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

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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 Extraversion, 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.

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; de Bruin, Nel & Comrey, 1997; Forbes, Dexter & Comrey, 1974; Montag & Comrey, 1982; Noller, Law & Comrey, 1988; Rodri-gues & 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 re-
Table 2

| Factors | Variables |
|---------|-----------|
| 16PF    | CPS       |
| A       | C         |
| C       | E         |
| Q4      | T         |
| O       | P         |
| R_{11}  |           |
| R_{12}  |           |
| R_{21}  |           |
| R_{22}  |           |

Table 1

| Scale name            | \( \alpha \) |
|-----------------------|--------------|
| 16PF 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 (Trust vs Suspicious) | 0,27        |
| M (Practical vs Imaginitive) | 0,15        |
| N (Naive 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        |

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 (\( \chi^2 = 37,266, df = 18, p < 0,05 \)), 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.
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 Q: 30.40
- 16PF Q4: -0.67
- CPS T: 0.42
- 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 unorderly, 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 (1988) 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: -0.66
- 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 toughness (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 defined 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) corresponded directly with this factor.

Discussion
As stated in the introduction, the goals of this study were 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 experience (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 rotation 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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