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# A comparison between three and five factor models of Pakistani personality data

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## Abstract

The Eysenck Personality Questionnaire-Revised (EPQ-R), the Eysenck Personality Profiler Short Version (EPP-S), and the Big Five Inventory (BFI-V4a) were administered to 135 postgraduate students of business in Pakistan. Whilst Extraversion and Neuroticism scales from the three questionnaires were highly correlated, it was found that Agreeableness was most highly correlated with Psychoticism in the EPQ-R and Conscientiousness was most highly correlated with Psychoticism in the EPP-S. Principal component analyses with varimax rotation were carried out. The analyses generally suggested that the five factor model rather than the three-factor model was more robust and better for interpretation of all the higher order scales of the EPQ-R, EPP-S, and BFI-V4a in the Pakistani data. Results show that the superiority of the five factor solution results from the inclusion of a broader variety of personality scales in the input data, whereas Eysenck's three factor solution seems to be best when a less complete but possibly more important set of variables are input. © 2001 Elsevier Science Ltd. All rights reserved.

*Keywords:* EPQ-R; BFI; EPP-S; Eysenck; Pakistan; Three factor; Five factor; Personality

## 1. Introduction

Development of an empirically based taxonomy of personality has centred upon resolving the issue of the number of higher order, broad or super factors of personality. Most debate concerns differences between the 'Big five' of Costa and McCrae (1985; 1992) and Eysenck's 'Giant three' factor model (e.g. Eysenck, 1967; Eysenck & Eysenck, 1985), although many others have contributed to the debate (Block, 1995; Brand, 1994; Cattell, 1995; Digman, 1990; Goldberg, 1993; Kline, 1993; McAdams, 1992; McKenzie, Tindell, & French, 1997; Salgado, 1997; Zuckerman, 1992).

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Both the Big five and Giant three taxonomies include the scales of neuroticism and extraversion (McCrae & Costa, 1985). The Giant three model also includes psychoticism which was incorporated by Eysenck (Eysenck & Eysenck, 1975). Although the factors of extraversion and neuroticism have been consistently retrieved across many studies, ratings, and questionnaires, it has been suggested that psychoticism is a blend of the Big five scales of agreeableness and conscientiousness (Costa & McCrae, 1992, 1995; Costa, McCrae, & Dye, 1991; McCrae & Costa, 1985). Roger and Morris (1991) found a two-factor solution for the psychoticism scale, where the first component emphasised callousness, paranoia, intolerance and self-serving attitudes, and the other focused on impulsiveness and non-planning. Eysenck (1992) argued that agreeableness and conscientiousness of the Big Five were just relatively unimportant components of Psychoticism.

The Eysenck Personality Profiler (EPP; Eysenck & Wilson, 1991) is the latest in the series of their personality questionnaires. The EPP was designed to measure 21 primary scales, where various scales each explain the higher order factors of psychoticism, extraversion and neuroticism, with 30 items in each scale. However, some of trait representations seem not to match well with the higher order factors (Eysenck, Barrett, Wilson, & Jackson, 1992). In order to improve the psychometric attributes and to shorten the length of the original EPP, it was reduced to 20 items per scale. However, Costa and McCrae (1995) still strongly believed that a five factor solution best fitted the EPP, as could be predicted from the work of Digman and Inouye (1986). However, a close examination of Costa and McCrae's results also provides significant support for a three factor classification of the scales, and thus it could be argued that Costa and McCrae's conclusion was premature. The factor analytic solutions seem to have provided a more than adequate three factor solution with the notable exception of the Practical-Reflective dimension. Costa and McCrae (1995) place significant emphasis on this dimension as evidence that a five factor solution is superior to a three factor solution. Jackson, Furnham, Forde, and Cotter (2000) find very little difference between a three and five factor solution for the EPP.

The EPP has also been reduced to just three primary scales per higher order factor to create the short version (EPP-S) producing three very clear higher order factors plus a Lie scale (Eysenck, Wilson, & Jackson, 1997). Extraversion was represented by three scales namely sociability, activity, and assertiveness; neuroticism was represented by anxiety, inferiority, and unhappiness; and psychoticism was represented by the risk taking, impulsiveness and irresponsibility traits. Eysenck et al. (1997) explain their reasoning behind the design of the EPP-S: 'The present shortened version of the EPP was produced because the original version was found to be too lengthy for some situations where a quicker turnaround was preferred. Also the large number of traits, while advantageous where detailed and expert consideration was possible, imposed a great load on the person analysing the data, and it was felt that a shorter inventory, containing just 3 scales for each major variable, plus a Lie scale, would give sufficient information for most purposes, particularly if the traits selected were felt to be particularly important for research and applied purposes' (p. 9).

The Eysenck Personality Questionnaire (EPQ) was standardised in England (Eysenck & Eysenck, 1975) and many cross-cultural studies of the EPQ have been undertaken subsequently (Barrett & Eysenck, 1984). The objectives of the cross-cultural research were primarily to show that the factors of psychoticism, extraversion, neuroticism, and the lie scale are as similar in other cultures as in England; to provide the countries with valid and reliable factors using appropriate

items in their scoring keys; and to compare the means and standard deviations of the personality factors for the two nations. The most recent study (Barrett, Petrides, Eysenck, & Eysenck, 1998) examined the factorial congruence of the Eysenckian scales as measured by the EPQ. Gender-specific data from 34 countries was used. Results demonstrated that the Eysenck factors are replicable across all 34 countries.

Although Extraversion and Neuroticism seem to have reached an adequate level of consensus between Giant three and Big five models of personality, the definition of other higher order scales in the Big five model remains nearly as contentious as the Psychoticism scale within the Eysenckian structure although there does seem to be reasonable cross-cultural stability (Digman, 1990). The five factor questionnaire used in this study is the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991). It is a 44 item measure of big five personality factors of Extraversion (E), Neuroticism (N), Agreeableness (A), Conscientiousness (C), and Openness (O). Each scale consists of 8–10 items, which are rated on a five point rating scale of strongly agree to strongly disagree with 3 as neutral. Coefficient alphas are reported to range from 0.63–0.82 and the evidence of convergent validity of the BFI scales using the NEO-FFI is substantial (John et al., 1991).

A multitrait-multimethod analysis of the Spanish and English version of BFI (John et al., 1991) was conducted (Benet-Martinez & John, 1998). The Spanish BFI was found to be a factorially valid measure of the Big Five for Spanish people. Moreover, factorial structure between these versions at the higher order trait level represented the Big five dimensions.

The present study is the first to present joint analyses of three personality questionnaires using participants based in Pakistan. We examine the concurrent validity of higher order scales of the EPP-S in conjunction with the BFI and the EPQ-R. We aim to determine whether a joint factor analysis of higher order scales of the EPQ-R, EPP-S (based on a three-factor model) and the BFI (based on five factor model) yields a 3-factor solution or 5-factor solution using Pakistani data with the purpose of trying to understand some of the advantages and disadvantages of Giant three and Big five models.

## 2. Method

### 2.1. Participants

One-hundred and sixty MBA students at a co-educational university in Pakistan participated in the study (108 males and 52 females, age range of 20–29 years, Mean = 23.09 years, S.D. = 1.93).

### 2.2. Measures

Three following personality questionnaires, written in English, were used in the study:

1. EPQ-R: The Eysenck Personality Questionnaire (Eysenck & Eysenck, 1991)
2. EPP-S: The Eysenck Personality Profiler-short version (Eysenck, et al., 1997); and
3. BFI v4a: The Big Five Inventory version 4a (John, et al. 1991)

### 2.3. Procedure

After explaining the purpose of the study, requesting honesty, and assuring confidentiality, the three personality questionnaires were administered.

### 3. Results

Table 1 reports the coefficient alphas, means, and standard deviations of all the higher order factors of EPQ-R, EPP-S and BFI. All scales show satisfactory reliability although the reliabilities for the BFI are a little lower than those published in the manual. The pattern of mean scores of the E, P, N, and Big five scales are similar to those from Western studies.

Table 1 also shows the correlations between the higher order scales of EPQ-R, EPP-S and BFI personality questionnaires. The same scales of Extraversion and neuroticism in the EPQ-R, EPP-S, and BFI have significant positive correlations, thus providing evidence of concurrent validity of these scales. The psychoticism scale of EPQ-R is negatively correlated with agreeableness and openness scales of the BFI. However, the psychoticism scale of the EPP-S also has a negative

Table 1  
Means, standard deviations, alphas and correlations between the scales<sup>a</sup>

	E-EPQ	N-EPQ	P-EPQ	E-EPP	N-EPP	P-EPP	E-BFI	N-BFI	A-BFI	C-BFI	O-BFI
Mean	14.59	11.49	9.24	22.49	16.98	20.24	3.33	2.78	3.83	3.54	3.44
S.D.	3.97	4.77	4.86	4.03	6.25	4.05	0.64	0.70	0.68	0.66	0.55
Alpha	0.71	0.75	0.78	0.72	0.87	0.66	0.61	0.61	0.73	0.72	0.59
N-EPQ	-0.05										
P-EPQ	0.00	0.16									
E-EPP	0.58**	-0.19*	-0.29**								
N-EPP	-0.18*	0.56**	0.24**	-0.43**							
P-EPP	0.03	0.05	0.17*	-0.11	0.11						
E-BFI	0.58**	-0.28**	-0.03	0.43**	-0.30**	0.08					
N-BFI	-0.10	0.54**	0.19*	-0.22**	0.50**	0.19*	-0.27**				
A-BFI	0.14	-0.20*	-0.64**	0.29**	-0.25**	-0.11	0.16	-0.40**			
C-BFI	0.06	-0.21*	-0.47**	0.35**	-0.31**	-0.34**	0.17*	-0.40**	0.46**		
O-BFI	0.23**	-0.14	-0.25**	0.29**	-0.27**	-0.03	0.25**	-0.20*	0.35**	0.31**	

<sup>a</sup> N = 135 for BFI and EPQ-R scales and 160 for EPP-S scales. E-EPQ, Extraversion Scale of Eysenck Personality Questionnaire-Revised; N-EPQ, Neuroticism Scale of Eysenck Personality Questionnaire-Revised; P-EPQ, Psychoticism Scale of Eysenck Personality Questionnaire-Revised; E-EPP, Extraversion Scale of Eysenck Personality Profiler-Short Version; N-EPP, Neuroticism Scale of Eysenck Personality Profiler-Short Version; P-EPP, Psychoticism Scale of Eysenck Personality Profiler-Short Version; E-BFI, Extraversion Scale of Big Five Inventory (V4a); A-BFI, Agreeableness Scale of Big Five Inventory (V4a); C-BFI, Conscientiousness Scale of Big Five Inventory (V4a); N-BFI, Neuroticism Scale of Big Five Inventory (V4a); O-BFI, Openness Scale of Big Five Inventory (V4a)

\* $P < 0.05$ (two tailed)

\*\* $P < 0.01$ (two tailed)

correlation with conscientiousness and agreeableness, but only the correlation with conscientiousness is significant. Overall the pattern of inter-correlations of all scales of these personality questionnaires is similar to previous research (e.g. Costa & McCrae, 1985, 1995; Eysenck et al., 1992, 1997).

The scree test factor extraction method (Cattell, 1966) suggests that five rather than three factors should be extracted. We also examined the number of factors to be extracted using the Kaiser-Guttman rule which suggests that important factors should have eigenvalues greater than one. Four factors had eigenvalues greater than one.

Table 2 shows the results of a factor analysis (principal components with varimax rotation) of the scales from the EPQ-R, EPP-S and BFI. We present both three and five factor solutions. We combined each of the three sets of primary scales of the EPP into their appropriate higher order scales by averaging so that all scales were at the same level of analysis.

### 3.1. Three-factor solution

Psychoticism scales of EPQ-R, EPP-S, and agreeableness, conscientiousness, and openness scales of BFI emerged as the first factor accounting for 32.6% of the total variance. The second and third factors comprised of EPQ-R, EPP-S and BFI scales of extraversion and neuroticism accounting for 15.6 and 12.3% of the total variance, respectively. Altogether 60.5% of the total variance was accounted for by the three-factors model. Note that the communalities ( $h^2$ ) of the psychoticism scale of the EPP-S and the openness scale of the BFI show a poor representation in three factor space.

Table 2

Factor loadings and communalities of varimax rotated principle components from higher order factors of the EPQ-R, EPP-S, and BFI<sup>a</sup>

Scales	Three-factors				Five-factors					
	I	II	III	$h^2$	I	II	III	IV	V	$h^2$
P-EPQ	−0.82	−0.06	0.03	0.67	0.06	−0.03	−0.90	0.10	−0.04	0.83
A-BFI	0.75	0.14	−0.17	0.61	−0.21	0.07	0.84	−0.01	0.12	0.77
C-BFI	0.73	0.14	−0.17	0.59	−0.18	0.11	0.49	−0.50	0.32	0.65
P-EPP	−0.45	0.16	0.10	0.24	0.07	0.03	−0.04	0.92	0.04	0.87
O-BFI	0.40	0.38	−0.09	0.31	−0.11	0.15	0.17	−0.01	0.94	0.95
E-EPQ	−0.05	0.88	0.02	0.78	0.02	0.90	−0.02	0.02	0.07	0.82
E-EPP	0.32	0.74	−0.14	0.67	−0.14	0.78	0.27	−0.23	0.05	0.76
E-BFI	−0.09	0.72	−0.33	0.64	−0.33	0.70	−0.02	0.17	0.11	0.65
N-EPQ	−0.05	−0.06	0.86	0.74	0.86	−0.05	−0.08	−0.06	0.01	0.76
N-BFI	−0.24	−0.04	0.78	0.68	0.78	−0.03	−0.13	0.20	−0.09	0.69
N-EPP	−0.20	−0.29	0.72	0.66	0.73	−0.28	−0.15	0.08	−0.12	0.66
Eigen Val	3.59	1.72	1.35		3.59	1.72	1.35	1.02	0.77	
% of Var	32.6	15.6	12.3		32.6	15.6	12.3	9.2	7.0	

<sup>a</sup> Definitions of Scales are shown in Table 1

### 3.2. Five-factor solution

Five factors accounted for 76.7% of the total variance. All factor loadings were found to be high ranging from 0.70 to 0.94. Neuroticism and extraversion loaded highly on the factor 1 and factor 2, respectively. On the third factor the psychoticism scale of the EPQ-R and agreeableness scale of the BFI loaded in opposite directions. The psychoticism scale of the EPP-S and conscientiousness scale of the BFI loaded in opposite directions on the fourth factor. The openness scale of the BFI emerged as a fifth factor. The communalities of all the scales in the five-factor solution were high and ranged from 0.65 to 0.94.

The factor structure that emerged in a randomly selected sub-sample closely resembled that of the total sample.

Finally, we also executed oblique rotation using direct oblimin and found that the oblique factors were very similar to the orthogonal varimax solution presented here.

## 4. Discussion

Evidence for extracting a three or a five factor model from the scree slope was quite strongly in favour of the five factor model, although this view point was not supported by the Kaiser-Guttman rule which suggested a maximum of four factors. We are not surprised that these techniques produce contrasting results since they are not wholly reliable methods.

In fact it is more illuminating to try and determine what it is about a five factor model of personality that makes it different from a three factor model. The factor loading matrix allows us to do this. When all the scales are forced into a three factor solution, extraversion and neuroticism are clear factors. Psychoticism comes out as a third factor, although the fit of some of the scales is imperfect as shown by the low communalities of Openness and the Psychoticism scale of the EPP-S. When a five factor solution is chosen, again extraversion and neuroticism are clear and separate factors. Agreeableness and EPQ-R psychoticism load on the third factor, conscientiousness and EPP-S psychoticism load on the fourth factor and Openness loads on the fifth. Communalities for this solution are quite high. From this we conclude:

1. The factor loading matrix provides reasonably clear evidence that a five factor solution fits the data better than a three factor solution. We are not surprised by this since one of our questionnaires is based on a five factor model. Nevertheless the poor communalities of EPP-S psychoticism and BFI openness with the three factor solution suggest that there are elements of a five factor model that cannot be easily accommodated in a three factor model.
2. There is little meaningful difference between different extraversion scales and different neuroticism scales across the three questionnaires.
3. Agreeableness is most highly related to psychoticism of the EPQ-R, whereas conscientiousness is most highly related to psychoticism of the EPP-S. In this study, it seems that psychoticism of the EPQ-R is *not* the same as psychoticism of the EPP-S (a point reinforced by the low correlation between the scales). Whilst being disagreeable is recognised as an important component of psychoticism, it seems that the lack of conscientiousness reflected in

the EPP-S psychoticism scale is quite similar to Eysenck and Eysenck's (1991) definition of psychoticism.

4. Openness makes up the fifth factor all on its own. Is openness an important dimension of personality? The answer to this question will be a big step towards resolving the conflict between three and five factor models of personality. Inclusion of this scales leads to a five factor solution and exclusion leads to a three or perhaps four factor solution. Openness is a scale about interest and perhaps intellect. According to Costa and McCrae (1995) openness is an important personality variable, yet Eysenck et al. (1992) suggest that its 'opposite', the scale of practicality, is of little relevance. Ferguson and Patterson (1998) using a combination of confirmatory factor analysis and hierarchical multiple regression, concluded that Openness was not a 'pure' dimension of personality as it was also associated with problem solving. McKenzie (1998) also highlights Openness as being a major weakness in the five factor model. He concludes that there is no evidence to support an openness factor in a reanalysis of 16PF data.

How we decide that a scale is of sufficient importance, relevance and of sufficiently unique identity to be included as a higher order factor of personality has yet to be decided (Eysenck, 1992, 1997; Zuckerman, 1992). It may be that it is not necessary to provide a full description of personality such as might be found with a Big 5 model to provide a full explanation of personality. It is in this area that personality theorists need first to have consensus in order to determine whether or not there are three or five higher order scales of personality.

Finally, it is important to make some conclusions about the EPP-S and its relation to the EPP and the BFI. Eysenck, et al. (1997) chose the nine most important and internally consistent scales out of the 21 used in the EPP. Their manual shows that in doing so they created a set of scales that have an excellent three factor solution. As such the EPP-S is a useful questionnaire when Giant three models are required. When a broader domain of scales is required, which contains both scales important and unimportant to Eysenck's model, then the EPP and Big 5 measures such as the BFI are recommended.

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