Special Feature

NEO-PI-R Factor Structure in College Students

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Little is known about the effectiveness and validity of the revised NEO personality inventory (NEO-PI-R) for identifying the personality traits of the big five in Indian context on students' sample. The main objectives of this study were to examine the replicability of the five-factor model and to establish external validity for personality traits in this population. A total of 205 technology students completed the NEO-PI-R, Emotional intelligence scale and Oxford Happiness Questionnaire. Using principal component analysis with varimax rotation, the dimensions of personality in the Indian students sample clearly replicate the five-factor structure for N,C, and A except A5 facet. Whereas, O and E did not get high loading of their all facets. Psychometric properties of   NEO-PI-R have been discussed in this paper

Keywords: Personality traits, Neuroticism, Extraversion, Agreeableness, Conscientiousness

Over the past decade, the Five-Factor model (FFM) of personality became one of the dominant paradigms in trait psychology (McCrae, 2001). Factor Model of Personality (FFM) has received widespread attention in research and   several studies have suggested that personality have adequately assessed using these five broad dimensions in recent years, (John, 1990; Costa & McCrae, 1992). NEO PI-R is considered the most comprehensive and best validated of personality measurement on the basis of FFM (Costa & McCrae, 1992) which is also the most   widely   used   because   it   is psychometrically well-developed and can bring considerable interpretative and predictive power to research on the five-factor model (Piedmont & Chae, 1997; Yang et al., 1999).

Five-Factor model of personality as measured by NEO PI-R has been explored in different cultures (McCrae & Costa, 1997). Research suggests that five basic dimensions underlie adult personality and are independent of dominant culture (McCrae &

Allik, 2002). Broadly speaking, these factors of Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C) are known as the dimensions of the Five-Factor Model (FFM) or the Big Five. This trait-like conceptualization of personality has received wide-spread support across cultures (McCrae & Costa,1997). However, there still remain cultures where values, socialization practices, and lifestyles are substantially different (Paunonen, Jackson, Trzebinski, & Forsterling, 1992) from those found in the West, and these need to be studied.

Rearrangement of the facets in exploratory factor analysis has been found in Asian and European samples (McCrae et al., 1996; Rolland, 2002; and Terracciano, 2003). Rotational variants in replicating study across the cultures can be either arbitrary or related to that society's stance on the Individualism–Collectivism dimension as suggested by (McCrae et al., 1998). More recently, Rossier, Dahourou, and McCrae (2005) found that in the French-speaking

Africans from Burkina Faso (Western Africa), the factors of N, C and O after varimax rotation were clearly identified, but not E and A. Instead the authors found the alternative interpersonal factors of Love–Hate and Submission–Dominance based on the reorganization of the facets from the E and A factors. In fact, when the factor structure of the African sample was rotated toward the normative American structure, Rossier et al. (2005) obtained the usual E and A factors, with high congruence coefficients. However, in the Burkinabe Zimbabwean (Piedmont, Bain, McCrae, & Costa, 2002) and Black South African samples the congruence coefficient was low for the O factor (McCrae et al., 2005a).

After varimax rotation, Caprara et. al., (2001) found that only Neuroticism (N), Openness (O), and Conscientiousness (C) factors were well defined. They reported that the facet scales of Extraversion (E) and Agreeableness (A) defined their respective factors rather poorly: the varimax rotation combined the E facets of Warmth (E1), Gregariousness (E2), and Positive Emotions (E6) with the A facets of Trust (A1), Altruism (A3), and Tender-Mindedness (A6), and the E facets of Assertiveness (E3), Activity (E4), and Excitement Seeking (E5) with the A facets of Straightforwardness (A2), Compliance (A4), and Modesty (A5). They concluded that the Italian version of the NEO-PI-R may not be measuring the same thing in Italy that it does in the United States. Hence, several studies have tried to confirm Factor formation of NEO PI in other cultures and documented varied results. Variation in results in various cultures motivate researchers to do further investigation in this area.

Emotional intelligence (EI) and Happiness have taken as external validity predictor of the big five factor of personality. Costa and McCrae (1992) showed that happiness was associated with greater extraversion and lower neuroticism,

supported by several researches (Furnham & Brewin, 1990; Hills & Argyle, 2002). In terms of the Big 5 dimensions, McCrae and Costa (1997) suggested that Agreeableness and Conscientiousness should facilitate more positive experiences in social and achievement situations, respectively, which in turn increase subjective well-being. Openness to experience, however, Should lead a person to experience both more positive and negative emotional states. No direct association should therefore be expected with openness to experience. The most compelling evidence for the strong associations between personality traits and happiness derived from DeNeve and Cooper's (1998) did meta-analysis, which indicated that four of the so-called Big Five personality factors, namely emotional stability (ES-opposite to neuroticism), conscientiousness (C), extraversion (E), and agreeableness (A) – usually in that order – predispose individuals towards happiness. More recently, four of the Big Five personality traits, namely ES, E, C and A, obtained significantly and positively correlated with both happiness and trait EI, Chamorro-Premuzic, Bennett, Furnham (2007). It seems on the basis of reviewed literature that neuroticism negatively and all other NEO PI factors excluding openness positively correlated with happiness and EI.

The present article re-examines the psychometric properties of NEO-PI-R in Indian context on students' sample. For external validity, it is hypothesized that emotional intelligence (EI) and happiness would be negatively correlated with Neuroticism and its facets and positively correlated with other factors of NEO PI and their facets.

Method

Participants:

A total sample of 205 students pursuing their UG or PG degree in different fields of

technology, comprising 154 males and 51 females, age between 18 and 27 years (M= 20.67, S.D. = 1.69). The sample consisted of undergraduate and graduate technology students who had given consent to participate.

Measures:

NEO-PI-R: The NEO-PI-R Costa and McCrae (1992) is a 240-item questionnaire specifically designed to measure the FFM of personality. Items are answered on a five-point Likert scale ranging from strongly disagree to strongly agree, and scales are balanced to control for the effects of acquiescence Cronbach's alphas for the present study were 0.86 for N, 0.70 for E, 0.72 for O, 0.81 for A, and 0.87 for C. In the present sample, the internal consistency coefficients ranged from 0.70 to 0.87 for domain scales, and from 0.21 to 0.73 for facet scales (Mdn = .62; see Table 1), which are lower compared to the normative sample (0.86 to 0.92 for the domain, and 0.56 to 0.86 for the facets). Consistent with prior research, facets O3: Feelings (0.33), O4: Actions (0.30) and O6: Values (0.34) have reported by Rossier et al. (2005). Similarly, (Savla, Davey, Costa, & Whitfield, 2007) showed the lowest levels of internal consistency; O3: Feelings 0.33, O4: Actions 0.30, O6: Values 0.34 .Most of the facet scales exceeded .50- a value that is acceptable for scales with only eight items, Costa and McCrae (1992).

Emotional Intelligence: The EI scale based on ability model (Mayer & Salovey, 1997) modified version of Schutte et al. (1998) measure was used. It is modified by Austin, Saklofske, Sandra, Huang and McKenney (2004). This scale contains 41 items having three subscale scores; Optimism/Mood Regulation, Appraisal of Emotion and Utilisation of Emotion. The overall score of this scale is used in the analyses of the present study. Internal consistency (Cronbach's alpha) of overall scale has calculated á 0.82 in the present study.

Oxford Happiness Questionnaire: The OHQ is a 29-item self-report measure on a 6-point scale ranging from 1 (strongly disagree) to 6 (strongly agree) (Hills & Argyle, 2002). It is designed to capture the cognitive appraisal component of happiness (i.e., life satisfaction). This measure demonstrated good reliability (á = .82) in the present study.

Results

Exploratory factor analysis method using principle component analysis (PCA) was undertaken to assess the construct validity of NEO PI. Cronbach's á was used to determine scale dimensionality and internal consistency reliability. Correlation was calculated to establish the relationship of NEO PI with emotional intelligence and happiness.

Table 1 shows mean and SD of present study and comparison with normative data. However, there is variation in age, gender ratio and educational qualification. Table 2 shows the Varimax solution for the factor analysis of 30 facet scores in the Indian students' data. Five factor minimum residual solutions were iterated six times to stabilize the communalities, giving principal factor solutions. This solution was designed to provide the best fit to the Big-Five theory of personality which the NEO-PI-R is supposed to represent since there are only five Big-Five factors. The 30 facet scales were factored using principal component analysis. In order to determine the appropriateness of the NEO five-factor personality structure, I examined factor solutions of five factors for consisting with normative data. In the five-factor solution, eigenvalues were 6.21, 3.08, 2.62, 2.24, and 1.39 for C, N, A, E, O respectively, which accounted for 51.75 % of variance. All NEO-PI-R facet scores had loadings of at least 0.40 on the factor or as secondary loading they were supposed to define. Twenty-four of the thirty facets showed their highest loading on the intended factor.

Table 1. Mean, standard deviation, and alpha of NEO-PI-R form S in Indian Technology students.

NEO-PI-R scale*	M	SD	a	**Normative Data M	SD	a
Domains(no. of items=48 in each domain)						
N: Neuroticism	96.42	18.15	.86	96.3	21.9	.92
E: Extraversion	110.39	15.73	.78	121.2	18.2	.89
O: Openness	118.48	15.02	.73	116.8	17.8	.87
A: Agreeableness	105.79	15.36	.81	113.5	16.6	.86
C: Conscientiousness	108.09	18.90	.87	114.5	21.1	.90
Neuroticism: facets (no. of items=8 in each facets)						
N1: Anxiety	16.76	4.40	.62	17.5	5.0	.78
N2: Angry	15.58	4.17	.55	16.0	5.1	.75
N3: Depression	16.86	4.75	.69	15.3	5.7	.81
N4: Self-consciousness	16.79	4.37	.57	16.4	4.7	.68
N5: Impulsiveness	17.01	3.42	.39	18.4	4.3	.70
N6: Vulnerability	13.37	4.19	.60	12.8	4.4	.77
Extraversion facets (no. of items=8 in each facets)						
E1: Warmth	20.16	4.73	.59	23.2	4.3	.73
E2: Gregariousness	17.32	5.10	.58	19.2	5.1	.72
E3: Assertiveness	15.16	4.34	.64	17.0	5.1	.77
E4: Activity	17.35	3.25	.30	18.8	3.8	.63
E5: Excitement-seeking	19.86	3.84	.45	21.5	4.0	.65
E6: Positive emotions	20.55	4.10	.48	21.5	4.1	.73
Openness facets (no. of items=8 in each facets)						
O1: Fantasy	22.51	5.64	.63	20.1	4.8	.76
O2: Aesthetics	20.45	5.20	.68	18.6	5.6	.76
O3: Feelings	20.61	3.96	.61	22.4	4.3	.66
O4: Actions	15.39	3.27	.21	15.8	3.5	.58
O5: Ideas	20.11	4.80	.66	19.1	5.0	.80
O6: Values	19.40	4.06	.50	20.8	3.7	.67
Agreeableness facets (no. of items=8 in each facets)						
A1: Trust	17.38	4.21	.59	18.7	4.4	.79
A2: Straightforwardness	16.72	4.79	.67	18.3	4.8	.71
A3: Altruism	20.39	4.16	.63	23.2	3.6	.75
A4: Compliance	16.02	4.44	.60	15.6	4.4	.59
A5: Modesty	16.28	4.07	.60	18.0	4.5	.67
A6: Tender-mindedness	19.03	3.16	.32	19.8	3.3	.56
Conscientiousness facets (no. of items=8 in each facets)						
C1: Competence	18.76	3.70	.52	21.1	4.0	.67
C2:: Order	17.21	4.50	.56	17.8	4.9	.66
C3:: Dutifulness	20.18	4.14	.61	21.2	4.1	.62
C4:: Achievement striving	17.88	4.52	.61	18.9	4.9	.67
C5:: Self-discipline	16.73	4.61	.73	18.9	5.1	.75
C6: Deliberation	17.34	3.84	.54	16.6	4.5	.71

*Total items in the test=8x6x5=240

** For collage students combined males & females (17-20 yrs.) [Costa & McCrae (1992)].

Table 2. Varimax rotated factor structure in normative sample (N = 1000) and the Indian Study of Technology students (N = 205)

NEO-PI-R scales	*Normative structure					Present study**				
	N	E	O	A	C	N	E	O	A	C
Anxiety	**0.81**					**0.73**				
Angry Hostility	**0.63**			*–0.48*		**0.69**				
Depression	**0.80**					**0.76**				
Self-consciousness	**0.73**					**0.67**				
Impulsiveness	**0.49**					**0.56**		*0.42*		
Vulnerability	**0.70**					**0.62**				*–0.42*
Warmth		**0.66**					**.67**			
Gregariousness		**0.66**					**.75**			
Assertiveness		**0.44**								**0.39**
Activity		**0.54**		*0.42*						**0.51**
Excitement Seeking		**0.58**					**0.46**			
Positive Emotions		**0.74**					**0.44**	*0.45*		
Fantasy			**0.58**					**0.45**		
Aesthetics			**0.73**							
Feelings		*0.41*	**0.50**					**0.56**		
Actions			**0.57**				*0.57*			
Ideas			**0.75**							*0.54*
Values			**0.49**					**0.64**		
Trust				**0.56**					**0.46**	
Straightforwardness				**0.68**					**0.64**	
Altruism		**0.52**		**0.55**					**0.71**	
Compliance				**0.77**					**0.69**	
Modesty				**0.59**				*–0.46*		
Tender-Mindedness				**0.62**					**0.60**	
Competence	*– 0.41*				**0.64**					**0.66**

* Costa & McCrae, (1992). **Less than 0.40 loadings are deleted.

Note: Primary loadings indicated in bold and secondary loadings in italics and bold when greater than 0.40.

Consistent with the normative structure, the present sample replicated important first loadings of their facets on N, A and C Factors, having the facet scores loaded at 0.56 or more on their expected factors and only A5: Modesty had its highest loading elsewhere. The facet scores for Extraversion and Openness defined their respective factors rather poorly, often having their highest loading on a different factor than the one they were supposed to define. Four facets of E loaded on the first factor and E3: Assertiveness with E4: Activity had its cross-loading on C, whereas, E6: Positive Emotions had its highest loading on O and E both. Whilst, the O factor was not easily identified. Only three facets (O1: Fantasy, O3: Feelings and O6: Values) of O loaded on their factor, O2: Aesthetics and O5: Ideas had its highest loading on C and O4: Actions had cross loading on E.

Important secondary loadings were observed as N5: Impulsiveness which had its secondary loading on O; N6: Vulnerability which had its secondary loading on C; only greater than 0.40 loadings were taken into account, (see Table2). A few facets did not show the usual loading patterns: E3: Assertiveness and E4: Activity on E; O2: Aesthetics, O4: Actions and O5: Ideas on O; A5: Modesty on A had weaker loadings.

To provide additional evidence of external validity, this article examines the correlation between the NEO-PI-R with self-report measures EI scale based on ability model (Mayer & Salovey, 1997) and Oxford Happiness Questionnaire (Hills & Argyle, 2002). It is expected that EI and Happiness would be negatively correlated with Neuroticism and its facets and positively correlated with other factors and their facets. In most of the cases, it is observed accordingly, (see Table 3).

Table3. Correlations of NEO-PI-R factors and their domains with the Oxford Happiness Questionnaire (OHQ) and Emotional Intelligence (EI)

NEO-PI-R scale Domains	EI	OHQ
N: Neuroticism	-20**	-.44**
E: Extraversion	.27**	.52**
O: Openness	.25**	.29**
A: Agreeableness	.16*	.09
C: Conscientiousness	.29**	.46**
Neutroticism facets		
N1: Anxiety	-0.10	-0.20**
N2: Angry	-0.12	-0.27**
N3: Depression	-0.25**	-0.43**
N4: Self-consciousness	-0.09	-0.34**
N5: Impulsiveness	-0.2	-0.16*
N6: Vulnerability	-0.25**	-0.46**
Extraversion facets		
E1: Warmth	0.16*	0.36**
E2: Gregariousness	0.12	0.31**
E3: Assertiveness	0.11	0.38**
E4: Activity	0.18*	0.37**
E5: Excitement-seeking	0.11	0.07
E6: Positive emotions	0.31**	045**
Openness facets		
O1: Fantasy	-0.07	-0.02
O2: Aesthetics	0.19**	0.22**
O3: Feelings	0.28**	0.21**
O4: Actions	0.09	0.11
O5: Ideas	0.18*	028**
O6: Values	0.21**	0.20**
Agreeableness facets		
A1: Trust	0.06	0.14
A2: Straightforwardness	0.11	-0.03
A3: Altruism	037**	0.25**
A4: Compliance	-0.01	0.06
A5: Modesty	-0.05	-0.16*
A6: Tender-mindedness	0.10	0.07
Conscientiousness facets		
C1: Competence	0.20**	0.40**
C2:: Order	0.20**	0.25**
C3:: Dutifulness	0.25**	0.35**
C4:: Achievement striving	0.15*	0.28**
C5:: Self-discipline	0.26**	0.44**
C6: Deliberation	0.24**	0.34**

**p<0.01   *p<0.05

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