

Needs and Cognition/Behavior Patterns at Work and the Big Five: An assessment of the Personality and Preference Inventory-Normative (PAPI-N) from the perspective of the five-factor model

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This study examined the relationship between psychological needs and cognition/behavior patterns at work as measured by the Personality and Preference Inventory – Normative (PAPI-N) and the five-factor model of personality as measured by the NEO Five Factor Inventory (NEO-FFI) in a sample of 91 working adults and 71 psychology undergraduates who worked or had some work experience. Our results showed significant and theoretically congruent correlations between the PAPI-N scales and the measures of the five-factor model. These correlations were similar to those found using alternative instruments to measure Murray's needs. Despite the differences in the conceptual origins of the PAPI-N and the NEO-FFI and divergences in the aspects of personality measured by the two inventories, joint and interbattery factor analyses showed that most of the needs and cognition/behavior patterns measured by the PAPI-N can be meaningfully organized within the framework of the five-factor model. These results provide further empirical evidence for the validity of the five-factor model and the PAPI-N, although they also point out personality aspects that are not encompassed by the five-factor model.

1. Introduction

Although not without criticism, over the past decade the five-factor model has become the dominant model for the organization of personality traits

(McCrae & Costa, 1997; Sanz, Silva, & Avia, 1999). Factor analyses of the terms used to describe personality in ordinary language and factor analyses of the scales from a variety of objective personality tests measuring a range of personality constructs have shown

that the five dimensions of neuroticism or emotional stability, extraversion, openness to experience or culture, agreeableness, and conscientiousness summarize and integrate the majority of personality traits (McCrae & Costa, 1997; Saucier & Goldberg, 1996). This model has been successfully applied in industrial/organizational psychology and, nowadays, there is a vast literature demonstrating the usefulness of personality traits based on the five-factor model in predicting job performance, training criteria, job satisfaction, leadership, and counterproductive behaviors such as deviant behaviors and turnover [see the reviews and meta-analyses by Barrick, Mount, & Judge (2001); Borman, Penner, Allen, & Motowidlo (2001); Goodstein & Lanyon (1999); Salgado (1997, 2002)].

Costa and McCrae (1985) developed one of the first personality questionnaires specifically designed to assess the Big Five, the NEO Personality Inventory (NEO-PI). Both this inventory and its revised (NEO-PI-R; Costa & McCrae, 1992) and abbreviated versions (NEO Five-Factor Inventory or NEO-FFI; Costa & McCrae, 1989) have become the standard for the assessment of the five-factor model. Indeed, these instruments have been largely responsible for its further development and widespread acceptance. Thus, one of the key arguments advanced by its supporters is that the five-factor model integrates the main personality constructs proposed from theoretical standpoints as divergent as Jung's typology, Leary's interpersonal theory, Guilford's temperamental theory, Eysenck's psycho-biological factor model, and the purely empirical perspective. This support is of course grounded in empirical research, which relates the NEO-PI, NEO-PI-R, and NEO-FFI on a satisfactory basis with the main personality questionnaires used to operationalize these models (respectively, the Myers-Briggs Type Indicator, the Interpersonal Adjective Scales-Revised, the Guilford-Zimmerman Temperament Survey, the Eysenck Personality Questionnaire, and the Minnesota Multiphasic Personality Inventory). Also, factor analysis studies have shown that the Big Five defined in the NEO inventories are present in the majority of such questionnaires (see Costa & McCrae, 1985, 1989, 1992; Sanz *et al.*, 1999).

Various studies carried out in this line of research have verified that the scales used in the main objective tests for the assessment of psychological needs based on Murray's (1938) need-press theory, which include the Personality Research Form (PRF; Jackson, 1984), the Edwards Personal Preference Schedule (EPPS; Edwards, 1959), and the Adjective Check List (ACL; Gough & Heilbrun, 1983), are empirically related with the Big Five factors assessed via the NEO inventories, or may be coherently organized within the factorial space defined by the Big Five in these inventories (Costa & McCrae, 1988; Craig, Loheidi, Rudolph, Leifer, & Rubin, 1998; Piedmont, McCrae & Costa, 1991, 1992).

This study sought to extend the scope of such research to the Personality and Preferences Inventory-Normative or PAPI-N (Cubiks, 1996), yet another personality instrument based on Murray's theory. The PAPI-N differs from the PRF, EPPS, and ACL, however, in that it was specifically designed to assess personality in the work context, especially in personnel selection. Both the EPPS and the ACL, and especially the PFR, have of course been used in applied psychology contexts in the areas of work and organizations, but none of these inventories was specifically developed to measure Murray's psychological needs in the work setting. Several studies suggest that the use of tests specifically designed to measure personality in work contexts increases criterion-related validity, thereby presumably increasing the utility of personality constructs in industrial/organizational psychology (Hunthausen, Truxillo, Bauer, & Hammer, 2003; Schmit, Ryan, Stierwalt, & Powell, 1995).

The PAPI-N is a questionnaire specifically designed to measure the most relevant needs in the world of work (need scales) and the individual's perception of his/her usual cognitions and behaviors in the situations (Murray's presses) imposed by the workplace (role scales; see Feltham & Hughes, 1999, for a description of the need and role scales). The definition of role in the PAPI-N implies the existence of consistent behavior and cognition patterns and, in this sense, it resembles the usual definition of personality trait as 'consistent patterns of thoughts, feelings, or actions that distinguish people' (Johnson, 1997, p. 74). Therefore, the role scales of the PAPI-N actually try to measure behavioral and cognitive personality traits in work situations. However, the PAPI-N also assumes that psychological needs, along with traits, are among the leading candidates to be useful units for personality research, especially the psychological needs proposed by Murray. Needs are usually defined as people's goals and desires, whereas traits are defined as people's habitual patterns of cognition, affect, and behavior. Traits answer the question of 'how' a person behaves; needs answer the question 'why' (Winter, John, Stewart, Klohnen, & Duncan, 1998). Therefore, traits and needs reflect two fundamental yet different aspects of personality, and the PAPI-N assumes that both constructs should be taken into account when considering personality in work settings. For example, Winter *et al.* (1998) demonstrated in two samples, using longitudinal data, that two needs (affiliation and power) and one trait (extraversion) have interactive effects on life outcomes over and above their separate individual effects.

Specifically, then, the objectives of this study were to examine the relationships between the PAPI-N and the NEO-FFI and to establish whether the five factors were present in the PAPI-N. The PAPI-N assumes that needs and roles are interrelated, forming a significant

personality structure in work setting, in such a manner that it is possible to distinguish certain basic personality dimensions or factors underlying the relationships between roles and needs in the world of work, ultimately providing an understanding of people's behavior in that setting. Examining this structure, Lewis and Anderson (1998) performed a factor analysis of the need and role scales of the PAPI-N and, as a result, they obtained the following seven factors: Active Dominance, which explains the relationship between the need to control others (P) and the leadership role (L); Conscientious Persistence, which integrates the roles of the organized type (C), the integrative planner (H), and attention to detail (D), and the need for rules and supervision (W); Openness to Experience, which accounts for the relationship between the need to finish tasks (N) and the need for change (Z), and the conceptual thinker role (R); Sociability, which underlies the relationships between the need to belong to groups (B), the need to relate closely to individuals (O) and the need to be noticed (X), and the social harmonizer role (S); Work Tempo, which agglutinates the roles of work pace (T) and ease in decision making (I); Agreeableness, which explains the inverse relationship between the need to be forceful (K) and the role of emotional restraint (E); and, finally, Seeking to Achieve, which integrates the needs to achieve (A) and to be supportive (F) with the role of the hard worker (G).

On the basis of the definitions of these factors and the Big Five, Lewis and Anderson (1998) proposed the following relationships between the PAPI-N factors (and the relevant scales) and the dimensions of the Big Five: Agreeableness and Openness to Experience, respectively, with the two dimensions of the Big Five with the same name; Sociability and Active Dominance with extraversion; and Conscientious Persistence and Seeking to Achieve with conscientiousness. In the opinion of Lewis and Anderson (1998), the remaining PAPI-N factor, Work Tempo, does not clearly correspond to the five-factor model, while the neuroticism dimension of the Big Five presents no strong links to the factors and scales of the PAPI-N, except to some extent with the role of emotional restraint (E).

In an unpublished prior study (Cubiks, 2000), a sample of 76 people in the United Kingdom were asked to complete the PAPI-N and NEO-FFI inventories. The majority of the sample held middle management jobs in a university and the objective of the study was to validate the hypotheses proposed by Lewis and Anderson (1996) concerning the relationships between the PAPI-N scales and the Big Five. An analysis of the correlations between the PAPI-N and NEO-FFI scales revealed that 17 of the 18 correlations theoretically proposed were statistically significant, and that, in 15 cases, these correlations were discriminative in the sense that the magnitude of the correlation between

the PAPI-N scale and the corresponding NEO-FFI scale was greater than that obtaining between the PAPI-N scale and the remaining NEO-FFI scales. Moreover, in 9 of the 18 theoretical correlations, the value of the coefficients was equal to or $< .50$, the convention for a large correlational effect size (Cohen, 1988).

Unfortunately, this study has not been replicated. The replication of empirical results is a key part of scientific method, especially where the sample from which findings were obtained was small. This study was intended to replicate the results obtained by Cubiks (2000) and to extend the scope of research to a new language, which had not previously been examined using the PAPI-N and the five-factor model. Thus, we assumed the hypotheses of Lewis and Anderson (1998) concerning the relationship between the PAPI-N scales and the Big Five, although with some modifications based on the factors encountered in factor analyses of the Spanish adaptation of the PAPI-N (Sanz, Gil, Barrasa, & García-Vera, 2006) and the results obtained by Cubiks (2000). Specifically, in the Spanish normative sample used for the PAPI-N Spanish adaptation, the need to finish tasks (N) did not significantly load on the openness to experience as was the case in the original UK version. Rather, N formed part of the conscientious persistence factor (Sanz *et al.*, 2006, Study 1). Consequently, it was expected in this study that this scale would be basically related with the conscientiousness dimension of the Big Five, as was also the case in the prior study carried out by Cubiks (2000).

In sum, empirical observation of the correlations between the PAPI-N and the NEO-FFI would therefore provide further evidence for the validity of the five-factor model as a comprehensive summary of individuals' key personality characteristics, including those needs and traits related with their behavior at work. It would also provide additional support for the validity of the PAPI-N as a personality assessment tool.

Finally, the study sought to extend the previous work of Cubiks (2000) by comparing the pattern of correlations between the PAPI-N need scales and the Big Five with the patterns found between the PRF, EPPS, and ACL need scales and the Big Five, and by factor analyzing the PAPI-N and the NEO-FFI. As mentioned above, earlier research has shown that the PRF, EPPS, and ACL are significantly related with the Big Five, specifically with regard to the measurements of the dimensions provided by the NEO-PI and the NEO-PI-R (Costa & McCrae, 1988; Craig *et al.*, 1998; Piedmont *et al.*, 1991, 1992). Like the PAPI-N, these questionnaires are based on Murray's need-press theory, and it was therefore to be expected that the pattern of correlations between the PAPI-N need scales and the NEO-FFI (the abbreviated version of the NEO-PI and the NEO-PI-R) would be similar to the patterns encountered between the need scales of the PRF, the EPPS, and the

ACL with the NEO-PI and the NEO-PI-R. The confirmation of this hypothesis would reaffirm the validity of the five-factor model, as well as the convergent-structural validity of the PAPI-N. On the other hand, a factor analysis of the PAPI-N and NEO-FFI should give a reasonable idea of the degree of correspondence between the PAPI-N and NEO-FFI dimensions and, therefore, between the Murray's need-press theory and the five-factor model.

2. Method

2.1. Participants

A sample of 91 working adults from the general population and 71 university students who either were in work or had some work experience participated voluntarily in this study. Working adults from the general population were recruited by a 'snowball' technique in which psychology graduate students invited working relatives to volunteer. Initially, the PAPI-N and the NEO-FFI were administered to 98 working adults, but data from seven participants were excluded because their questionnaires included more than three missing or invalid responses. The questionnaires of another eight participants also included missing or invalid responses, but these were less than three and were replaced by the neutral score. Finally, the working adult subsample comprised 91 participants (60% females) between 19 and 55 years of age ($M = 33.3$ years; $SD = 8.8$). These participants worked in a wide range of occupations (e.g., lawyer, firefighter, economist, psychologist, cook, electrician, teller, teacher, manager, salesperson), the most frequent being human resource technician (18.6%), computer technician/programmer (16.3%), and clerk (8.1%). Initially, the questionnaires were also administered to 110 volunteer psychology undergraduates at the Universidad Complutense de Madrid, but data from 39 students were excluded because they neither had a job nor had worked at any time (a job is here defined as paid work for a duration of over one month). Finally, the university student subsample consisted of 71 participants (84.5% females) between 19 and 30 years of age ($M = 21.3$ years; $SD = 2.1$) who worked or had worked in a range of occupations, the most frequent being waiter/bar staff (14.1%), shop assistant (14.1%), sales staff (9.8%), and clerk (7%).

2.2. Instruments

2.2.1. PAPI-N (Cubiks, 1996)

The PAPI-N is a questionnaire comprising 126 affirmations, each of which is scored by the participant along a seven-point scale from 1 ('absolutely agree') to 7 ('absolutely disagree'). It provides a personality profile in 10 need and 10 role scales, which respectively reflect

the psychological needs and stable behavior patterns (role) of a person in the job. Each of the 20 need and role scales of the PAPI-N comprises six items, one of which is given a negative presentation in order to control acquiescence. The PAPI-N also includes a social desirability scale, adding a further six items to the questionnaire. The study was carried out using the 20 need and role scales of the Spanish adaptation of the PAPI-N (Cubiks, 2001). The psychometric properties of this adaptation are adequate in terms of internal consistency reliability and factor validity and are comparable to those of the original English-language version (Sanz *et al.*, 2006). Thus, in the Spanish normative sample of 420 job applicants, 13 PAPI-N scales showed reliability coefficients (Cronbach's α 's) of .80 or higher, and the remaining PAPI-N scales had α 's equal to or higher than the standard of .70 proposed by Nunnally (1978) with two exceptions, R and K. The α of R (.66) was close to the standard, but that of K was low (.41). In the same sample, factor analyses of need items and of role items revealed 10 need factors and 10 role factors, respectively, supporting the factorial validity of the Spanish PAPI-N in distinguishing between ten different psychological needs and 10 different roles (Sanz *et al.*, 2006, Study 1). In the volunteer sample of the present study, internal consistency indices were comparable with those obtained in the Spanish normative sample, with α 's equal to or higher than .80 for 14 PAPI-N scales, and α 's higher than .70 for the remaining scales, with three exceptions: the α coefficients of R and S (.68 and .67, respectively) were not far from the standard for adequate reliability, but the coefficient for K was again low (.51), replicating the poor results obtained in the normative Spanish sample (we discuss the implications of this finding below).

2.2.2. NEO-FFI

The NEO-FFI is an abbreviated version of the NEO-PI (and the NEO-PI-R) comprising 60 items, each scored using a five-point Likert scale from 0 ('strongly disagree') to 4 ('strongly agree'). It provides a measurement of the Big Five through five scales each made up of 12 items. These scales are Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness. In this study we used the Spanish adaptation of the NEO-FFI developed by Avia, Silva, and Sanz (1998–2000; see Sanz *et al.*, 1999), which exhibits acceptable internal consistency reliability and factor validity indices similar to those presented by the original English language version of Costa and McCrae (1989, 1992). Thus, both in a Spanish general population sample of 1171 adults (normative sample) and in a Spanish college sample of 1444 undergraduates, all the scales of the Spanish NEO-FFI showed α coefficients higher than the standard of .70 (Sanz *et al.*, 1999). The only exception to this general pattern of good internal

consistency was Agreeableness. This scale had an α of .71 in the college sample, but an α of .68 in the general population sample. In these two same samples, factor analyses revealed clear five-factor structures consistent with the Big Five model. In fact, in both samples, 57 out of 60 NEO-FFI items showed high loadings ($\geq .35$) on the intended factor and lower loadings ($< .35$) on the non-intended factors (Sanz *et al.*, 1999). In the sample of the present study, internal consistency indices for the Spanish NEO-FFI were comparable to those found in the above-mentioned samples, with α 's of .70 or higher for all NEO-FFI scales except for one (in this case, Openness showed an α coefficient of .63).

2.3. Procedure

The NEO-FFI and the PAPI-N were individually administered (in that order) to participants of the working adult subsample by the graduate student who invited them to join the study, but they were collectively administered (also in that order) to participants of the university student subsample, divided into groups of 50–60 people.

3. Results

3.1. Correlations between the PAPI-N and the NEO-FFI

Table 1 shows the correlations found in this study between the PAPI-N scales and the Big Five scales of the NEO-FFI, as well as the correlations found in the prior study by Cubiks (2000). Taking into account the hypothesized relationships, it can be seen that 14 out of the 18 theoretical correlations proposed were statistically significant (see the shaded correlations in Table 1), and that 11 of them were also discriminative in the sense that the magnitude of the correlation between a given PAPI-N scale and the corresponding NEO-FFI scale was greater than that between the PAPI-N scale and the other NEO-FFI scales. Moreover, in six of the 18 theoretical correlations the magnitudes exhibited by the coefficients were equal to or greater than .50, the convention for a large correlational effect size (Cohen, 1988). In addition, the results obtained were very similar to the previous findings of Cubiks (2000) with 13 of the 18 assumed correlations turning out to be statistically significant in both the Spanish and UK samples, and in 11 of them the coefficients obtained in both samples exhibited magnitudes equal to or $> .30$, the convention for a medium correlational effect size (Cohen, 1988). This and the above data offer empirical support for an adequate linkage between the PAPI-N and the five-factor model.

3.2. Structural similarity between instruments measuring Murray's needs

To establish the degree of similarity between the pattern of PAPI-N/NEO-FFI correlations found in this study and the patterns found in previous studies relating instruments measuring Murray's needs (e.g., PRF, ACL, EPPS) and instruments measuring the Big Five (e.g., NEO-PI, NEO-PI-R, NEO-FFI), we used an analytic strategy proposed by Huba and Hamilton (1976; see also Piedmont *et al.*, 1991). Huba and Hamilton (1976) obtained a quantitative estimate of the structural similarity between instruments by correlating coefficients from the correlation matrices (after transforming the correlation coefficients to Fisher's z coefficients). The correlation matrices were sourced from various studies. Correlations with the PAPI-N are the same as those found between the NEO-FFI and the PAPI-N in this study and in the prior study by Cubiks (2000). The correlations with the PRF were obtained by Costa and McCrae (1988), who ran the PRF and the NEO-PI on a sample of 296 US adults. The sources of the ACL data are a study performed by Piedmont *et al.* (1991) on a sample of 410 US adults, which also used the NEO-PI to measure the Big Five, and a study by Craig *et al.* (1998) carried out with a sample of 147 postgraduate psychology students who completed the ACL and the NEO-PI-R. Finally, the Big Five correlations with the EPPS were obtained in a study by Piedmont *et al.* (1992). The researchers applied a normative version of the EPPS to 166 US university students, who were also asked to complete the NEO-PI.

Since the PAPI-N and the PRF have eight need scales in common, the Huba and Hamilton procedure meant correlating the 40 correlation coefficients making up the PAPI-N/NEO-FFI correlation matrix with the 40 correlation coefficients forming the PRF/NEO-PI correlation matrix. Similarly, because the PAPI-N and the ACL have nine need scales in common, 45 coefficients from the PAPI-N/NEO-FFI correlation matrix were correlated with the 45 coefficients from the ACL/NEO-PI correlation matrix obtained in the study by Piedmont *et al.* (1991), and with the 45 coefficients from the ACL/NEO-PI-R correlation matrix produced in the study by Craig *et al.* (1998). The same procedure was employed to correlate the PAPI-N/NEO-FFI correlation matrix with the EPPS/NEO-PI correlation matrix, since the PAPI-N and the EPPS also have nine need scales in common. Obviously, to compare the pattern of correlations between the PAPI-N used in this Spanish study with the PAPI-N in the UK study, the 50 coefficients from the former were correlated with the 50 from the latter, since the PAPI-N has ten need scales. Table 2 shows the correlation coefficients between matrices resulting from this analysis.

Table 1. Correlations between PAPI-N and NEO-FFI in the English sample of Cubiks (2000; UK; N = 76) and in the Spanish sample of the present study (SP; N = 162)

Scales of PAPI-N	Scales of NEO-FFI									
	Neuroticism		Extraversion		Openness		Agreeableness		Conscientiousness	
	UK	SP	UK	SP	UK	SP	UK	SP	UK	SP
P: Need to control others	-.47**	-.13	.23*	.14	.17	-.03	-.34**	-.34**	.08	.09
L: Leadership role	-.51**	-.33**	.35**	.38**	.04	.13	-.21	-.14	.16	.10
C: Organized type	-.07	-.22**	-.23*	.14	-.12	.02	-.14	.26**	.71**	.60**
H: Integrative planner	-.21	-.19*	-.11	.12	.05	.14	-.21	.08	.68**	.57**
D: Attention to detail	-.10	-.11	-.12	.06	.00	.08	-.04	.09	.62**	.46**
W: Need for rules and supervision	-.04	-.04	-.01	.17*	-.36**	-.08	.28*	.19*	.41**	.23**
R: Conceptual thinker	-.14	-.18*	.05	.15	.62**	.51**	-.24*	-.15	.30**	.07
Z: Need for change	-.17	-.24**	.22	.32**	.37**	.24**	-.12	.18*	.11	.27**
N: Need to finish a task	-.15	-.21**	-.09	.23**	-.12	.04	-.05	.32**	.60**	.60**
X: Need to be noticed	-.50**	-.13	.59**	.43**	.34**	.10	.02	-.19*	.01	-.04
B: Need to belong to groups	-.39**	-.14	.54**	.38**	.07	.07	.42**	.28**	.01	.22**
S: Social harmonizer	-.51**	-.29**	.66**	.53**	.04	.19*	.45**	.34**	.11	.28**
O: Need to relate closely	-.32**	-.07	.33**	.42**	.10	.14	.37**	.47**	.12	.27**
I: Ease in decision making	-.21	-.27**	.05	.22**	.14	.01	-.25*	-.04	.04	.12
T: Work pace	-.25*	-.24**	.21	.22**	.36**	-.02	-.15	.14	.43**	.39**
K: Need to be forceful	-.22	-.01	-.02	.24**	.34**	.07	-.49**	-.12	.23	-.06
E: Emotional restraint	-.25*	-.25**	.05	-.27**	-.13	.01	.32**	-.06	.25*	-.07
A: Need to achieve	-.14	.10	.08	.13	.25*	-.05	-.18	-.24**	.32**	.14
F: Need to be supportive	.01	.10	-.02	.24**	-.15	.11	.29**	.22**	.16	.23**
G: Role of the hard worker	-.16	-.10	.36**	.22**	.19	.14	.24*	.28**	.56**	.67**

Note: Statistically significant correlations are shown in boldface; the shaded correlations indicate hypothesized convergent correlations. NEO-FFI, Costa and McCrae's NEO Five Factors Inventory; PAPI-N, Personality and Preference Inventory – Normative. * $p < .05$, ** $p < 0.01$ (two-tailed).

The data presented in Table 2 indicate that the similarity of the correlation pattern between the PAPI-N and the Big Five as compared with the correlation patterns between other measures of Murray's needs and the Big Five oscillates between a minimum of .47 (compared with the ACL matrix obtained by Piedmont *et al.*, 1991) and a maximum of .58 (compared with the PRF matrix), based on the PAPI-N correlation matrix obtained from the Spanish sample used in this study. The similarity indices are higher using the PAPI-N/NEO-FFI correlation matrix obtained in the UK sample (Cubiks, 2000), with the correlations between matrices oscillating between a minimum correlation of .51 (compared with the EPPS matrix) and a maximum of .71 (compared with the PRF matrix). As expected, the similarity of the two matrices of correlations between the PAPI-N and NEO-FFI needs, which were respectively obtained from the Spanish and UK samples, was quantified by a high correlation of .72.

3.3. Joint factor analysis of the PAPI-N and the NEO-FFI

In order to examine the relationships between the PAPI-N and the NEO-FFI from the standpoint of the five-factor model, we decided to perform a joint factor

analysis of the PAPI-N scales and the NEO-FFI scales, particularly since both the Kaiser–Meyer–Olkin test of sampling adequacy (.79) and Bartlett's test of sphericity [$\chi^2 (N = 162, df = 300) = 1965.9, p < .001$] showed that the factor model was appropriate to explain the correlations obtained between the two instruments. The application of the maximum likelihood extraction method resulted in six factors with eigenvalues > 1 which explained 65.7% of the variance in the data. Cattell's scree test, however, indicated that a five-factor solution explaining 61% of the variance would be more appropriate (the eigenvalues of the first ten factors obtained were 6.5, 3.2, 2.3, 1.8, 1.5, 1.1, .9, .8, .7, and .7). In fact, an extension of Horn's (1965) parallel analysis criterion indicated five factors as well. In this procedure, a regression equation is used to predict the mean value of successive latent roots of correlation matrices based on random data (Longman, Cota, Holden, & Fekken, 1989; Keeling, 2000). Both with the regression equation proposed by Longman *et al.* (1989) and with that proposed by Keeling (2000), this analysis revealed that the first five eigenvalues of the sample correlation matrix exceeded their corresponding predicted mean values. In addition, after rotating both the five- and six-factor solutions using the *direct quartimin* method of oblique rotation,¹ the five-factor solution was the most easily interpreted from a

Table 2. Correlations between matrices of correlations of Murray's needs measures with Big Five measures

	PAPI-N/NEO-FFI matrix (Cubiks, 2000)	PRF/NEO-PI matrix (Costa and McCrae, 1988)	ACL/NEO-PI matrix (Piedmont et al., 1991)	ACL/NEO-PI-R matrix (Craig et al., 1998)	EPPS/NEO-PI matrix (Piedmont et al., 1992)	PAPI-N/NEO-FFI matrix (present study)
PAPI-N/NEO-FFI matrix (Cubiks, 2000)	1.00					
PRF/NEO-PI matrix (Costa & McCrae, 1988)	.71	1.00				
ACL/NEO-PI matrix (Piedmont et al., 1991)	.60	.88	1.00			
ACL/NEO-PI-R matrix (Craig et al., 1998)	.65	.81	.88	1.00		
EPPS/NEO-PI matrix (Piedmont et al., 1992)	.51	.83	.66	.63	1.00	
PAPI-N/NEO-FFI matrix (present study)	.72	.58	.47	.54	.55	1.00

Note. All correlations are statistically significant at $p < 0.01$ (two-tailed). ACL, Gough and Heilbrun's Adjective Checklist; EPPS, Edwards Personal Preference Schedule; NEO-FFI, Costa and McCrae's NEO Five Factors Inventory; NEO-PI, Costa and McCrae's NEO Personality Inventory; NEO-PI-R, Costa and McCrae's NEO Personality Inventory Revised; PAPI-N, Personality and Preference Inventory – Normative; PRF, Jackson's Personality Research Form.

psychological standpoint. The pattern matrix for the five-factor solution is shown in Table 3.²

The five factors were defined by the five scales of the NEO-FFI, clearly representing the Big Five model, except for the significant double loading of NEO-FFI agreeableness on the relevant factor and on extraversion, the other interpersonal factor. Our hypotheses suggested a strong link between the PAPI-N and the conscientiousness, extraversion, agreeableness, and openness to experience dimensions of the five-factor model. This was precisely what we found. Thus, each of conscientiousness, extraversion, agreeableness, and openness factors was defined by at least three PAPI-N scales (one in the case of openness), as well as the corresponding NEO-FFI marker, and the majority of the factor loadings of these PAPI-N scales were congruent with the expected relationships, especially with regard to conscientiousness, extraversion, and openness to experience. However, our hypotheses also suggested that: (a) the PAPI-N factor 'Agreeableness', which included E and K, would define the agreeableness dimension of the Big Five; (b) the PAPI-N factor 'Work Tempo', which embraced T and I, would not be clearly represented in the five-factor model, and (c) none of the PAPI-N scales, except for the role of emotional restraint (E), would adequately represent the neuroticism dimension of the Big Five. These three hypotheses were not confirmed. Thus, E and K did not load significantly on the agreeableness factor; instead, P (need to control others), X (need to be noticed), L (leadership role), and A (need to achieve) loaded on it. On the other hand, work pace (T) loaded

significantly on conscientiousness, and ease in decision making (I), but not the role emotional restraint (E), loaded negatively on neuroticism. Although these results are not entirely surprising and appear theoretically coherent, before speculating further it would be worth replicating these results with other factor analytic approach, the interbattery factor analysis, which is more accurate at identifying which dimensions, if any, are shared by the PAPI-N and the NEO-FFI.

3.4. Interbattery factor analysis of the PAPI-N and the NEO-FFI

Although personality researchers used to carry out joint factor analyses to describe the dimensionality underlying two or more different tests of personality (e.g., the NEO-PI and the PRF; Costa & McCrae, 1988), Finch, Panter, and Caskie (1999) noted that this use of joint factor analysis is problematic, because factors that are specific to each test are confounded with factors that are common across tests (see also Cudeck, 1982). In such situations, Cudeck (1982) and Finch et al. (1999) suggest using Tucker's (1958) interbattery factor analysis, particularly the maximum likelihood interbattery factor analysis developed subsequently by Browne (1980), because it can separate within-method and across-method variability.

Therefore, we conducted an interbattery factor analysis of the PAPI-N scales and the NEO-FFI scales with MBFACT (revised version of May 1991), a computer program developed by Cudeck (1980). This

Table 3. Joint factor analysis and interbattery factor analysis of PAPI-N and NEO-FFI scales (pattern matrix with five factors after maximum likelihood extraction and *direct quartimin* rotation)

Scales	Joint factor solution					Interbattery factor solution				
	I	II	III	IV	V	I	II	III	IV	V
NEO-FFI										
Neuroticism	-.10	.01	.01	-.07	.62	-.13	-.13	.08	-.08	.74
Extraversion	-.01	.52	.11	.06	-.34	-.06	.72	.30	.07	-.17
Openness to experience	-.05	.04	-.11	.57	-.00	.01	.09	-.13	.80	.08
Agreeableness	.17	.42	-.53	-.09	-.30	.11	.60	-.59	-.10	-.05
Conscientiousness	.78	-.06	-.01	-.14	-.23	.88	.03	.02	-.05	-.03
PAPI-N										
N: Need to finish a task	.77	.07	-.05	-.01	-.15	.61	.19	-.08	-.04	-.05
G: Role of the hard worker	.74	.11	-.03	.03	-.04	.72	.14	-.01	.09	.15
H: Integrative planner	.72	-.05	.11	.12	.06	.67	-.10	.07	.14	-.02
C: Organized type	.70	.01	-.05	-.05	-.03	.65	.05	-.07	-.05	-.09
D: Attention to detail	.69	-.04	.03	.16	.13	.54	-.09	.02	.07	.03
W: Need for rules and supervision	.44	.29	-.02	-.09	.25	.18	.23	.01	-.16	.02
T: Work pace	.42	-.00	.12	.13	-.29	.37	.12	.08	-.08	-.18
O: Need to relate closely	.23	.78	-.22	.19	.06	.10	.65	-.16	.05	.11
B: Need to belong to groups	.13	.67	-.01	.04	-.05	.07	.48	.01	-.02	-.04
S: Social harmonizer	.15	.54	.05	.11	-.32	.08	.60	.02	.11	-.17
E: Emotional restraint	.07	-.47	-.06	.12	-.18	.00	-.36	-.28	.06	-.41
F: Need to be supportive	.34	.43	.12	-.01	.22	.18	.33	.01	.07	.29
P: Need to control others	.05	-.06	.85	-.08	-.18	.12	-.18	.52	-.01	-.16
X: Need to be noticed	-.17	.37	.68	.03	-.08	-.18	.28	.53	.09	-.12
L: Leadership role	-.04	.17	.63	.13	-.37	.00	.15	.40	.14	-.35
A: Need to achieve	.24	.02	.60	-.00	.25	.18	-.07	.50	-.05	.17
K: Need to be forceful	-.14	.32	.27	.16	.00	-.14	.17	.32	.07	.02
R: Conceptual thinker	.11	-.15	.11	.98	.08	.10	-.09	.10	.67	-.05
Z: Need for change	.19	.25	.03	.26	-.16	.19	.28	.01	.23	-.12
I: Ease in decision making	.12	-.09	.35	.03	-.42	.06	.08	.19	-.01	-.32

Note: Loadings of 0.40 or above are shown in boldface. NEO-FFI, Costa and McCrae's NEO Five Factors Inventory; PAPI-N, Personality and Preference Inventory – Normative.

program provided us maximum likelihood estimates of the interbattery factor model parameters, as well as obliquely rotated interbattery factors by the *direct quartimin* method. Table 3 shows the rotated factor loadings (the pattern matrix) of the five-factor interbattery solution.

As in the joint factor solution, the interbattery factor solution also showed five readily interpretable factors, which correspond to the Big Five personality dimensions. In fact, although the double loading for the NEO-FFI was still present on the extraversion factor (with NEO-FFI agreeableness), the interbattery solution was cleaner overall, with higher loadings of the NEO-FFI markers, so that they more clearly defined the five factors. The interbattery solution also supported a strong link between the PAPI-N and the conscientiousness, extraversion, agreeableness, and openness to experience dimensions of the Big Five. Thus, the conscientiousness, extraversion, agreeableness, and openness factors were again each defined by at least three PAPI-N scales (one in the case of openness), as well as the corresponding NEO-FFI marker, and the majority of the factor loadings of these PAPI-N scales were congruent with the expected relationships, espe-

cially with regard to conscientiousness, extraversion, and openness to experience.

Contrary to our hypotheses, and as was the case in the joint solution, E and K did not load significantly on the agreeableness factor of the interbattery solution, but, again, P, X, L, and A did load. The fact that K did not load significantly on the agreeableness factor (nor did it load significantly on any of the remaining factors) is not surprising given its low reliability indices in Spanish samples (Sanz *et al.*, 2006), including the sample examined in the present study. Concerning emotional restraint (E), the interbattery solution, in contrast to the joint factor solution, supported our alternative hypothesis that E would significantly and negatively define the neuroticism factor together with the relevant NEO-FFI scale. As mentioned above, this last relationship had already been tentatively proposed by Lewis and Anderson (1998) and could indicate that people who are prone to negative emotions have greater difficulty in controlling them and presenting a calm and controlled face to the world.

Therefore, given the performance of K and E, it seems that it would be very difficult to find the agreeableness dimension among the PAPI-N scales.

However, our results showed that P, L, X, and A load positively on the factor marked by the negative pole of NEO-FFI agreeableness. The need to control others (P), the leadership role (L) and the need to be noticed (X) are probably aspects of extraversion; likewise, the need to achieve (A), interpreted as wanting to get ahead, is also probably an aspect of extraversion, whereas interpreted as wanting to get things done it would be an aspect of conscientiousness. Therefore, the fact that these PAPI-N scales defined a factor along with NEO-FFI agreeableness seems surprising. However, taking into account the relationships of interpersonal traits with extraversion and agreeableness that finding can be partially explained by the five-factor model.

It is a fact repeatedly confirmed that there are personality traits that appear to lie within two or more Big Five domains; in the language of factor analysis, some traits load on more than one factor (Hofstee, De Raad, & Goldberg, 1992). This is the case of many interpersonal traits that form extraversion and agreeableness. This phenomenon is clearly illustrated by the interpersonal circumplex model (Wiggins, 1979), a circular arrangement of interpersonal traits around two orthogonal axes that describes expected relationships among those traits. Thus, interpersonal characteristics located adjacent to one another on the circle (e.g., sociable and friendly) are positively related and, correspondingly, characteristics located on opposite sides of the circle are negatively related (e.g., friendly and hostile), whereas those at right angles to one another (e.g., friendly and dominant) are conceptually unrelated. The traditional axes of the interpersonal circumplex model are dominance and affiliation, but empirical studies show that extraversion and agreeableness are equally plausible alternative axes, with extraversion located between dominance and affiliation, and agreeableness between affiliation and submission (McCrae & Costa, 1989). In this context, the interbattery factor solution seems to suggest that some interpersonal needs and traits assessed by the PAPI-N and probably located near the affiliation axis of the circumplex space (need to relate closely, need to belong to groups, and social harmonizer; see Table 3) form a factor mainly marked by NEO-FFI extraversion, but also defined by NEO-FFI agreeableness. Integrating the Big Five and circumplex models, that factor would correspond to an affiliative extraversion. On the other hand, the interbattery factor solution also suggests that other interpersonal needs and traits assessed by the PAPI-N and probably located near the dominance axis of the circumplex space (need to control others, leadership role, and need to be noticed; see Table 3) form a factor negatively marked by NEO-FFI agreeableness. Integrating the Big Five and circumplex approaches, that factor would correspond to the negative pole of a submissive agreeableness.

Finally, the interbattery solution, in contrast to the joint factor solution, supported our hypothesis that T (work pace) and I (ease in decision making) would not be clearly represented in the five-factor model. In addition, in the interbattery solution there tend to be weaker loadings not only for T and I, but also for the PAPI-N scales of Need for rules and supervision (W), Need to be supportive (F), Need to be forceful (K), and Need for change (Z).

4. Discussion

The objective of this study was to make further progress with research identifying the five-factor model in various different personality inventories based on Murray's (1938) need-press theory by identifying the model in another instrument that is also based on Murray's theory but differs from the instruments already examined in that it is designed for the assessment of psychological needs and behavior/cognition patterns relevant to the work setting. This is the PAPI-N.

The results of our study suggest that the five-factor model can be identified on the basis of the PAPI-N, despite the different theoretical approaches and scale construction strategies taken in the PAPI-N and the NEO-FFI, and the fact that each measures different aspects of personality. Three classes of related data support this conclusion. In the first place, there was a statistically significant correlation between each of the PAPI-N scales and at least one of the Big Five dimensions of the NEO-FFI, and the pattern of these correlations was both theoretically coherent and replicated the findings of a previous study carried out by Cubiks (2000) on a UK population. The results of this study thus extended to the Spanish population.

Secondly, the pattern of correlations found between the PAPI-N need scales and the Big Five as measured by the NEO-FFI, both in the present study and in the study carried out by Cubiks (2000), was similar to the patterns exhibited by other instruments measuring Murray's needs that have been repeatedly validated and are widely used, such as the PRF, the ACL and the EPPS. This once again confirms the plausibility of the five-factor model as a summary of the universe of personality traits, as well as confirming the convergent-structural validity of the PAPI-N, both in its original version and in the Spanish adaptation. To take this last point further, the convergent-structural validity of the PAPI-N was also supported by the finding of a correlation of .72 between the PAPI-N-needs/NEO-FFI correlation matrix obtained from the Spanish sample and the PAPI-N-needs/NEO-FFI correlation matrix obtained from the UK sample.

Nevertheless, those correlation analyses also revealed convergence problems in some of the need

scales, which may reflect more or less subtle differences in the manner in which Murray's needs are operationally defined in the various instruments. Such differences are particularly evident for the need to relate closely to individuals (or need for succorance) and the need to be supportive (or need for deference). For example, while the items making up the scale Need to relate closely to individuals (O) in the PAPI-N only take into account the pursuit of affection, sympathy, caring and intimacy, the items in the PRF, ACL and EPPS succorance need scales stress above all feelings of insecurity or defenselessness, and the search for protection and help. It is not surprising, then, that the succorance need scales of these three instruments correlate rather with neuroticism in the NEO-PI/NEO-FFI, which explicitly includes elements of vulnerability, defenselessness and insecurity (Costa & McCrae, 1985, 1989) than with extraversion in the NEO-PI/NEO-FFI. It is also not surprising that the succorance need scales do not exhibit much convergence with the O scale in the PAPI-N, which as a consequence of the content of its items, is more closely correlated with extraversion and agreeableness in the NEO-PI/NEO-FFI.

Finally, the third class of data supporting the conclusion that the five-factor model can be identified on the basis of the PAPI-N come from the joint and inter-battery factor analyses of the PAPI-N and NEO-FFI. Both kinds of analysis revealed that most of the PAPI-N scales exhibited significant loadings in a five-factor solution marked by the Big Five of the NEO-FFI, and that all of the factors in this solution included at least one PAPI-N scale with a significant loading. However, the interbattery factor analysis, which allows the common trait structure underlying two instruments to be described more accurately by separating battery-specific (method) factors from interbattery (personality dimension) factors, also revealed that there were weak to negligible loadings for six PAPI-N scales. It would appear, then, that (a) the NEO-FFI traits and the PAPI-N needs and roles cover a similar range of individual personality differences; (b) the PAPI-N covers a five dimensional space similar to that of the NEO-FFI, although it is somewhat differently divided; and (c) there are some individual personality differences at work that are measured by the PAPI-N but are not encompassed by the personality space of the five-factor model as assessed through self-report measures, although they seem to be few in number.

4.1. Research implications

Overall, the results of this study support the validity of the five-factor model to the extent that the psychological needs and cognition/behavior patterns relevant in the work setting that are assessed by the PAPI-N can be

coherently organized and interpreted within the framework of the Big Five. Consequently, the model once again appears as a reasonable framework for the classification of personality constructs, even where such constructs are oriented to the work setting. This finding would also support the use of the five-factor model as a taxonomy for organizing personality constructs in future studies on the role of personality in personnel selection.

However, the PAPI-N also seems to reflect aspects of personality, specifically four psychological needs (need for rules and supervision, need to be supportive, need to be forceful, and need for change) and two personality traits (work pace and ease in decision making), not encompassed by the NEO five-factor approach. If the five-factor model is all-encompassing as a personality framework, it will be important to carry out future research aimed at understanding why it fails to capture these six personality aspects at this broad level of abstraction. Furthermore, the need of further research on additional personality constructs above and beyond the Big Five is consistent with certain evidence that the personality constructs that are missing entirely from the five-factor model are important predictors of job performance and other important work criteria (Hough, 1992). Of course, it may be that the NEO five-factor model does encompass all personality variables measured by the PAPI-N and that, in the present study, this fact was obscured by effects of sampling errors, measurement errors (especially for the K scale of the PAPI-N) and restriction of range on correlations between the NEO-FFI and the PAPI-N. Further research with methods better designed to prevent those effects is needed to replicate the results of this study.

Along with traits, psychological needs are among the leading candidates to be useful units for personality research (Winter *et al.*, 1998). Therefore, the usefulness of personality assessment in industrial/organizational settings might be fostered by considering tests specifically designed to measure needs in the workplace such as the PAPI-N. The PAPI-N/NEO-FFI correlations found in this study, the similarity between those correlations and the correlations found in previous studies relating other instruments measuring Murray's needs and other instruments measuring the Big Five, and the results of the joint and interbattery factor analyses of the PAPI-N and NEO-FFI provide additional support for the validity of the PAPI-N as a personality assessment tool. Thus, the possibility of having a well-validated instrument to measure psychological needs could help revitalize the assessment of psychological needs in work settings for research and applied purposes, especially in countries like Spain where there is currently no local adaptation of any questionnaire for measuring psychological needs (e.g., no Spanish adaptations of the PRF, EPPS or ACL exist).

4.2. Practice implications

From a practical point of view, the results of this study allow interpretation of the PAPI-N scales in terms of a common framework: the five-factor model. The five factors have been seen as a kind of *lingua franca* enabling users of one test to communicate with users of another. Therefore, users of the PAPI-N may use the empirical relationships between PAPI-N and NEO-FFI found in this study to communicate their results to other users using the common framework of the five-factor model. Based on these empirical relationships, furthermore, users of the PAPI-N may translate the vast amount of findings that show the usefulness of the five-factor model in predicting job performance, training criteria, job satisfaction, leadership, and counterproductive behaviors such as deviant behaviors and turnover, into predictions and hypotheses with the PAPI-N scales (for reviews and meta-analyses of those findings see, for example, Barrick *et al.*, 2001; Borman *et al.*, 2001; Goodstein & Lanyon, 1999; Salgado, 1997, 2002).

When making those interpretations and translations, PAPI-N users and researchers may take into account that most of the PAPI-N scales/Big Five theoretical relationships proposed by Lewis and Anderson (1998) were supported by our data, but with some exceptions, the most important of which concern the Big Five agreeableness factor. Therefore, we would recommend PAPI-N users and researchers to classify the PAPI-N scales within the Big Five personality dimensions on the basis of our interbattery factor results. On the other hand, PAPI-N users and researchers should also bear in mind that, at least for conscientiousness and neuroticism, the validity coefficients of the Big Five personality dimensions for predicting job performance are greater when assessed using Big Five-based inventories than when assessed using non-Big Five-based inventories (Salgado, 2003). Therefore, the classification of the PAPI-N scales in terms of the five-factor model does not guarantee to obtain the typical criterion validity coefficients found in the literature with personality inventories specifically developed within the FFM framework.

4.3. Limitations of the study

Some limitations of this study should be noted. Although most of the measures used in this study showed adequate consistency reliability indices, the α coefficient for K (need to be forceful) was low (.51), replicating the poor index (.41) obtained in the normative Spanish sample (Sanz *et al.*, 2006, Study 1). In fact, despite the adequate internal consistency of the K scale in the original English PAPI-N, this scale has also exhibited low reliability indices in other countries (Sanz *et al.*, 2006). In view of the generalization of those low

reliability indices, it may be that they are a consequence of cultural differences inherent in the type of behavior patterns that are related in each country with the need to be outspoken and direct with people and to aggressively push for what the individual wants. In any case, the low reliability index for K calls for caution in interpreting the present results on the relationships between the PAPI-N and the Big Five insofar as they refer to the need to be forceful.

The use of the NEO-FFI, instead of the NEO-PI or the NEO-PI-R, to measure the Big Five may have underestimated the validity of the Big Five to encompass the PAPI-N. The NEO-FFI is an abbreviated version of the NEO-PI and the NEO-PI-R, and its scales therefore exhibit lower indices for reliability and validity than those of the original inventories (Costa and McCrae, 1985, 1989; Sanz *et al.*, 1999). Therefore, additional studies should be done in order to confirm the present findings with the NEO-PI or the NEO-PI-R. In a related vein, the use of the NEO-FFI may to some extent have handicapped the PAPI-N in its comparison with other instruments measuring Murray's needs (PRF, ACL, and EPPS) concerning their correlations with the Big Five, since these other needs assessment instruments were correlated with the NEO-PI (and the NEO-PI-R in the case of the ACL). On the other hand, these comparisons between correlation matrices were made with data obtained in samples that differed in many aspects (e.g., country of origin – Spain, United Kingdom, United States – population of reference – adults from the general population, university students, working adults from the general population). Therefore, such differences may have produced an underestimation of the structural similarity between instruments measuring Murray's needs. Additional research should examine the structural similarity between those instruments with data obtained from the same sample.

Finally, given the sample size of the present study, the effects of the sampling error could produce a substantial variation in the true correlations. A variety of rules have been suggested for determining the sample size required to produce a stable solution when performing factor analyses (e.g., the sample size is determined as a function of the number of variables, with rules that determine a ratio of 2, 5, 10, or 20 subjects for each variable). These rules, however, frequently lack both empirical support and a theoretical rationale. Guadagnoli and Velicer (1988) using a Monte Carlo procedure found, contrary to the popular rules, that sample size as a function of the number of variables was not an important factor in determining stability; in fact, component saturation and absolute sample size were the most important factors. Thus sample component patterns possessing moderate component saturation (.60) provided a good fit to the population pattern when sample size was greater than or equal to 150 observations (Guadagnoli & Velicer, 1988).

In our two factorial analyses (see Table 3), the average loadings for those variables that were salient for a factor were .60 and .54, respectively. According to Guadagnoli's and Velicer's results, therefore, a sample size of 162 subjects (> 150) could have been sufficient to obtain an accurate solution. However, it is obvious that additional studies should be carried out to confirm the present findings, since 'science is the business of discovering replicable effects', and 'the only direct evaluation of result replicability is the so-called 'external' replication (i.e., actual replication with a new sample)' (Thompson, 1996, p. 29).

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Notes

1. *Direct quartimin* is a special case of *direct oblimin* rotation where gamma is equal to 0, precisely the default value of gamma (or delta) for *direct oblimin* in SPSS.
2. The results reported in Table 3 are nearly identical to those obtained using different analytical procedures, such as principal axis factoring or principal components factoring. The results obtained using a joint factor analysis by maximum likelihood are reported to facilitate comparison with those obtained using an interbattery factor analysis (see next subsection).

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