



# A general factor of personality in the Comrey Personality Scales, the Minnesota Multiphasic Personality Inventory-2, and the Multicultural Personality Questionnaire

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## ABSTRACT

In three studies, we analyzed validation data from personality questionnaires to test whether a general factor of personality (GFP) occupies the apex of the multi-factorial hierarchy. In Study 1, we carried out a cross-validation study of the Comrey Personality Scales ( $N_s = 746, 2097$ ) and found a GFP explained 41% of the reliable variance in a model that went from the eight primary traits to three higher-order factors (Extraversion, Conscientiousness, Empathy), and from there to the GFP. In Study 2, we analyzed the Minnesota Multiphasic Personality Inventory-2 ( $N = 2600$ ) and found a GFP explained 49% of the variance in two second-order factors and 20% of the total reliable variance in a model that went from the 10 clinical scales to four higher-order factors to two second-order factors to the big one. In Study 3, we analyzed the Multicultural Personality Questionnaire ( $N = 840$ ) and found a bi-factor model in which a GFP accounted for 41% of the reliable variance with significant loadings on four of the five factors (Open-Mindedness, 0.49; Social Initiative, 0.36; Emotional Stability, 0.38; and Flexibility, 0.95).

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## 1. Introduction

Most personality scales inter-correlate, i.e., they are not orthogonal. For example, when Digman (1997) assembled 14 studies of inter-scale correlations in the Big Five (Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism), the mean inter-scale correlation was 0.26. Digman obtained two higher-order factors: Alpha (Agreeableness, Conscientiousness, Emotional Stability) and Beta (Extraversion, Openness), which he associated with socialization processes and personal growth, respectively. Subsequently, DeYoung (2006) and DeYoung, Peterson, and Higgins (2001) replicated Digman's two-factor solution and re-labeled Alpha as Stability and Beta as Plasticity.

A positive manifold among traits has led to the observation that a general factor of personality (GFP) occupies the apex of the personality hierarchy in the same way that  $g$ , the general factor of mental ability, occupies the apex in the organization of cognitive abilities. Within the lexical tradition of studying natural languages, a large evaluative first factor (good vs. bad) has long been found (Saucier, 2008). For those studying questionnaires, the notion of

a general personality factor can be found in the “ $w$ -factor” (for will power; see Webb (1915); also Spearman (1927)). In 1997, at the Spearman Symposium on Intelligence and Personality, Hofstee (2001) introduced a general “ $p$ -factor” (personality factor) analogous to  $g$  and speculated on its heritability and evolutionary significance. Hofstee, Ten Berge, and Hendriks (1998) re-emphasized the significance of  $p$ : “At the top level of abstraction we have the first principal component.... Qualities and traits, when scored in the socially desirable direction, tend to be positively correlated.... the common component of a number of qualities is potentially as meaningful as is the  $g$ -factor of intelligence” (p. 903). Hofstee (2003) even dubbed  $p$  “the primordial one” (p. 249).

It was Musek (2007), however, who brought the GFP to center stage. He marshaled evidence for “The Big One” by analyzing data from three samples of differently-aged subjects across several assessment methods including self-reports and observer ratings. His measures included the Big Five Inventory, the Big Five Observer, the Positive Affect and Negative Affect Schedule, the Satisfaction with Life Scale, the Self-Liking and Competence Scale, and the International Personality Item Pool. Musek's analyses yielded first, Digman (1997) Big Two, followed by a higher-order factor that explained 60% of the source variance. Individuals high on the dimension were emotionally stable, agreeable, conscientious,

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extraverted, and intellectually open, with a sense of well-being, satisfaction with life, and self-esteem.

The genetics and evolution of the GFP were discussed by Rushton, Bons, and Hur (2008) who found the GFP accounted for 56% of the reliable variance in the Big Five factors of Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (reverse keyed as Emotional Stability), the EAS temperament traits of Emotional Stability, Activity, and Sociability, and several measures of prosocial behavior. The results were robust across three diverse samples—214 university students in Canada, 322 pairs of adult monozygotic (MZ) and dizygotic (DZ) twins from the UK, and 575 pairs of 2–9-year-old twins from South Korea. High scorers were identified as open, conscientious, sociable, agreeable, emotionally stable, and altruistic. Analyses of the twin data showed the GFP was present by 2–3-years of age with 50% of the variance due to genetic and 50% to environmental influences.

Further support for the GFP came from two studies by Rushton and Irwing (2008) who used structural equation modeling (SEM) to examine the inter-scale correlations of the Big Five. In Study 1, a GFP explained 45% of the reliable variance in a model that went from the Big Five to the Big Two to the Big One in the 14 sets of inter-scale correlations ( $N = 4,496$ ) assembled by Digman (1997) to establish the Big Two. Higher-Order Alpha was defined by Conscientiousness, Emotional Stability, and Agreeableness, with loadings of from 0.61 to 0.70, while beta was defined by Openness and Extraversion, with loadings of 0.55 and 0.77. In turn, the GFP was defined by Alpha and Beta with loadings of 0.67. In Study 2, the above model was confirmed with a GFP that explained 44% of the variance using data from a published meta-analysis of four alternative measures of the Big Five ( $N = 4,000$ ) by Mount, Barrick, Scullen, and Rounds (2005).

The present investigation examined whether the GFP could be found in three additional personality inventories based on a broad array of conceptual approaches. Study 1 carried out a cross-validation of the GFP on data from the first and third editions of the Comrey Personality Scales (CPS), which provided a stringent test of the GFP hypothesis because the scales were designed to produce orthogonal primary-level factors. Study 2 examined the validation data from the Minnesota Multiphasic Personality Inventory-2 (MMPI-2), which is typically used with clinical samples. Study 3 examined the validation data from the Multicultural Personality Questionnaire (MCPQ), which is a more specialized test designed to measure inter-personal behavior in a multicultural context.

## 2. The Comrey Personality Scales

### 2.1. Method

The Comrey Personality Scales (CPS) provides a comprehensive multi-dimensional assessment instrument for use in measuring eight major personality characteristics. The CPS was first published in 1970 and is now in its third edition (Comrey, 1995; Comrey,

2008). The eight major dimensions each contain several trait facets: *Trust vs. Defensiveness* (Lack of Cynicism, Lack of Defensiveness, Belief in Human Worth, Trust in Human Nature, Lack of Paranoia); *Orderliness vs. Lack of Compulsion* (Neatness, Routine, Order, Cautiousness, Meticulousness); *Social Conformity vs. Rebelliousness* (Law Enforcement, Acceptance of Social Order, Intolerance of Non-Conformity, Respect for Law, Need for Approval, Negative Tolerance of Vulgarity, Unselfishness); *Activity vs. Lack of Energy* (Exercise, Energy, Need to Excel, Liking for Work, Stamina, Meticulousness, Lack of Depression); *Emotional Stability vs. Neuroticism* (Lack of Inferiority Feelings, Lack of Depression, Lack of Agitation, Lack of Pessimism, Mood Stability); *Extraversion vs. Introversion* (Lack of Reserve, Lack of Seclusiveness, No Loss for Words, Lack of Shyness, No Stage Fright); *Mental Toughness vs. Sensitivity* (No Fear of Bugs, No Crying, No Romantic Love, Tolerance of Blood, Tolerance of Vulgarity); *Empathy vs. Egocentrism* (Sympathy, Helpfulness, Service, Generosity, Unselfishness).

Each personality scale contains 20 items. In addition there are two validity scales. A Validity Check scale consists of eight items measuring random responding or misunderstanding, and a Response Bias scale with 12 items measuring Social Desirability responding. This makes a total of 180 items for the inventory as a whole. Half of the items on each scale are positively worded with respect to the scale name and half are negatively worded in order to control for possible acquiescence response set. Each item is a statement to which the respondent replies using a seven-point answer scale (e.g., “A sad movie makes me feel like crying”—(1) Never, (2) Very rarely, (3) Rarely, (4) Occasionally, (5) Frequently, (6) Very frequently, and (7) Always).

A unique feature of the test construction philosophy is to increase item reliability through the use of multiple-response formats with seven-point answer scales. To increase the reliability of the factor structure still further, multiple items were used as the basic unit variable, a procedure described as Factor Homogeneous Item Discrimination (FHID). This provided a total score over several (usually from two to six) items which met two criteria: (a) the items were specifically conceived and logically conceptualized as measures of the particular variable under consideration, and (b) in empirical terms, they defined the factor in factor analyses of items. This dual criterion was said to establish both conceptual and empirical homogeneity.

### 2.2. Results

Table 1 gives the correlations (above the diagonal) among the eight scales reported by Comrey (1970) for the original validation sample of 746 volunteer subjects (362 males, 384 females, mostly university students), and (below the diagonal) for the updated validation sample of 2,097 volunteer subjects (962 males, 1,135 females; again mostly university students but also including police officers, security guards, prisoners, nurses, and psychiatric outpatients; mean age = 25 years, SD = 11 years). Shown in the diagonal

**Table 1**  
Correlations among the Comrey Personality Scales (decimal points omitted). Above diagonal for the original 1970 validation sample,  $N = 746$ ; below diagonal for the updated 1995 validation sample,  $N = 2,907$ . Alpha reliabilities are in the diagonal.

	Trust	Orderliness	Conformity	Activity	Emotional stability	Extraversion	Mental toughness	Empathy
Trust	(.91)							
Orderliness	.01	(.92)						
Conformity	.14	.48	(.94)					
Activity	.11	.36	.20	(.91)				
Emotional stability	.34	.11	.18	.39	(.95)			
Extraversion	.12	.01	.05	.35	.36	(.96)		
Mental toughness	-.07	-.26	-.27	.10	.14	.01	(.87)	
Empathy	.33	.05	.08	.25	.15	.24	-.26	(.94)

are the split-half reliabilities. The mean inter-scale correlation in both data sets was  $r = 0.14$  after reverse keying Masculinity (0.18 after correction for reliability). The original 746 subjects were included in the updated validation sample, so the two samples are not independent. Nevertheless, the existence of two data sets allows for a quasi cross-validation design in which the factor structure of the CPS can be explored and tested in a calibration sample, and then cross-validated in a validation sample. Cross-validation is a particularly powerful form of model testing (Jöreskog, 1993), so we adopted this strategy using LISREL 8.72 (Jöreskog & Sorbom, 2001), despite the lack of independence between the two samples.

In order to evaluate model fit we relied mainly on the standardized root mean square residual (SRMSR), the root mean square error of approximation (RMSEA), and the non-normed fit index (NNFI), as indicated by the simulations of Hu and Bentler (1998, 1999). We adopted cut-off points of  $\leq 0.05$  for the SRMSR, about 0.06 for the RMSEA, and  $\geq 0.95$  for the NNFI. These also conform to more recent recommendations (Schermelleh-Engel, Moosbrugger, & Muller, 2003).

As a first step the data were subjected to an exploratory analysis with Mplus using maximum likelihood estimation and promax rotation, testing for one, two and three factors. The RMSEA index (0.05) suggested the plausibility of the three-factor solution (Fig. 1). Higher-order-factors were found: Extraversion (Emotional Stability, Extraversion, Activity, Masculinity); Conscientiousness (negative Masculinity, Orderliness, Conformity); and Empathy (negative Masculinity, Trust, Empathy). Consequently, this solution was subjected to confirmatory factor analysis. With the addition of two correlated errors, it provided an adequate fit to the data ( $\chi^2 = 54.3$ ;  $df = 15$ ;  $P < 0.01$ ; SRMSR = 0.04; RMSEA = 0.06; NNFI = 0.93). Correlations between the three-factors suggested the existence of a higher-order factor. Because the higher-order factor is only just identified, the fit statistics are identical to the first-order model. All factor loadings were significant at the  $P < 0.001$  level, and the second-order loadings were moderate to large in magnitude.

As a second step, a cross-validation was carried out whereby the higher-order, three-factor model derived from the calibration sam-

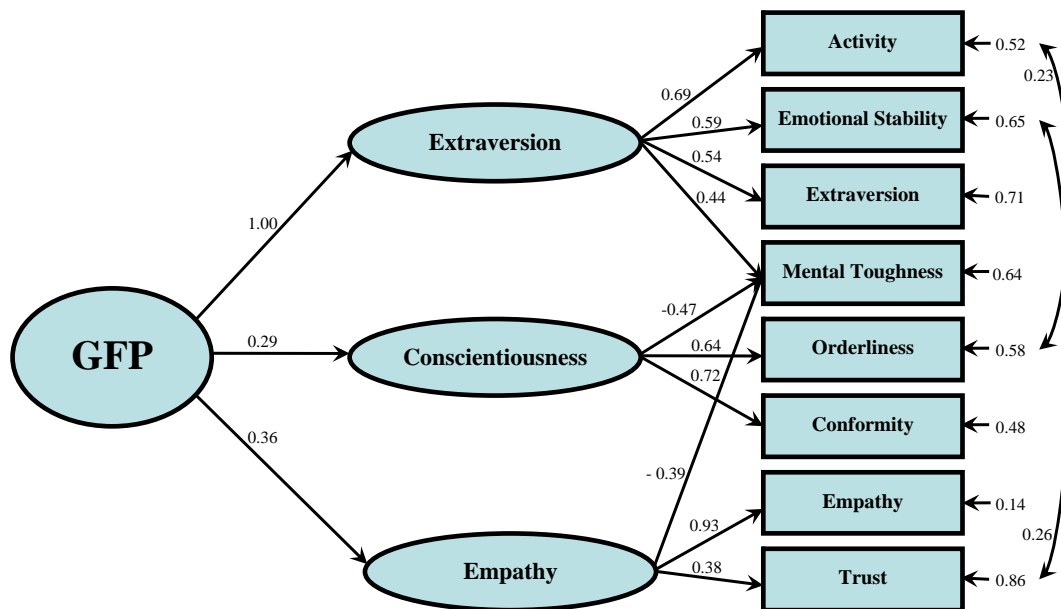
ple was tested using the updated validation sample. This model, minus the correlated errors, was directly subjected to a confirmatory factor analysis. With the addition of two correlated errors, one differing from that in the calibration sample, the results indicated a reasonable fit to the data ( $\chi^2 = 155.86$ ;  $df = 14$ ;  $P < 0.01$ ; SRMSR = 0.04; RMSEA = 0.07; NNFI = 0.91), providing evidence for the generalizability of the model. As evident from Fig. 1, the three first-order factors showed moderate to large loadings on the general factor, explaining 41% of the variance, with extraversion demonstrating an exceptionally high loading.

### 3. The Minnesota Multiphasic Personality Inventory-2

#### 3.1. Method

The Minnesota Multiphasic Personality Inventory-2 (MMPI-2) is a broad-based test designed to assess a number of the major patterns of personality and emotional disorders. It is an extensively updated and re-standardized version of one of the earliest self-report questionnaires designed to help clinical diagnosis (Hathaway & McKinley, 1943; Helmes, 2008). A nationwide sampling program yielded a normative sample of 2,600 people aged between 18 and 90 years (1,138 males, 1,462 females), with age, ethnic, racial, and geographic backgrounds roughly comparable to the 1980 US. Census except for an underrepresentation of Hispanics and Asian-Americans and an overrepresentation of college educated and higher socioeconomic groups.

The revision contains 567 statements to which the respondent answers true, false, or cannot say. The answers fall on 10 clinical scales and three validity scales (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989). The 10 clinical scales are: *Hypochondriasis* (High scorers reflect an exaggerated concern about their physical health); *Depression* (High scorers are usually depressed, despondent, and distressed); *Conversion Hysteria* (High scorers complain about physical symptoms with no apparent organic cause); *Psychopathic Deviate* (High scorers show a disregard for social and moral standards); *Masculinity/Femininity* (High scorers show “traditional” masculine or feminine attitudes and interests); *Paranoia* (High scorers demonstrate extreme suspiciousness and feelings of



**Fig. 1.** Standardized confirmatory factor solution on the Comrey Personality Scales going from eight primary traits to three higher-order factors to the GFP (Ellipses enclose factors, boxes enclose indicators. Long unidirectional arrows represent factor loadings, short arrows unexplained variance, and double-headed arrows depict correlated errors. GFP = General factor of personality).

**Table 2**  
Intercorrelations of basic scales for contemporary normative sample (N = 2,600) of the Minnesota Multiphasic Personality Inventory-2. Reliabilities in diagonal.

	Hs	D	Hy	Pd	Mf	Pa	Pt	Sc	Ma	Si
Hypochondriasis (Hs)	(.79)									
Depression (D)	.55	(.62)								
Hysteria (Hy)	.47	.35	(.57)							
Psychopathic deviate (Pd)	.35	.36	.26	(.61)						
Masculinity/femininity (Mf)	.03	.15	.16	.12	(.48)					
Paranoia (Pa)	.24	.29	.27	.41	.21	(.37)				
Psychasthenia (Pt)	.56	.54	.02	.49	.16	.39	(.86)			
Schizophrenia (Sc)	.58	.44	.08	.60	.11	.43	.84	(.86)		
Hypomania (Ma)	.20	-.14	-.04	.39	.01	.18	.35	.49	(.60)	
Social introversion (Si)	.35	.55	-.17	.13	.10	.10	.56	.44	-.20	(.83)

persecution); *Psychasthenia* (High scorers tend to be highly anxious, rigid, tense, and obsessively worrying); *Schizophrenia* (High scorers tend to be socially withdrawn and to have strange beliefs, unusual experiences, and special sensitivities); *Hypomania* (High scorers tend to be emotionally excitable, and impulsive, often featuring over-ambitiousness, extraversion, and high aspirations); and *Social Introversion* (High scorers tend to be shy, self-effacing, and to prefer solitary pursuits). The three validity scales are *Lie* (High scorers attempt to present themselves in a very favorable light, and possibly tell lies to do so); *Frequency* (High scorers are presenting themselves in a particularly bad way and may well be “faking bad”); *Correction* (High scorers tend to be very defensive).

3.2. Results

We used unit-weighting to average the values of the data given in the test manual for the 1,056+ males and 1,342+ females from the nationally referenced sample (N fluctuated slightly by scale; Butcher et al., 1989). Table 2 gives the inter-scale correlations among the 10 clinical scales. Shown in the diagonal are the alpha reliabilities. The average correlation among the 10 scales was  $r = 0.28$  (0.43 corrected for reliability using the coefficient alphas). The inter-correlated nature of these scales has long been recognized as giving rise to a large general factor which may be variously interpreted as comorbidity, social desirability, anxiety, ego resilience, or demoralization (Butcher et al., 1989; Helses, 2008).

We carried out a principal axis factor analysis on the 10 clinical scales with the data both uncorrected and then corrected for unreliability by replacing the unities in the diagonal with the scale’s reliability. The GFP accounted for 35% of the total variance and 53% of the reliable variance. We also carried out a SEM analysis. As a first step, an exploratory factor analysis of the ten scales was conducted with Mplus using maximum likelihood estimation and promax rotation, testing for factor solutions ranging from one to four factors. The RMSEA index (0.05) suggested that a four-factor solution provided the most adequate fit (Fig. 2). Higher-order-factors were found as follows: Alpha (Social Introversion, Schizophrenia, Psychasthenia, negative Hysteria, Depression); Beta (Hysteria Hypochondriasis, Depression); Gamma (Hysteria, Depression, Masculinity/Femininity, Psychopathic Deviate, Paranoia, negative Hypomania); and Delta (Schizophrenia, Psychasthenia, Psychopathic Deviate, Paranoia, Hypomania). Consequently, this solution was subjected to confirmatory factor analysis using LISREL 8.72. This began with a first order confirmatory analysis with four factors, followed by a higher-order analysis with two higher-order factors, and finally with the correlation between the two second-order factors replaced by the GFP, identified by assuming equality of factor loadings. The resultant model, as presented in Fig. 2, provides close fit to the data according to the SRMSR and NNFI, while the RMSEA is indicative of moderate fit ( $\chi^2 = 435.1$ ;  $df = 25$ ;  $P < 0.01$ ; SRMSR = 0.05; RMSEA = 0.078; NNFI = 0.95). The GFP accounted for 49% of the variance in the two second-order factors and 20% of the total reliable variance.

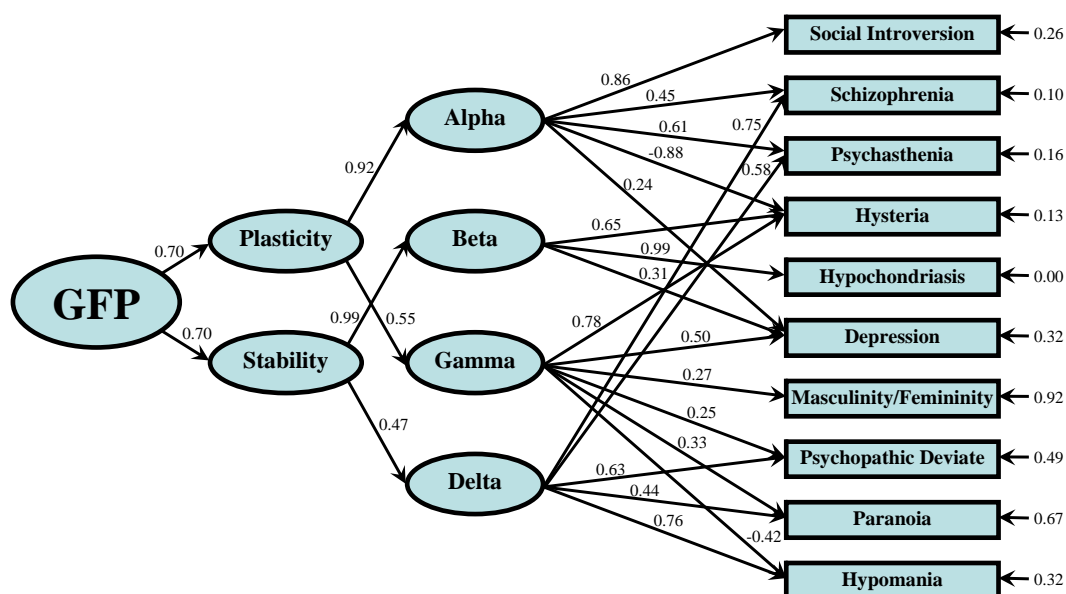


Fig. 2. Third-order confirmatory factor model of the Minnesota Multiphasic Personality Inventory-2 with a general factor of personality (conventions as for Fig. 1).

We loosely interpreted Alpha as Social Introversion, Beta as Anxiety, Gamma as Asocial, and Delta as Anti-Social, with Alpha and Gamma giving rise to a higher-order factor that could be (negative) Plasticity or Externalizing Behavior and Beta and Delta giving rise to a higher-order factor that could be (negative) Stability or Internalizing Behavior, with both of these then giving rise to the GFP. However, given the high levels of comorbidity, it would be prudent not to over-interpret the meaning of any of these factors. The emergence of a general factor of mental disorder based on the MMPI-2 mirrors the highly correlated nature of the prevalence of DSM-IV disorders in the general population (Kessler, Chiu, Demler, & Walters, 2005), while two factors at the second-order level is consistent with what is typically found in analyses of comprehensive taxonomies of personality (DeYoung, Hasher, Djikic, Criger, & Peterson, 2007).

**4. The Multicultural Personality Questionnaire**

**4.1. Method**

Van der Zee and Van Oudenhoven (2001) described the Multicultural Personality Questionnaire (MCPQ) as broadly based on the Costa and McCrae (1992) Big Five factors but narrowed so as to cover traits relevant to multicultural success—such as selecting and training international employees. Five dimensions of multicultural orientation are assessed using 78 five-point scales running from *not at all applicable* (1) to *totally applicable* (5). The scales are: *Cultural Empathy* (High scorers have an interest in other people and are sensitive to their feelings and beliefs); *Open-Mindedness* (High scorers have an absence of prejudice); *Social Initiative* (High scorers tend to actively approach social situations and take the initiative); *Emotional Stability* (High scorers remain calm in stressful situations); and *Flexibility* (High scorers adapt to new situations). Subsequently, Leone, Van der Zee, van Oudenhoven, Perugini, and

Ercolani (2005) reported on the cross-cultural generalizability of the scales for 421 Italian (261 female, 160 male) and 419 Dutch (316 female, 103 male) college students aged 18–26 years.

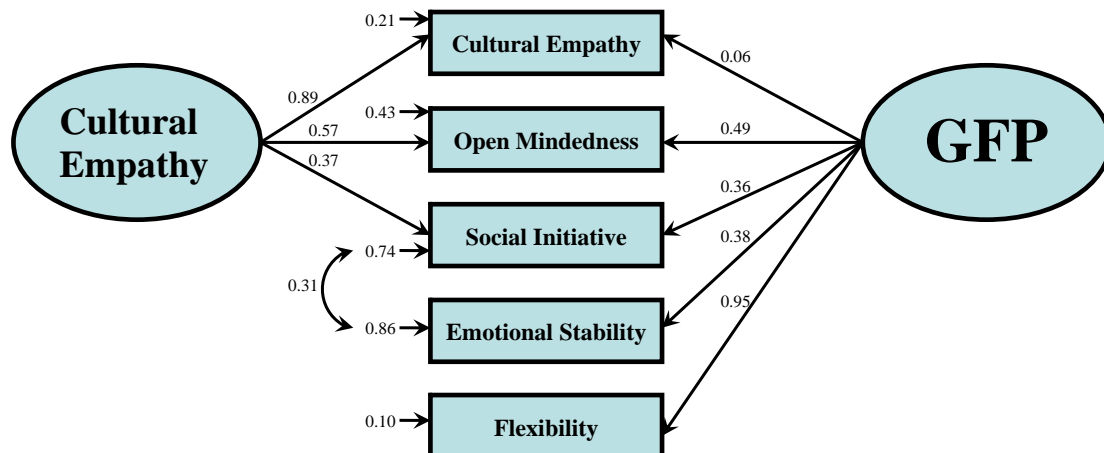
**4.2. Results**

Table 3 gives the inter-scale correlations for Leone et al. (2005) combined sample based on a unit-weighting. Shown in the diagonal are the averaged alpha coefficient reliabilities. The mean inter-scale correlation was  $r = 0.31$ . A principal axis factor analysis was carried out on the data both uncorrected and then corrected for reliability by replacing the unities in the diagonal with each trait’s alpha coefficient. The GFP accounted for 33% of the total variance and 41% of the reliable variance. The loadings on the GFP were Cultural Empathy, 0.45; Open-Mindedness, 0.75; Social Initiative, 0.65; Emotional Stability, 0.42; and Flexibility, 0.55.

We carried out a confirmatory analysis of a one-factor model with LISREL 8.72 using the same criteria for goodness-of-fit as in Study 1. According to these criteria, a one factor model did not fit the data ( $\chi^2 = 359.7$ ,  $df = 5$ ,  $P < 0.001$ , SRMSR = 0.12, RMSEA = 0.29, NNFI = 0.32). Inspection of the modification indices suggested the possibility of a second factor which loaded on Cultural Empathy, Open-Mindedness and Social Initiative. We fit a bi-factor model, since in such models the factors are uncorrelated, which in principle greatly simplifies interpretation (Jöreskog & Sorbom, 2001). With the addition of a correlated error between Social Initiative and Emotional Stability, this model provided a good fit to the data ( $\chi^2 = 0.07$ ,  $df = 2$ ,  $P = 0.67$ ; SRMSR = 0.007; RMSEA = 0.00, NNFI = 1.01). From Fig. 3, it can be seen that all scales, with the exception of Cultural Empathy, showed moderate to large loadings on the general factor, four of which were significant at the 0.01 level. This analysis supports the existence of a major common factor of personality, but clearly not all personality scales relate to this factor.

**Table 3**  
Intercorrelations for the sales of the Multicultural Personality Questionnaire from two combined samples ( $N = 840$ ; decimals omitted). Reliabilities in diagonal.

	Cultural empathy	Open-mindedness	Social initiative	Emotional stability	Flexibility
Cultural empathy	(79)	54	34	00	06
Open-mindedness		(83)	38	18	47
Social initiative			(88)	44	34
Emotional stability				(87)	36
Flexibility					(70)



**Fig. 3.** MCPQ confirmatory bi-factor structure (conventions as for Fig. 1).

## 5. Discussion

The three studies reported here unequivocally support the existence of a general personality factor, together with a number of more minor factors. Most previous tests of the GFP have relied on assessments of the Big Five (Musek, 2007; Rushton & Irwing, 2008), although the GFP has also been found using the EAS temperament traits and an eclectic set of 35 traits assembled agnostic as to the underlying structure of personality (Rushton et al., 2008). The current studies considerably broaden the array of assessment contexts in which a GFP has been identified.

One question that arises is whether the three general factors from the three questionnaires are the same? We believe they do all indicate the same underlying latent dimension but note that in any particular study, the GFP picks up whatever content is most represented in the item pool—such as Extraversion from the Comrey Personality Scales in Study 1, Dysphoria from the Minnesota Multiphasic Personality Inventory in Study 2, and Flexibility from the Multicultural Personality Questionnaire in Study 3. Whether the same GFP exists in multiple personality measures can only be determined with data from different tests on the same people.

Another question is whether the size of the GFP is method dependent? It is a truism that the amount of variance explained will depend on a study's particular tests and analytical procedures. However, in principle, there is nothing vague about the GFP. Quite the contrary; it is by definition the most internally consistent linear combination of all traits. In this it resembles the *g* factor in the intelligence domain. If this suggestion is correct, its location at the apex of the hierarchy will be almost completely fixed in any large data set.

The observation that a GFP occupies the apex of the hierarchical structure should stimulate theoretical interest and generate additional research. Does the GFP reflect a substantive dimension with real world correlates that evolved as a result of natural selection for socially desirable behavior as Rushton et al. (2008) suggested? Such a formulation would be in accord with Hofstee's (2001) description of a general factor as the extent to which an individual has desirable versus undesirable qualities. As Hofstee noted, social desirability is much more than just an artifact of social perception. Some people are more socially desirable than others by virtue of being more reality-oriented, competent, and steady. Numerous intriguing questions remain about the GFP, which an evolutionary perspective might enlighten.

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