



Predictions of the MCMI-III personality disorders from NEO-PI-R domains and facets: Comparison between American and Spanish samples

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ABSTRACT. This *ex post facto* study analyzes the relationships between NEO-PI-R domains and facets and 14 MCMI-III personality disorders scales in a Spanish non-clinical sample ($N = 674$). It also aims to explore differences and similarities with the results obtained by Dyce and O'Connor in an American sample with the same instruments. As expected, facet-level factor analyses forced to five factors showed a pattern of relationships strongly similar between both samples, with a total congruence coefficient of .92, and acceptable factor congruence coefficients, except for the Openness factor (.68). In accordance with the predictions by Widiger and Widiger *et al.* percentages of significant correlations were around 60% in both samples, with most of them agreeing. The domain-level multiple regression analysis also revealed a great resemblance between both American and Spanish results, Neuroticism being the strongest predictor of personality disorders. More differences arose in the multiple regressions at facet-level, although the variance accounted for by included facets was practically the same as the domains. The cross-cultural validity of the predictive value of the NEO-PI-R over the MCMI-III personality disorders and the relative benefits of the facet-level analyses over domain-level analyses are discussed.

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KEYWORDS. NEO-PI-R. MCMI-III. Domain and facet-level predictions. Personality disorders. Five-factor model. *Ex post facto* study.

RESUMEN. Este estudio *ex post facto* analiza las relaciones entre las dimensiones y facetas del *NEO-PI-R* y los 14 trastornos de personalidad del *MCMI-III* en una muestra no clínica española ($N = 674$). Se exploran las diferencias y similitudes con los resultados de Dyce y O'Connor en una muestra americana con los mismos instrumentos. Como se esperaba, los análisis factoriales de facetas reteniendo cinco factores mostraron un modelo de relaciones muy similar entre ambas muestras, con un coeficiente de la congruencia total de 0,92, y coeficientes de congruencia de factor aceptables, salvo para el factor Apertura (0,68). En consonancia con las predicciones de Widiger y Widiger *et al.* los porcentajes de correlaciones significativas estaban alrededor de 60% en ambas muestras, y la mayoría coincidían. El análisis de regresión múltiple con dimensiones también reveló un gran parecido entre los resultados americanos y españoles, Neuroticismo fue el predictor más relacionado con los trastornos de personalidad. Se encontraron diferencias en las regresiones por facetas, aunque la varianza explicada fue prácticamente la misma que en las dimensiones. Se discute la validez transcultural y el valor predictivo del *NEO-PI-R* sobre los trastornos de personalidad del *MCMI-III*, junto con las ventajas relativas de las facetas sobre las dimensiones.

PALABRAS CLAVE. *NEO-PI-R*. *MCMI-III*. Predicción de dimensiones y facetas. Trastornos de personalidad. Modelo de cinco factores. Estudio *ex post facto*.

RESUMO. O presente estudo analisa as relações entre os domínios e facetas do *NEO-PI-R* e as 14 escalas de perturbações de personalidade do *MCMI-III* numa amostra não clínica espanhola ($N = 674$). Também tem como objectivo explorar diferenças e similaridades com os resultados obtidos por Dyce e O'Connor numa amostra americana com o mesmo instrumento. Como esperado, a análise factorial forçada a cinco factores mostrou um padrão de relação muito similar entre ambas as amostras, com um coeficiente de congruência total de 0,92, e coeficientes de congruência por factor aceitáveis, excepto para o factor Abertura (0,68). De acordo com as predições de Widiger e Widiger *et al.*, foram encontradas percentagens de correlações significativas à volta de 60% em ambas as amostras, com a maioria delas no sentido do acordo. A análise de regressão múltipla ao nível dos domínios também revelou uma maior semelhança entre os resultados espanhóis e americanos, sendo o neuroticismo o melhor predictor das perturbações de personalidade. Nas regressões múltiplas ao nível das facetas, surgiram mais diferenças, apesar da variância responsável pelas facetas incluídas ser praticamente a mesma dos domínios. A validade cross-cultural do valor predictivo do *NEO-PI-R* sobre o *MCMI-III* e os benefícios relativos das análises ao nível da faceta sobre as análises ao nível do domínio são discutidas.

PALAVRAS CHAVE. *NEO-PI-R*. *MCMI-III*. Perturbações de personalidade. Modelo de cinco factores. Estudo *ex post facto*.

Introduction

Despite the evident differences and controversies between the categorical and dimensional model in the classification of personality disorders (Butcher, 2005; Presley and Walton, 1973; Widiger and Frances, 1985), attempts have been made to look for a dimensional model which is adaptable to the categorical personality disorders of the Axis II of the Diagnostic and Statistical Manual of Mental Disorders (DSM). The first attempt was the circumplex system of interpersonal classification (IPC; Kiesler, 1983). Some of the DSM-III Axis II disorders were easily placed in the circumplex, but others caused some problems. For example, the Schizotypal disorder did not stand out from the Schizoid one, given that both personality disorders (PD's) share an introverted interpersonal style. The Antisocial disorder was also difficult to represent in the IPC system. Widiger and Frances (1985) proposed utilizing the IPC dimensional system to classify personality disorders, but the proposal did not prosper.

Wiggins and Pincus (1989) classified the personality disorders of the DSM-III using the Minnesota Multiphasic Personality Inventory (MMPI) scales derived by Morey, Waugh, and Blashfield (1985). They also applied different dimensional questionnaires developed after the Five-Factor Model (FFM) of personality, among which were the Interpersonal Adjective Scales-Big Five (IASR-B5), and the Neuroticism, Extraversion and Openness Personality Inventory (NEO-PI). A factor analysis constrained to five factors and including the personality disorders classified using Morey *et al.*'s scales (1985) derived from MMPI and the dimensional questionnaires of personality was conducted. The Extraversion factor grouped the scales of the Histrionic and Narcissistic disorders (in positive) and Avoidant and Schizoid (in negative). The Neuroticism factor included Borderline and Dependent disorders. The Dependent (in positive), Antisocial, Paranoid and Narcissistic (in negative) disorders loaded on the Agreeableness factor. The Compulsive (in positive), Antisocial and Passive-Aggressive (in negative) scales loaded on the Conscientiousness factor. Finally, the Schizotypal scale loaded on the Openness factor. Widiger and Trull (1992) stated that Wiggins and Pincus' results (1989) were consistent with the expectations based on the IPC model of personality disorders and the association of the circumplex to the five factors. Nevertheless, Wiggins and Pincus (1989) considered that the IPC is inadequate in describing the Compulsive and Borderline personality disorders, and in differentiating the Schizotypal from Schizoid.

Later, Costa and McCrae (1990) correlated the NEO-PI with the scales of the personality disorders derived from the MMPI by Morey *et al.* (1985) and the Millon Clinical Multiaxial Inventory (MCMI) I and II. In this study, the MMPI scales were related to the MCMI I and II scales, with some significant exceptions such as the Compulsive disorder. Neuroticism correlated positively with the Borderline and Schizotypal disorders, and negatively with the Narcissistic disorder, Extraversion positively with the Narcissistic disorder and negatively with the Schizotypal. Curiously, Openness correlated with the Antisocial disorder. Agreeableness correlated negatively with the Antisocial, Paranoid and Narcissistic disorders. Finally, Conscientiousness correlated positively with the MCMI-I and II Compulsive disorder, and negatively with the Borderline and Antisocial disorders. In general, the results tend to reproduce those obtained by Wiggins and Pincus (1989). As both studies were conducted with voluntary subjects from community or students, the reported relationships between the Axis I and II were limited to non-clinical populations.

Since 1990, several studies have been carried out to relate the FFM with personality disorders. Saulsman and Page (2004) made a meta-analysis including 15 studies ranging from Costa and McCrae (1990) to Dyce and O'Connor (1998). These studies were based on different samples: adults from the general community, students, psychiatric outpatients and inpatients, male sex offenders, and so forth. The FFM measures applied were the NEO-PI, the 50 Bipolar Self-Rating Scales (BSRS), the 23 Bipolar Big Five (BB5), clinical assessments and the NEO-PI-R. Several personality disorder measures were used, ranging from structured interviews based on DSM-III-R criteria to scales derived from the MMPI or inventories such as different versions of the MCMI. The authors concluded that their results were consistent with the hypothesis that the personality disorders can be extreme and maladaptive variants of the five factors (Costa, and Widiger, 1994, 2002) and that each of the personality disorders showed associations with the five factor model which are meaningful and predictable given their individual diagnostic criteria (Widiger, Trull, Clarkin, Sanderson, and Costa, 1994, 2002). Disorders characterized by emotional distress like Paranoid, Schizotypal, Borderline, Avoidant and Dependent, presented positive relationships with Neuroticism. Disorders characterized by gregariousness, such as the Histrionic and Narcissistic disorders, were associated positively with Extraversion. Those characterized by shyness and reclusive qualities, such as the Schizoid, Schizotypal and Avoidant disorders, showed negative associations with Extraversion. Disorders defined by interpersonal difficulties, like the Paranoid, Schizotypal, Antisocial, Borderline and Narcissistic disorders, showed a negative association with Agreeableness. Orderliness disorders, like the Obsessive-Compulsive disorder, showed a positive association with Conscientiousness, in contrast with those characterized by recklessness, like the Antisocial and Borderline disorders.

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 as a measure of personality disorders (Dyce and O'Connor, 1998; reproduced in O'Connor and Dyce, 2002). This study is particularly important because it tested the predictions by Widiger (1993) and Widiger *et al.* (1994) about the relationships between NEO-PI-R facets and personality disorders and evaluated the relative benefits of facet-level analyses over domain-level analyses. Dyce and O'Connor (1998) considered that "To focus on facets should increase specificity and discrimination between PD's and provide the richer descriptions preferred by clinicians" (p. 32). The authors explored the relations between the MCMI-I and II personality disorders and the NEO-PI-R 30 facets through a principal components analysis forced to 5 orthogonal factors. This procedure made it possible to group the 30 facets in five factors and to ascertain factorial loadings for the 14 personality disorders scales. The Neuroticism factor was composed of 6 NEO-PI-R respective facets, and 10 of the 14 MCMI scales with loadings higher than .30, indicating that Neuroticism is related to the disorders defined by emotional distress. The Extraversion factor also integrated the Schizoid, Avoidant and Histrionic disorders (the latter in positive). No MCMI scale loaded on the Openness factor. The Sadistic, Narcissistic, Antisocial, Paranoid, and Passive-Aggressive disorders loaded on the Agreeableness factor, in that order. Finally, the Obsessive-Compulsive and the Antisocial disorders loaded on the Conscientiousness factor with loadings of .73, and .32, respectively.

Statistical criteria for evaluating the significance of correlations between facets and scores in the 14 personality disorders assessed by the MCMI-III were adjusted to

the significance level of .0001, according to the Bonferroni adjustment. Correlations (positive or negative) confirmed 63% of Widiger *et al.*'s predictions (1994), taking correlations higher than $\pm .15$ as the criterion. The strongest support emerged for the Schizoid, Antisocial, Borderline, Avoidant, Passive-aggressive and Sadistic predictions. However, an important number of statistically significant non-predicted correlations were found. Also, a linear regression taking the NEO-PI-R domains as independent variables showed that most of the disorders were predicted by a combination of two domains, accounting for an average of 34% of the disorders' variance (mean multiple $r = .58$). The equations developed from the facets included between two and five facets, accounting for an average of 38% of the variance (mean multiple $r = .62$). The authors concluded that, although the increases in effect sizes were modest, facet-level analysis provide greater discrimination between PD's than domain-level analysis.

The present *ex post facto* study (Montero and León, 2005) aims to analyze the relationships between the FFM and personality disorders in a Spanish non-clinical sample. Dyce and Connor (1998)'s study will be taken as reference in order to compare both studies. Note that the two samples are very similar (mostly university students), and the same instruments will be applied: NEO-PI-R and MCMI-III. The former is widely used in the Spanish context, with similar psychometric properties to the original English version. However, the latter has not yet been adapted to Spanish, and was therefore translated and validated for this study. The main aims are the following: a) to compare the factor structure of the 30 NEO-PI-R facets and the 14 PD's in both countries, and b) to test for differences between the two countries in the predictive value of domains and facets regarding the personality disorders scales.

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 ($SD = 15.11$) for males, and 31.10 ($SD = 14.62$) for females. 50 % of the subjects were undergraduate university students and the other 50 % were students' friends and relatives.

Instruments

- Millon Clinical Multiaxial Inventory (MCMI-III; Millon, Millon, and Davis, 1994). This is an inventory consisting of 175 true-false items from which scores on 14 personality disorders (PD's), 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. The alpha coefficients reported in the test manual ranged from .67 to .89 and the test-retest values (5-14 days) ranged from .88 to .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. Descriptives and alpha coefficients

were very similar to those obtained in the original studies (Dyce, O'Connor, Parkins, and Janzen, 1997), with reliability coefficients ranging from .64 to .84.

- Neuroticism, Extraversion and Openness Personality Inventory-Revised (NEO-PI-R). This instrument is a well-known measure of the “big five” personality domains: Neuroticism (N), Extroversion (E), Openness to experience (O), Agreeableness (A), and Conscientiousness (C), and their thirty facets (six by factor). Subjects answer the 240 items of the questionnaire following a 5-point scale, ranging from 0 (strongly disagree) to 4 (strongly agree). The psychometric properties of the Spanish version satisfactorily replicated of the original English version (Aluja, García, García, and Seisdedos, 2005).

Procedure

The MCMI-III and the NEO-PI-R were administered to psychology students in the classroom. Students were trained in the application of psychometric tests, and protocols were given to them to be administered to relatives and friends. Protocols were applied to subjects older than 25 for the purpose of obtaining a larger age distribution. Only properly filled in questionnaires were processed statistically.

Results

Factor analysis

As in Dyce and Connor's study (1998), preliminary analyses were conducted in order to test the factor structure congruence between the present sample and the American validation sample (Costa and McCrae, 1992). Firstly, a principal components analyses with varimax rotation and forced to five factors was carried out. The outcome matrix was compared with the original one through procrustes rotation procedure, computing congruence indexes for every dimension and facet. The congruence index (*rc*; Cattell, 1978) is used to find out if the extracted factors are equivalent across two samples. A value of *rc* above .90 is considered a high degree of factor similarity; a value greater than .95 is generally interpreted as a practical identity of the factor. Congruence coefficients for the NEO-PI-R factors were .97, .97, .97, .96, and .96, for Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness, respectively, the total congruence index being .97. Dyce *et al.* (1997) provided factorial matrices for the 14 MCMI-III scales for two, three and four factors with the same sample as that used by Dyce and O'Connor (1998). With the aim of comparing both MCMI-III factor structures, a four-factor matrix was obtained following the same procedure by Dyce *et al.* (1997). Total congruence coefficient was .98 (F-I: .99; F-II: .99; F-III: .98; F-IV: .95).

Furthermore, five factors were extracted from a varimax principal components factor analysis including the 30 NEO-PI-R facets and the 14 PD's scales (Table 1). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .91, and Bartlett's Test of Sphericity (BTS) yielded an approximate $\chi^2 = 17274.073$, $p < .001$. The five factors accounted for 57.40% of the total variance. The first factor grouped the 6 Neuroticism facets and all 14 PD scales, with the exception of Histrionic, Narcissistic and Obsessive-Compulsive ones. The second one included four Extraversion facets (E1, E2, E4, E6), three Agreeableness and one Neuroticism facets in negative (A1, A3, A6 and N2),

Histrionic in positive and Schizotypal in negative. The third one was composed of all Openness facets, N1, N5, and E5, and Schizoid in negative. The fourth one was formed by three Agreeableness facets in negative (A2, A4 and A5), four Extraversion facets (E3, E4, E5 and E6) and two Neuroticism facets in negative (N4, N6) to a lesser extent, and Antisocial and Sadistic disorders. Lastly, the fifth factor grouped the six Conscientiousness facets, one of Agreeableness (A6), two of Neuroticism and one of Extraversion in negative (N5, N6, and E5), and the Obsessive-Compulsive in positive and Antisocial and Borderline scales in negative. Congruence coefficients were .96, .88, .68, .96, and .98 for Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness factors, respectively. In regard to the scales, 33 of 44 obtained congruence coefficients higher than .90, and total congruence index with the American sample (Dyce and O'Connor, 1998) after the procrustes rotation was .92, indicating that both matrices were highly similar.

TABLE 1. Comparison of principal component analyses of MCMI-III and NEO-PI-R personality scales in Spanish and American samples (Dyce and O'Connor, 1998), and congruence coefficients (CC) by variable.

	<i>American sample</i>					<i>Spanish sample</i>					CC
	F-I	F-II	F-III	F-IV	F-V	F-I	F-II	F-III	F-IV	F-V	
	N	E	O	A	C	N	E	O	A	C	
Paranoid	.50	-.20	.02	-.54	.06	.76	-.09	-.21	.28	.09	.91
Schizoid	.33	-.56	.11	-.26	.09	.52	-.43	-.39	-.03	.11	.79
Schizotypal	.57	-.23	.28	-.35	-.10	.80	-.09	-.08	.08	-.06	.84
Antisocial	.12	.06	.13	-.59	-.32	.37	.04	-.03	.53	-.54	.91
Borderline	.70	-.11	.10	-.34	-.20	.82	.07	-.01	.13	-.30	.94
Histrionic	-.22	.68	.10	-.15	.01	-.23	.62	.17	.39	-.14	.99
Narcissistic	.05	.08	.27	-.60	.12	-.10	.24	.02	.77	-.04	.71
Avoidant	.70	-.42	.03	-.07	-.03	.72	-.28	-.12	-.26	.04	.98
Dependent	.72	.02	-.07	.16	.01	.76	.19	-.18	-.25	-.08	.98
Obsessive-compulsive	.02	-.07	-.13	.14	.73	.00	-.06	-.17	-.19	.73	.97
Passive-Aggressive	.60	-.06	-.06	-.43	-.09	.86	-.01	-.06	.14	-.18	.97
Self Defeating	.71	-.21	.09	-.19	-.03	.80	-.06	-.11	-.09	-.11	.95
Depressive	.82	-.21	.05	-.11	-.02	.85	-.08	-.01	-.14	-.01	.99
Sadistic	.39	-.01	-.04	-.65	.03	.65	-.02	-.07	.53	-.17	.96
N1: Anxiety	.77	-.08	-.10	.11	-.02	.60	-.09	.39	-.27	-.03	.80
N2: Angry Hostility	.59	.03	-.15	-.45	-.14	.55	-.33	.28	.22	-.17	.78
N3: Depression	.93	-.19	-.06	.00	-.18	.71	-.20	.21	-.28	-.15	.95
N4: Self-Consciousness	.72	-.24	-.13	.10	-.09	.57	-.25	.15	-.42	-.08	.91
N5: Impulsiveness	.41	.25	.03	-.20	-.43	.34	.02	.31	.24	-.47	.92
N6: Vulnerability	.74	-.04	-.16	.15	-.30	.57	-.20	.21	-.34	-.34	.86
E1: Warmth	-.12	.70	.23	.38	.14	-.07	.81	.19	.06	.09	.97
E2: Gregariousness	-.09	.74	-.14	.14	-.09	-.10	.58	.15	.02	-.25	.92
E3: Assertiveness	-.25	.50	.13	-.38	.22	-.28	.11	.15	.69	.12	.96
E4: Activity	-.12	.58	.15	-.13	.20	-.02	.31	.25	.49	.08	.94
E5: Excitement seeking	-.14	.54	.13	-.23	-.09	-.02	.27	.41	.39	-.33	.88
E6: Positive emotions	-.22	.65	.31	.27	.07	-.33	.53	.22	.32	-.08	.92
O1: Fantasy	-.02	.09	.57	.01	-.29	.02	.03	.52	.19	-.33	.89
O2: Aesthetics	.08	.12	.70	.13	.07	.06	.15	.66	-.02	.09	.96
O3: Feelings	.20	.37	.54	.04	.06	.15	.20	.71	.22	.00	.96
O4: Actions	-.29	.11	.49	.05	-.14	-.13	.03	.51	.09	-.27	.90
O5: Ideas	-.17	-.01	.60	-.11	.13	-.18	-.07	.57	.13	.15	.99
O6: Values	-.01	-.01	.44	.09	-.15	-.32	.15	.40	-.12	-.06	.80

A1: Trust	-.29	.32	.18	.52	.11	-.32	.51	-.06	-.14	.13	.90
A2: Straightforwardness	-.01	-.04	.10	.75	.15	-.02	.13	-.10	-.61	.19	.92
A3: Altruism	.02	.34	.20	.60	.28	.01	.67	.05	-.16	.26	.90
A4: Compliance	-.12	-.03	.10	.73	.10	-.17	.26	-.23	-.62	.12	.87
A5: Modesty	.29	-.18	.00	.60	.01	.08	.25	-.01	-.66	.06	.97
A6: Tender-Mindedness	.17	.21	.30	.53	.11	.12	.41	-.10	-.25	.30	.70
C1: Competence	-.37	.21	.10	-.07	.67	-.33	.12	-.02	.20	.68	.99
C2: Order	.04	.01	-.19	-.02	.63	-.02	-.07	.02	.01	.53	.86
C3: Dutifulness	-.03	.07	.05	.13	.72	-.05	.18	-.07	-.10	.72	.98
C4: Achievement Striving	-.12	.26	.10	.01	.72	.00	.14	.25	.19	.73	.94
C5: Self-Discipline	-.33	.10	.01	.11	.74	-.18	.06	-.01	.00	.80	.97
C6: Deliberation.	-.07	-.21	-.16	.24	.60	-.13	-.04	-.15	-.24	.69	.99

NOTES. N: Neuroticism; E: Extroversion; O: Openness to experience; A: Agreeableness; C: Conscientiousness. In boldface loadings equals or superior .30.

Also, another varimax principal components factor analysis including the five domains and the MCMI personality disorder scales was conducted. The NEO-PI-R domains loaded on their respective factors. Most personality disorders (11) had loadings higher than .40 on the Neuroticism factor. Only the Histrionic, Narcissistic and Obsessive-Compulsive scales did not load on this factor. The Extraversion factor was formed by Schizoid and Avoidant in negative, and Histrionic and Narcissistic in positive. The Conscientiousness factor included the Antisocial in negative, and the Obsessive-Compulsive in positive. The Agreeableness factor was integrated by Narcissistic, Antisocial, Sadistic and Paranoid in negative and Dependent in positive, and finally, no personality disorder scale loaded on the Openness factor. Although no congruence coefficient could be computed, relationships between PD's and domains were more similar to those reported by Dyce and O'Connor (1998). For instance, Schizoid loaded on Neuroticism and Extraversion and no PD loaded on the Openness factor.

Correlational analyses

Pearson correlations between NEO-PI-R domains and facets and MCMI PD scales in both samples are reported in Table 2. Widiger *et al.*'s (1994) facet-level predictions are also listed in this Table for comparison with the obtained correlations. Calculating the significance of correlations required the application of the Bonferroni adjustment due to the large number of comparisons. The adjusted significance level was .0001 (.05/455), meaning that correlations had to be greater than .15 to be significant. Overall support for the predictions was 92 out of 150, that is, 61.33% of predicted relationships were significant for both samples. We report the number of significant predictions for each personality disorder at the bottom of each column of correlations in Table 2. Additionally, it can be observed that 40% of non-predicted correlations were significant in the Spanish sample.

TABLE 2. Correlations between PD scales and NEO-PI-R domain/facets in Spanish and American samples.

		Paranoid		Schizoid		Schizotypal		Antisocial		Borderline		Histrionic		Narcissistic							
		r ^s	r ^a	r ^s	r ^a	r ^s	r ^a	r ^s	r ^a	r ^s	r ^a	r ^s	r ^a	r ^s	r ^a						
N1	h	.26	.29	.11	.21	h	.29	.34	h/L	.05	-.05	H	.41	.44	-.15	-.29	-.26	-.07			
N2	H	.36	.43	L	.20	.22	L	.36	.35	H	.33	.26	H	.45	.53	H	-.08	-.11	H	.04	.13
N3		.35	.37		.31	.31	h	.44	.47	h	.14	.10	H	.54	.63	H	-.26	-.32	h/L	-.29	-.03
N4		.26	.32	L	.29	.30	H	.34	.38	L	.00	-.01	H	.36	.46	H	-.33	-.36	H	-.37	-.08
N5		.17	.17		-.02	.01	H	.25	.26	H	.44	.28	H	.43	.38	H	-.12	.04		.13	.09
N6		.25	.23	L	-.17	.19	h	.37	.34	L	.15	.00	H	.48	.48	h	-.19	-.23	H	-.31	-.10
E1	L	-.15	-.35	L	-.43	-.44	L	-.16	-.30	I	-.05	-.19		-.07	-.30	H	.55	.48		.23	-.07
E2	L	-.16	-.26	L	-.50	-.46	L	-.16	-.25		.06	-.04	h	.00	-.17	h	.49	.42		.11	-.08
E3		-.09	-.08		-.25	-.23		-.20	-.10		.16	.07	h	-.16	-.15		.40	.43	H	.51	.27
E4		.03	-.08		-.24	-.25		-.04	-.14		.18	.04		.01	-.14	h	.38	.39		.38	.14
E5		-.04	-.03	L	-.04	-.03	L	.02	-.01	H	.37	.23		.14	-.03	h	.40	.36		.37	.13
E6	I	-.20	-.31	L	-.49	-.40		-.22	-.26		.07	-.15	h	-.17	-.34	H	.51	.42		.34	-.01
O1		-.07	-.04		-.18	-.10	H	.08	.16		.27	.09		.13	.07	h	.19	.12	H	.14	.09
O2	I	-.05	-.08		-.16	-.06		.05	.12		.00	-.03		.04	-.01	H	.09	.11		.06	.05
O3	I	-.01	-.05	L	-.27	-.16	L	.08	.07		.13	.04		.13	.08	H	.28	.21		.23	.12
O4	L	-.13	-.20		-.21	-.09		-.02	-.10		.16	.00		.01	-.14	h	.19	.19		.14	.03
O5		-.14	-.06		-.13	-.05	H	-.10	.05		-.02	.01		-.14	-.05	I	.05	.12		.14	.15
O6		-.33	-.05		-.28	.00	h	-.22	.00		-.05	.08		-.19	.08		.11	-.01		-.02	.03
A1	L	-.31	-.48		-.24	-.34	L	-.26	-.37		-.22	-.28		-.25	-.37	h	.21	.18		.00	-.17
A2	L	-.15	-.34		-.05	-.11		-.03	-.25	L	-.37	-.48	L	-.09	-.27	I	-.23	-.11	I	-.45	-.36
A3		-.12	-.27		-.19	-.22		-.10	-.23	L	-.20	-.28		-.07	-.24	L	.16	.13		.10	-.22
A4	L	-.23	-.39	h	-.03	-.11		-.13	-.22	L	-.35	-.39	L	-.21	-.34		-.09	-.05		-.35	-.27
A5	I	-.09	-.13		-.02	.03		-.04	.02	L	-.30	-.25		-.07	.02		-.13	-.23	L	-.48	-.49
A6	I	.04	-.19		.00	-.12		.02	-.05	L	-.19	-.20		-.01	-.11		-.01	.06	L	-.10	-.12
C1	h	-.15	-.18		-.13	-.16		-.27	-.30		-.33	-.21		-.40	-.37	I	.08	.21	h	.19	.12
C2		-.01	.00		-.03	.02		-.10	-.11		-.22	-.19		-.14	-.11		-.02	-.04		-.07	.03
C3		-.02	-.04		.01	-.05		-.12	-.11	L	-.39	-.25		-.20	-.17		-.04	.02		-.07	.01
C4		.03	-.11	I	-.15	-.12		-.10	-.20		-.29	-.20	L	-.17	-.25		.14	.17	h	.13	.07
C5		-.11	-.24		-.05	-.13		-.20	-.30	L	-.47	-.30		-.32	-.37	L	-.01	.14		-.04	-.07
C6		-.07	.10		.02	-.02		-.18	-.18	L	-.51	-.44		-.36	-.26		-.17	-.14		-.18	.05
Sig. Predict.		6/14	10/14		5/9	5/9		7/11	8/11		11/15	12/15		8/12	9/12		10/17	1/7		5/12	4/12
Sig.Nonpredict.		5/16	6/16		10/21	8/21		7/22	10/22		9/16	4/16		8/18	10/18		5/13	7/13		8/19	2/19
N		.37	.40		.23	.28		.45	.47		.25	.12		.59	.64		-.20	-.29		-.24	-.02
E		-.16	-.27		-.56	-.47		-.19	-.26		.21	-.01		-.06	-.27		.68	.61		.48	.09
O		-.17	-.13		-.29	-.12		-.02	.10		.13	.05		.00	.01		.22	.19		.17	.13
A		-.24	-.44		-.11	-.21		-.15	-.27		-.44	-.46		-.18	-.31		-.01	.00		-.37	-.40
C		-.08	-.16		-.07	-.10		-.22	-.28		-.51	-.36		-.37	-.35		-.01	.08		-.03	.00
		Avoidant		Dependent		Obsc-Compulsive		Passi-Aggressive		Masochistic		Sadistic		Depressive							
		r ^s	r ^a	r ^s	r ^a	r ^s	r ^a	r ^s	r ^a	r ^s	r ^a	r ^s	r ^a	r ^s	r ^a						
N1	H	.38	.49	H	.41	.47	.01	.00		.43	.37	.35	.42	.22	.23	H	.48	.61			
N2		.27	.40		.20	.25	h	-.18	-.14	H	.50	.57	.33	.42	.51	.50		.40		.40	.48
N3	h	.50	.63	H	.51	.53	h	-.04	-.13		.53	.51	H	.51	.62	h	.28	.28	H	.63	.75
N4	H	.53	.62	h	.46	.51	h	.08	.01		.39	.36	.42	.48	h	.14	.22	H	.47	.56	
N5		.11	.22		.18	.20		-.38	-.30		.36	.30		.22	.26		.39	.25		.20	.28
N6	H	.44	.46	H	.45	.53		-.16	-.15		.50	.41	H	.42	.48		.22	.15		.51	.56
E1	L/H	-.34	-.36	h	.01	-.01	L	-.01	.04		-.11	-.27		-.16	-.25		-.07	-.26		-.15	-.25
E2	L	-.23	-.37		.05	-.03		-.18	-.10		-.07	-.14		-.13	-.22		-.05	-.12		-.13	-.20
E3	L	-.42	-.36	L	-.38	-.31	H	-.11	.00		-.15	-.11		-.29	-.19	H	.14	.13		-.29	-.21
E4	L	-.25	-.29		-.13	-.13		-.12	.06		-.01	-.08		-.15	-.14		.18	.00		-.12	-.24
E5	L	-.20	-.24		-.05	-.09	I	-.32	-.13		.03	-.05		-.07	-.12		.17	.09		-.10	-.22
E6		-.40	-.37		-.20	-.10	I	-.16	.02		-.26	-.31	L	-.30	-.31		-.07	-.26		-.38	-.37
O1		-.06	-.06		-.05	-.05		-.37	-.28		.06	-.01		.01	-.05		.09	-.05		.00	-.04
O2		-.04	-.03		-.06	.02		-.07	.01		.01	-.08		.02	.06		-.01	-.08		.03	.00
O3		-.10	-.03		-.01	.03	L	-.16	-.04		.06	-.03		.03	.04		.12	-.01		.07	.09
O4		-.16	-.26		-.17	-.22		-.31	-.12		-.06	-.18		-.09	-.14		.00	-.08		-.09	-.20
O5	L	-.17	-.09		-.26	-.19		-.07	-.01		-.19	-.13		-.13	-.10		-.11	-.01		-.12	-.09
O6		-.25	.01		-.24	-.04	L	-.19	-.14		-.27	-.05		-.21	.01		-.21	-.04		-.19	.05
A1		-.27	-.33		-.11	-.12		.08	.12	L	-.32	-.39		-.25	-.37		-.30	-.38		-.25	-.34
A2		.10	.05	H	.09	.06	L	.20	.18		-.12	-.29	L	.03	.15		-.30	-.45		.08	.05
A3		-.15	-.13	H	.10	.11	L	.14	.23		-.08	-.24	H	-.10	-.18	L	-.16	-.35		-.07	-.11
A4		.04	-.10	H	.15	.14		.22	.19		-.22	-.39	L	-.02	.15	L	-.45	-.49		-.05	.19
A5		.13	.20	h	.17	.19		.13	.09		-.02	-.04		.09	.16		-.26	-.24		.13	.20
A6		.04	-.02		.14	.16		.22	.11		-.02	-.14		.05	-.04	L	-.06	-.22	L	.06	.03
C1		-.25	-.33		-.31	-.32		.38	.38	L	-.37	-.30		-.34	-.31		-.21	-.09		-.33	-.35
C2		.00	.01		-.04	.00	H	.33	.48		-.11	-.05		-.10	-.01		-.08	.01		-.03	-.04
C3		-.05	-.10		-.05	-.02	H	.45	.45	L	-.17	-.13		-.13	-.06		.19	-.09		-.06	-.07
C4		-.09	-.24	L	-.11	-.13	H	.42	.43		-.12	-.19	L	-.19	-.15		-.04	-.10		-.08	-.17
C5		-.13	-.31		-.18	-.26		.52	.51	L	-.27	-.29	L	-.24	-.27		-.25	-.21		-.14	-.30
C6		.03	.00		-.07	.00	H	.53	.43		-.26	-.20		-.14	-.14		-.33	-.14		-.08	-.02
Sig. Predict.		10/10	10/10		6/11	6/11		8/15	4/15		5/6	5/6		5/8	4/8		3/6	4/6		3/4	3/4
Sig.Nonpredict.		6/20	8/20		8/19	7/19		9/15	5/15		10/24	12/24		9/22	10/22		14/24	10/24		8/26	16/26
N		.49	.63		.49	.55		-.15	-.14		.61	.55		.50	.59		.39	.35		.60	.72
E		-.46	-.48		-.18	-.16		-.24	-.03		-.15	-.23		-.27	-.30		.07	-.11		-.30	-.36
O		-.18	-.12		-.19	-.12		-.28	-.15		-.09	-.13		-.08	-.04		-.02	-.10		-.07	-.05
A		-.02	-.11		.14	.12		.26	.22		-.20	-.36		-.05	-.18		-.42	-.52		-.03	-.12
C		-.10	-.22		-.17	-.16		.61	.62		-.30	-.26		-.25	-.21		-.26	-.14		-.06	-.22

Notes. r^s: correlation in Spanish sample; r^a: correlation in American sample; correlations >.15 are significant according to the Bonferroni adjustment (.05/455 = .0001); H, L = high, low, respectively, based on DSM-III-R diagnostic criteria; h, l = high, low, respectively, based on associated features in DSM-III-R; H/h, L/l = high, low, respectively, based on clinical literature; all predictions are from Widiger *et al.* (1994); in boldface, significant predicted correlations.

Linear regression analyses

As in Dyce and O'Connor's study (1998), two stepwise regressions were carried out (Table 3). The entry significance level was also set at .0001 for all equations. Note that the variables included in the equations were very similar in both countries, especially for domain-level analyses. The multiple r 's for the domains were .59 and .58 in the Spanish and American samples, respectively. The multiple r 's for the facets (.62 in both samples) equations were only slightly higher than the multiple r 's for the domains. However, facets do contribute to discriminate between different PD's. In most cases, the majority of facets from the same domain are not included in the equation for one PD, and the important facets from a particular domain vary from one PD to another. For example, the results once again highlight the importance of Neuroticism in personality disorders prediction but the importance of the Neuroticism facets varies largely across PD's.

TABLE 3. Multiple r , r^2 , and stepwise regression coefficients for NEO-PI-R domains and facets predicting personalit disorders scores in Spanish and American samples.

		NEO-PI-R domains				NEO-PI-R facets					
		r	r^2	β		r	r^2	β			
Schizoid	S	.59	.35	-.58^E	-.15 ^A	.63	.40	-.32^{E2}	-.15^{E1}	-.16^{O6}	-.27^{E6}
	A	.47	.22	-.47^E		.54	.29	-.31^{E2}	-.21^{E1}	.20^{N3}	
Avoidant	S	.61	.37	.41^N	-.37^E	.63	.40	.25^{N4}	.24^{N3}	-.21^{E1}	-.16^{E3}
	A	.69	.48	.52^N	-.30^E	.72	.52	.31^{N4}	.39^{N3}	-.24^{E2}	
Dependent	S	.58	.33	.54^N	.23^A	-.19^O	.58	.34	.52^{N3}	.19^{N4}	-.17^{O5}
	A	.59	.35	.59^N	.22^A		.63	.40	.23^{N3}	.19^{N4}	.26^{N6}
Histrionic	S	.68	.47	.68^E		.70	.49	.33^{E1}	.18^{E3}	.23^{E2}	.18^{E6}
	A	.61	.37	.61^E		.61	.37	.37^{E1}	.23^{E3}	.16^{E5}	-.14^{A5}
Narcissistic	S	.62	.38	-.39^A	.40^E	-.22^N	.67	.45	-.22^{A2}	-.26^{A5}	.17^{E1}
	A	.44	.19	-.43^A	.20^O		.52	.27	-.19^{A2}	-.41^{A5}	-.16^{N4}
Antisocial	S	.62	.38	-.42^C	-.31^A	.18^E	.65	.42	-.28^{C6}	-.19^{N2}	-.21^{C5}
	A	.53	.28	-.28^C	-.40^A		.58	.34	-.35^{C6}	-.40^{A2}	.16^{N2}
Sadistic	S	.53	.28	-.36^A	.32^N		.59	.34	.36^{N2}	-.23^{A4}	-.16^{C6}
	A	.58	.34	-.47^A	.27^N		.59	.34	.40^{N2}	-.32^{A2}	
Compulsive	S	.66	.44	.59^C	-.17^E	-.15^O	.68	.45	.27^{C6}	.32^{C5}	-.15^{O1}
	A	.64	.41	.65^C	-.17^E		.64	.41	.17^{C6}	.24^{C5}	-.14^{O1}
Passive-Aggressive	S	.61	.38	.60^N	-.28^A		.65	.42	.27^{N3}	.22^{N2}	-.16^{O2}
	A	.62	.40	.50^N	-.28^A		.64	.41	.32^{N3}	.36^{N2}	-.16^{A2}
Masochistic	S	.53	.28	.46^N	-.18^E		.54	.29	.43^{N3}	-.14^{C1}	
	A	.59	.35	.59^N			.63	.40	.55^{N3}	-.16^{A1}	
Schizotypal	S	.46	.21	.46^N		.48	.23	.37^{N3}	.17^{N2}		
	A	.54	.29	.45^N	.18^O	-.22^A	.57	.32	.43^{N3}	-.17^{E2}	.18^{O2}
Borderline	S	.62	.38	.54^N	-.18^C		.64	.41	.48^{N3}	-.20^{C6}	.16^{N5}
	A	.67	.45	.61^N	-.21^A		.70	.49	.59^{N3}	-.16^{C6}	-.23^{A4}
Paranoid	S	.45	.20	.33^N	-.19^A	-.18^O	.50	.25	-.16^{A1}	.26^{N3}	-.22^{O6}
	A	.55	.30	.33^N	-.38^A		.56	.31	-.32^{A1}	.28^{N2}	-.15^{E2}
Depressive	S	.62	.39	.56^N	-.17^E		.65	.42	.69^{N3}	-.15^{E6}	
	A	.73	.53	.68^N	-.13^E		.76	.58	.69^{N3}	.13^{N2}	

Note. In boldface domains and facets in accordance in both samples.

Discussion

The general goal of the present study was to replicate the relationships found by Dyce and O'Connor (1998) between NEO-PI-R and MCMI-III personality disorder scales in a similar non-clinical Spanish sample. Preliminary results demonstrated that both questionnaires have very similar factor structures and acceptable internal consistency in both samples, providing assurance that the results obtained could be compared.

The first aim of the present study was to compare the factor structure of the NEO-PI-R facets and the MCMI-III PD's in both American and Spanish samples. Although the Neuroticism, Conscientiousness, and Agreeableness factors were highly similar to the American ones, and the total congruence index was acceptable (.92), the Spanish Extraversion and Openness factors showed some divergences compared to the American ones, specially the latter one with a congruence coefficient of .68. The minimal difference between both samples in the congruence coefficient of the Extraversion factor (.88) could be due to the fact that three Extraversion facets loaded higher on the Agreeableness factor, and three Agreeableness facets loaded on the Extraversion factor. Note that the Schizoid, Histrionic and, to a lesser extent, Avoidant facets loaded on the Extraversion factor. Regardless of the Openness factor, no MCMI-III scale was related to this factor in the American sample whereas Schizoid did load on it in the Spanish one. Note that this piece of evidence is congruent with previous literature, since Schizoid personality disorder tends to correlate negatively with Openness (Saulsman and Page, 2004). The E5, N5, and N1 facets also loaded on this factor. The relationship between Openness and Sensation Seeking is well documented in the literature (*e.g.*, Aluja, García, and García, 2003), and García, Aluja, García, and Cuevas (2005) showed that the Openness domain could present some relation with N1 and N5.

By observing the individual congruence coefficients of the personality disorders, it can be seen that most of them reach the .90 value, indicating a strong similarity across both countries. The three exceptions were Schizoid (.79), Schizotypal (.84) and Narcissistic (.71). However, note that the Schizoid PD correlates negatively with E1, E2, E5 and E6 facets in both the American and Spanish samples. Equally, the Schizotypal scale correlates with N1, N3, N4, N6 and A1 in both samples, although in the American one, this scale also correlated with A2, A3, and A4. In short, although the congruence coefficients suggest a difference between both samples, inspection of the individual correlations between each PD and the NEO-PI-R facets supports an equivalent pattern of relationships for the Schizoid and Schizotypal PD's between both samples.

Narcissistic was found to be the most different PD. At first glance, it can be observed that the main loading was on the same factor: Agreeableness. Also, this scale correlates highly with A2, A4, and A5 in both samples, and the correlations with the domain were highly similar (-.37, and -.40 in the Spanish and American sample, respectively). However, the relationships with the remaining factors were somewhat different, especially for Extraversion. The Narcissistic scale correlated .48 with the Extraversion domain in the present sample, but .09 in the American one. Also, this scale correlated with E1, E3, E4, E5, and E6 in the Spanish sample, but only with E3 in the American one. Furthermore, the Narcissistic scale loaded on the Openness factor in the American sample, but not in the Spanish one. Previous studies included in the meta-analysis by Saulsman and Page (2004) show that this scale could correlate with both Extraversion and Agreeableness. In fact, they do so irrespectively of the nature of the sample type, personality disorder measure and, as in the present paper, when the NEO is used as a measure of the Five Factor model. Thus, no clear explanation of the different pattern emerges from the literature. In any case, the present study suggests that predictions about the Narcissistic PD should incorporate more Extraversion NEO-

PI-R facets than E3. In this way, Lynam and Widiger (2001) found that experts related high scores on the Extroversion domain and facets (with special emphasis on E3 and E5) with the Narcissistic personality disorder.

Factor analyses of personality disorders demonstrate that personality disorders covariate highly between each other. When 4 factors are extracted, the first three are strongly related, the fourth only being composed of the Obsessive-Compulsive disorder (Kass, Skodol, Charles, Spitzer, and Williams, 1985). This study was replicated by Hyler and Lyons (1988) with 11 DSM-III personality disorder scales with a sample of 287 psychiatrists' ratings of 358 patients. With regard to the MCMI, a structure formed by three correlated factors seems to be the most plausible (Craig and Bivents, 1998; Dyce *et al.*, 1997; Retzlaff and Gibertini, 1987). Further studies (O'Connor, 2005) support a factor structure of the personality disorders composed of three factors, the fourth being composed exclusively of the Obsessive-Compulsive disorder. These results are sustained by the high correlations between personality disorders (Lynam and Widiger, 2001). Underlying this high comorbidity between PD's (Widiger and Frances, 2002) is the assumption that personality disorders are extreme and maladaptive variants of personality traits (Costa and Widiger, 1994, 2002). Thus, if the same personality trait is involved in several PD's, they will correlate and consequently be grouped in the same factor. The best example of this is Neuroticism, which included most of the PD's in factor analysis. In fact, Neuroticism has been shown to be a strong predictor of disorders, irrespective of the kind of disorder it may be (affective, behavioral and so forth) (Krueger, Caspi, Moffit, Silva, and McGee, 1996).

The second aim of the study was to explore the differences between both samples in the predictive value of personality domains and facets in relation to personality disorders scales. Both studies reproduced a similar percentage (about 60%) of the clinical predictions reported by Widiger *et al.* (1994, 2002), of whom 82 were the same in both samples and only 20 (10 for each country) were different. Predictions obtained from the regression analysis showed that, in the main, one or two domains accounted for most of the variance. The domains and facets with the highest standardized regression weights were practically the same in both samples. Each regression equation obtained from facets was defined by a range between two and six variables, with a trend to enter more facets in the Spanish sample. It should be remarked that, as in Dyce and O'Connor (1998), the explained percentage of personality disorder variance was practically the same, regardless of whether domains or facets were used.

Although using facets instead of domains does not increment substantially predictive power over personality disorders, we agree with Dyce and O'Connor (1998) that facet-level analyses contribute to increase specificity and discriminate between PD's. It can thus be found that only a small number of facets explain the overall relationship between any PD and a domain, or that two PD's related with the same domain differ in the responsible facets of such a relationship. For example, as can be observed in Table 3, Antisocial and Narcissistic presented a similar relationship with the Agreeableness domain, but A5 was only related with the Narcissistic domain. In the same way, while a PD may not be related to a domain, it may be to any facet of that domain. This is the case of Openness, which is the domain least represented in PD's scores. Although

no relationship emerged between any PD and the Openness domain, facet-level relationships presented in Table 2 indicate that, in both samples, O3 was associated with Histrionic and Schizoid, and O4 with Avoidant and Histrionic. This suggests, as Dyce and O'Connor (1998) claimed, that facet-level analyses are very useful in a clinical context.

There are, however, several drawbacks to facet-level analyses. Relationships between facets and personality disorders may not show the necessary cross-validity. Note that 14 of 55 variables do not replicate across samples in the domain-level regression analyses, but the proportions were 48 of 96 in the facet-level analysis. This means that 50% of the facets introduced in the equations were not replicated across samples, compared to only 25% in the domain-level analysis. It should be mentioned that replicated facets were normally those belonging to the domains most important for the PD. Also, the principle of parsimony should be observed, since five variables account for the same variance as thirty do. This finding would allow the use in clinical contexts of short versions, just measuring the FFM domains (*v.g.*, Neuroticism, Extraversion, and Openness Five Factor Inventory -NEO-FFI-). The use and availability of these short scales has obvious advantages since the administration and correction time are considerably reduced (Buchanan, Johnson, and Goldberg, 2005).

Differences between the dimensional and categorical systems of the personality assessment were remarked in the introduction section. In this case, following the procedure used by other authors (Costa and McCrae, 1990; Dyce and O'Connor, 1998; Wiggins and Pincus, 1989), the relationships between two self-report questionnaires has been investigated: a) a personality dimensional questionnaire -NEO-PI-R- and another one -MCMI-III- designed to obtain scores based on the DSM-IV criteria of personality disorders. Note that the procedure to assess personality disorders is notably different to that of clinical assessment suggested by the DSM-IV. This is a strong limitation of both the present and previous studies using Millon's scales, derived scales from the MMPI (Morey *et al.*, 1985), or similar instruments. Future studies should focus on generating a model of personality disorders based on dimensional personality models. One such proposal has been already developed (Costa and McCrae, 2005), as well as the necessary instruments to apply personality traits in clinical contexts (*v.g.*, Trull and Widiger, 2002).

In conclusion, the relationships between the NEO-PI-R and the MCMI-III are highly similar in both American and Spanish samples, thus confirming the cross-cultural validity of the relationships between personality disorders and the FFM. The main differences were observed for the Openness factor and the Schizoid, Schizotypal, and Narcissistic PD's. A similar percentage of agreement (about 60%) with clinical predictions reported by Widiger (1993), and Widiger *et al.* (1994, 2002) was found, most of the rightly predicted correlations being the same in both samples. Statistical results show that Neuroticism is linked with most of the PD's, whereas the remaining factors add specificity and discrimination between PD's. The present study also confirms the claim by Dyce and O'Connor (1998) about the advantages of facet-level analyses, although the principle of parsimony and the better cross-validity of the domain-level analyses suggest the usefulness of this approach.

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