

**PUBLISHED: 2007**

*Journal of personality disorders, 21(1)*

<https://doi.org/10.1521/pedi.2007.21.1.58>

**THE MCMI-III PERSONALITY DISORDERS SCORES PREDICTED  
BY THE NEO-FFI-R AND THE ZKPQ-50-CC: A COMPARATIVE  
STUDY**

Anton Aluja<sup>1</sup>, Luis F. García<sup>1</sup>, Lara Cuevas<sup>1</sup> and Oscar García<sup>2</sup>

<sup>1</sup>Department of Pedagogy and Psychology. University of Lleida. (Spain)

<sup>2</sup>European University of Madrid (Spain)

Correspondence concerning this article should be addressed to Anton Aluja.

Department of Pedagogy and Psychology,  
Faculty of Education Science,  
University of Lleida.  
Complex de la Caparrella, s/n.  
25192 Lleida (Catalonia)  
Spain  
e-mail: [aluja@pip.udl.es](mailto:aluja@pip.udl.es)

**Abstract:** This study was designed to compare the NEO-FFI-R versus the ZKPQ-50-CC in their relationships with the fourteen MCMI-III personality disorder scales in a Spanish non-clinical sample (N=674). Previous studies showed consistent relationships between the Five Factor Model and the DSM-IV personality disorders (PD), but there is no comparative study between both Five Factor and Zuckerman's personality models. The aim was to replicate previous results about relationships between the Big-Five and PD's using the revised short version of the NEO-PI-R, and to compare the NEO-FFI-R versus the ZKPQ-50-CC regarding the relationships with MCMI-III personality disorder scales. Results showed no sharp differences between the NEO-FFI-R and ZKPQ-50-CC scales. Each instrument explained around 30% of the PD's MCMI-III scales variance. Using conjointly the 10 personality scales from the NEO-FFI-R and ZKPQ-50-CC, the PD's accounted variance rose to 38%. Differences and similarities between both short personality questionnaires are discussed.

**Key words:** MCMI-III, NEO-FFI-R, ZKPQ-50-CC, personality disorders predictions.

## INTRODUCTION

In spite of the traditional discrepancies between the dimensional and categorical models of classification of normal personality and personality disorders (PD's), there is a current tendency to coordinate both strategies. In this sense, evidence is available to demonstrate that the personality structure is basically the same in clinical and non-clinical samples (O'Connor, 2002), and that abnormal personality can be understood as extremes of normal personality variation (O'Connor & Dyce, 2001). The dimensional models provide profiles based on a certain number of dimensions (according to the personality model of reference) that can be used as predictors of the different categorical PD's classified in the DSM (Costa, & Widiger, 2002; De Fruyt, De Clercq, Van de Wiele, & Van Heeringen, 2006; DeLamatre, & Schuerger, 1992; Widiger, & Costa, 1994; Wang, Du, Wang, Livesley & Jang, 2004). The dominant personality model, the Five Factor Model (FFM), contributes with a long list of empirical studies about the predictive power of the Big Five in relation to PD's in a variety of samples and dependent measures. In this way, two meta-analyses have analyzed the extensive literature on the FFM and PD's based on the DSM-III-R and the DSM-IV (Ostendorf, 2000; 2002; Saulsman & Page, 2004).

Saulsman and Page (2004) concluded that Neuroticism presented positive relationships with disorders characterized by emotional distress (v.g., Paranoid, Borderline or Avoidant). Extroversion showed positive relationships with disorders characterized by gregariousness (v.g., Histrionic), and negative with those characterized by shyness and reclusive qualities (v.g., Schizoid and Avoidant). No prominent relationships between the Openness dimension and any of the personality disorder diagnostic categories were reported. In regard to Agreeableness, this trait showed a negative association with disorders defined by interpersonal difficulties (v.g., Paranoid, Antisocial or Narcissistic) and, finally, Conscientiousness was positively related to Orderliness disorders, like the Obsessive-Compulsive one, and negatively to those characterized by recklessness (v.g., Antisocial). Only one of the studies examined by Saulsman and Page (2004) applied the NEO-PI-R as a measure of the FFM and the MCMI-III (Millon et al., 1994) as a measure of personality disorders (Dyce and O'Connor, 1998).

Ostendorf (2002) presented a meta-analysis estimated population mean of correlations between Big Five personality factors and personality disorders. The results were very similar to those reported by

Saulsman and Page (2004). Neuroticism was related to the majority of PD's excluding Antisocial, Schizoid, Narcissistic and Compulsive. Extraversion was related positively to Histrionic and negatively to Schizoid, Avoidant, Dependent, Compulsive, Passive-Aggressive, Masochistic and Depressive. Agreeableness was negatively related to Paranoid, Schizotypal, Antisocial, Borderline, Narcissistic, Passive-Aggressive, Sadistic and Masochistic. Conscientiousness was negatively related to Schizotypal, Antisocial, Borderline, Dependent, Passive-Aggressive, Sadistic, and Masochism, and related to Obsessive-Compulsive (positive).

Zuckerman, Kuhlman, Joireman, Teat, & Kraft (1993) have proposed an alternative model of five personality factors. They also developed the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ) as a measure of these five factors. This model was derived empirically through exploratory factor analysis over 33 scales from 7 personality questionnaires (Zuckerman, Kuhlman & Camac, 1988). After obtaining several rotated structures ranging from 3 to 6 factors, it was found that a 5-factor structure was the best and most robust solution, including the following factors: Impulsive-Unsocialized Sensation Seeking (ImpSS), Neuroticism-Anxiety (N-Anx), Aggression-Hostility (Agg-Host), Activity (Act), and Sociability (Sy) (Zuckerman, Kuhlman, Thornquist & Kiers, 1991). Recently, Aluja, Rossier, García, Angleitner, Kuhlman and Zuckerman (2006) have developed a short version of the ZKPQ (ZKPQ-50-CC) selecting 10 items per scale. This short version presented an equivalent factor structure and similar properties to the original scale in four languages: English, French, German, and Spanish (Aluja et al., 2006).

With regard to the convergent validity of both personality models, Zuckerman et al., (1993) found that a 4-factor solution performed by a principal component analysis and including the ZKPQ, the NEO-PI-R and the EPQ demonstrated that the Extraversion scales of the NEO-PI-R and of the EPQ grouped in a first factor together with Sy and Act. The Neuroticism scales of the three questionnaires grouped in a second factor. The third factor was formed by Conscientiousness, Psychoticism and ImpSS scales, and the fourth factor was formed by Agreeableness, Agg-Host and Openness. A further analysis, including the 30 facets of the NEO-PI-R and extracting five factors showed the same structure with the main

difference that the 6 facets of Openness grouped in a fifth independent factor. These results were replicated by Aluja, Garcia and Garcia (2004) in a Spanish large sample.

Note that in previous research about the convergent validity of both questionnaires, the NEO-PI-R and ZKPQ-III-R demonstrated that Neuroticism and N-Anx scales are very similar. Also, Extraversion is mainly related with Sy and, to a lesser extent, with Act. For this reason, they are expected to be similarly related to the same PD's. As Agg-Host is negatively associated with Agreeableness; it will therefore be negatively associated with PD's predicted by Agreeableness, and ImpSS would be negatively related to the PD's associated with Conscientiousness.

Unlike the NEO-PI-R, the relationships between the ZKPQ and the DSM PD's are largely unknown. As far as we are aware, there is only one study (Wang et al., 2004) that investigates the relationships among the ZKPQ and personality disorders assessed by the Dimensional Assessment of Personality Pathology-Basic Questionnaire (DAPP-BQ; Livesley & Jackson, 2002) in a sample of 149 healthy university subjects. The relationships between both questionnaires were summarized by a principal component analysis extracting five factors. The first one, called "Emotional Dysregulation", was integrated by N-Anx and emotional distress scales as Affective Lability, Anxiousness, Cognitive Distortion, Identity Problems, etc. The second one was integrated by Agg-Host and Narcissism, Rejection, Callousness, and Conduct Problems, forming a factor named "Antisocial Behavior". ImpSS loaded on a third factor with the Self-Harm, Conduct Problems or Compulsivity (negative) scales. The fourth factor was described by Sy (negative), Intimacy Problems, Restrictive Expressions or Insecure Attachment, defining an "Inhibition" factor. Finally, the fifth factor, called "Compulsivity", was integrated by Act and Compulsivity only.

Zuckerman (1991) asserted that a basic dimension of personality should meet four criteria: 1) It should be reliably identified across different methods, genders, ages and cultures, 2) it should show moderate heritability, 3) it should be identified in non-human species, and 4) it should be associated with some biological markers. On the basis of these criteria, Zuckerman (1991) developed a theoretical model with great emphasis on psychobiological aspects of personality dimensions. This characteristic constitutes a pattern of uniqueness with respect to FFM (Joireman, & Kuhlman, 2004). Also,

Zuckerman's model, influenced by Eysenck's and Gray's personality theories, is mainly focused on temperamental characteristics of personality, especially on unsocialized impulsivity sensation seeking and anxiety. Therefore, Zuckerman's basic personality dimensions may add supplementary information beyond FFM to understand DSM-IV personality disorders, especially those within the impulsivity (v.g., Antisocial, Borderline...) and anxiety (Avoidant, Dependent...) spectrums.

There is no study investigating simultaneously the relationships among the three models: the FFM, Zuckerman's and Millon's. However, a previous study carried out by Dyce and O'Connor (1998) gives information about relationships between the NEO-PI-R and the MCMI-III in a similar and large university student's sample. Since the NEO-FFI-R is the short version of the NEO-PI-R, results are expected to be similar to the findings of Dyce and O'Connor (1998). In the current study, only the five dimensions were analyzed, because the NEO-FFI-R does not assess facets. The aim of the present investigation was to study and to compare the relationship of the NEO-FFI-R and ZKPQ-50-CC with the 14 PD scales of the MCMI-III.

## **METHOD**

### *Subjects*

The participants were 674 voluntary students from three Spanish universities in Barcelona, Lleida, and Madrid (37.8 % males and 62.2 % women; in one case the sex was not reported). The average age was 33.19 (s.d.: 15.11) for males, and 31.10 (s.d.: 14.62) for females. Fifty per cent of the subjects were undergraduate university students and the other 50 % were students' friends and relatives.

### *Measures*

*Millon Clinical Multiaxial Inventory (MCMI-III)*. The MCMI-III (Millon, Millon, & Davis, 1994) is an inventory consisting of 175 true-false items from which scores on 14 Personality Disorders (PD's) and 10 clinical syndrome scales can be computed. Additionally, the MCMI-III incorporates 3 "modifier" scales. The total scores were obtained by computing according to handbook instructions. Millon, et al., (1994) designed the scales to explicitly align with the diagnostic criteria of the DMS-IV. Evidence for the validity of the English original version was provided in the form of correlations with ratings by

clinicians, with collateral tests measuring identical constructs, and strong diagnostic efficiency statistics. The alpha coefficients reported in the test manual ranged from 0.67 to 0.89 and the test-retest values (5-14 days) ranged from 0.88 to 0.93. A Spanish version of the MCMI-III was not available when the present study was carried out. For this reason, the MCMI-III was translated to Spanish under the supervision of a native English-speaking Psychologist. Note that the alpha coefficients for this Spanish version were strongly similar to the English version, ranging from 0.64 to 0.84.

The NEO-FFI-R is a revised version of the NEO-FFI. Like the latter, the NEO-FFI-R is a shortened 60-item version (12 per scale) of the NEO-PI-R (Costa & McCrae, 1992), distributed in five scales: Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A), and Conscientiousness (C). McCrae and Costa (2004) proposed this revised short version after the best items from a factor analysis. They replaced 14 items from the NEO-FFI with items taken from the NEO-PI-R. These new items were selected on the basis of four criteria: 1) to minimize the effects of acquiescence, 2) to increase the correlations with NEO-PI-R factor scores, 3) to diversify item content by selecting items from underrepresented facets, and 4) to increase the intelligibility of the items. Internal reliability coefficients of the NEO-FFI-R scales range from 0.75 to 0.82. The NEO-FFI-R psychometric properties were replicated in Spanish samples by Aluja, García, Rossier and García (2005), with alpha reliabilities ranging between 0.71 and 0.82.

The ZKPQ-50-CC is a 50-item version of the Zuckerman-Kuhlman Personality Questionnaire (Zuckerman et al., 1993). This reduced version was obtained from the original 89-items through different procedures of item analysis carried out simultaneously in American, German, Spanish, and Swiss samples. This questionnaire includes only 10 items per scale: Impulsive Sensation Seeking (ImpSS), Neuroticism-Anxiety (N-Anx), Aggression-Hostility (Agg-Host), Activity (Act), Sociability (Sy). In the present study, the Infrequency (*Inf*) scale was not further analyzed. The validation study of the ZKPQ-50-CC shows similar psychometric properties to the original ZKPQ in the four countries (Aluja, et al., 2006).

### *Statistical analyses*

Means, standard deviation, kurtosis, skewness and internal consistency of all scales used in the study have been computed in order to test if they fit to a normal population. For this study, the relationships between NEO-FFI-R and ZKPQ-50-CC dimensions were investigated through a principal components analysis extracting both four and five factors. The relationships between the MCMI-III and the two personality questionnaires were studied by bivariate and multivariate procedures: a) Pearson product-moment correlations, and b) Principal Components with Varimax analysis forced to five factors. Both types of analysis allowed us to compare our results with those reported by Dyce and O'Connor (1998). Finally, two separate hierarchical regression analyses (stepwise method) were conducted to examine the incremental validity of each model over the other. Thus, only one questionnaire is analyzed in the first step, and the other one is added in a second step.

## **RESULTS**

### *Descriptive, distribution statistics and reliability*

The kurtosis and skewness statistics reported a normal distribution of frequencies for the NEO-FFI-R and ZKPQ-50-CC scales (values between -1 and +1), but for the MCMI-III only six scales obtained values ranging from -1 to +1. Alpha reliabilities were between 0.64 and 0.79 for Millon's scales (average 0.73), between 0.74 and 0.81 for the NEO-FFI-R (average 0.76) and between 0.68 and 0.78 for ZKPQ-50-CC (average 0.73).

### *NEO-FFI-R and ZKPQ-50-CC principal component analysis*

In order to test the relationships between the NEO-FFI-R and ZKPQ-50-CC scales, a principal component analysis with Varimax rotation was carried out (Table 1). Using the Eigenvalue  $\geq 1$  criterion, four factors accounting for 68% of the variance were extracted. The first factor was defined by E, O, ImpSS and Sy. The second factor was formed by N and N-Anx; the third by A-, C-, ImpSS and Agg-Host; and the fourth by C and Act. Furthermore, a five-factor solution was obtained (Table 1). The five

factors explained 77.68% of the variance. In this solution, O formed an independent factor. Only ImpSS obtained a secondary loading (0.31) on the Openness factor.

#### *MCMII-III PD scales, NEO-FFI-R and ZKPQ-50-CC correlational analysis*

Table 2 shows a correlation matrix between Millon PD's, the NEO-FFI-R and ZKPQ-50-CC scales. Following the Bonferroni adjusted significance level for 0.01 ( $p < 0.00007$ ), correlations larger than 0.15 were significant. As can be seen, N was related to 13 of the 14 PD's, E was negatively related to Schizoid, Avoidant, Masochistic, Obsessive-Compulsive, Schizotypal and Depressive, and positively related with Histrionic and Narcissistic. Openness only obtained significant correlations with Schizoid. Agreeableness correlated with Obsessive-Compulsive (positive) and, in negative, with Schizoid, Narcissistic, Antisocial, Sadistic, Passive-Aggressive, Schizotypal, Borderline and Paranoid. Finally, C correlated positively with Obsessive-Compulsive, and negatively with Antisocial, Sadistic Masochistic, Schizotypal and Borderline. In this case, N-Anx presented a similar pattern of correlations to the N dimension of the NEO-FFI-R. ImpSS correlated positively with Histrionic, Narcissistic, Antisocial, Sadistic and Borderline, and negatively with Schizoid and Obsessive-Compulsive. Agg-Host was positively related to Narcissistic, Antisocial, Sadistic, Passive-Aggressive, Borderline and Paranoid, and negatively to Obsessive-Compulsive. Act was positively related with Histrionic, Narcissistic and Obsessive-compulsive, and Sy correlated positively with Histrionic and Narcissistic, and negatively with Schizoid, Avoidant, Obsessive-Compulsive, Masochistic, Paranoid and Depressive.

#### *Principal component analyses (MCMII PD's-NEO-FFI-R and MCMII PD's-ZKPQ-50-CC)*

Two independent Principal Components analysis with Varimax rotation were performed. The first one included the MCMII-III and NEO-FFI-R scales, and the second one the MCMII-III and the ZKPQ-50-CC scales. Five factors were extracted for both analyses.

Regarding the MCMII-III and NEO-FFI-R, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.88, and Bartlett's Test of Sphericity (BTS) yielded approx. Chi-Square= 8407.19; d.f.: 171 ( $p < 0.001$ ). Note that both KMO and Bartlett's Test of Sphericity indicate that factor analysis is

appropriate. The variance accounted for by the five factors was 76.35%. The five scales of the NEO-FFI-R were distributed in the 5 factors without significant secondary loadings. The first one was defined by Neuroticism and 10 PD scales. The second factor was integrated by Extraversion and Schizoid, Avoidant (in negative) and Narcissistic. The third factor was formed by Agreeableness, Narcissistic, Antisocial, Sadistic and Paranoid. The fourth was integrated by Conscientiousness, Antisocial, Obsessive-Compulsive and Borderline, and the fifth by Openness only.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.88, and Bartlett's Test of Sphericity (BTS) yielded approx. Chi-Square= 8458.08; d.f.: 171 ( $p < 0.001$ ) for the factor analysis of the ZKPQ-50-CC and MCMI-III. It is important to note that both KMO and Bartlett's Test of Sphericity indicated that factor analysis is appropriate. The variance accounted for by the five factors was 75.89%. As with the NEO-FFI-R, the first factor was defined by N-Anx and 10 of 14 MCMI-III scales (excluding Histrionic, Narcissistic, Antisocial and Obsessive-Compulsive disorder scales). The second one was defined by Sy (also with a high ImpSS secondary loading) and Schizoid, Schizotypal (both negative) and Histrionic disorders scales. In the third factor, scales loading were ImpSS, Narcissistic, Histrionic, Antisocial, Obsessive-Compulsive (negative) and Borderline. The fourth was formed by Agg-Host (also with a high N-Anx secondary loading) and the Sadistic and Passive-Aggressive disorder scales. Finally, Act, Narcissistic, Obsessive-Compulsive and Paranoid scales loaded on the fifth factor.

### *Hierarchical regression analysis*

As NEO-FFI-R and ZKPQ-50-CC showed a significant and similar level of prediction of the PD's, it is of great interest to explore the incremental validity of each instrument over the other. There are several justification for this rationale: (a) both instruments are well studied and considered to assess major personality models, (b) there has been some debate in the past between these two different personality descriptive models, suggesting overlap, but also unique features, (c) though the relationships between the FFM and PD's are well-described, the relationships between the ZKPQ-50-CC and PD's are not, despite the fact that Zuckerman's model includes a number of dimensions with clear potential to explain disorder variance, ImpSS being the main candidate, (d) therefore, it would be interesting to

examine the incremental validity of each model over the other to predict PD variance. Table 4 also shows hierarchical regression analyses results (stepwise method). The input criteria was restricted to a  $p < 0.0001$  with the purposes of comparing with Dyce and O'Connor's results (1998) and reducing the likelihood of making a Type I error. Results showed that the same percentage of variance (30%) was explained irrespective of introducing the NEO-FFI-R or ZKPQ-50-CC in the first step. In the same way, the incremental validity (measured through the change in  $R^2$ ) was the same in both hierarchical regression analyses (7%).

## DISCUSSION

The present study examined the relationships between the NEO-FFI-R and ZKPQ-50-CC and the MCMI-III personality disorder scales. The first conclusion is that the NEO-FFI-R and the ZKPQ-50-CC are measuring similar constructs taking into account the high covariance among their scales. In detail, results show that Neuroticism and N-Anx assess similar constructs and Extraversion was related with Sy and ImpSS. Agreeableness was strongly associated with Agg-Host (in negative), and Conscientiousness with Act. Additionally, albeit to a lesser extent, Openness extends to a relationship with ImpSS, in line with previous studies (Aluja, Garcia & Garcia, 2003; Garcia, Aluja, Garcia & Cuevas, 2005).

The four-factor solution seems to be the most plausible following the eigenvalue  $\geq 1$  rule. In this line, several studies of personality disorder structure show that abnormal personality possesses a four-factor structure similar to the Big Five, but lacking an equivalent to Openness (Austin & Deary, 2000; Livesley, Jang, & Vernon, 1998; Markon, Krueger, & Watson, 2005). Correlations with the MCMI-III PD's followed a similar pattern irrespective of the instrument used. Thus, Neuroticism and N-Anx, Extraversion and Sy, Agreeableness and Agg-Host and Conscientiousness and ImpSS showed a similar pattern of correlations with PD's scales. Openness presented a low but significant correlation with the Schizoid scale, as was the case of Act with the Obsessive-Compulsive, Histrionic and Narcissistic scales. The correlations of the NEO-FFI-R dimensions with the MCMI-III PD's were similar to those reported by Dyce and O'Connor (1998) using the NEO-PI-R.

The five-factor solution of the NEO-FFI-R and the 14 MCMI-III PD's reproduced the factor matrix presented by Dyce and O'Connor (1998), although these authors used the 30 facets instead of the five dimensions. Neuroticism was grouped with several PD scales, Extraversion with Histrionic and Schizoid, Agreeableness (with negative value) with Narcissism, Antisocial, Sadistic and Paranoid, Conscientiousness with Obsessive-Compulsive and negative with Antisocial. Finally, Openness factor did not show a relation with any personality disorder. Since no NEO-FFI-R dimension had significant secondary loading on other factors, they showed a high orthogonally level in relation to the personality disorders. Although the five ZKPQ-50-CC dimensions are theoretically orthogonal, ImpSS and N-Anx had high secondary loadings on other factors. This fact suggests that ImpSS plays a role on the PD's defined by gregariousness and shyness and reclusive qualities, and that Sadistic and Passive-Aggressive personality disorders present a component of both hostility and anxiety.

In the present study, we applied hierarchical regression analysis with the likelihood of entering the equation of  $p < 0.0001$ , so it is not surprising that we found almost the same number of variables in the regression equations than did Dyce and O'Connor (1998). In this way, 28 variables are included in our equations when the NEO-FFI-R was introduced in the first step (30% of average variance), in contrast with the 26 variables in the Dyce and O'Connor's study (1998; 33%). In 7 of 14 PD's, the regression equations were formed by the same variables in both studies. For instance, Dyce and O'Connor (1998) found that the combination of N+ and A- predicted the Paranoid, Borderline, Passive-Aggressive, and Sadistic PD's. In our case, this combination predicted the Passive-Aggressive and Sadistic PD's. However, some differences appeared between both studies. For instance, Openness contributed to explain the Schizotypal and Narcissitic PD's in the Dyce and O'Connor's study (1998), but only contributed to the Paranoid disorder in the present study.

When the ZKPQ-50-CC scales were introduced in the first step, equations were formed by between 1 and 3 variables, the average of variance being 30%. The equations for each personality disorder were similar to those obtained in the NEO-FFI-R, so it is not strange that there were no global differences between NEO-FFI-R and ZKPQ-50-CC in the prediction of PD scales. As we found in the NEO-FFI-R, the most predictive dimension is Neuroticism (N-Anx). ImpSS is the most relevant for the

Narcissistic, Antisocial and Obsessive-Compulsive (negative) PD's. Finally, Agg-Host and Agreeableness presented an opposite pattern of results. Agg-Host was the most predictive dimension for the Sadistic disorder, and contributed to the Paranoid, Antisocial, Narcissistic, Dependent and Passive-Aggressive PD's.

In addition, ZKPQ-50-CC scales help to predict PD's beyond NEO-FFI-R dimensions since the incremental validity analysis showed an increase of 7% of the global variance. These results indicate that ImpSS plays a relevant role in the prediction of some personality disorders independently of the relationships observed between this scale and the Extraversion and Conscientiousness NEO-FFI-R dimensions (Aluja et al., 2004). Equally, N-Anx and Agg-Host may contribute to the description of PD's beyond the convergent NEO-FFI-R dimension. On the other hand, NEO-FFI-R predicts PD's beyond ZKPQ-50-CC scales with similar levels of incremental validity (7%). In this case, Neuroticism, Extraversion, Agreeableness, and Conscientiousness were able to add predictive power beyond ZKPQ-50-CC scales.

The short versions analyzed in the present study have the drawback that the corresponding facets of each questionnaire are not included. This observation is of particular relevance for the FFM since personality disorder research has largely focused on the NEO-PI-R facets (Costa, & Widiger, 2002). For instance, Dyce and O'Connor (1998) reported that including the 30 NEO-PI-R facets offers a richer and more diverse description of the personality disorders and a slight increase in the accounted total variance (38%; Dyce and O'Connor, 1998). In this sense, facet level analyses may contribute to increase specificity and discriminate between PD's. Thus, it can be found that only a small number of facets explain the overall relationship between any PD and a domain and, also that a domain is not related to a PD, whereas a facet is. A further study comparing the ZKPQ with NEO-PI-R facets would be useful in this respect.

To sum up, if we compare the predictive power of the NEO-FFI-R versus ZKPQ-50-CC in relation to MCMI-III PD's, we may conclude that neither instrument outperformed the other. Both questionnaires showed similar measures in Neuroticism (N and N-Anx) and Extraversion (E, Sy, and ImpSS) and their relations with the PD's were also similar. ImpSS was the variable most predictive of

unsocialized and erratic disorders (v.g., Antisocial, Narcissistic...). It also showed an inverse pattern of relationships with Conscientiousness, as was the case with Agg-Host and Agreeableness.

Conscientiousness and Act are related with the Obsessive-Compulsive disorder. Openness was mostly unrelated with PD's, as shown in the literature. Finally, in order to confirm the usefulness of the two questionnaires in the prediction of personality disorders, the findings of the present study should be replicated in clinical samples. The low prevalence of PD's in our sample restricts the range and is a limitation of the present study.

## REFERENCES

- Aluja, A., García, O., & García, L.F. (2003). Relationships among extraversion, openness to experience, and sensation seeking. *Personality and Individual Differences, 35* (3), 671-680.
- Aluja, A., García, O., & García, L.F. (2004). Replicability of the three, four and five Zuckerman's personality super-factors: exploratory and confirmatory factor analysis of the EPQ-RS, ZKPQ and NEO-PI-R. *Personality and Individual Differences, 36*, 1093-1108.
- Aluja, A., García, O., Rossier, J., & García, L.F. (2005). Comparison of the NEO-FFI, the NEO-FFI-R and an alternative short version of the NEO-PI-R (NEO-60) in Swiss and Spanish samples. *Personality and Individual Differences, 38*, 591-604.
- Aluja, A., Rossier, J., García, L.F., Angleitner, A., Kuhlman, M., and Zuckerman, M. (2006). A cross-cultural shortened form of the ZKPQ (ZKPQ-50-CC) adapted to English, French, German and Spanish languages. *Personality and Individual Differences, 41*, 619-628
- Austin, E. J., & Deary, I. J. (2000). The 'four As': A common framework for normal and abnormal personality? *Personality and Individual Differences, 28*, 977-995.
- Costa, P. T., & McCrae, R. R. (1992). *Professional Manual: Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor-Inventory (NEO-FFI)*. Odessa, FL: Psychological Assessment Resources.
- Costa, P. T., & Widiger, T. A. (2002). *Personality disorders and the Five-Factor Model of personality*. Washington, DC: American Psychological Association. The Validity of Cloninger's .

- De Fruyt, F., De Clercq, B.J., Van de Wiele, & Van Heeringen, K. (2006). Psychobiological Model versus the Five-Factor Model to Predict DSM-IV Personality Disorders in a Heterogeneous Psychiatric Sample: Domain, Facet and Residualized Facet Descriptions. *Journal of Personality*, 74, 479-510.
- DeLamatre, J.E., & Schuerger, J. M. (1992). Personality disorder concept scales and 16 PF dimensions. *Psychological Reports*, 70(3), 839-849.
- Dyce, J.A., & O'Connor, B.P. (1998). Personality disorders and the five-factor model: A test of facet-level predictions. *Journal of Personality Disorders*, 12(1), 31-45.
- García, L.F., Aluja, A., García, O., & Cuevas, L. (2005). Is Openness to Experience an independent personality dimension? Convergent and discriminant validity of the openness domain and its NEO-PI-R facets. *Journal of Individual Differences*, 26(3) 132-138.
- Joireman, J., & Kuhlman, D.M. (2004). The Zuckerman-Kuhlman Personality Questionnaire: Origin, development, and validity of a measure to assess an Alternative Five-Factor model of personality. In R.B. Stelmack (Ed.), *On the Psychobiology of Personality: Essays in Honor of Marvin Zuckerman* (pp. 49-64). Oxford, UK: Elsevier.
- Livesley, W. J., Jang, K. L., & Vernon, P. A. (1998). Phenotypic and genetic structure of traits delineating personality disorder. *Archives of General Psychiatry*, 55, 941–948.
- Livesley, W.J., Jackson, D.N. (2002). *Manual for the dimensional assessment of personality pathology*. Port Huron: Sigma Press, 2002.
- Markon, K., Krueger, R. F., & Watson, D. (2005). Delineating the structure of normal and abnormal personality: An integrative hierarchical approach. *Journal of Personality and Social Psychology*, 88, 139-157.
- McCrae, R.R., & Costa, P.T. (2004). A contemplated revision of the NEO five-factor inventory. *Personality and Individual Differences*, 36, 587-596,
- Millon, T., Millon, C., & Davis, R. (1994). *Millon Clinical Inventory-III manual*. Minneapolis, MN: National Computer Systems.
- O'Connor, B. P. (2002). The search for dimensional structure differences between normality and abnormality: A statistical review of published data on personality and psychopathology. *Journal of Personality and Social Psychology*, 83, 962–982.

- O'Connor, B. P., & Dyce, J. A. (2001). Rigid and extreme: A geometric representation of personality disorders in five-factor model space. *Journal of Personality and Social Psychology, 81*, 1119–1130.
- Ostendorf, F. (2000). Personality disorders and the five-factor model of personality: A meta-analysis. *European Psychiatry, 15*, 226S-227S.
- Ostendorf, F. (2002). *Generalizability of the relationships between personality disorders and the Big Five Factors of personality*. Contribution to the Symposium Personality and Personality Disordered organized by T. A. Widiger at the 11<sup>th</sup> European Conference on Personality, July 21-25. Jena, Germany.
- Saulsman, L.M., & Page, A.C. (2004). The five-factor model and personality disorder empirical literature: a meta-analytic review. *Clinical Psychological Review, 23*, 1055-1085.
- Wang, W., Du, W., Wang, Y., Livesley, W.J., & Jang, K.L. (2004). The relationship between the Zuckerman–Kuhlman Personality Questionnaire and traits delineating personality pathology. *Personality and Individual Differences, 36*, 155-162.
- Widiger, T.A., & Costa, P.T. (1994). Personality and personality disorders. *Journal of Abnormal Psychology, 103*, 78-91.
- Zuckerman, M. (1991). *Psychobiology of Personality*. New York: Cambridge University Press.
- Zuckerman, M., Kuhlman, D.M., & Camac, C. (1988). What lies beyond E and N? Factor analyses of scales believed to measure basic dimensions of personality. *Journal of Personality and Social Psychology, 54*, 96-107.
- Zuckerman, M., Kuhlman, D.M., Teta, P., Joireman, J., & Kraft, M. (1993). A comparison of three structural models of personality: The big three, the big five, and the alternative five. *Journal of Personality and Social Psychology, 65*, 757-768.
- Zuckerman, M., Kuhlman, D.M., Thornquist, M., & Kiers, H. (1991). Five (or three) robust questionnaire scales factors of personality without culture. *Personality and Individual Differences, 12*, 929-941.

## TABLES

Table 1

NEO-FFI-R and ZKPQ-50-CC principal components analysis extracting four and five factors

	I	II	III	IV	I	II	III	IV	V
Neuroticism	-.084	<b>.890</b>	.127	-.100	-.125	<b>.889</b>	.130	-.091	.033
Extraversion	<b>.839</b>	-.218	.023	.220	<b>.841</b>	-.180	.053	.232	.118
Openness	<b>.356</b>	.188	.081	.059	.089	.053	.030	.015	<b>.973</b>
Agreeableness	.052	.068	<b>-.883</b>	.012	.087	.077	<b>-.879</b>	.007	-.027
Conscientiousness	-.198	-.112	<b>-.324</b>	<b>.744</b>	-.218	-.143	<b>-.345</b>	<b>.732</b>	.068
N-Anx	-.005	<b>.910</b>	.013	-.046	-.039	<b>.916</b>	.019	-.036	.024
ImpSS	<b>.685</b>	-.020	<b>.395</b>	-.200	<b>.615</b>	-.021	<b>.409</b>	-.198	<b>.310</b>
Sy	<b>.823</b>	-.081	-.159	-.052	<b>.881</b>	-.010	-.113	-.030	-.070
Aggr-Host	.142	.256	<b>.711</b>	-.026	.114	.267	<b>.721</b>	-.013	.014
Act	.247	-.037	.190	<b>.778</b>	.259	-.015	.200	<b>.790</b>	-.051
<i>% Accounted variance</i>	<i>21.08</i>	<i>17.93</i>	<i>16.31</i>	<i>16.66</i>	<i>20.22</i>	<i>17.62</i>	<i>16.52</i>	<i>12.62</i>	<i>10.70</i>

ImpSS: Impulsive sensation seeking; N-Anx: Neuroticism-Anxiety; Agg-Host: Aggressivity-Hostility; Act: Activity; Sy: Sociability. Loadings equal to or higher than 0.30 are in boldface.

Table 2

Product-moment Pearson correlations between the MCMI-III and NEO-FFI-R and ZKPQ-50-CC scales

MCMI-III PD's scales	N	E	O	A	C	ImpSS	N-Anx	Agg-Host	Act	Sy
Paranoid	<b>.370</b>	-.100	-.113	<b>-.272</b>	-.049	.101	<b>.313</b>	<b>.234</b>	.063	-.139
Schizoid	<b>.258</b>	<b>-.529</b>	<b>-.189</b>	<b>-.155</b>	-.060	<b>-.202</b>	<b>.253</b>	-.003	-.057	<b>-.547</b>
Schizotypal	<b>.439</b>	<b>-.164</b>	.008	<b>-.185</b>	<b>-.186</b>	<b>.163</b>	<b>.437</b>	<b>.167</b>	.006	<b>-.172</b>
Antisocial	<b>.161</b>	.138	.042	<b>-.399</b>	<b>-.454</b>	<b>.512</b>	.100	<b>.394</b>	.018	.113
Borderline	<b>.550</b>	-.052	.015	<b>-.198</b>	<b>-.297</b>	<b>.291</b>	<b>.486</b>	<b>.287</b>	.017	-.004
Histrionic	<b>-.218</b>	<b>.656</b>	.092	.021	-.001	<b>.443</b>	<b>-.173</b>	.142	<b>.191</b>	<b>.604</b>
Narcissistic	<b>-.228</b>	<b>.425</b>	.087	<b>-.378</b>	-.041	<b>.430</b>	<b>-.241</b>	<b>.335</b>	<b>.182</b>	<b>.205</b>
Avoidant	<b>.462</b>	<b>-.411</b>	-.086	-.054	-.086	-.141	<b>.458</b>	.004	-.070	<b>-.313</b>
Dependent	<b>.474</b>	-.101	-.111	.102	-.133	.032	<b>.480</b>	-.048	.005	.002
Obsessive-Compulsive	-.050	<b>-.168</b>	-.134	<b>.180</b>	<b>.541</b>	<b>-.392</b>	-.038	<b>-.259</b>	<b>.160</b>	<b>-.200</b>
Passive Aggressive	<b>.567</b>	-.128	-.064	<b>-.211</b>	<b>-.235</b>	<b>.176</b>	<b>.526</b>	<b>.313</b>	-.004	-.082
Masochistic	<b>.488</b>	<b>-.237</b>	-.018	-.102	<b>-.210</b>	.042	<b>.487</b>	.098	-.046	<b>-.153</b>
Depressive	<b>.597</b>	<b>-.258</b>	.008	-.076	-.126	-.023	<b>.601</b>	.108	-.016	<b>-.155</b>
Sadistic	<b>.339</b>	.041	-.019	<b>-.419</b>	<b>-.201</b>	<b>.304</b>	<b>.298</b>	<b>.491</b>	.072	-.020

N: Neuroticism; E: Extraversion; O: Openness; A: Agreeableness; C: Conscientiousness; ImpSS: Impulsive sensation Seeking; N-Anx: Neuroticism-Anxiety; Agg-Host: Aggressivity-Hostility; Act: Activity; Sy: Sociability. Significant correlations ( $r > .15$ ) are in boldface

Table 3

Principal component analysis (Varimax rotation) including MCMI-III PD's, NEO-FFI-R and ZKPQ-50-CC scales.

MCMI-III PD's scales	I	II	III	IV	V	MCMI-III PD's scales	I	II	III	IV	V
Paranoid	<b>.72</b>	-.11	<b>.45</b>	.16	-.15	Paranoid	<b>.67</b>	-.29	.19	.20	<b>.36</b>
Schizoid	<b>.44</b>	<b>-.66</b>	.28	.09	-.22	Schizoid	<b>.47</b>	<b>-.75</b>	.05	-.03	.09
Schizotypal	<b>.81</b>	-.18	.23	-.03	.01	Schizotypal	<b>.79</b>	-.23	.22	.05	.13
Antisocial	<b>.35</b>	.19	<b>.51</b>	<b>-.61</b>	-.08	Antisocial	.29	.01	<b>.85</b>	.18	.02
Borderline	<b>.83</b>	.05	.16	-.33	-.01	Borderline	<b>.79</b>	.02	<b>.40</b>	.15	-.03
Histrionic	-.15	<b>.90</b>	.07	-.07	-.03	Histrionic	-.24	<b>.77</b>	.25	.14	.29
Narcissistic	-.14	<b>.53</b>	<b>.71</b>	-.02	-.05	Narcissistic	-.26	.15	<b>.53</b>	<b>.33</b>	<b>.54</b>
Avoidant	<b>.71</b>	<b>-.51</b>	-.07	.05	-.01	Avoidant	<b>.78</b>	<b>-.38</b>	-.11	-.10	-.11
Dependent	<b>.83</b>	-.01	-.25	.00	-.12	Dependent	<b>.86</b>	.08	-.05	-.18	-.01
Obsessive-Compulsive	.00	-.16	-.10	<b>.87</b>	-.07	Obsessive-Compulsive	.02	-.17	<b>-.74</b>	-.06	<b>.47</b>
Passive Aggressive	<b>.83</b>	-.03	.23	-.19	-.08	Passive Aggressive	<b>.78</b>	-.09	.28	<b>.30</b>	.03
Masochistic	<b>.82</b>	-.23	.04	-.08	.01	Masochistic	<b>.84</b>	-.18	.12	-.01	-.02
Depressive	<b>.86</b>	-.21	-.02	.00	.07	Depressive	<b>.88</b>	-.13	-.03	.08	-.05
Sadistic	<b>.59</b>	.11	<b>.58</b>	-.19	-.08	Sadistic	<b>.51</b>	-.12	<b>.49</b>	<b>.46</b>	.22
Neuroticism	<b>.65</b>	-.17	-.10	-.17	.23	ImpSS	.10	<b>.40</b>	<b>.64</b>	.07	.16
Extraversion	-.08	<b>.84</b>	.08	.00	.09	N-Anx	<b>.66</b>	.10	-.21	<b>.40</b>	-.28
Openness	.01	.12	.08	-.03	<b>.94</b>	Agg-Host	.07	.06	.24	<b>.87</b>	.00
Agreeableness	-.03	.13	<b>-.75</b>	.19	-.17	Act	.04	.17	-.07	-.04	<b>.72</b>
Conscientiousness	-.13	.09	-.06	<b>.82</b>	.00	Sy	-.01	<b>.83</b>	.15	-.05	.07
<i>% Accounted variance</i>	<i>33.3</i>	<i>14.5</i>	<i>11.6</i>	<i>11.1</i>	<i>5.8</i>	<i>% Accounted variance</i>	<i>32.9</i>	<i>14.5</i>	<i>12.9</i>	<i>7.9</i>	<i>7.5</i>

ImpSS: Impulsive sensations seeking; N-Anx: Neuroticism-Anxiety; Agg-Host: Aggressivity-Hostility; Act: Activity; Sy: Sociability. Loadings equal to or higher than 0.30 are in boldface.

Table 4. Hierarchical regression analysis of NEO-FFI-R and ZKPQ-50-CC dimensions<sup>(a)</sup> as predictors of the MCMI-III PD scales.

MCMI-III PD scales	NEO-FFI-R + ZKPQ-50-CC							ZKPQ-50-CC + NEO-FFI-R								
	Step 1: NEO-FFI-R			Step 2: ZKPQ-50-CC				Change in R <sup>2</sup>	Step 1: ZKPQ-50-CC			Step 2: NEO-FFI-R				Change in R <sup>2</sup>
	R	R <sup>2</sup>	Dimensions	R	R <sup>2</sup>	Dimensions	R		R <sup>2</sup>	Dimensions	R	R <sup>2</sup>	Dimensions			
Paranoid	.46	.21	N+, A-, O-	---(b)	---(b)	---(b)	---(b)	.36	.13	N-Anx+, Agg-Host+	.47	.22	A-, N+, O-	.09		
Schizoid	.56	.31	E-, A-	.63	.40	Sy-, N-Anx-	.09	.59	.34	Sy-, N-Anx+	.65	.42	E-, A-, O-	.08		
Schizotypal	.46	.21	N+, A-	.51	.26	N-Anx+	.05	.51	.26	N-Anx+, ImpSS+, Sy-	.54	.29	N+	.03		
Antisocial	.56	.31	C-, A-, E+	.65	.43	ImpSS+, Agg-Host+	.12	.57	.33	ImpSS+, Agg-Host+	.65	.43	C-, A-	.10		
Borderline	.59	.34	N+, C-	.65	.42	ImpSS+, N-Anx+	.08	.57	.32	N-Anx+, ImpSS+	.64	.41	N+	.09		
Histrionic	.66	.43	E+	.71	.51	Sy+, ImpSS+	.08	.67	.45	Sy+, ImpSS+, N-Anx-	.72	.51	E+	.06		
Narcissistic	.58	.34	E+, A-, N-	.64	.41	Agg-Host+, ImpSS+	.07	.57	.32	ImpSS+, N-Anx-, Agg-Host+	.64	.41	E+, A-	.09		
Avoidant	.55	.31	N+, E-	.59	.35	N-Anx+	.04	.54	.29	N-Anx+, Sy-	.60	.35	E-, N+	.06		
Dependent	.50	.25	N+, A+	.56	.31	N-Anx+, Agg-Host-	.06	.51	.26	N-Anx+, Agg-Host-	.56	.31	N+	.05		
Obsc.-Compulsive	.57	.33	C+, E-	.60	.36	ImpSS-, Act+	.03	.47	.22	ImpSS-, Act+, Agg-Host-	.60	.36	C+	.14		
Pas.-Aggressive	.59	.35	N+, A-	.64	.41	N-Anx+, ImpSS+	.06	.57	.32	N-Anx+, Agg-Host+	.62	.39	N+	.07		
Masochistic	.49	.24	N+	.54	.29	N-Anx+	.05	.49	.24	N-Anx+	.54	.29	N+	.05		
Depressive	.60	.36	N+	.66	.43	N-Anx+	.07	.61	.37	N-Anx+	.66	.43	N+	.06		
Sadistic	.51	.27	A-, N+	.61	.37	Agg-Host+, ImpSS+	.10	.56	.32	Agg-Host+, N-Anx+, ImpSS+	.61	.37	A-	.05		
<i>Average</i>	<i>.55</i>	<i>.30</i>		<i>.60</i>	<i>.38</i>		<i>.07</i>	<i>.54</i>	<i>.30</i>		<i>.61</i>	<i>.37</i>		<i>.07</i>		

(a) N: Neuroticism; E: Extraversions; O: Openness; A: Agreeableness; C: Conscientiousness; ImpSS: Impulsive Sensation Seeking; N-Anx: Neuroticism-Anxiety; Agg-Host: Aggressivity-Hostility; Act: Activity; Sy: Sociability.

(b) No ZKPQ-50-CC scale entered into the equation in the second step.