The Spanish Norms of the NEO Five-Factor Inventory: New Data and Analyses for its Improvement

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Abstract

This study examined the psychometric properties of the Spanish version of the NEO Five-Factor Inventory (NEO-FFI) in a large sample of 1136 adults (444 men and 692 women). Participants who completed the NEO-FFI were university students (65%), professionals of education and health (27%), and a small group of older people (8%). Item-level analyses provided reliability measures and factor structure of the NEO-FFI. The N, E, and C scales showed higher internal consistency and homogeneity than A and O. Some weaker items, particularly in the O scale, were found. Overall, its reliability and factor structure were in line with results reported in other studies; in addition, the analyses provided similar means of scales and intercorrelations between the five factors. The present study found that normative data of Neuroticism and Conscientiousness scales can be improved in the Spanish edition of the NEO-FFI. The discussion includes the utility of improved norms for the profile analysis, suggesting its applicability as a dimensional measure for personality disorders.

Keywords: Five-Factor model, Item analysis, Norms, Personality, NEO-FFI.

Resumen

Hacia una mejora de los datos normativos en la adaptación española del NEO-FFI. En una amplia muestra de 1136 sujetos adultos (444 varones y 692 mujeres) se han estudiado las propiedades psicométricas de la versión española del Inventario abreviado del NEO-PI-R (el NEO-FFI). Los participantes en el estudio que completaron el NEO-FFI fueron estudiantes universitarios (65%), profesionales sanitarios y de la educación (27%) y un pequeño grupo de personas mayores (8%). Mediante análisis de ítems se obtuvieron medidas de la fiabilidad y estructura factorial del NEO-FFI. Las escalas de Neuroticismo (N), Extraversión (E) y Responsabilidad (C) fueron superiores a las de Amabilidad (A) y Apertura (O) en consistencia interna y homogeneidad. Se encontraron algunos ítems más débiles, en particular de la escala O. En conjunto, la fiabilidad y estructura factorial del NEO-FFI son coincidentes con las halladas por los estudios con la versión en inglés, con similares medias de las escalas y correlaciones entre los cinco factores. Según este

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estudio, los datos normativos de las escalas N y C de la adaptación española pueden mejorarse. En la discusión se tiene en cuenta la utilidad de los datos normativos del NEO-FFI mejorados para el análisis de perfiles, así como se sugiere su aplicabilidad como medida dimensional de los trastornos de personalidad

Palabras clave: Modelo de los Cinco Factores, Análisis de ítems, Datos normativos, Personalidad, NEO-FFI.

The Five-Factor model consists of hierarchical trait organization and comprises five basic personality dimensions or factors. These factors are often termed the "Big Five" and represent a general consensus in differential psychology. During the past decades, Costa and McCrae (1985) and McCrae and Costa (1997) have proposed this model as general framework for studying the different traits of normal personality into lexical research. The five factors are named *Neuroticism (N)*, *Extraversion (E)*, *Openness (O)*, *Agreeableness (A), and Conscientiousness (C)*. The Big Five model has derived mainly from the lexical approach to the study of personality (John, 1990; McCrae & John, 1992). The lexical approach to the taxonomy of personality traits has been followed by psychometric studies, many of which have given support to the Bige Five model (McCrae & Costa, 1987; McCrae, 1989). Indeed, as can be seen in Goldberg (1993), there are two five-factor models, one developed by Costa and McCrae (1985) and operationalized in the NEO Personality Inventory (NEO-PI), and a second model associated with studies based on the lexical hypothesis. Between the two versions of the five-factor model there are high similarities and agreement (Golberg, 1993; Saucier & Golberg, 1998).

The NEO Personality Inventory-Revised (NEO-PI-R) of Costa and McCrae (1992) is a self-report inventory, one of the most widely used measures of the Five-Factor model. The NEO-PI-R comprises 240 elements or items. The participants respond by marking whether they are *strongly agree*, *agree*, *neutral*, *disagree* or *strongly disagree* with a given proposition about themselves. The scores of items are summed to provide an overall measure of the five factors. Every factor comprises six facets or scales for more specific characteristics of personality. For example, the N factor refers to a tendency to experience tension, hostility, depression, social-anxiety, impulsivity, and stress vulnerability, all of which are facets of neuroticism.

Costa and McCrae also developed a short form of the NEO-PI, that is the NEO-FFI (NEO Five Factor Inventory, Costa & McCrae, 1992). The NEO-FFI comprises only 60 items derived from a factor analysis on scores of the NEO-PI. The NEO-FFI was developed to provide a concise measure of the five basic personality factors and also uses a five-point Likert response format. The NEO-FFI has been translated into several different languages and shown validity and utility in a number of different contexts, according to McCrae and Costa (2004).

"The psychometry behind the items and factor structure of the NEO-FFI also appear more ambiguous than one would perhaps desire" (Egan, Deary & Austin, 2000). Some studies have provided recently item-level analyses of the English version of NEO-FFI (e.g., Egan et al., 2000; Holden & Fekken, 1994; McCrae & Costa, 2004).

Generally, some items in the O and A scales have low loading in their correspondent factor and result deviated from the norms presented in the manual. So, for example, the obtained scores on the sample of the female Canadian student by Holden and Fekken (1994). This weakness of some items and scales is recognized in the contemplated revision of the NEO-FFI by McCrae and Costa (2004).

Recently, McCrae and Costa (2004) have proposed a revision of this short form of NEO-PI-R. They propose a contemplated revision of the NEO-FFI by replacing 14 of their 60 items. Different selection of elements was performed in the Spanish NEO-FFI normalization than in the English original version. By this reason, both versions do not have *item-by-item* coincidence. The Spanish NEO-FFI resulted from selected items with higher loadings on factors, according to data of the Spanish NEO-PI-R adaptation (see Costa & McCrae, 1999). This selection of 60 items already included 10 of the 14 items proposed for replacement by McCrae and Costa (2004).

The current study sought to examine the psychometric properties of the Spanish version of the NEO-FFI to ascertein whether similar results could be observed in other studies with the English version. The NEO-FFI was given to 1136 Spanish participants as part of three independent research studies. Data from these studies were used together and subjected to item-level analyses. The main purpose of this study was the improvement of existent norms (Costa & McCrae, 1999) in Spanish version of NEO-FFI.

METHOD

Participants

The sample consisted of 1136 subjects between the ages of 18 and 81 (M= 39.8, SD= 12.7, median= 26). Subjects who completed the NEO-FFI were 733 (65%) *students* of several careers in Unniversidad de León (España), 312 (27%) *professionals* mainly of education and health, and a small group of 91 (8%) *old persons* attending courses in the named "University of Experience". The majority of the present sample were university students who ranged in age from 18 to 34 years, a subsample of professionals who ranged from 23 to 60 years, and a small subsample of older persons between 55 and 75 years of age. The full sample comprises only 444 men because between the 693 university students women largely exceeded the men: among university students more than two-thirds were girls.

Test and procedure

The NEO-FFI (NEO Five Factor Inventory, Costa & McCrae, 1992) was administered to all subjects of the research. The NEO-FFI comprises 60 items derived from a factor analysis on scores of the Spanish NEO-PI-R translation. The instructions indicated the response type on the Likert five-point scale. The participants responded by marking on each of 60 items whether they are *strongly agree*, *agree*, *neutral*, *disagree* or *strongly disagree* with a given proposition about themselves. The scores of 12 items are summed to provide an overall measure of every factor. The NEO-FFI was administered

to university students in the classroom (in small groups) and was corrected by the same students. The NEO-FFI was offered to professionals to complete in their homes by means of trained collaborators. Several older persons completed the questionnaire, not in the classroom, but in their homes, as well. The correction of responses of both groups was carried out by trained collaborators.

RESULTS

Normative data and item-level-analysis of the Spanish NEO-FFI.

Table 1 presents a summary of factor means, standard deviations, reliabilities (alpha coeficients) and mean inter-item correlation (mic) as an estimate of scale homogeneity for the full sample. As shown in Table 1, all scales had acceptable reliabilities and homogeneity, particularly the N, E and C scales, and the A scale resulting with the lower reliability and homogeneity. Table 1 presents a comparison of males and females scores on the Spanish NEO-FFI scales.

The gender differences are highly significant for N and A, with men being lower than women. There was no significant difference for E, O and C, but it is a clear trend

Table 1. Means, standard deviations, internal consistency (Cronbach's alpha coeficients), and mean inter-item correlation (mic) for a large Spanish sample tested using the NEO-FFI (n= 1136), and divided by sex (raw scores).

	All subjects (n = 1136)				Men (n = 444)		Women (n = 692)		t	$p <$
	Mean	SD	Alpha	Mic	Mean	SD	Mean	SD		
N	20.53	7.46	0.82	0.28	18.88	7.13	21.58	7.48	-6.03	.001
E	31.72	6.74	0.81	0.27	31.27	6.86	32.05	6.64	-1.91	ns
O	28.27	6.73	0.76	0.22	27.81	6.99	28.58	6.55	-1.88	ns
A	29.95	5.94	0.71	0.17	28.76	6.05	30.72	5.76	-5.49	.001
C	30.49	6.55	0.81	0.28	30.06	6.69	30.82	6.50	-1.89	ns

Table 2. Normogram to convert adult raw scores on the NEO-FFI to equivalent T-scores and Percentile-scores based on the new Spanish norms.

Pc	All subjects (n = 1136)					Males (n = 444)					Females (n = 692)					**T**
	N	E	O	A	C	N	E	O	A	C	N	E	O	A	C	
99	40	45	44	43	45	37	45	44	43	45	41	46	44	43	45	**73**
98	38	44	42	41	44	36	44	43	41	44	38	45	42	42	44	**71**
95	34	42	40	40	41	32	42	39	38	40	34	43	40	40	41	**66**
85	29	39	35	36	37	26	39	35	35	37	30	39	35	37	37	**60**
65	23	35	31	32	33	21	34	31	31	33	24	35	31	33	34	**54**
50	**20**	**32**	**28**	**30**	**31**	**18**	**32**	**28**	**29**	**30**	**21**	**32**	**29**	**31**	**31**	**50**
30	16	28	25	27	27	15	28	24	26	27	17	29	25	28	28	**44**
15	13	25	21	24	24	12	25	20	22	23	14	25	22	25	24	**40**
5	9	20	17	20	19	8	19	17	19	19	10	21	18	21	20	**34**
3	8	19	16	18	17	6	17	15	17	17	9	20	16	19	17	**31**
1	6	13	12	15	14	5	13	12	15	14	7	15	14	16	14	**27**

in the same direction, it is, with women being higher than men. Given that significant gender differences were found across some factors, separate means and standard deviations were calculated for total sample, for male participants, and for female participants. These initial standardization data are presented in Table 1.

The percentiles and T-score norms for total sample, and also separate norms for men and women, are presented in Table 2 (the raw scores were converted to T-values, with a mean of 50 and an SD of 10). As in the original Spanish version of NEO-FFI, it is not standard but empirical normalization.

Table 3 presents a comparison between mean scores (when T-score= 50) for men and women of UK, US, and Spain. According to the data, the means of the present research (New) show considerable difference with the means of Spanish norms (Manual) particularly for N and C factors, being men and women in Manual lower for N and higher for C. In fact, there is great similarity between our norms (New) and all measures in English version of NEO-FFI, particularly between scores of Spanish norms (New) and scores of British norms (see Egan et al., 2000). Nevertheless, all Spanish scores (of the Manual and New) for E appear over those of English version (British and American).

Varimax rotation of the Spanish NEO-FFI items.

To determine its underlying factor structure, the Spanish NEO-FFI scores of item-level (60 items) were subjected to a principal components analysis with varimax rotation. Fourteen factors initially were extracted with eigenvalues greater than 1, which explained a total of 54.09% of the observed variance in the NEO-FFI. The five-factor solution suggested by a scree test accounted for approximately 35% of the total variance. For the NEO-FFI analysis, the first five eigenvalues (with percentage of explained variance) were N 7.10 (11.83), E 4.34 (7.23), C 3.63 (6.05), A 3.03 (5.05), and O 2.82 (4.69).

Table 4 provides the item composition and their loadings on any of the five factors. As can be seen in Table 4, only N56, O28, O33, O48 and A59 shared higher loadings in other factors (for example, the three O items said share higher loadings in E factor). Factors N, E and C had all items loading highly and positively on the factors,

Table 3. Comparison of British, American, and Spanish (Manual and New) raw scores for the NEO-FFI when T-score= 50.

	UK		US		Spanish (Manual)		Spanish (New)	
	Men	Women	Men	Women	Men	Women	Men	Women
N	19	20	18	20	14	16	19	21
E	27	27	27	27	32	33	31	32
O	26	26	27	27	29	30	28	28
A	30	30	32	34	32	34	29	31
C	32	32	34	35	36	36	30	31

Table 4. Factor-analysis of the five varimax factors extracted from the 60 items of the NEO-FFI in a sample of 1136 Spanish subjects (the parentheses indicate the number of items in the NEO-PI-R, and the bold numbers are those with higher loading in the other scale).

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
N 1 (136)	.62				
N 6 (61)	.44				
N 11 (211)	.53				
N 16 (41)	.68				
N 21 (191)	.68				
N 26 (86)	.61				
N 31 (91)	.66				
N 36 (186)	.59				
N 41 (236)	.48				
N 46 (71)	.60				
N 51 (201)	.40				-.33
N 56 (156)	.27			.32	
E 2 (177)		.52			
E 7 (122)		.52			
E 12 (217)		.54			
E 17 (147)		.54			
E 22 (37)		.57			
E 27 (137)	-.41	.47			
E 32 (227)		.41	.41		
E 37 (102)		.33			
E 42 (7)		.52			
E 47 (117)		.54			
E 52 (142)		.55			
E 57 (32)		.47			
O 3 (188)			.68		
O 8 (128)			.66		
O 13 (233)			.50		
O 18 (98)			.60		
O 23 (53)			.68		
O 28 (63)		.34	.31		
O 33 (123)		.33	.27		
O 38 (173)			.63		
O 43 (113)			.57		
O 48 (133)		.35	.30		
O 53 (108)			.39		
O 58 (43)			.37		
A 4 (184)				.57	
A 9 (189)				.56	
A 14 (159)				.55	
A 19 (169)				.49	
A 24 (139)				.53	
A 29 (154)				.52	
A 34 (74)				.50	
A 39 (214)				.33	
A 44 (114)				.32	
A 49 (94)				.45	
A 54 (49)				.40	
A 59 (119)			.34	.32	
C 5 (130)					.56
C 10 (50)					.65
C 15 (110)					.62
C 20 (235)					.65
C 25 (120)					.51
C 30 (195)					.59
C 35 (200)					.61
C 40 (215)					.55
C 45 (85)					.63
C 50 (90)		-.41			.43
C 55 (205)					.44
C 60 (95)					.49

with the exception of only one item (N56) which had higher loading in A factor. With this criterion in the item-level factor analysis, the Manual of Spanish NEO-FFI edition shows in Table A4 similar higher loadings of five items in the other five factors, being again three items of the O factor which share higher loadings in the E and N factors. In fact, factor 3 contains nine of 12 items, as in the present analysis; but only the O33 or O7 item (133 in the NEO-PI-R) shares similar loadings in both analyses. Also in the two Spanish samples the lower percentage of variance explained by five factors proceeds from the O dimension. Factor 2 contains the E27 or E7 item (137 in the NEO-PI-R) which has a negative loading in N dimension, as in the Spanish NEO-FFI edition.

The first five extracted factors with eigenvalues over 1 are ordered for the NEO-FFI differently in dependence of the actual study. So, in the Spanish edition (Costa and McCrae, 1999) the Factor 1 corresponds to C because the higher percentage of explained variance, being N Factor 2 and E Factor 3. Instead, our analysis shows N as Factor 1, E as Factor 2, C as Factor 3, A as Factor 4, and O as Factor 5; the same order appeared in McCrae and Costa (2004), except C being the second Factor. In the study of Egan et al. (2000), Factor 1 "is clearly and unequivocally N, with all items loading highly and positively on the factor" (p. 911), and "N, A, and C dimensions represent coherent separate traits, while E and O were more problematic" (p. 912). On the contrary to other studies already quoted, our analysis also shows that N and E are the two more robust dimensions measured with the Spanish NEO-FFI; of 35% of variance explained by the first five factors (N-E-C-A-O) with item-level analysis, the 19.06% is due to N (11.83%) and E (7.23%).

To test the stability of the factor solution, additional principal components analyses with varimax rotations were conducted on the following subsamples: randomly selected 50% of the total sample, men-women samples, and younger-older age group samples (ages 18-24 and 25-80). Across all subsamples, the item content of the factors changed only minimally (the same weaker items appeared across the subsamples), and the five factors remained equivalent when compared to the factor analysis results for the overall sample.

Discussion

The NEO-FFI was designed as a brief instrument that would provide reasonable estimates of the five factors of personality, perhaps mainly of use in exploratory research in a variety of contexts and cultures, as affirmed by McCrae and Costa (2004). The aim of this study has been to improve the psychometric properties of the Spanish NEO-FFI version (Costa & McCrae, 1999) identifying weaker items and dimensions. In the present study some weak items were found, two of which (123 and 133) were also detected by McCrae and Costa (2004). See, for example, E32 which loads equally in O scale in Table 3; this item (227 of NEO-PI-R: "I am a very active person") was given also as weak in other studies (e.g., Egan et al., 2000; McCrae & Costa, 2004).

Overall, our results with item factor analyses suggested that the most consistently problematic items were from the O and A scales. Also, that these two scales had lower reliability than the N, E and C scales, in particular the lesser reliability was that of the A scale. It is also worth noting that the O personality dimension shared higher loadings

of several items with E scale. For example, the item 123 of the NEO-PI-R appeared as a weak item of the O scale across different studies. Instead, the other nine items (186, 7, 32, 133, 189, 169, 139, 184, and 85) selected for replacement from the NEO-PI-R for contemplated revision of original English NEO-FFI (see McCrae & Costa, 2004) were inicially included in Spanish edition of the NEO-FFI.

McCrae and Costa (2004) said that the new version is not appreciably better than the old except in the case of A, in which 5 of 12 items were changed. They think that the internal consistency estimates are all acceptable, being the estimates 0.70-0.75 for O scale and 0.72-0.69 for A scale in their two samples of NEO-FFI. According to our analyses (see Table 1), both O and A scales have similar estimates (0.76 and 0.71, respectively), being the mean inter-item correlation (mic) of A scale (0.17) out of optimal level of homogeneity, which is in the 0.20 to 0.40 for personality scales (Briggs & Cheek, 1986).

The item factor analyses in this study with Spanish version supports the idea proposed by McCrae and Costa (1997) on the universality of personality traits. Also the intercorrelations (by means of the Pearson's r) between NEO-FFI scale scores were similar to those of other studies (e.g., Egan et al., 2000; McCrae & Costa, 2004), with most correlations that were significant due to the large samples analysed, with the exception of O which was uncorrelated with N and C dimensions. The scales are correlated, specially N with lower E, lower A, and lower C; E is associated with higher levels of C and O. The means for the five factors of the Spanish version of the NEO-FFI (Costa & McCrae, 1999) are very different from those found in this study for N and C scales, being our data similar to the findings of the NEO-FFI in English language.

With respect to reliability, although internal consistency and homogeneity estimates were all acceptable, results suggested high levels of internal consistency and homogeneity for N and E dimensions, with C next to them. The similarity of reliability with English studies gives to these three dimensions the needed stability for future practical applications, as also for research. Nevertheless, in existing Spanish norms there is recognition that samples influenced the low scores of N scale, being also the samples responsible for the high scores of the C scale. We think that the normative data of the present study will be a contribution to improve the norms of the Spanish NEO-FFI (see Costa & McCrae, 1999), specially those of the N and C scales showing a satisfactory reliability.

The results of the present study have implications for both research and practice. Research on the relations between personality traits and job performance is now of absolute crucial importance for the optimal deployment of human resources (Goldberg, 1993). For example, in the personnel selection those measures associated with C are most likely to be valid predictors for all jobs. The links between the personality profiles and the job requirements could be better understood with the improved NEO-FFI of the Big Five model.

If personality factors are reasonably invariant across ages including adolescence (McCrae et al., 2002), we think that the improved Spanish NEO-FFI should prove useful as a acceptable instrument for research into the five-factor framework from age 12 to age 18. There was agreement in the classroom (university students of personality psychology) about the weaker items of the Spanish version of NEO-FFI for adolescents,

being necessary the change for some items as 123, 133, 227, 119, 63, and 156 (numbers in the NEO-PI-R).

Some clinical implications may be considered about the applicability of NEO-FFI framework for personality disorders, that is, if these could be better understood with a dimensional model than with a categorical system (see Butcher & Rouse, 1996). For example, Schmitz, Hartkamp, Baldini, Roolnik, and Tress (2001) intended to discriminate patients with personality disorders from those with other mental disorders using the NEO-FFI measures.

Finally, our data provides strong evidence that a good instrument, like the Spanish NEO-FFI, can be improved, adding thus more clinical utility because of its applicability as a dimensional measure for personality disorders, and for a better profile analysis particularly in personnel selection.

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Received September 1, 2004
Final acceptance October 26, 2004