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A contribution to the cross-cultural replicability of the five-factor personality model

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Over the recent years numerous studies have contributed to the evidence of cross-cultural validity of the five-factor model as the most adequate paradigm for description of the personality domain. The aim of this study was to validate Croatian translation of the most widely used five-factor questionnaire, NEO PI-R (Costa & McCrae; 1992b). The research was carried out on two samples of subjects. The first sample consisted of 466 high school graduates, 233 males and 233 females, whose mean age was 18. The second sample consisted of 256 adults, 123 males and 133 females, whose mean age was 46 years. Alpha reliabilities in both samples were very high for all five scales, and are in the range of values obtained on the normative American sample. Correlations among the scales are also comparable to those reported by authors of the questionnaire. Furthermore, factor analysis of the facets in both samples provided close replications of the original factor structure. Results of our validation study clearly show that NEO-PI R is a valid instrument for the assessment of five broad personality dimensions in Croatian population, and thus are still another contribution to the empirical evidence on the universality of the five-factor model.

One of the most important developments in the personality research over the past decade is a formulation of five-factor, or Big Five personality model. Accumulated findings of the numerous researchers over the years have lead to a wide acceptance of the five basic dimensions as best representing the structure of personality (Digman, 1990; Wiggins & Pincus, 1992). As Briggs (1992) states, "...the five factor model for describing the universe of personality trait descriptors enjoys a substantial lead over its primary competitors." The trait approach has thus reappeared as a dominant theoretical and research paradigm in the field of personality.

Although the most recent in the line of trait models of personality, five-factor model has a relatively long history (Digman, 1990; John, 1990; John, Angleitner & Ostendorf, 1988). First evidence on the existence of the five robust personality factors has appeared in the personality literature over the forty years ago in the studies attempting to replicate Cattell's personality structure. However, these studies until recently have not drawn much attention of personality researchers, while Cattell's and Eysenck's models based on factor analytic method long dominated the field of personality structure (Digman, 1990).

Generally, two lines of research have contributed to the development of the five-factor model. One of them is lexical tradition, trying to develop a taxonomy of personality traits by factor analyzing trait terms describing personality in natural languages (e.g. Goldberg, 1982, 1990; Peabody & Goldberg, 1989). The rationale for this approach rests on a basic assumption known as "lexical hypothesis". John, Angleitner and Ostendorf (1988), summarizing various preceding formulations, offer the following definition of the lexical hypothesis: "those individual differences that are the most salient and socially relevant in people's lives will eventually become encoded into their language: the more important such a difference, the more likely is it to become expressed as a single word" (p. 174). Lexical studies in English, Dutch, German, yielded similar five basic factors (John, Angleitner & Ostendorf, 1988; Wiggins & Pincus, 1992), while those in Hungarian (Szirmak & De Raad, 1994) and Italian (Caprara & Perugini, 1994) provided evidence for the four of them.

Five factors also appeared in the analyses of the most commonly used personality questionnaires (Digman, 1990). A series of studies done by Costa and McCrae show that a variety of personality instruments can be in-

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terpreted within the five-factor framework, such as Personality Research Form, assessing Murray's needs (Costa & McCrae, 1988), Adjective Check List (Piedmont, McCrae & Costa, 1991), Myers-Briggs Type Indicator, Guilford-Zimmerman Temperament Survey (McCrae, 1989) and in California Psychological Inventory (McCrae, Costa and Piedmont, 1993). Noller, Law and Comrey (1987) and Boyle (1989), examining the Cattell's 16 PF, Eysenck's Personality Inventory and Comrey's Personality Scales, also confirm the existence of five broad personality dimensions underlying the structure of three instruments.

The five factor taxonomy has proved to be invariant in peer and spouse ratings, in different samples regarding sex, age and race and with different methods of administration (McCrae & Costa, 1987; Costa & McCrae, 1992a,b,c).

Although the descriptions of the five-factor model as well as the labels for certain factors sometimes differ in content, the formulation by Costa and McCrae (e.g. McCrae & Costa, 1987) as operationalized in their NEO Personality Inventory (Costa & McCrae, 1992b) seems to be the most widely accepted. They propose the following five broad domains: neuroticism, extraversion, openness to experience, agreeableness and conscientiousness.

The core of neuroticism domain, as defined by Costa and McCrae, is a general proneness to experiencing psychological distress and negative affect such as anger, guilt, fear, sadness etc. Moreover, it also refers to poor adaptation, such as irrational ideas, poorer impulse control and coping with stress. This well known construct has been explicitly proposed in almost all personality models up to now.

Extraversion, another well established personality dimension, is related to interpersonal features such as sociability as the core element (McCrae & Costa, 1987), warmth and dominance, as well as temperamental ones such as activity, excitement seeking and positive emotionality.

Openness to experience has remained unrecognized as a basic personality dimension in prior models, although some of its specific facets have often been a part of personality theories and instruments. Also, the nature of this dimension has been a subject of different interpretations by the researchers of different traditions. Often referred to as the fifth factor, this dimension has most often been labeled as Intellect (e.g. Goldberg, 1990, 1994) by the authors following lexical approach. On the other hand, authors of the questionnaire tradition propose the term "openness to experience", referring to a much broader domain, with a wider range of correlates than lexical Intellect (McCrae, 1994). As described by Costa and McCrae (1992b; McCrae & Costa, in press), intellectual and artistic interests appear to be the core of openness, along with active imagination, need for variety, independence of judgment and attentiveness to inner feelings. Openness is clearly distinct from mental ability, shows only modest relations with education and psychometric intelligence, but is related to measures of creativity and divergent thinking (McCrae, 1987).

Agreeableness is primarily viewed as an interpersonal dimension, along with extraversion, although it is less well known. Altruism is the basic feature underlying this dimension, so agreeable people are well intentioned, tender-minded, willing to help the others and cooperate with them, and have positive expectations from others. People on the negative pole of this dimension are antagonistic, egocentric, uncooperative and mistrustful. As the authors point out, it is appealing to see the agreeable side of this domain as socially more desirable and adaptive, although traits labeled as disagreeable are often necessary for successful everyday functioning. Moreover, extremely high agreeableness, as well as extremely low one, can be maladaptive and pathological.

The fifth major dimension in Costa and McCrae's model, conscientiousness, is related to self - discipline dutifulness, orderliness, will to achieve. Conscientious person is well organized, determined, purposeful, punctual, reliable and completes the tasks. Academic and occupational success are associated with the positive pole of this dimension, while negative pole is related to the compulsive behaviors.

Considering the accumulating evidence in favor of the five-factor personality taxonomy, it is important to note that the majority of the data on its comprehensiveness come from research done on American samples. However, cross-cultural research demonstrating the replicability of the five-factor structure in other countries is a necessary step for demonstrating the universality of the model. As it was previously mentioned, studies done within the lexical tradition in Dutch and German reported five factors similar to those found in English (John, Angleitner & Ostendorf, 1988; Wiggins and Pincus, 1992). Paunonen, Jackson, Trzebinski and Fosterling (1992), using personality questi-onnaires in Canadian, Finnish, German and Polish samples, confirmed the robustness of five-factor solution across four countries and conclude that "the generalizability of this factor strucure is not limited only to English-speaking respondents" (p. 455). The conclusion was supported by the research carried out in Canadian (Holden, & Fekken, 1994), Israeli (Montag & Levin, 1994), Italian (Caprara, Barbaranelli, Borgogni & Perugini, 1993) and Spanish samples (Silva et al., 1994). Using the NEO Personality Inventory, or its short form NEO-FFI in the Canadian study, these authors replicated the original five factor structure.

The existence of five major dimensions received support even in non-Western cultures. Using the culture specific research strategy in developing their own personality

descriptors and item pool in Philipine sample, Church and Katigbak (1989) reported evidence for cross-cultural generalizability of the five dimensions originally found in English trait terms. Yang and Bond (1990) recovered five factors both in imported, American, and in Chinese trait descriptors, although the "Chinese Big Five" is different in content than the standard model.

Present study, validating the Croatian translation of the NEO Personality Inventory, provides further evidence to the cross-cultural research on the five-factor model of personality. As McCrae, Costa and Yik (1996) point out, the equivalence of a set of traits across cultures can be assessed by the replicability of structure in translations of the instrument with a known factor structure. Therefore, research on the replicability of the proposed model in various countries and cultures is a necessary step in examining its universality.

METHOD

Instrument

NEO Personality Inventory (NEO-PI) by Costa and McCrae is the most widely used phrase-based inventory purportedly developed for the assessment of the five-factor model. In our study we validated the most recent version of the instrument, Revised NEO Personality Inventory (Costa & McCrae, 1992b), form S for self-reports. The same instrument also has a form R, version for rating someone else.

The origins of the instrument lie in the NEO Inventory, designed to measure the first three of the five basic dimensions: neuroticism, extraversion and openness to experience, and contained 18 facet scales measuring specific traits defining the domains. Later development of the instrument led to the inclusion of two remaining basic dimensions, agreeableness and conscientiousness. The facet scales for those two dimensions, along with the previously validated facet scales for the first three, form the most recent version of the instrument, NEO PI-R. Development of the instrument itself was guided by rational or deductive approach along with the factor analytic strategy. The selection of the most relevant traits defining each of the domains was based on the survey of the psychological literature. Facet scales were then developed by factor analyzing a proposed item pool, and items for each facet scale were selected in order to form maximally discriminant scales.

NEO PI-R is thus a 240 item inventory, comprising five scales assessing five broad domains. Each domain scale consists of 48 statements assigned to the six eight item facet scales, and they are listed in Table 1. These facets measure more specific traits that define each of the broad domains. Subjects respond to each statement on a five-point scale, ranging from "strongly disagree" to "strongly agree".

The instrument was first translated into Croatian, and, according to the instructions from the authors, back-translation of the Croatian version was then carried out by a translator unfamiliar with the original. The back translation was submitted for a review to the authors, and less than 10% of the originally translated items needed re-translation. After approval of the revised items, Croatian version of the instrument was completed for the validation purposes.

Participants

The study was carried out on two samples of participants. First sample consisted of 466 high school graduates, 233 males and 233 females from five Croatian cities, including Zagreb as a large urban area and four smaller cities. Their mean age was 18 years (age range 17-19). Second sample consisted of 256 adult citizens of Zagreb, 123 males and 133 females, whose mean age was 46 years (age range 35-61).

Procedure

High school graduates completed NEO PI-R along with three other personality questionnaires in their classes, in groups of about 30 participants with the supervision of one or two experimenters. The order of instruments was varied for each group of subjects. The data for the adult sample were collected as a part of the family study of the five factors. Students from Zagreb were asked to take home an envelope containing two copies of the NEO PI-R and the accompanying letter, ask their parents to complete the questionnaires and then to return them to school. Data for the adult sample were thus collected without the supervision of the experimenters. Questionnaires were administered anonymously for all the participants.

RESULTS AND DISCUSSION

Means and standard deviations of the NEO PI-R domain and facet scales for the high school and adult sample are presented in Table 1.

Table 1[*]

Means (*M*) and standard deviations (*SD*) for NEO PI-R domain and facet scales in high school and adult sample

	High school sample		Adult sample	
NEO-PI-R scale	*M*	*SD*	*M*	*SD*
Domains				
Neuroticism	92.31	24.19	86.32	22.97
Extraversion	114.86	20.52	99.01	17.65
Openness	117.16	19.07	101.76	19.29
Agreeableness	106.13	20.42	118.36	17.51
Conscientiousness	111.41	22.11	129.38	19.26
Neuroticism				
N1: Anxiety	15.67	5.91	16.48	5.81
N2: Angry Hostility	15.70	4.83	14.61	4.81
N3: Depression	15.70	5.82	13.98	5.37
N4: Self-Consciousness	16.03	5.24	16.19	4.89
N5: Impulsiveness	17.07	4.69	14.11	4.13
N6: Vulnerability	12.12	5.09	10.96	4.71
Extraversion				
E1:Warmth	20.84	4.65	19.45	4.35
E2:Gregariousness	19.12	5.75	16.02	5.42
E3: Assertiveness	14.99	5.08	13.26	4.79
E4: Activity	18.57	4.10	19.03	3.98
E5: Excitement-Seeking	19.71	4.99	13.26	4.56
E6: Positive Emotion	21.63	4.90	17.98	4.58
Openness				
O1: Fantasy	20.80	5.48	14.76	5.71
O2: Aesthetics	20.04	6.49	19.45	6.20
O3: Feelings	21.50	4.60	19.07	4.27
O4: Actions	15.24	3.78	12.84	3.84
O5: Ideas	20.35	5.47	17.47	5.70
O6. Values	19.20	3.80	18.16	3.62
Agreeableness				
A1: Trust	16.95	4.99	18.99	4.76
A2: Straightforwardness	16.07	4.90	19.85	4.53
A3: Altruism	21.86	4.48	23.01	4.11
A4: Compliance	14.78	5.45	17.09	4.49
A5: Modesty	16.77	5.72	18.57	4.83
A6: Tender-Mindedness	19.68	3.90	20.85	3.45
Conscientiousness				
C1: Competence	19.74	4.31	21.69	4.03
C2: Order	17.48	4.44	19.51	4.17
C3: Dutifulness	20.30	4.64	25.13	3.38
C4: Achievement striving	20.71	4.75	21.58	4.36
C5: Self-discipline	17.25	5.67	21.78	4.63
C6: Deliberation	15.88	5.21	19.68	4.78

Note. High school sample: $N = 460$-461; Adult sample: $N = 256$.
* $p < .05$; ** $p < .01$.

[*] All the data analyses were carried out using pairwise method, i.e. on the largest number of subjects for whom all the data were available. Due to the missing values total number of subjects therefore differs for various analyses. For each analysis the total number of subjects included is cited in the footnote of the corresponding table.

Table 2

Mean inter-item correlations and Cronbach alpha reliabilities for the NEO PI-R scales in two samples

	High school sample		Adult sample	
NEO-PI-R scale	*r*	α	*r*	α
Domains				
Neuroticism	.18	.91	.17	.91
Extraversion	.14	.88	.10	.83
Openness	.11	.85	.11	.86
Agreeableness	.14	.88	.11	.85
Conscientiousness	.18	.91	.18	.90
Neuroticism				
N1: Anxiety	.32	.79	.31	.78
N2: Angry Hostility	.18	.64	.19	.65
N3: Depression	.31	.78	.28	.76
N4: Self-Consciousness	.21	.68	.19	.65
N5: Impulsiveness	.17	.62	.11	.51
N6: Vulnerability	.30	.77	.30	.76
Extraversion				
E1:Warmth	.23	.70	.19	.64
E2:Gregariousness	.32	.78	.25	.72
E3: Assertiveness	.24	.72	.21	.69
E4: Activity	.13	.55	.11	.49
E5: Excitement-Seeking	.17	.60	.12	.50
E6: Positive Emotion	.23	.69	.20	.65
Openness				
O1: Fantasy	.29	.76	.32	.79
O2: Aesthetics	.36	.82	.33	.80
O3: Feelings	.20	.67	.16	.62
O4: Actions	.07	.40	.11	.50
O5: Ideas	.27	.74	.30	.77
O6. Values	.09	.44	.07	.41
Agreeableness				
A1: Trust	.24	.71	.24	.71
A2: Straightforwardness	.20	.68	.17	.62
A3: Altruism	.27	.73	.26	.73
A4: Compliance	.24	.72	.15	.59
A5: Modesty	.32	.79	.21	.69
A6: Tender-Mindedness	.11	.49	.10	.47
Conscientiousness				
C1: Competence	.26	.69	.24	.67
C2: Order	.13	.55	.15	.56
C3: Dutifulness	.20	.64	.16	.52
C4: Achievement striving	.25	.71	.22	.67
C5: Self-discipline	.34	.80	.27	.74
C6: Deliberation	.27	.74	.28	.74

Note. High school sample: $N = 461$-463; Adult sample: $N = 256$.

Table 3

Factor structure of the NEO PI-R scales in high school and adult sample (in parentheses)

NEO-PI-R scale	N		E		O		A		C	
Neuroticism										
N1: Anxiety	.86	(.85)	-.09	(-.05)	-.01	(.07)	.05	(.14)	.00	(.00)
N2: Angry Hostility	.68	(.75)	.04	(-.08)	.05	(-.04)	-.45	(-.37)	-.07	(.00)
N3: Depression	.82	(.81)	-.17	(-.16)	.02	(-.02)	.18	(.18)	-.17	(-.21)
N4: Self-Consciousness	.75	(.66)	-.16	(-.02)	-.06	(-.08)	.31	(.33)	-.00	(-.03)
N5: Impulsiveness	.46	(.52)	.17	(-.02)	.13	(.06)	-.41	(-.27)	-.36	(-.38)
N6: Vulnerability	.77	(.76)	-.16	(-.19)	-.06	(-.02)	.10	(.09)	-.30	(-.34)
Extraversion										
E1:Warmth	-.01	(.01)	.85	(.79)	.06	(.27)	.08	(-.01)	.05	(.09)
E2:Gregariousness	-.17	(-.26)	.75	(.69)	-.14	(-.02)	-.14	(-.14)	-.07	(.08)
E3: Assertiveness	-.32	(-.41)	.41	(.18)	.08	(.18)	-.56	(-.66)	.16	(.12)
E4: Activity	-.19	(.10)	.37	(.36)	.21	(-.02)	-.44	(-.55)	.38	(.28)
E5: Excitement- Seeking	-.08	(-.03)	.38	(.12)	.16	(.16)	-.46	(-.65)	-.14	(-.18)
E6: Positive Emotion	-.24	(-.26)	.67	(.52)	.22	(.35)	-.14	(-.12)	-.00	(.05)
Openness										
O1: Fantasy	.27	(.07)	.15	(-.03)	.54	(.74)	-.06	(-.13)	-.34	(-.22)
O2: Aesthetics	.30	(.08)	.25	(.18)	.65	(.76)	.15	(.12)	.07	(.16)
O3: Feelings	.35	(.28)	.49	(.29)	.51	(.68)	-.07	(-.07)	.02	(.10)
O4: Actions	-.14	(.02)	-.03	(.12)	.57	(.27)	-.17	(-.21)	-.20	(-.44)
O5: Ideas	-.06	(-.22)	.02	(.11)	.75	(.73)	-.07	(-.10)	.18	(.17)
O6. Values	-.30	(-.25)	-.05	(.12)	.53	(.39)	.02	(.02)	-.21	(-.13)
Agreeableness										
A1: Trust	-.18	(-.24)	.47	(.67)	.04	(.08)	.52	(.31)	-.00	(-.06)
A2:Straightforwardness	.11	(.09)	-.03	(.17)	-.02	(.04)	.77	(.72)	.07	(-.08)
A3: Altruism	.09	(.00)	.57	(.65)	.06	(.20)	.57	(.33)	.18	(.26)
A4: Compliance	-.11	(-.15)	.03	(.15)	-.09	(.05)	.75	(.67)	.06	(-.01)
A5: Modesty	.13	(.33)	-.11	(.17)	-.02	(-.23)	.71	(.66)	-.05	(-.15)
A6:Tender-Mindedness	.33	(.28)	.32	(.42)	.12	(.14)	.46	(.47)	.00	(.04)
Conscientiousness										
C1: Competence	-.38	(-.45)	.19	(.32)	-.03	(.04)	-.19	(-.16)	.71	(.56)
C2: Order	-.01	(-.02)	-.03	(-.03)	-.13	(.03)	-.04	(-.13)	.66	(.74)
C3: Dutifulness	.02	(.04)	.02	(.18)	-.02	(.08)	.28	(.20)	.72	(.75)
C4: Achievement striving	.05	(-.05)	.09	(.17)	.08	(.18)	-.14	(-.29)	.81	(.71)
C5: Self-discipline	-.30	(-.20)	-.04	(.16)	-.02	(.05)	.01	(-.04)	.80	(.78)
C6: Deliberation	-.05	(-.27)	-.08	(-.04)	-.15	(-.11)	.27	(.10)	.71	(.73)
% of explained variance	19.0	(21.4)	9.0	(8.9)	5.7	(4.9)	15.2	(11.5)	11.8	(13.2)

Note. N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness.
N (High school graduates) = 466; *N* (adults) = 256. Loadings greater than .40 in absolute magnitude are given in boldface.

Table 4

Factor structure of the NEO PI-R scales and congruences for variables and factors in the high school sample after Procrustes rotation to the American normative structure

NEO-PI-R scale	N	E	O	A	C	Variable congruence
Neuroticism						
N1: Anxiety	**0.86**	-0.10	-0.04	0.05	0.01	0.98**
N2: Angry Hostility	**0.69**	0.16	0.04	-0.41	-0.03	0.96**
N3: Depression	**0.82**	-0.20	-0.01	0.15	-0.17	0.97**
N4: Self-Consciousness	**0.74**	-0.23	-0.09	0.28	-0.01	0.94**
N5: Impulsiveness	**0.48**	0.29	0.13	-0.35	-0.32	0.97**
N6: Vulnerability	**0.77**	-0.16	-0.09	0.07	-0.30	0.99**
Extraversion						
E1:Warmth	-0.02	**0.79**	0.10	0.30	0.09	0.97**
E2:Gregariousness	-0.17	**0.77**	-0.10	0.06	-0.03	0.98**
E3: Assertiveness	-0.31	**0.53**	0.11	**-0.44**	0.20	0.96**
E4: Activity	-0.18	**0.44**	0.23	-0.32	**0.42**	0.94**
E5: Excitement-Seeking	-0.06	**0.49**	0.18	-0.35	-0.10	0.98**
E6: Positive Emotion	-0.23	**0.67**	0.26	0.03	0.04	0.96**
Openness						
O1: Fantasy	0.29	0.16	**0.54**	-0.02	-0.32	0.97**
O2: Aesthetics	0.31	0.17	**0.65**	0.22	0.09	0.95**
O3: Feelings	0.36	**0.47**	**0.52**	0.07	0.06	0.99**
O4: Actions	-0.11	0.00	**0.58**	-0.18	-0.19	0.85
O5: Ideas	-0.04	-0.01	**0.75**	-0.06	0.19	0.99**
O6. Values	-0.28	-0.07	**0.54**	-0.01	-0.21	0.94**
Agreeableness						
A1: Trust	-0.20	0.32	0.06	**0.62**	-0.01	0.96**
A2: Straightforwardness	0.09	-0.23	-0.03	**0.74**	0.03	0.94**
A3: Altruism	0.07	0.39	0.08	**0.71**	0.18	0.94**
A4: Compliance	-0.14	-0.17	-0.09	**0.73**	0.02	0.99**
A5: Modesty	0.11	-0.29	-0.03	**0.66**	-0.09	0.94**
A6: Tender-Mindedness	0.32	0.18	0.12	**0.54**	-0.00	0.90*
Conscientiousness						
C1: Competence	-0.39	0.19	-0.02	-0.12	**0.72**	0.96**
C2: Order	-0.02	-0.05	-0.14	-0.02	**0.66**	0.98**
C3: Dutifulness	0.00	-0.10	-0.03	0.30	**0.70**	0.96**
C4: Achievement striving	0.04	0.07	0.07	-0.08	**0.82**	0.96**
C5: Self-discipline	-0.31	-0.09	-0.02	0.02	**0.79**	0.95**
C6: Deliberation	-0.07	-0.18	-0.16	0.26	**0.69**	0.95**
Factor congruence	0.95**	0.94**	0.96**	0.96**	0.98**	0.96**

Note. N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness.
$N = 466$.
Loadings greater than .40 in absolute magnitude are given in boldface.
** Congruence higher than that of 95% rotations from random data
* Congruence higher than that of 99% rotations from random data

Reliability indexes obtained for the domain scales in high the school sample are in the range of values reported for the American sample (Costa & McCrae, 1992b), and are generally very high. Reliabilities of the facet scales range from .40 to .82, which is acceptable range of values for eight-item scales. Similar values were obtained for the domain and facet scales adult sample, except somewhat lower reliability of the Extraversion domain scale in comparison with American sample and our high school sample.

NEO PI-R facet scales were factor analyzed using the principal component analysis with Varimax rotation. Resulting factor structures for the two samples are presented in Table 3.

In high school sample five components were extracted with the eigenvalue greater than 1. All the facets have primary factor loadings on the intended factor, excepting three E facets, Assertiveness, Activity and Excitement - Seeking, which have their primary loadings on A factor.

Principal component analysis in the adult sample resulted in six components with the eigenvalue greater than 1, sixth factor being defined only by two Openness factors, Actions and Values. Facets were then Varimax rotated to five factor solution, and the resulting factor loadings are presented in parentheses in Table 3.

As in the high school sample, three Extraversion facets - Assertiveness, Activity and Excitement Seeking have their primary loadings on Agreeableness. In addition, two Agreeableness facets - Trust and Altruism have their primary loading on Extraversion factor. The finding that some E facets have their primary loadings on A factor and vice versa is common in the research with NEO-PI (e.g. Katigbak, Church & Akamine, 1996; McCrae, Costa et al., 1996; Ostendorf & Angleitner, 1994). According to the authors, these findings reflect the fact that model represented by the NEO- PI is not purely a simple structure model. Namely, the model does not postulate that lower level personality traits should define only one broad domain. Five factors represented by those traits are very broad, basic dimensions, so many of the primary traits also have large and meaningful secondary loadings (Costa & McCrae, 1992d; McCrae, Zonderman et al., 1996). This is particularly true with respect to the Agreeableness and Extraversion domains, which are primarily interpersonal in nature and define the plane of interpersonal behavior (McCrae & Costa, 1989). Thus many traits assigned to A and E fall somewhere between the two dimensions and are meaningfully related to both of them.

Compared to the American college-age sample (Costa & McCrae, 1992b), our high school subjects score significantly lower on the following domain scales: Neuroticism (M = 96.3 and 92.3, respectively; t (848) = 2.52, $p < .05$), Extraversion (M = 121.2 and 114.9, respectively; t (848) = 4.77, $p < .01$) Agreeableness (M = 113.5 and 106.1, respectively; t (848) = 5.80, $p < .01$), and Conscientiousness (M = 114.3 and 111.4, respectively; t (848) 2.08, $p < .05$) than their American peers.

Somewhat different pattern of results was obtained examining differences between American and Croatian adult samples. Compared to the American normative sample (Costa & McCrae, 1992b), Croatian adult subjects are higher in Neuroticism (M = 79.1 and 86.3, respectively; t (1254) = 4.57, $p < .01$) and Conscientiousness (M = 123.1 and 129.4, respectively; t (1254) = 4.73, $p < .01$), but lower in Extraversion (109.4 and 99.0, respectively; t (1254) = 8.33, $p < .01$), Openness (M = 110.6 and 101.8, respectively; t (1254) = 5.04, $p < .01$) and Agreeeableness (M = 124.3 and 118.4, respectively; t (1254) = 4.93, $p < .01$).

Compared to their American peers, both of our subsamples significantly differ on almost all five-factor dimensions. The only exception is Openness, with no difference between our adolescent sample and their American counterparts. However, the attempt to interpret the nature of these differences would necessarily be speculative in nature. Namely, according to the authors (McCrae, Costa et al. 1996), mean level comparisons across cultures are appropriate only if we have evidence that the two versions of the test are strictly paralell. Otherwise the observed differences may be attributable to a number of other variables, such as minor stylistic variations in translation or culturally different styles of self-presentation.

Table 2. contains mean inter-item correlations and Cronbach alpha reliabilities for the NEO PI-R domain and facet scales in high school and adult sample.

In addition, in adult sample one facet of Openness, Actions, has its primary loading on C factor, a finding parallel to one reported in Chinese sample (McCrae, Costa et al., 1996). The other O facet, Values, has no clear loading on any of the factors, although both of these facets have their primary loadings on the intended factor in the high school sample. Moreover, in both samples the lowest percentage of the explained variance is for Openness scale. These findings are in line with the frequently expressed comments on the controversial nature of the fifth dimension and need for its further clarification (e.g. De Raad, 1994; McCrae, 1994; Angleitner & Ostendorf, 1994).

In sum, exploratory factor analyses of the facet scales replicated the original factor structure very well. Only five-factor solutions were meaningful, and majority of the facets have their primary loadings on the intended factor.

In their recent article McCrae, Zonderman et al. (1996) advocate the use of targeted Procrustes rotation as the most adequate method for evaluating the replicability of factor structures. In this procedure the factor structure to be examined is rotated to maximum fit with some hy-

pothesized factor structure. The hypothesized structure, or target matrix, can be derived either from theory or from the previous empirical data. Table 4 shows the Procrustes-rotated factor structure of the NEO PI-R in our high school sample, where the results were rotated to American normative sample as a target.

Here the variable congruences were calculated along with total factor congruences to examine the replicability of factor loadings for individual variables as well. McCrae, Zonderman et al. (1996) propose this procedure, arguing that with many variables in the analysis high factor congruences might be obtained, while some critical variables do not load on the intended factor. According to the authors, this is of particular interest in cross-cultural research. Namely, the same basic dimensions can be recovered in many cultures, but their specific variable structure may differ between cultures. Using the variable congruen-ce coefficient we can examine the replicability of factor structure with respect to every single variable in the analysis.

In determining the statistical significance of the obtained congruence coefficients, McCrae, Zonderman et al. (1996) used a variation of Monte Carlo solution, proposed by Paunonen et al. (1992). This method, employed in our analysis as well, compares the obtained factor congruences to the distribution of factor congruences obtained when the results were repeatedly rotated to random targets. When the obtained congruence coefficient exceeds 95% or 99% of the values obtained by random rotation, we can conclude that this coefficient value is not due to chance with less than 5% or 1% risk level.

Procrustes rotation of the NEO PI-R facets in our high school sample resulted in the factor structure that is a complete replication of the targeted structure of American normative sample. Primary loadings of all facets are on the intended factor, and the large secondary loadings are parallel to the ones in American sample (Costa & McCrae, 1992b). Moreover, all variable congruence coefficients are significant and exceed the value of 0.90, except the one for Actions facet of Openness. The factor congruences are very high and highly significant for all five factors, as well as the total congruence coefficient. Procrustes rotation factor analysis thus provided strong evidence for the cross-cultural generalizability of the NEO PI-R and the model itself.

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Procrustes rotations to American normative sample as a target provided similar results in two non-Western samples, Chinese (McCrae, Zonderman et al., 1996) and Philipine (Katigbak et al., 1996). However, it is interesting to note that in the Chinese sample the Actions facet of Openness was the only one with the nonsignificant congruence coefficient, the finding that was repeated in our analysis. The Actions facet thus appears to have the poorest fit in cross-cultural research with NEO PI-R. This finding, along with its relatively low reliability, may suggest some problems with the translation of the scale or its meaning in our culture and may indicate the need for some revisions.

Table 5

Correlations among NEO PI-R scales in high school sample (above the diagonal) and adult sample (below the diagonal)

	N	E	O	A	C
N	-	-.30**	.15**	.03	-.32**
E	-.35**	-	.28**	-.15**	.11
O	-.02	.40**	-	.02	-.16**
A	.02	-.05**	.10	-	.09
C	-.40**	.32**	.05	.05	-

Note. N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness. High school sample: N=454. Adult sample: N = 256.
*p < .01 **p < .001

Table 6
Correlations between NEO PI-R and EPQ scales in high school sample

	N	E	O	A	C
EPQ E	-.32**	.78**	.12*	-.18**	.11
EPQ N	.79**	-.21**	.16**	.01	-.20**
EPQ P	.06	.01	.04	-.49**	-.43**
EPQ L	-.11*	-.20**	-.14**	.48**	.44**

Note. N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness.
*p < .01; **p < .001.

Correlations between domain scales in both samples show moderate relations between neuroticism and both extraversion and conscientiousness, as well as between extraversion and openness to experience. In the sample of adults the correlation between extraversion and conscientiousness is also notable. The reported correlations between domains are within the range of values reported in the original sample (Costa & McCrae, 1992b).

The correlations between three Eysenck's (Eysenck & Eysenck, 1975) dimensions - EPQ N, E and P, and the L sca-le, and NEO PI-R domain scales are presented in Table 6.

Two of the Eysenck's three dimensions, neuroticism and extraversion, are also represented in five-factor model. The correlations between corresponding N and E scales of the two instruments are expectedly very high, somewhat higher than those reported by McCrae and Costa (1985) and are in favor of the convergent validity of the two NEO PI-R domain scales. Obviously, N and E scales of the two instruments measure the same constructs (e.g. Draycott & Kline, 1995). Furthermore, both conscientiousness and agreeableness negatively correlate with psychoticism, as it was hypothesized and obtained by McCrae and Costa (1985). The obtained positive correlations of the L scale with A and C are also in accordance with the predictions and findings of McCrae and Costa (1985). As the authors point out, it can be expected that subjects who describe themselves in terms of agreeableness and conscientiousness traits - as well adjusted, responsible, well intentioned, also score high on the L scale. Commenting these results, they hold that L scale may reflect substantive personality disposition rather than response style.

The magnitude of the correlations between NEO PI-R domain scales is a subject of Eysenck's criticism (1992a). He argues that there are no reasons in favor of the five basic dimensions, as the proponents of the model ignore high correlations between the factors and thus arbitrarily introduce more factors on basic personality level than actually needed. On the other hand, as noted earlier, Costa and McCrae (1992d) comment that the five basic domains are very broad, so some of the first-order traits primarily define one of the domains, but are also meaningfully related to some other domain. These mixed traits create the observed intercorrelations between domains, and are to be expected in the instrument that samples traits very broadly.

Eysenck's criticism particularly questions the existence of agreeableness and conscientiousness as separate highest-order factors. While Costa and McCrae (1992d; McCrae & Costa, 1985), regard P as a blend of low A and low C as broad dimensions, Eysenck (1992a,b) suggests a different explanation - A and C are subfactors which partly define P. In a recent study Costa and McCrae (1995) particularly address this issue and believe that different pattern of correlations A and C show with primary traits defining Eysenck's three dimensions adds further empirical evidence to their conceptual distinction of the two domains.

CONCLUSION

In sum, the results of our research with Croatian translation of the NEO PI-R show that the instrument is a valid measure of five broad personality dimensions in our population, and thus are still another contribution to the evidence on its cross-cultural validity. Despite the criticism of the model both on theoretical and empirical grounds (Block, 1995; Draycott & Kline, 1995; Eysenck, 1992a,b; McAdams, 1992; Pervin, 1994), there are still

much more personality researchers favoring the model, and research evidence supporting its generality across methods, samples, instruments and cultures is more convincing than the voice of its critics. The five-factor model thus currently represents a very fruitful line of research in the field of personality, with the potential for important advancements in applied fields such as clinical (eg. Costa & Widiger, 1994; McCrae, 1991) and organizational settings (eg. Barrick & Mount, 1991).

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