaires: psychometric properties and sex differences. *Appetite.* 2016;105:328-33.
10. Meule A, Richard A, Dinic R, Blechert J. Effects of a smart phone-based approach—avoidance intervention on chocolate craving and consumption: randomized controlled trial. *JMIR mHealth uHealth.* 2019;7:e12298.
11. Marín-Soto MD, Vargas-De León C, Pérez-Vielma NM, Castillo-Ramírez M, Miliar-García A, Murillo-Tovar MM, et al. Deseo intenso por alimentos apetecibles: validación y estandarización del Food Craving Questionnaire-Trait en México. *Gac Med Mex.* 2020;156:27-33.
12. Meule A, Lutz A, Vögele C, Kübler A. Food cravings discriminate differentially between successful and unsuccessful dieters and non-dieters. Validation of the Food Cravings Questionnaires in German. *Appetite.* 2012;58:88-97.