

Validation of the Big Five Questionnaire (BFQ-C), short version, in Colombian adolescents

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ABSTRACT

Introduction. The most widely accepted theoretical and measurement model in personality study is the Big Five Personality Test, designed to measure five traits: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness. One of the most commonly used instruments for evaluating personality in children and adolescents is the BFQ-C. However, its applicability may be limited by its length. The short version of the test has shown stability across different cultures but there is no empirical evidence on its psychometric properties to enable it to be used in the Latin American context. **Objective.** This study seeks to validate the short version of the Big Five Questionnaire for Children (BFQ-C) in the Colombian population. **Method.** The questionnaire was administered to 844 adolescents (55% boys and 45% girls) aged between 11 and 16 ($M = 13.55$ and $SD = 2.30$). Seven possible models were obtained from a series of exploratory and confirmatory analyses to explain the factorial structure of the test, which were compared with each other to find the model with the best statistical fit. **Results.** The model with the best absolute fit coincided with the five-factor proposal of the scale, for which empirical evidence is provided for the universality of the Big Five model. The factors showed adequate levels of reliability. **Discussion and conclusion.** The short version of the BFQ-C has good psychometric properties in adolescents and constitutes a useful instrument for measuring personality in the Latin American context.

Keywords: Personality, Big Five Model, adolescents, psychometrics.

RESUMEN

Introducción. El modelo teórico y de medición más aceptado en el estudio de la personalidad es el de los Cinco Grandes: Energía, Amabilidad, Conciencia, Inestabilidad Emocional y Apertura a la Experiencia. El BFQ-C es uno de los instrumentos más usados para evaluar a niños y adolescentes. No obstante, su aplicabilidad puede verse limitada por su extensión. Aunque la versión corta ha evidenciado cierta estabilidad en distintas culturas, no hay evidencia empírica sobre sus propiedades psicométricas para usarse en el contexto latinoamericano. **Objetivo.** Validar en población colombiana la versión corta del Cuestionario de los Cinco Grandes para Niños (BFQ-C). **Método.** Se aplicó el cuestionario a 844 adolescentes (55% hombres y 45% mujeres), con edades entre los 11 y los 16 años ($M = 13.55$ y $SD = 2.30$). A partir de una serie de análisis exploratorios y confirmatorios, se obtuvieron siete modelos posibles para explicar la estructura factorial de la prueba; éstos se compararon entre sí para hallar el modelo con el mejor ajuste estadístico. **Resultados.** El modelo con el mejor ajuste absoluto coincidió con la propuesta penta factorial de la escala, por lo que se ofrece evidencia empírica para la universalidad del modelo de los Cinco Grandes. Los factores evidenciaron niveles de confiabilidad adecuados. **Discusión y conclusión.** En su versión corta, el BFQ-C presenta buenas propiedades psicométricas en adolescentes y constituye un instrumento útil para la medición de la personalidad en el contexto latinoamericano.

Palabras clave: Personalidad, Modelo de los Cinco Grandes, adolescentes, propiedades psicométricas.

INTRODUCTION

The study of personality is of great interest in psychology because it is a construct that contributes to the explanation of both socially valued behaviors and maladaptive and psychopathological ones (Abihssira García, 2019; Alarcón, Pérez-Luco, Wenger, Salvo, & Chesta, 2018; Caprara et al., 2017; González-Hernández & Ato-Gil, 2019). Although the concept is derived from different approaches, it can be understood as a series of individual attributes that are stable over time, gives subjects a sense of identity, integrity, and uniqueness, and provides them with a certain regularity in their behaviors (Caprara & Cervone, 2000). Current psychological research has focused on the Big Five Personality Traits model comprising the following variables: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience (Cupani, Sánchez, Gross, Chiepa, & Dean, 2013; Edo et al., 2002; Olivier & Herve, 2015). Its popularity lies in the fact that it offers the possibility of creating a common framework for the evaluation of personality through a five-factor structure, validated in different cultures and age groups (Edo et al., 2002).

The extraversion factor reflects the ability to make friends and experience positive emotions; agreeableness is associated with empathy and warmth in interpersonal relationships (Caprara, Barbaranelli, Borgogni, & Perugini, 1993), and conscientiousness is related to impulse control and determination in goal achievement (Caprara et al., 1993). Neuroticism refers to the tendency to experience negative emotions (Cassaretto, 2009), while openness comprises aspects such as intellectual curiosity, appreciation for art, and tolerance for divergent ideas (Simkin, Etchezahar, & Ungaretti, 2012).

Several instruments have been designed to measure the Big Five in adults (Caprara et al., 1993; Costa & McCrae, 2008; Goldberg, 1992), while versions for children and adolescents include the 240-item NEO-PI-RJ (Edo et al., 2002) and the 65-item BFQ-C (Barbaranelli, Caprara, Rabasca, & Pastorelli, 2003).

The latter has been validated in the Netherlands (Muris, Meesters, & Diederer, 2005), Spain (Carrasco-Ortiz, Holgado-Tello, & del Barrio-Gandara, 2005; del Barrio, Carrasco, & Holgado, 2006; Soto et al., 2011), France (Olivier & Herve, 2015), and Argentina (Cupani, Morán, Ghío, Azpilicueta, & Garrido, 2020; Cupani & Ruarte, 2008), confirming the reliability and the five-factor structure of the scale. A study conducted in Spain showed a better fit with a four-factor model (Holgado-Tello, Carrasco-Ortiz, del Barrio-Gándara, & Chacón-Moscoso, 2009), although this difference may be explained by the fact that it used polychoric rather than Pearson matrices, which were used in previous studies (Holgado-Tello et al., 2009).

Since the existing instruments have too many questions for the under-12 population (Beaton & Frijters, 2012), short

versions of the BFQ-C that keep the five-factor structure of the construct and maintain adequate reliability indicators have also been developed. Short versions of the BFQ-C have been validated in Italy (Mamazza, 2012), Russia (Kuzmina et al., 2018), Australia (Bore et al., 2020), Greece (Markos & Kokkinos, 2017) and Korea (Kim & Kim, 2012).

Objective

Due to the lack of validation of the short version of the BFQ-C in the Latin American context, this research focused on analyzing its psychometric properties in a sample of Colombian adolescents.

METHOD

Study design

A psychometric study was conducted with a cross-cutting design.

Subjects

Participants were 844 adolescents between 11 and 16 years of age ($M = 13.55$ and $SD = 2.30$), 464 of whom (55%) were boys. All of them were contacted at educational institutions in the city of Barranquilla, Colombia.

Measurements

The study used the short version of the BFQ-C translated into Spanish. Positively scored items reflect six behaviors per trait. Answer choices range from 1 (almost never) to 5 (almost always). The original version of the instrument validated with Italian adolescents has satisfactory reliability and validity results, with a Cronbach's alpha ranging from .65 to .85 for each of the scales (Mamazza, 2012).

Procedure

The educational institutions received written information on the project, as well as the test protocols and their ethical aspects. Tests were administered on a single day during the regular class schedule with the support of two researchers and the students' respective teachers in the institutions that agreed to participate. Only students who agreed to participate and had the consent of their parents were included in the sample.

Statistical analysis

The factorial structure was analyzed using the two-step method (Anderson & Gerbing, 1988) involving exploratory factor analysis [EFA] and confirmatory factor analysis [CFA].

For the EFA, the criteria included an eigenvalue higher than or equal to 1 [$\lambda > 1$]; explained variance higher than or equal to 60% [60% δ^2 exp]; the Kaiser criterion; and the theoretical five-factor model of the scale. Criteria based on resampling or bootstrapping were also considered to minimize the effect of bias due to random capitalization. These criteria included the Minimum Average Partial Test (MAP) and Parallel Analysis (PA), both optimal and classical. In all cases, the extraction method chosen was the Principal Components method and Varimax rotation, due to the assumption of factorial independence.

Polychoric (PolychoricCM) and Pearson (PearsonCM) matrices were used for CFA.

In the analysis, Unweighted Least-Squares (ULS) were used for the models obtained by PolychoricCM, whereas Maximum Likelihood (ML) was used for the models obtained by PearsonCM. Both methods were used to analyze the theoretical model of the scale and the one obtained through bootstrapping.

Absolute, incremental, and parsimony fit indicators were extracted. Among the absolute adjustment indicators,

the following were evaluated: X2 Ratio (X^2/gf); X2 Significance (*P-value of X2*); RMSEA goodness-of-fit index (*GFI*); Root mean square error of approximation (*RMSEA*); RMSEA Significance (*P-value RMSEA*); and the Non-Centrality Parameter (*NCP*).

The following incremental adjustment indicators were obtained: Adjusted goodness-of-fit index (*AGFI*); Non-Normed Fit Index (*NNFI*); Normed Fit Index (*NFI*) and Comparative Fit Index (*CFI*).

The following were evaluated for the parsimony indicators: the Parsimony Normed Fit Index (*PNFI*) and the Parsimony Goodness of Fit Index (*PGFI*).

Reliability analysis was based on McDonald's omega and Cronbach's alpha using JASP. Average inter-item correlation was also analyzed.

Ethical considerations

The entire procedure was conducted in accordance with the Declaration of Helsinki (revised in Brazil, 2013) and approved by the Ethics Committee of the Universidad del

Table 1
Fit measures for Factors Evaluated

| Fit indicators | Model No. | | | | | | | | |
|--|-----------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 1 | 2 | 3 | | 4 | 5 | 6 | 7 | |
| | ML | ML | ML | ULS | ULS | ULS | ULS | ML | ULS |
| Absolute fit measures | | | | | | | | | |
| [χ^2] | 1150.2 | 998.6 | 1305.6 | 1313.1 | 1192.1 | 4076.6 | 2688.3 | 1305.6 | 1334.5 |
| Ratio χ^2 | 3.0 | 2.71 | 3.31 | 3.32 | 3.06 | 10.09 | 6.69 | 3.31 | 3.38 |
| P-value of χ^2 | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 |
| GFI | .92 | .93 | .91 | .95 | .95 | .87 | .92 | .91 | .95 |
| RMSEA | .05 | .045 | .052 | .053 | .049 | .100 | .082 | .052 | .053 |
| P-value of RMSEA | .75 | .990 | .110 | .093 | .620 | .000 | .000 | .110 | .050 |
| NCP | 766.22 | 629.66 | 910.57 | 918.05 | 802.1 | 3672.6 | 2286.3 | 910.57 | 939.47 |
| ECVI | 1.56 | 1.41 | 1.71 | 1.72 | 1.59 | 4.98 | 3.34 | 1.71 | 1.75 |
| RMSR | .055 | .051 | .057 | .056 | .053 | .090 | .071 | .057 | .055 |
| Incremental fit measures | | | | | | | | | |
| AGFI | .90 | .91 | .89 | .94 | .95 | .85 | .91 | .89 | .94 |
| NNFI | .94 | .95 | .93 | 1.03 | 1.03 | 1.03 | 1.03 | .93 | 1.03 |
| NFI | .92 | .93 | .91 | 1 | 1 | 1 | 1 | .91 | 1 |
| CFI | .95 | .95 | .94 | 1 | 1 | 1 | 1 | .94 | 1 |
| Parsimony fit measures | | | | | | | | | |
| PNFI | .81 | .79 | .83 | .91* | .90 | .93** | .92* | .83 | .91* |
| PGFI | .76 | .74 | .77 | .81** | .80* | .76 | .80* | .77 | .81** |
| No. of fit measures that meet criteria | 6 | 9 | 6 | 9 | 7 | 7 | 9 | 6 | 10 |

Notes: Values with * indicate that there is no substantial difference from the maximum and values with ** indicate that it is the maximum value.

GFI = Goodness of fit index; RMSEA = Root Mean Square Error of Approximation; NCP = Non-Centrality Parameter; ECVI = Expected Cross Validation Index; RMSR = report root-mean-square residuals; AGFI = Adjusted Goodness of Fit Index; NNFI = Non-Normed Fit Index; NFI = Normed Fit Index; CFI = Comparative Fit Index; PNFI = Parsimony Normed Fit Index; PGFI = Parsimony Goodness of Fit Index.

Table 2
Statistics for the Reliability Index of Internal Consistency

| | Mean | SD | Cronbach's α | McDonald's ω | Average inter-item correlation |
|------------------------------|-------|------|---------------------|---------------------|--------------------------------|
| Factor 1 (Neuroticism) | 3.486 | .241 | .846 | .853 | .486 |
| Factor 2 (Extraversion) | 3.412 | .427 | .743 | .746 | .327 |
| Factor 3 (Agreeableness) | 3.701 | .276 | .712 | .734 | .307 |
| Factor 4 (Conscientiousness) | 2.513 | .156 | .728 | .738 | .314 |
| Factor 5 (Openness) | 3.331 | .395 | .640 | .646 | .231 |

Note: Observations are based on the answers of 844 subjects without missing data.

Norte, file number 146. Questionnaires were completed anonymously.

RESULTS

Exploratory and confirmatory factor analysis

First step EFA. The assumption of multivariate normality was confirmed and the existence of an underlying factorial structure in the BFQ-C answers was proven, since the value of the determinant (D) of both inter-item correlation matrices was close to the zero criterion ($D_{Pearson} = .0003$; $D_{Polychoric} = .0002$), like the significance measure of Bartlett's test of sphericity ($P\text{-value}_{Pearson} = .000$; $P\text{-value}_{Polychoric} = .000$). The results of the sampling adequacy of Kaiser, Meyer, and Olkin [KMO] were above the criterion of .5, with a value of .87 for both matrices ($KMO_{Pearson} = .87$; $KMO_{Polychoric} = .87$).

Initially, 18 possible models were identified for the factorial structure of the scale, organized as follows: nine models for the $Pearson\text{CM}$ and nine for the $Polychoric\text{CM}$. Four models were rejected because they contained factorial solutions including factors without an item load (Freiberg-Hoffmann, Stover, de la Iglesia, & Fernández-Liporace, 2013). Likewise, several models were repeated in different criteria, as a result of which, at the end there were a total of seven possible solutions for the explanation of the factorial structure of the test, of which Model No. 7 displayed five factors, which tallied with the theoretical model of the scale.

Second step CFA. The models obtained were compared with each other through the rival model strategy, whereby their indicators of absolute, incremental, and parsimony fit were evaluated, until the best fit was identified (Table 1).

Beginning with the absolute adjustment measures, the following models stood out: No. 2 and No. 7_{ULS}. In the incremental adjustment indicators, the following models were noticeable: No. 4, No. 3_{ULS}, and No. 7_{ULS}. For the parsimony adjustment measures, models No. 5, as well as No. 3_{ULS} and No. 7_{ULS} attracted attention. Models No. 3_{ULS} and No. 7_{ULS} showed the best adjustments in several indicators. Both models corresponded to a five-factor solution with the only

difference being found in the location of item 24: "I think other people are good and honest." In model No. 3_{ULS} this item belongs to the Extraversion factor, since it probably shows an aspect of sociability, whereas in model No. 7_{ULS} it forms part of the Agreeableness factor, due to its relationship with empathy and concern for others.

In model No. 7_{ULS}, it showed the best RMSEA significance, which is why it is considered the best statistical fit of all, since it complies with 10 indicators. This model was derived from the theoretical criterion of the scale based on the polychoric matrices.

Internal consistency analysis

The results for McDonald's omega and Cronbach's alpha of the factors were above .7, which is considered good, except for factor 5 (openness), where the values were .65 and .64, respectively, indicating acceptable reliability (Alomi & Rayah, 2020). As for the average inter-item correlation, it was found that the factors showed values between .3 and .4, which can be considered ideal, except for factor 5, for which the score was .23, which is regarded as acceptable (Hajjar, 2018) (Table 2).

DISCUSSION AND CONCLUSION

This research validated the short version of the BFQ-C that measures personality in children and adolescents and found a high reliability of the instrument and consistency of the structural analysis with the theoretical model of the Big Five. The results showed that the short version of the BFQ-C translated into Spanish has psychometric properties equivalent to the full version and evidenced a strong convergence with theoretically relevant external criteria that support the universality of the Big Five model.

Although a previous study found a factorial solution of four factors, it used only polychoric matrices for its analysis (Holgado-Tello et al., 2009). The present study incorporated both polychoric and Pearson matrices and maintained the original five-factor structure. Since polychoric matrices

showed a better fit in their models, it would be more appropriate to use these rather than Pearson's in studies that incorporate factor analysis techniques (Domínguez-Lara, 2014; Lorenzo-Seva & Ferrando, 2020).

The Big Five model has shown that its factors are independent of culture and remain stable across the life cycle (Bore et al., 2020; Kim & Kim, 2012; Kuzmina et al., 2018; Lemos, 2006; Markos & Kokkinos, 2017). As a common framework in the study of personality, it would encourage the incorporation of psychodiagnostics, the establishment of comparisons between different research projects, and the study of the evolution of the human personality from childhood up to adulthood, which would allow a better understanding of evolutionary development and ultimately human nature (Lemos, 2006).

This research validated the psychometric characteristics of the short version of the BFQ-C translated into Spanish, finding high reliability and validity of the factorial structure in keeping with the theoretical model of the Big Five underpinning the test, which is a step in the right direction for its use with the Latin American child and adolescent population.

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Conflict of interest

The authors declare that they have no conflicts of interest.

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