

# AN INTER-BATTERY FACTOR ANALYSIS OF THE COMREY PERSONALITY SCALES AND THE 16 PERSONALITY FACTOR QUESTIONNAIRE

GIDEON P DE BRUIN  
*Department of Psychology*  
*Rand Afrikaans University*

## ABSTRACT

The scores of 700 Afrikaans-speaking university students on the Comrey Personality Scales and the 16 Personality Factor Questionnaire were subjected to an inter-battery factor analysis. This technique uses only the correlations between two sets of variables and reveals only the factors that they have in common. Three of the Big Five personality factors were revealed, namely Extroversion, Neuroticism and Conscientiousness. However, the Conscientiousness factor contained a relatively strong unsocialised component and in this regard it is similar to Eysenck's Psychoticism factor. The results support the construct validity of the Comrey Personality Scales and the 16 Personality Factor Questionnaire. Implications for personality questionnaire design and validation are discussed.

## OPSOMMING

Die tellings van 700 Afrikaanssprekende universiteitsstudente vir die Comrey Persoonlikheidskale en die 16 Persoonlikheidsfaktorvraelys is aan 'n interbattery-faktorontleding onderwerp. Hierdie tegniek gebruik slegs die korrelasies tussen twee stelle veranderlikes en ontblyt slegs faktore wat die twee stelle veranderlikes gemeen het. Drie van die faktore van die vyffaktormodel is blootgelê, naamlik Ekstroversie, Neurotisme en Konsensieusheid. Die Konsensieusheidsfaktor het ook 'n relatief sterk ongesosialiseerdheidskomponent ingesluit en in hierdie sin is dit soortgelyk aan Eysenck se Psigotisme faktor. Die resultate ondersteun die konstrugeldigheid van die Comrey Persoonlikheidskale en die 16 Persoonlikheidsfaktorvraelys. Implikasies vir die ontwerp en validering van persoonlikheidstoetse word bespreek.

This study examined the factors common to the Comrey Personality Scales (CPS; Comrey, 1970) and the 16 Personality Factor Questionnaire Form A (16PF; Cattell, Eber & Tatsuoka, 1970) for a sample of Afrikaans-speaking university students. Both Comrey and Cattell proposed exhaustive taxonomies of personality traits after extensive programmes of factor analytic research. However, the two systems show marked differences. Cattell claims to have identified about twenty fundamental personality factors (Smith, 1988), while Comrey (1995) recognises only eight basic personality factors. Boyle (1989) suggested that these differences may be a reflection of different levels of explanation in the two systems, with Cattell's factors lying on the first order level and Comrey's factors on the second order level.

Two joint factor analyses of the CPS and 16PF in Australia (Noller, Law & Comrey, 1987<sup>1</sup>) and Israel (Montag & Comrey, 1990), respectively, produced solutions in which between five and seven factors provided the best theoretical and statistical fit to the observed data. At least four of the factors identified in these studies appeared similar to the factors of the five factor model of personality. The five factor model has strongly emerged as a comprehensive and integrative higher order model of the structure of personality in the last decade (e.g. Digman, 1990; John, 1990; McCrae, 1989). Although different names have been attached to the Big Five factors, they are commonly referred to as Extroversion, Neuroticism, Conscientiousness, Agreeableness and Openness to Experience (or Culture or Intellect).

Another prominent model of the structure of personality is that proposed by Eysenck (Eysenck & Eysenck, 1985). This model postulates three orthogonal basic trait factors, namely Extroversion, Neuroticism and Psychoticism. The first two factors correspond to the Extroversion and Neuroticism factors of the five factor model and were also found by Noller et al. (1987) and Montag and Comrey (1990). Eysenck (1991) believes that Agreeableness and Conscientiousness of the five factor model are components of his broader Psychoticism factor

and that they should not be regarded as basic trait factors their own right (however, also see Costa & McCrae, 1992).

Boyle (1989) re-analysed Noller et al.'s (1987) data and concluded that they extracted too many factors. He noted that his analysis provided strong support for the validity of five Cattell's second order trait factors, namely Extroversion, Anxiety, Tough Poise, Independence and Control.

The goal of this study was to examine whether factors similar to those reported in the studies of Noller et al. (1987) and Montag and Comrey (1990) could be identified in an Afrikaans-speaking South African sample using a method specifically designed to uncover only factors that two batteries of tests have in common, namely inter-battery factor analysis (Browne, 1979). A further goal was to relate the factors found in this study to the factors of Eysenck and those of the five factor model.

## METHOD

### Participants and procedure

The CPS and 16PF were completed by 700 Afrikaans-speaking first-year university students. The participants consisted of approximately an equal number of men and women with an average age of 18 years.

### Instruments

The traits measured by the Comrey Personality Scales and the 16PF respectively, are listed and described in Table 1. This table also includes the internal consistency reliability coefficients computed for the present sample.

The replicability of the factor structure of the CPS has been demonstrated in several countries and languages (Brief & Comrey, 1993; Caprara, Barbaranelli & Comrey, 1992; Bruin, Nel & Comrey, 1997; Forbes, Dexter & Comrey, 1997; Montag & Comrey, 1982; Noller, Law & Comrey, 1988; Rodrigues & Comrey, 1974; Zamudio, Padilla & Comrey, 1983). Extensive evidence concerning the relationships of the CPS scales with other personality measures and real life criteria further support their construct validity (Comrey, 1995). From Table 1 it appears that reliable scores can be obtained with the CPS.

The manual of the 16PF contains a wealth of information

*Requests for reprints should be addressed to: de Bruin, G.P., Department of Psychology, University of Stellenbosch, Private Bag XI, 7602, Matieland*

*1. Noller et al. (1987) also included the Extroversion, Neuroticism and Lie scales of the Eysenck Personality Inventory in their factors analysis.*

garding the construct validity of the traits it measures (Cattell et al., 1970). Unfortunately there is no consensus on the factorial validity of the scales, with many authors suggesting that there are less than 16 factors underlying the total set of items (e.g. Barrett & Kline, 1982; Howarth, 1976; Matthews, 1989, McKenzie, 1988). In addition it can be seen from Table 1 that the reliabilities of the scales appear to be unsatisfactory. However, Cattell (e.g. 1973) has consistently argued (in contrast to most psychometricians) that internal consistency is not a necessary requirement for a good psychometric instrument.

**Table 1**

**Traits measured by the 16PF and CPS with internal consistency reliability estimates for the present sample**

Scale name	$\alpha$
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**16 Personality Factor Questionnaire**

A (Reserved vs Warmhearted)	0,52
C (Unstable vs Stable)	0,51
E (Submissive vs Dominant)	0,60
F (Desurgent vs Surgent)	0,65
G (Low superego strength vs Superego strength)	0,41
H (Restrained vs Adventurous)	0,70
I (Tough-minded vs Tender-minded)	0,49
L (Trusting vs Suspicious)	0,27
M (Practical vs Imaginative)	0,05
N (Naïvité vs Shrewdness)	0,15
O (Self-assured vs Apprehensive)	0,47
Q1 (Conservatism vs Radicalism)	0,11
Q2 (Group dependent vs Self-sufficient)	0,42
Q3 (Uncontrolled vs Controlled)	0,26
Q4 (Relaxed vs Tense)	0,64

**Comrey Personality Scales**

T (Trust vs Defensiveness)	0,71
O (Orderliness vs Lack of Compulsion)	0,82
C (Social Conformity vs Rebelliousness)	0,66
A (Activity vs Lack of Energy)	0,82
S (Emotional Stability vs Neuroticism)	0,83
E (Extroversion vs Introversion)	0,92
M (Tough-mindedness vs Sensitivity)	0,82
P (Empathy vs Egocentrism)	0,89

**Data analysis**

The present study employed the maximum-likelihood inter-battery factor analysis of Browne (1979). The aim of this technique is to identify those factors that are common to two sets of variables, by factor analysing only the correlations between the two sets of variables. Only those factors that are common to both batteries are revealed. Factors that are present in only one of the batteries remain uncovered (Panter, Tanaka & Hoyle, 1994). Figure 1 shows that the intercorrelation matrix of two sets of variables can be divided into four quadrants. In an inter-battery factor analysis only the upper right or lower left quadrants are analysed (Gorsuch, 1983).

**RESULTS**

Eight, seven, six and five factor solutions were obtained. The varimax rotated six factor solution provided the most parsimonious and theoretically meaningful solution. Although the chi-square for the residuals was significant ( $\alpha^2 = 37,266$ ,  $df = 18$ ,  $p < 0,05$ ), the Tucker-Lewis reliability coefficient suggested that in practical terms the six factor solution provided an acceptable fit with the data (TLI = 0,98). Table 2 contains the varimax rotated factor matrix. Next, each of the factors are discussed.

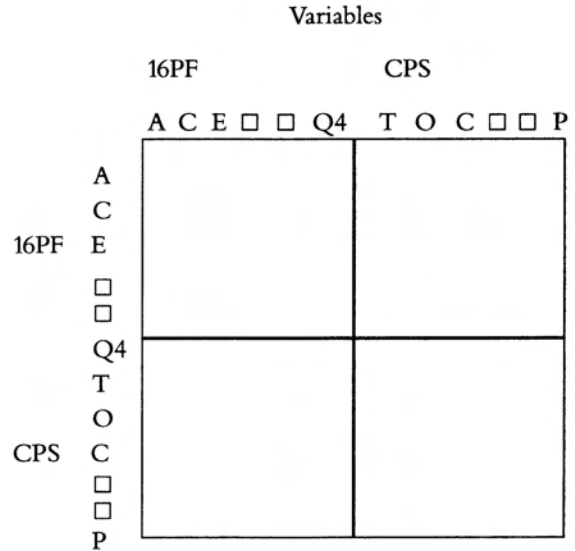


Figure 1 Inter-battery factor analysis analyzes only the upper right or lower left quadrant of the intercorrelation matrix that contains the correlations between the 16 PF and CPS

**Table 2**

**Varimax rotated inter-battery factor solution of the CPS and 16PF scales**

Scales	Factors					
	1	2	3	4	5	6
16PFA	<u>0,50</u>	-0,06	0,04	<u>0,37</u>	0,10	0,24
16PFC	0,17	<u>0,62</u>	0,23	-0,13	-0,02	-0,09
16PFE	<u>0,55</u>	0,02	-0,07	<u>-0,36</u>	0,06	-0,15
16PFF	<u>0,66</u>	0,04	-0,20	0,01	-0,13	0,05
16PF G	0,01	0,25	<u>0,64</u>	0,17	0,15	0,03
16PF H	<u>0,82</u>	0,21	0,08	-0,02	0,00	-0,03
16PFI	0,07	-0,17	-0,06	0,29	-0,15	<u>0,51</u>
16PFL	0,04	<u>-0,34</u>	-0,07	-0,27	0,21	0,09
16PF M	-0,07	-0,18	-0,03	-0,03	0,01	<u>0,41</u>
16PF N	-0,02	0,09	0,08	-0,04	<u>0,34</u>	-0,09
16PFO	-0,11	<u>-0,61</u>	0,07	0,10	-0,09	0,10
16PF Q1	0,03	-0,01	-0,05	<u>-0,36</u>	0,00	-0,06
16PF Q2	<u>-0,34</u>	-0,02	-0,09	-0,05	0,06	0,00
16PF Q3	-0,17	<u>0,40</u>	0,23	0,03	0,13	0,04
16PF Q4	-0,07	<u>-0,67</u>	-0,08	0,01	-0,10	0,09
CPS T	0,05	<u>0,47</u>	0,14	<u>0,34</u>	-0,13	-0,10
CPS O	-0,18	0,03	<u>0,53</u>	0,19	<u>0,41</u>	0,05
CPS C	0,03	0,03	<u>0,47</u>	<u>0,41</u>	-0,02	0,01
CPS A	<u>0,31</u>	<u>0,32</u>	<u>0,53</u>	-0,19	-0,04	-0,08
CPS S	0,29	<u>0,71</u>	0,13	-0,04	0,09	-0,06
CPS E	<u>0,86</u>	0,19	0,05	0,00	0,04	0,06
CPS M	-0,14	<u>0,30</u>	-0,10	<u>-0,56</u>	0,01	<u>-0,35</u>
CPS P	0,18	0,21	<u>0,30</u>	0,26	-0,11	<u>0,50</u>

Note: All factor loadings are rounded to two decimal places. Loadings of 0,30 and higher are underlined.

**Factor 1 (Extroversion)**

The following scales have significant loadings on the first factor:

16PFA	0,50,
16PFE	0,55,
16PFF	0,66,
16PF H	0,82,
16PF Q2	-0,34,
CPS A	0,31, and
CPS E	0,86.

The clustering of the 16PF scales A, E, F, H, and Q2 have been

observed in several studies and represents Cattell's second order Extroversion factor (Krug & Johns, 1986). The high loading of the CPS E scale (0,86) supports the conclusions of Montag and Comrey (1990) and Noller et al. (1987) that it is equivalent to Cattell's second order Extroversion factor. This factor matches the Extroversion factors of Eysenck and the five factor model. The loading of the CPS A scale suggests that people scoring high in extroversion are more active than people whose scores lie in the direction of introversion.

### Factor 2 (Emotional Stability)

The following scales have significant loadings on the second factor:

16PF C	0,62,
16PF L	-0,34,
16PF O	-0,61,
16PF Q3	0,40,
16PF Q4	-0,67,
CPS T	0,47,
CPS A	0,32,
CPS S	0,71, and
CPS M	0,30.

This pattern of 16PF scales is clearly recognisable as Cattell's well-known second order Anxiety factor (Krug & Johns, 1986). The high loading (0,71) of the CPS S scale suggests that it is a good indicator of Cattell's second order Anxiety factor. This factor can be regarded as similar to the Neuroticism factor of the five factor model and Eysenck's model. The loading of the CPS T scale suggests that people with high scores for this factor are suspicious and hostile toward others, while the loading of the CPS A scale indicates that emotionally stable individuals have more energy than individuals with low scores for emotional stability. In the last place the loading of the CPS M scale suggests that tough-minded people are more emotionally stable than sensitive people. Montag and Comrey (1990) and Noller et al. (1987) reported similar factors to the one found in this study.

### Factor 3 (Conscientiousness/Psychoticism)

The following scales have significant loadings on this factor:

16PF G	0,64,
CPS O	0,53,
CPS C	0,47,
CPS A	0,53, and
CPS P	0,30.

This factor was defined by scales related to morality and the adherence to rules (16PF G, CPS C), orderliness and meticulousness (CPS O), energy, stamina and the will to excel (CPS A), and to a lesser degree, empathy (CPS P). High scorers will probably be hard-working and reliable, strive to excel, be cooperative and conforming, and be concerned with the well-being of others. This factor appears similar to the Conscientiousness factor of the five factor model, but it also includes a strong conformity component and an empathy component. In this regard, this factor also appears similar to the opposite pole of Eysenck's (1992) broad Psychoticism factor (high scorers on the Psychoticism factor typically are disorderly, unreliable, non-conforming and egocentric). In his re-analysis of the Noller et al. (1987) data, Boyle (1989) found a similar factor to the one reported here and he equated it with Cattell's Control/Superego second order factor. Eysenck and Eysenck (1985) pointed out that Cattell's second order Superego factor 'looks very much like psychoticism' (p. 124).

### Factor 4 (Independence)

The following scales had significant loadings on this factor:

16PF A	0,37,
16PF E	-0,36,
16PF Q1	-0,36,
CPS T	0,34,
CPS C	0,41, and
CPS M	-0,56.

The scales with significant loadings on this factor are related to

interpersonal warmth (16PF A), assertiveness and dominance (16PF E), experimentation, a critical attitude and radicalism (16PF Q1, CPS C), trust (CPS T) and masculinity and tough-mindedness (CPS M). High scorers will probably be cold, critical, rebellious, dominant, unemotional and suspicious. In addition high scorers may be open to new and alternative ideas that deviate from the accepted norm. It therefore appears that this factor contains elements of Agreeableness and Openness to Experience. Montag and Comrey (1990) and Noller et al. (1987) reported similar factors to the one reported here. Montag and Comrey (1990) commented that this factor matched Cattell's second order Independence factor.

### Factor 5 (Residual factor)

The following scales have significant loadings on this factor:

16PF N	0,34, and
CPS O	0,41.

This factor is not interpreted because it is only weakly defined by two scales. It is also not clear what the 16PF N and CPS O scales have in common. However, it was necessary to extract this factor because factors four and six were forced together when only five factors were extracted.

### Factor 6 (Tough-mindedness)

The following scales have significant loadings on this factor:

16PF I	0,51,
16PF M	0,41,
CPS M	-0,35, and
CPS P	0,50.

The scales that define this factor are related to sensitivity (16PF I, CPS M), imaginativeness (16PF M), and empathy (CPS P). This factor is similar to Cattell's Tough-mindedness or Tough Poise second order factor (Krug & Johns, 1986). This factor also corresponds with elements of the Agreeableness and Openness to Experience factors of the five factor model. None of the factors reported by Montag and Comrey (1990) or Noller et al. (1987) correspond directly with this factor.

### Discussion

As stated in the introduction, the goals of this study was twofold. The first was to compare the factors of the present study to those reported by Montag and Comrey (1990) and Noller et al. (1987). The second goal was to compare the factors found in the present study with the factors of the five factor model and Eysenck's three factor model.

The results revealed a strong similarity between four of the factors found in the present study and the factors of the Montag and Comrey (1990) and Noller et al. (1987) studies. These results underline the robustness of the factors, because the analytic techniques and the participants in the studies differed substantially. Montag and Comrey (1990) and Noller et al. (1987) made use of principal factor analysis, while the present study employed an inter-battery factor analysis. Regarding the participants, Montag and Comrey (1990) made use of Israeli driver's licence applicants, Noller et al. (1987) made use of volunteers representative of the Australian population and the present study made use of Afrikaans-speaking university students. The inter-battery factor analysis provided support for the construct validity of the CPS and the 16PF on the second order level. It is clear that the two instruments largely measure the same broad constructs. However, because of the superior reliability of its subscales and the replicability of its first order factor structure, the CPS is probably the instrument of choice for research and applied purposes. Next, the factors found in the present study will be compared to the factors of the five factor model and Eysenck's three factor model.

The Extroversion and Emotional Stability factors found in this study are similar to the Extroversion and Neuroticism factors of the five factor model and Eysenck's model. In addition, the Conscientiousness/Psychoticism factor found in this study appears similar to the Conscientiousness factor of the five factor model and Eysenck's Psychoticism factor. However, both

the Independence and Tough-mindedness factors found in the present study do not directly match any of the factors of the five factor model or Eysenck's model. The Independence factor is probably most similar to the Agreeableness factor of the five factor model (due to the loadings of 16PF A, 16PF E, CPS T, and CPS M), but it also contains an element of openness to change (16PF Q1 and CPS C) that is mostly associated with the Openness to Experience factor of the five factor model. Likewise the Tough-mindedness factor contains elements related to openness to feelings and ideas (16PF I and 16PF M), but also elements related to sensitivity and empathy (16PF I, CPS M and CPS P) that is mostly associated with Agreeableness. Perhaps a hand rotated or Procrustes solution might show that the two factors can be rotated to positions more clearly aligned with Agreeableness and Openness to Experience.

In conclusion, the study provides support for the importance of the Extroversion, Neuroticism and Conscientiousness factors of the five factor model in an Afrikaans-speaking sample. These factors correspond largely with the traits of Eysenck's three factor model. These higher order traits have now been identified in several different countries and in several different languages (Costa & McCrae, 1992; Eysenck & Eysenck, 1985). The space defined by these three higher order factors provides researchers with a conceptual "map" of the domain of personality traits and can serve as a guideline for the development of personality measures. By administering new personality questionnaires with established questionnaires, such as the 16PF and CPS, the meaning of the new measure can be determined (at least in part) from the position that it occupies in the three-dimensional factor space defined by Extroversion, Neuroticism and Conscientiousness/Psychoticism. This should lead to greater conceptual clarity over the meaning of the traits that a questionnaire measures. Overlap between trait measures with different names will be revealed if they occupy the same position in the factor space. Similarly, differences between trait measure that have the same name, but really measure different constructs will also be revealed if they occupy different positions in the factor space.

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