

# Primary Scale Structure of the Eysenck Personality Profiler (EPP)

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Whether three or five dimensions are best able to explain and describe personality has been one of the major questions debated by personality researchers in recent times. The primary scales of the Eysenck Personality Profiler (EPP) and the short version (EPP-S) were examined using a sample of 400 students to determine their factor structure. Results by exploratory and confirmatory factor analysis showed that the EPP fits both a three- and five-factor structure reasonably well, while the EPP-S has a much better three-factor structure. The differences are explained in terms of the number of primary scales included by the authors in each of the tests. It is concluded that it is premature to believe that the five-factor structure provides the best description of personality.

The resolution generally in favor of trait theory, that was present in the 1970s and early 1980s concerning the person-situation debate, has led to a growing interest in the measurement of personality from the psychometric perspective (Digman, 1990; Furnham, 1994; Goldberg, 1993) and the development of psychobiological models of personality (e.g. Cloninger, 1987; Eysenck, 1967; Zuckerman, 1991). Now there seems to be an increasing realization that it is necessary to develop an empirically founded and consensually agreed taxonomy of personality.

The greatest debate over the past ten years, attracting probably the most attention, relates to the number and description of the basic, fundamental, highest-order, orthogonal, super-factors of personality. Although the major conflict has been between the prominent three- and five-factor theorists (e.g. Costa & McCrae, 1995; Eysenck, 1992), many other prominent personality researchers have contributed to the discussion (Block, 1995; Brand, 1994; Cattell, 1995; Digman, 1990; Goldberg, 1993; Kline, 1993; McAdams, 1992; McKenzie, Tindell, & French, 1997; Salgado, 1997; Zuckerman, 1992).

This paper analyzes the structure of the Eysenck Personality Profiler (EPP; Eysenck & Wilson, 1991) and the shorter version of the Eysenck Personality Profiler (EPP-S; Eysenck, Wilson, & Jackson, 1997). The EPP is one of a long line of instruments developed by Eysenck that follow the Giant three-factor structure: Maudsley Personality Questionnaire (MPQ), Maudsley Personality Inventory (MPI), Eysenck Personality Inventory (EPI), Eysenck Personality Questionnaire (EPQ), and the Revised Eysenck Personality Questionnaire (EPQ-R). These instruments were designed to measure the

primary personality traits at the super-factor level: either two (Extraversion and Neuroticism) for the MPI and EPI or three (Extraversion, Neuroticism, and Psychoticism) for the EPQ and EPQ-R. The EPP measures traits at *both* the super-factor level and the primary scale level, yielding three superfactors (Extraversion, Neuroticism, and Psychoticism) and 21 primary scales, as well as a Lie scale. The EPP-S also yields three superfactors, but based on nine primary scales. A Lie scale is also included.

The EPP has been subject to evaluative studies (Eysenck, Barrett, Wilson, & Jackson, 1992; Costa & McCrae, 1995; Jackson, Furnham, Forde, & Cotter, 2000) and has been used in a variety of studies (e.g. Furnham, Forde, & Cotter, 1998; Jackson & Corr, 1998; Jackson, Furnham, & Lawty-Jones, 1999; Jackson & Wilson, 1994; Wilson & Jackson, 1994). Costa & McCrae (1995) are extremely critical of the three-factor structure of the EPP and conclude that a five-factor solution (the Big five) provides the best structure for it. Typically, the five-factor structure of personality comprises Extraversion, Neuroticism, Openness, Conscientiousness, and Agreeableness. However close examination of Costa and McCrae's (1995) results reveal that there is also reasonable support for a three-factor classification of the primary scales, thus possibly rendering their conclusion premature. Costa and McCrae (1995) place significant emphasis on the Practical primary scale of the EPP as evidence that a five-factor solution is superior to a three-factor solution. However Eysenck, et al. (1992) maintain that the Practical-Reflective scale has little basis for inclusion in a personality model. Costa and McCrae's study can also be criticized in that it used only 229 participants and this could be regarded as being insufficiently powerful.

The EPP-S has received very little coverage to date in the literature. Eysenck, Wilson, and Jackson (1997) explain their choice of the nine scales from the original 21: "The present shortened version of the EPP was produced because the original version was found 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 analyzing the data, and it was felt that a *shorter* inventory, containing just three 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 aim of the present study is to re-examine the factor structure of the EPP and the EPP-S. By this means, we intend to examine whether a selection of scales specifically chosen to represent a reasonably full description of personality (the EPP), or those specifically chosen to be important for research and applied purposes (i.e. the EPP-S), has a more typical Eysenckian three-factor structure than Big five structure.

## METHOD

### *Participants*

A total of 400 first year undergraduates completed the EPP as part of an undergraduate course (27.5% were male and 72.5% were female). One rule of thumb is that 400 participants is well above the minimum necessary for providing a reliable solution

Table 1

Descriptions of the EPP Scales			
Super-factor	Primary scale	Description	Example item from each scale
Extraversion	E1: Activity	High scorers are: Generally active, energetic, starters of work and proactive.	At work or at play, do other people find it hard to keep up with the pace you set?
	E2: Sociability	Inclined to seek out the company of other people and are generally happy and comfortable in social situations.	Do you like going out a lot?
	E3: Assertiveness	Independent, dominant, and stand up for their rights, perhaps to the extent of being viewed as "pushy."	Do you express your opinions very forcefully?
	E4: Expressiveness	Open with their feelings, volatile, and demonstrative.	Are you prone to exaggeration and elaboration when relating a story to your friends?
	E5: Ambition	Ambitious, hard-working, competitive, keen to improve their social standing, and place a high value on productivity.	Do you take an unusual amount of pride in your work?
	E6: Dogmatic	Uncompromising in their views on most matters and they are likely to defend them vigorously and vociferously.	Do you determine nearly all of your conduct in relation to a single great cause?
	E7: Aggression	Given to the direct or indirect expression of aggression through temper tantrums, fighting, violent argument, and sarcasm.	Do you often blame other people when something goes wrong?
Neuroticism	N1: Inferiority	Low in self-esteem have a low opinion of themselves and believe themselves to be failures	Do you feel that you have little to be proud of?
	N2: Unhappiness	Characteristically pessimistic, gloomy and depressed, disappointed with their existence and at odds with the world.	Do things often seem hopeless to you?
	N3: Anxiety	Easily upset by things that go wrong and are inclined to worry unnecessarily about unpleasant things that may or may not happen	Do you worry too long over humiliating experiences?
	N4: Dependence	Lacking in self-reliance, think of themselves as helpless pawns of fate, are pushed around by other people and events and show a high degree of what has been called "authoritarian submission" - the unquestioning obedience to institutional power.	Would you prefer a job in which somebody else made the decisions and told you what to do?
	N5: Hypochondria	Likely to acquire psychosomatic symptoms and imagine that they are ill.	Do severe aches and pains make it impossible for you to concentrate on your work?
Psychoticism	N6: Guilt	Self-blaming, self-abasing, and troubled by their conscience regardless of whether or not their behavior is really morally reprehensible.	Do you expect to be punished for your sins?
	N7: Obsessiveness	Careful, conscientious, highly disciplined, staid, finicky, and easily irritated by things that are unclean, untidy, or out of place.	Do you routinely check that all the lights, appliances and taps are off before you go to bed?
	P1: Risk-taking	Reward seeking and like to live dangerously with little concern for the possible adverse consequences.	Do people who drive cautiously annoy you?
	P2: Impulsiveness	Inclined to act on the spur of the moment, make hurried, often premature decisions, and are usually carefree, changeable and unpredictable.	Do you usually make up your mind quickly?
	P3: Irresponsibility	Inclined to be overly casual, thoughtless, careless of protocol, unpredictable, and socially unreliable.	Are you inclined to live each day as it comes along?
	P4: Manipulativeness	Detached, calculating, shrewd, worldly, expedient and self-interested in their dealings with other people.	Are you adept in the use of white lies?
	P5: Sensation seeking	Forever seeking thrills in life and have an insatiable thirst for novel experiences	Is boredom one of the things you fear most of all?

Table 1 (cont.)

	P6: Tough-mindedness	Tolerant of and probably enjoy violence obscenity and swearing.	Do crude and vulgar jokes make you feel uncomfortable?
	P7: Practical	Inclined to be practical, are interested in doing things rather than thinking about them and tend to be impatient with ivory tower theorizing.	Are you bored by discussions of what life might be like in the future?
Lie	L: Lie scale	Able to put themselves in a positive light so as to try and create a positive impression.	As a child were you ever cheeky to your parents?

E1 - E3, N1 - N3 and P1 - P3 together with the Lie scale are used in the EPP-S.

The classification of primary factors into superfactors follows the system outlined in the EPP manual.

(Gorsuch, 1974; Hahn & Comrey, 1994; Kline, 1994). Nearly two-thirds (65%) of the respondents were under the age of twenty, 27.3% were in their twenties, 5.5% were in their thirties, and the remaining 2.3% were in their forties or fifties.

### Questionnaires

The Eysenck Personality Profiler (EPP; Eysenck & Wilson, 1991) is a 440-item questionnaire measuring 21 primary scales and three personality super-factors. Each item requires a response on a three point scale: "yes," "no," or "can't decide." In addition to the above scales, there is also a 20-item Lie scale. Table 1 reports the names and definitions of the primary scales and identifies which scales are included in the EPP-S. An example item from each scale is also presented.

### Results

Means and standard deviations of the scales are shown in Table 2. In general, Cronbach's alpha for each of the scales is satisfactory, although the Dogmatic scale and the Expressive scale have less satisfactory alphas of 0.57, and 0.54 respectively.

We used exploratory factor analysis to investigate the structure of the EPP. Maximum likelihood analysis with varimax rotation was used to obtain three and five-factor orthogonal solutions of the EPP. A three-factor solution explains 58% of the variance, and a five-factor explains 69% of the variance. Five-factors had eigenvalues greater than 1. A scree slope analysis suggests that the greatest gradient change occurred at four factors.  $\chi^2$  tests of both the three and five-factor solutions were significant ( $\chi^2 = 515$ ,  $df = 150$ ,  $p < .001$ , and  $\chi^2 = 280$ ,  $df = 115$ ,  $p < .001$  respectively). With regard to the three-factor solution, factor 1 is Neuroticism, factor 2 is Extraversion and factor 3 is Psychoticism. With regard to the five-factor solution, and if popular five-factor terminology is adopted, factor 1 is Neuroticism, factor 2 is Extraversion, factor 3 is Conscientiousness, factor 4 is Agreeableness, and factor 5 is Openness. The factor loadings of the five-factor solution tend to be higher than the three-factor solution.

Maximum likelihood analysis with varimax rotation was also used to obtain three- and five-factor orthogonal solutions to the EPP-S (see Table 4). The three- and five-factor solutions explained 74% and 87% of the variance respectively. A scree slope

Table 2

Means and Standard Deviations of the Eysenck Personality Profiler				
Super-factor	Primary scale	Mean	SD	Alpha
Extraversion	E1: Activity	19.65	7.62	.77
	E2: Sociability	24.02	8.12	.83
	E3: Assertiveness	17.75	7.56	.79
	E4: Expressiveness	17.89	5.70	.54
	E5: Ambition	18.57	7.78	.79
	E6: Dogmatic	17.42	5.47	.57
	E7: Aggression	14.86	7.25	.76
Neuroticism	N1: Inferiority	21.05	9.87	.89
	N2: Unhappiness	17.02	10.56	.86
	N3: Anxiety	21.44	9.16	.85
	N4: Dependence	15.71	7.21	.74
	N5: Hypochondria	8.99	6.21	.74
	N6: Guilt	14.13	7.85	.80
	N7: Obsessiveness	16.08	7.12	.74
Psychoticism	P1: Risk-taking	18.78	7.07	.75
	P2: Impulsiveness	21.05	9.87	.89
	P3: Irresponsibility	20.96	6.60	.69
	P4: Manipulativeness	15.61	5.96	.65
	P5: Sensation-seeking	21.04	7.55	.77
	P6: Tough-mindedness	15.26	6.84	.72
	P7: Practical	18.46	7.37	.75
	L: Lie scale	13.52	6.95	.75

analysis would suggest that the greatest gradient change would occur at three factors, and there are three factors with eigenvalues greater than 1. A  $\chi^2$  test of the three-factor solution was significant for a three-factor solution ( $\chi^2 = 35$ ,  $df = 12$ ,  $p < .001$ ), and for a four-factor solution, but was not significant for a five-factor solution. With regard to the three-factor solution, factor 1 is Neuroticism, factor 2 is Psychoticism and factor 3 is Extraversion. The five-factor solution seems less easy to label in terms Costa and McCrae's (1995) "Big Five" terminology.

Oblique rotational methods resulted in almost identical solutions to those of the orthogonal rotation method reported in this study.

We then used confirmatory factor analysis, by means of structural equation modeling, to determine the goodness of fit of various previously conceived models to our data (see Table 5). We compared the three-factor model proposed by Eysenck et al. (1992) in which N7: Obsessiveness and P7: Practical were omitted, the three-factor model proposed by the EPP Manual, the three-factor EPP-S model proposed by Eysenck, Wilson, & Jackson (1997), and the five-factor validimax solution obtained by Costa & McCrae (1995). In our confirmatory factor analysis, we used five different goodness of fit measures, which each have specific advantages and disadvantages. The  $\chi^2$  goodness of fit is widely quoted, but one assumption is that the variables are normally distributed and the EPP variables are not. Moreover, the  $\chi^2$  test is sensitive to sample size with large samples tending to lead to rejection of otherwise satisfactory models. All models show a relatively poor goodness of fit using the  $\chi^2$  test. The Goodness of Fit Index (GFI)

Table 3

Three and Five-Factor Solutions to the EPP					
	I	II	III	IV	V
Eigen	5.44	4.28	2.51	1.20	1.09
% Of Var	25.9	20.4	12.0	5.7	5.2
Cum %	25.9	46.3	58.2	63.9	69.2
(a) Three-factor solution					
N2:Unhappiness	.88	.10	-.03		
N1:Inferiority	.86	-.13	-.05		
N3:Anxiety	.86	-.11	.20		
N4:Dependence	.86	.08	-.05		
N6:Guilt	.73	.17	.10		
N5:Hypochondria	.69	.17	.22		
P6:Tough-mindedness	-.40	.38	-.13		
P2:Impulsiveness	.10	.76	-.19		
E7:Aggression	.22	.74	.22		
P1:Risk-taking	-.19	.71	-.30		
P5:Sensation-seeking	-.24	.70	-.00		
E4:Expressiveness	.18	.66	.22		
E3:Assertiveness	-.42	.63	.35		
P3:Irresponsibility	.13	.62	-.55		
P4:Manipulativeness	.20	.50	.07		
E1:Sociability	-.46	.47	.15		
E5:Ambition	-.03	-.03	.80		
N7:Obsessiveness	.38	-.21	.68		
E1:Activity	-.44	.25	.56		
E6:Dogmatism	.28	.37	.51		
P7:Practicality	-.33	-.05	-.34		
(b) Five-factor solution					
N4:Dependence	.87	.03	-.10	.08	-.02
N1:Inferiority	.87	-.13	-.11	-.05	-.02
N3:Anxiety	.87	-.17	.08	.01	.14
N2:Unhappiness	.85	.01	-.16	.14	.11
N6:Guilt	.73	.12	-.00	.05	.23
N5:Hypochondria	.70	.04	.14	.23	.06
P6:Tough-mindedness	-.46	.23	-.16	.44	-.06
P2:Impulsiveness	.15	.78	-.11	.15	.04
P1:Risk-taking	-.14	.75	-.17	.16	-.10
P5:Sensation-seeking	-.16	.73	.14	.16	-.05
P3:Irresponsibility	.11	.65	-.51	.13	-.01
E2:Sociability	-.31	.62	.40	-.10	-.13
E4:Expressiveness	.21	.61	.17	.15	.38
E3:Assertiveness	-.43	.49	.28	.34	.39

Table 3 (cont.)

E5:Ambition	.08	-.09	.83	.07	.10
E1:Activity	-.29	.29	.73	.01	-.04
N7:Obsessiveness	.38	-.40	.53	.21	.18
P4:Manipulativeness	.16	.17	-.01	.80	-.21
E7:Aggression	.17	.45	.07	.67	.25
E6:Dogmatism	.20	.03	.25	.58	.43
P7:Practical	-.21	.07	-.01	.05	-.87

measures how much better the model fits the data compared with no model at all. The EPP-S model fits the nine primary scales reasonably well (GFI = .86), whereas the other models are poorer (all between .6 and .7). The Adjusted Goodness of Fit Index (AGFI) is similar to the GFI but takes into account the degrees of freedom and thereby rewards simpler models. Again the EPP-S model is best (AGFI = .73), whereas all the other models are poorer and similar (around .6). The Root Mean Square Error of Approximation (RMSEA) is a different kind of measure that concentrates on how precisely the model fits the data, and none of the proposed solutions showed a good fit.

## DISCUSSION

It is difficult to choose between the three and five-factor solutions of the EPP using exploratory or confirmatory factor analysis. Overall, exploratory factor analysis suggests that the three-factor solution has the advantage of parsimony, and would seem to be as interpretable as the five-factor solution. However, the five-factor solution does explain a greater percentage of variance and the  $\chi^2$  is significant suggesting that the five-factors are useful. Moreover, five-factors is exactly the number of factors with eigenvalues greater than 1.

In contrast, the three-factor solution is superior with regard to the EPP-S, primarily because there are only three-factors with eigenvalues above 1 and the factor loading matrix is very interpretable. Nevertheless,  $\chi^2$  was significant for a four factor solution, but not for a five-factor solution, suggesting that the five-factor structure provides the upper limit to the number of factors that can be extracted.

Goodness of fit measures derived from confirmatory factor analysis supported the EPP-S solution most of all, but in general found very few differences in goodness of fit between three- and five-factor solutions. All models suggest the need for improvement, which may result from adding more paths and possibly error covariances. In the absence of theory, however, it is unwise to use structural equation modeling for major model improvements.

While the factor clarity of the EPP-S seems to be an improvement over the EPP in terms of identifying a clear three-factor solution, it is interesting to determine if the EPP-S is satisfactory in providing a complete description of personality. Practical has a

**Table 4**  
**Three and Five-Factor Solutions to the EPP-S**

	I	II	III	IV	V
Eigen	3.45	2.17	1.06	61	.53
% of var	38.4	24.1	11.7	6.7	5.9
Cum var	38.4	62.4	74.1	80.9	86.7
(a) Three-factor solution					
N3:Anxiety	.90	-.13	-.10		
N1:Inferiority	.88	-.04	-.25		
N2:Unhappiness	.87	.16	-.20		
P3:Irresponsibility	.00	.86	-.23		
P1:Risk-taking	-.16	.80	.17		
P2:Impulsiveness	.17	.78	.32		
E1:Activity	-.13	-.12	.89		
E2:Sociability	-.32	.30	.60		
E3:Assertiveness	-.37	.39	.54		
(b) Five-factor solution					
N3:Anxiety	.89	-.11	.01	-.14	-.11
N2:Unhappiness	.89	.12	-.19	.03	-.15
N1:Inferiority	.86	-.02	-.13	-.30	-.08
P1:Risk-taking	-.19	.86	.12	.11	-.04
P2:Impulsiveness	.16	.79	.15	.18	.20
P3:Irresponsibility	.03	.79	-.41	.02	.16
E1:Activity	-.19	.04	.91	.15	.19
E3:Assertiveness	-.27	.24	.16	.89	.16
E2:Sociability	-.27	.19	.19	.16	.89

**Table 5**  
**Confirmatory Factor Analysis of Previous Models of the EPP**

	EPP-S	EPP <sup>1</sup>	EPP <sup>2</sup>	EPP <sup>3</sup>
Chi-squared	303	2353	1667	1792
Df	24	186	132	179
P	.00	.00	.00	.00
GFI	.86	.64	.68	.70
AGFI	.73	.55	.59	.61
RMSEA	.17	.17	.17	.15

EPP-S = Primary trait model of the EPP-S

EPP<sup>1</sup> = Model proposed by EPP manual

EPP<sup>2</sup> = Model proposed by Eysenck et al. (1992)

EPP<sup>3</sup> = Model proposed by Costa & McCrae (1995)

factor all to itself in the five-factor EPP model, and is excluded from the EPP-S. Is Practical (or, its opposite, Openness) a scale of personality? Eysenck et al (1992) claim that it is not and that it can be safely excluded from a model of personality, but Costa and McCrae (1995) say that it is an important scale and that more scales of this type should be included in the measure.

Practical is defined in the following way by Eysenck and Wilson (1991): Low scorers are inclined to be interested in ideas, abstractions, philosophical questions, discussions, speculations, and knowledge for the sake of knowledge; that is, generally thoughtful in the literal sense of the word and introspective. High scorers are inclined to be practical, are interested in doing things rather than thinking about them and tend to be impatient with ivory tower theorizing.

Practical is therefore a scale about interests and perhaps intellect and therefore seems relatively different to personality. Ferguson and Patterson (1998), using a combination of confirmatory factor analysis and hierarchical multiple regression, concluded that Openness was not related to personality, since it was primarily associated with problem solving. Moreover, McKenzie (1998) also suggests Openness is a major weakness in the five-factor model. He concludes that there is no evidence to support an Openness factor in a further analysis of 16PF data.

The scales of Manipulativeness, Aggression, and Dogmatism which make a separate factor in the five-factor solution of the EPP are also excluded from the EPP-S. Eysenck et al. (1992) reported that these scales had relatively low alpha reliabilities (especially Dogmatism and Manipulativeness). Low reliabilities for Dogmatism and Manipulativeness are also found in this study. Together with their general lack of theoretical relevance (Eysenck et al., 1992), it seems that the case for their inclusion within a model of personality is not completely sound. By excluding these scales, the case for the three-factor model becomes much stronger.

The results of this study suggest that neither the Giant three nor Big five models of personality are particularly better at explaining the structure of the EPP. It may be that there are more scales in the EPP than are required to fit Eysenck's three-factor model of personality, but that there are not enough Practical or Openness scales for a complete five-factor description of personality. The EPP-S is a reduced version of the EPP and follows the three-factor theory of personality more closely, but at the same time it seems that the deliberate exclusion of primary scales by the authors, on the basis of their presumed lack of importance, may mean that a full description of personality is not obtained. On the basis of their study, Costa and McCrae (1995) suggest that Eysenckians need to move towards the five-factor model. However, this study together with other studies (e.g. Jackson et al, 2000) provides more evidence that this is not the case.

## NOTES

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