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Overlap between General Factors of Personality in the Big Five, Giant Three, and trait emotional intelligence

Dimitri Van der Linden [a,*], Ioannis Tsaousis [b], K.V. Petrides [c]

[a] Institute of Psychology, Erasmus University Rotterdam, The Netherlands
[b] Department of Psychology, University of Crete, Greece
[c] London Psychometric Laboratory, University College London, United Kingdom

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ABSTRACT

We extracted General Factors of Personality (GFPs) from inventories based on the Big Five model and on Eysenck's Giant Three model within one sample ($N = 274$). The GFPs from the two inventories showed considerable overlap, ranging from .52 to .67 (in absolute values). The mean intercorrelation was $r = .60$. Moreover, the GFPs showed strong overlap with measures of trait emotional intelligence ($r_{mean} = .72$). These correlations remained substantial even after we controlled for social desirability bias. Overall, the pattern of results supports the notion of the GFP as a construct that is consistent across different measures and that is closely related to the construct of trait emotional intelligence.

1. Introduction

Recently it has been re-emphasized that a general factor exists in many measures of personality (e.g., Musek, 2007; Rushton & Irwing, 2011; Van der Linden, te Nijenhuis, & Bakker, 2010). This General Factor of Personality (GFP) emerges from the shared variance among more specific personality traits and reflects a continuum of socially desirable behavior with positive traits at the high end of that continuum and negative traits at the low end. Large meta-analyses confirmed the existence of the GFP, explaining approximately 50% of the variance in the well-known Big Five model (Rushton & Irwing, 2011; Van der Linden, te Nijenhuis, et al., 2010). In addition, the GFP has also been identified in many other personality measures that are not based on the Big Five (see Rushton & Irwing, 2011 for a review).

Despite such robust findings, to date the GFP remains a controversial topic eliciting a lively debate. This debate does not focus on whether a general factor in personality can be identified because evidence on this point is indisputable. Instead the debate concentrates on the interpretation of the GFP. Several researchers have suggested that higher-order personality factors, such as the GFP, reflect nothing more than a methodological or statistical artifact (Anusic, Schimmack, Pinkus, & Lockwood, 2009; De Vries, 2011). In this artifact view of the GFP, the main explanation is that the factor mainly emerges from tendencies of participants to provide socially desirable answers on personality measures (e.g., Bäckström, Björklund, & Larsson, 2009).

Other researchers have suggested that the GFP is a substantive factor with theoretical and real-life implications (Musek, 2007; Rushton et al., 2009; Van der Linden, Scholte, Cillessen, te Nijenhuis, & Segers, 2010; Van der Linden, te Nijenhuis, et al., 2010). In this substantive view, it is acknowledged that the GFP reflects social desirability, but in a true sense and not only as a response bias. Thus, individuals scoring high on the GFP possess a mix of socially desirable traits and can be described as open, hard-working, sociable, friendly, and emotionally stable (Rushton et al., 2009). Such a mix of traits may convey social advantages like eliciting higher job performance ratings from their supervisors (Van der Linden, te Nijenhuis, et al., 2010), or being rated as more likeable or popular by classmates (Van der Linden, Scholte, et al., 2010).

Currently, there are still several important issues in the GFP debate, some of which we aim to address in the context of the present study. The first relates to the consistency of GFPs extracted from different personality frameworks. In the cognitive ability domain, the consistency of the general factor *g* is established. The *g*s extracted from different cognitive tests normally show enough overlap to suggest that the same construct is measured. The average correlation between *g*s extracted from different tests is $r = .75$ (Jensen, 1998).

In the domain of personality, the evidence regarding the consistency of the GFP currently showed mixed results. Several recent

* Corresponding author. Address: Erasmus University Rotterdam, Institute of Psychology T13-39, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands. Tel.: +31 10 408 2454.
E-mail address: vanderlinden@fsw.eur.nl (D. Van der Linden).

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studies reported good consistency among GFPs from different personality inventories: (i) Van der Linden, te Nijenhuis, Cremer, and van der Ven (2011) reported an average correlation of $r = .53$, with a range of .40–.67 between GFPs from six different inventories, (ii) Wood and Hardy (2012) reported correlations in the range from $r = .64$ to $r = .78$ between GFPs from four personality inventories, (iii) Rushton and Irwing (2011) and Loehlin and Martin (2011) used two different inventories and reported correlations ranging from $r = .72$ to $r = .80$.

On the other hand, De Vries (2011) reported low correlations between GFPs extracted from Big Five and HEXACO inventories. Similarly, Hopwood, Wright, and Donnellan (2011) reported lack of strong consistency between GFPs from eight different personality questionnaires.

Considering these contradictory results, in the present study we sought to contribute to the literature in this area by examining the convergence of GFPs extracted from two personality measures based on different theoretical frameworks: the Big Five model of personality (Goldberg, 1981) as operationalized by the Traits Personality Questionnaire (TPQue: Tsaousis, 1999), and the Giant Three model of personality (Psychoticism, Extraversion, and Neuroticism) as operationalized by the Eysenck Personality Questionnaire (EPQ: Eysenck & Eysenck, 1975).

To our knowledge, no previous studies have directly compared GFPs based on the Big Five model and the Giant Three model. If the GFP is indeed a general factor underlying many lower-order traits, then it can be expected that GFPs extracted from different inventories will show considerable overlap (Van der Linden et al., 2011). In contrast, if the GFP is merely a statistical artifact, we would not expect GFPs extracted from different inventories to correlate strongly (see for example, De Vries, 2011; Hopwood et al., 2011).

The second issue we address relates to the content, or psychological meaning of the GFP. Specifically, if the GFP is a substantive factor, it would be important to establish its nature and nomological net. One interpretation is that the GFP reflects a personality factor that facilitates social participation (Loehlin & Martin, 2011). That is, the GFP might reflect the ability or propensity to behave in a way that is socially appropriate given specific interpersonal situations. For example, one may be very angry, but instead of acting out in rage, calmly expresses one's dissatisfaction with the situation. Such behavior is often useful because it enhances the probability of reaching social goals like making friends, finding a partner, or obtaining promotion at work. The proneness to exhibit socially appropriate behavior may be more than just impression management or faking, but instead may reflect a fundamental aspect of an individual's personality.

The tendency to show appropriate behavior in different interpersonal contexts has been linked to the construct of emotional intelligence (e.g., Petrides, 2011). Consequently, we expect the GFP to overlap with measures of emotional intelligence (EI). The literature also shows that currently there are different theoretical models of EI, ranging from models that include cognitive abilities to models in which EI consists of a set of different traits (Petrides, 2011). In the present study however we focus on the trait emotional intelligence model. Trait EI refers to a constellation of emotional perceptions located at the lower levels of personality hierarchies (Petrides, Pita, & Kokkinaki, 2007). The reason for focusing on trait EI is that this construct is considered to reflect a personality trait that lies outside the taxonomy of human cognitive ability. In addition, it has been shown that trait EI is meaningfully related to mainstream scientific models of personality, such as the Big Five and the Giant Three (e.g., Petrides et al., 2010). Thus, a logical next step is to examine whether GFPs extracted from these personality models are related to Trait EI.

The designated operationalization vehicle of trait EI is the trait emotional intelligence questionnaire (TEIQue: Petrides et al., 2007). Previous studies have shown that trait EI, as operationalized with the TEIQue, is related to multiple life domains such as job satisfaction, relationship satisfaction, and general health (see Petrides, 2011 for an overview).

Veselka et al. (2009) found initial evidence that a GFP, extracted from the HEXACO model of personality, and trait EI occupy closely related factors space. To our knowledge however, there are no studies that within one sample have compared GFPs extracted from different personality models (i.e., the Big Five and Giant Three models) to trait EI. In addition, no previous studies have explicitly linked a GFP extracted from the Giant Three to trait EI. In the present study we will do so and expect that the GFPs from the Big Five and the Giant Three will both considerably overlap with trait EI.

As stated above, a prominent alternative explanation for the GFP is that it represents a social desirability artifact. Again however, the current evidence on this view is contradictory. Several studies have indicated that the GFP predominantly reflects socially desirable responding tendencies (Anusic et al., 2009; Bäckström et al., 2009), whereas other studies indicated that social desirability as a bias is not a good explanation for the GFP (e.g., Erdle & Rushton, 2011). Given these contradictory findings in the literature, we consider it useful to also contribute to the investigation of the relationships between the GFP and social desirability.

In sum, we will compare GFPs extracted from the Big Five and the Giant Three against a measure of trait EI as well as against a measure of social desirability with a view to elucidate the theoretical and empirical nature of the GFP.

2. Method

2.1. Participants and procedure

Two hundred and seventy four Greek students from two State Universities (Thessaloniki and Athens) participated (92 males, 182 females; see also, Petrides et al., 2007). The mean age of the sample was 24.45 years ($SD = 5.85$ years). The detailed data collection procedure is described in Petrides et al. (2007) where the data set has been extracted. All participants filled out the measures on the Big Five, Giant Three, and trait emotional intelligence (see below).

2.2. Measures

2.2.1. Big Five

The Big Five factors were measured with the Trait Personality Questionnaire (TPQue: see Tsaousis, 1999 for validation) consisting of 206 items with a five-point Likert scale format. The TPQue measures Openness (O), Conscientiousness (C), Extraversion (E), Agreeableness (A), and Neuroticism (N). Internal consistencies were .73, .85, .86, .73, and .84, respectively. Each of the Big Five factors is built up from six underlying personality facets (see Tsaousis, 1999).

2.2.2. Giant Three

We used the 84-item Greek adaptation of the Eysenck Personality Questionnaire (EPQ: Eysenck & Eysenck, 1975) to measure the three Eysenckian dimensions (Neuroticism, N; Extraversion, E; Psychoticism, P). We used the six-point Likert scale version that increases variability in the responses and the reliability of the scores. The alphas of the three dimensions were .89, .89, and .50 for E, N, and P, respectively. The EPQ also contains a Lie Scale, which assesses the tendency for socially desirable answers. We used this scale as a measure of social desirability response bias or faking.

2.2.3. Trait emotional intelligence

The trait emotional intelligence questionnaire (TEIQue v 1.00: Petrides, 2001) was used to operationalize trait EI. This version

consists of 144 items responded to in a seven-point Likert Scale format.

2.3. Statistical analysis

We extracted GFPs by obtaining the first unrotated factor in the joint correlation matrix of the personality scales (see also Van der Linden, te Nijenhuis, et al., 2010; Veselka et al., 2009). We used Maximum Likelihood (ML) as well as Principal Component Analysis (PCA). The former method has optimal properties for extracting the shared variance uncontaminated by the unique variance of the individual scales. The latter method assigns both shared and unique variance to the factors.

Besides analyzing the scale scores, we also conducted factor analyses on facets scores for the TPQue and parcel scores for the EPQ. These analyses allowed us to compare GFPs based on different levels of the personality measurements. The TPQue contains 30 (5 factors * 6 facets) personality facets (e.g., Conscientiousness involves the facets: Competence, Order, Dutifulness, Achievement, Striving, Self-discipline, and Deliberation). The EPQ is not based on a facet structure, however we constructed 18 (3 dimensions * 6 parcels) unidimensional parcels comprising 3 or 4 items, according to the internal consistency parceling approach (Kishton & Widaman, 1994).

3. Results

3.1. GFP extraction

3.1.1. Big Five

The first unrotated factor in the Big Five inventory explained 41% of the variance (Eigen value [*EV*] = 2.03). Each Big Five factor loaded substantially and in the expected direction on this factor. Under the ML method, factor loadings were .40, .44, .76, .37, and −.56, for O, C, E, A, and N, respectively. Under the PCA method, the loadings were .50, .61, .78, .56, and −.69, respectively. In the Big Five facets analyses, the first factor explained 24% of the variance (*EV* = 7.32). The majority of the 30 facets loaded substantially and in the expected direction on this factor (ML, absolute $M_{Loading}$ = .41, *SD* = .22; PCA, absolute $M_{Loading}$ = .43, *SD* = .20). Table 1 shows that the Big Five GFPs extracted with the different extraction methods (ML or PCA) or the different variables (scale scores or facet scores) were very highly correlated, ranging from *r* = .94 to *r* = .98, thus showing the GFP's existence, independent of extraction method.

3.1.2. Giant Three

The first unrotated factor in the EPQ explained 46% of the variance of the lower-order scales (*EV* = 1.39). Under the ML method, Neuroticism showed the largest loading on the GFP (.99), with Psychoticism and Extraversion showing lower loadings of .35 and −.27, respectively. Note that due to the inclusion of two socially undesirable scales, the GFP was also keyed in that direction. Under the PCA method, GFP loadings were .66, −.41, and .88 for P, E, and N, respectively. In the parcel analyses, the first factor explained 29% of the variance (*EV* = 5.22), with most of the 18 parcel loadings in the expected direction in both the ML (absolute $M_{Loading}$ = .43, *SD* = .26) and the PCA (absolute $M_{Loading}$ = .46, *SD* = .22) method. As can be seen in Table 1, similarly to the Big Five, the various GFPs extracted from the EPQ also correlated very highly, ranging from *r* = .88 to *r* = .99 (Mean *r* = .91).

3.1.3. GFP comparisons

In Table 1, it becomes clear that the GFPs from the Big Five and Giant Three measures substantially overlapped: Depending on the type of GFP (ML or PCA, and scales or facets/parcels), the correlations ranged from −.52 to −.67. The negative sign of the correlation is due to the higher number of socially undesirable scales in the EPQ which causes a reflection in the GFP sign. The lowest correlation (*r* = −.52) was between the Big-Five based GFP (ML-method) and the Giant-Three based GFP (ML-method). The highest correlation (*r* = −.67) was between the Big-Five based GFP (ML) and Giant-Three GFP extracted from the parcel scores. The average correlation was *r* = .60.

3.2. GFP, Trait EI, and social desirability as response bias

The correlations between the GFPs and trait EI were substantial (see Table 1), ranging in absolute values from .61 to .78 (r_{mean} = .72). In GFP-theory, the scores on many personality scales partly reflect a shared component (the GFP) and partly the unique variance of a trait. In line with this notion, we used hierarchical regression analysis to test whether the total unique variance of the individual traits contributed to the prediction of trait EI,

Table 1
Correlations between the variables in the study (*n* = 274).

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
1. Openness	–																	
2. Conscientiousness	−.05	–																
3. Extraversion	.37	.30	–															
4. Agreeableness	.30	.23	.26	–														
5. Neuroticism	−.13	−.42	−.43	−.11	–													
6. Psych (EPQ)	.02	−.17	.09	−.01	.23	–												
7. Extra (EPQ)	.21	.24	.84	.22	−.38	.12	–											
8. Neuro (EPQ)	−.09	−.34	−.29	−.13	.83	.35	−.27	–										
9. GFPB5-ML (*S*)	.46	.52	.91	.44	−.67	−.04	.75	−.52	–									
10. GFPB5-PC (S)	.56	.61	.78	.56	−.69	−.10	.64	−.55	.97	–								
11. GFPB5-ML (F)	.39	.63	.84	.42	−.71	−.05	.74	−.56	.98	.94	–							
12. GFPB5-PC (F)	.37	.58	.87	.32	−.74	−.07	.69	−.55	.98	.98	.98	–						
13. GFPG3-ML (S)	−.09	−.34	−.29	−.13	.83	.35	−.27	.99	**−.52**	**−.57**	**−.64**	**−.57**	**–**					
14. GFPG3-PC (S)	−.11	−.37	−.39	−.15	.75	.66	−.41	.88	**−.55**	**−.59**	**−.65**	**−.59**	.88	–				
15. GFPG3-ML (P)	−.13	−.37	−.45	−.17	.84	.35	−.47	.97	**−.55**	**−.59**	**−.67**	**−.60**	.97	.93	–			
16. GFPG3-PC (P)	−.11	−.37	−.39	.15	.75	.66	−.41	.88	**−.56**	**−.60**	**−.66**	**−.59**	.88	.99	.93	–		
17. Trait EI	.25	.57	.61	.25	−.68	−.11	.53	−.63	.76	.77	.78	.78	−.63	−.61	−.69	−.61	–	
18. Lie-scale	.10	.42	.22	.32	−.13	.22	.22	−.07	.32	.37	.30	.35	−.08	−.01	−.11	−.01	.37	–

Note: The correlations in bold describe the relationships between the various GFPs extracted from the TPQue and EPQ. The correlations in the grey area describe the relationships between trait EI and the GFPs. *S* = factor scale scores, *F* = facet scores, *P* = parcel scores, B5 = Big Five, B3 = Giant three. $r \geqslant .12$ is $p < .05$.

Table 2
Partial correlations between the various GFPs and trait emotional intelligence, after controlling for scores on the Lie-scale ($N = 274$).

	Type of general factor							
	B5-ML(*S*)	B5-PC (*S*)	B5-ML(*F*)	B5-PC(*F*)	B3-ML(*S*)	B3-PC(*S*)	B3-ML(*P*)	B3-PC(*P*)
Trait EI	.73	.73	.75	.75	−.65	−.65	−.70	−.65

Notes: *S* = factor scale scores, *F* = facet scores, *P* = parcel scores. All *rs* $p < .01$.

beyond the GFP. Note that as the GFP is by definition a composite of lower-order scales it is useful to look at the level of explained variance but the individual beta-weights are less relevant in this analysis because they cannot be interpreted in a straightforward manner. This is because with a composite score in step 1 that is a linear combination of *n* variables, the number of freely estimated weights in step 2 is $n - 1$. The first hierarchical regression analysis included trait EI as the dependent variable, the Big Five-based GFP (ML) entered in step 1, and the individual Big Five scales (O, C, E, A, and N) entered in step 2. This analysis showed that the GFP in step 1 explained a substantial 58% of the variance in trait EI ($\Delta R^2 = .58$, $F(1, 270) = 370.66$, $p < .001$). The total unique variance of the Big Five scale scores in step 2 explained an additional and significant 8.4% of the trait EI variance ($\Delta R^2 = .08$, $F(4, 266) = 16.67$, $p < .001$).

A similar regression analysis with the Giant-Three-based GFP entered in step 1 and the individual Giant Three scales scores entered in step 2 showed similar results. The GFP in step 1 explained 39.2% of the total trait EI variance ($\Delta R^2 = .39$, $F(1, 270) = 173.92$, $p < .001$) and the unique variance of the Giant Three explained an additional 13.5% ($\Delta R^2 = .14$, $F(1, 268) = 38.11$, $p < .001$). Thus, for both the Big Five as well as for the Giant Three we found that the GFP explained the largest proportion of TEI variance, whereas the unique parts of the scale scores explained much smaller, yet significant proportions of the variance in trait EI.

Table 1 also shows the correlations between the GFPs and the Lie scale, which ranged between (in absolute values) .01 to .37 and were often significant, yet much lower than the GFP-trait EI correlations. There was also a significant correlation between trait EI and the Lie scale ($r = .37$). Therefore, we decided to re-estimate the correlations between the GFPs and trait EI, after controlling for Lie scale scores, using partial correlation analysis. Table 2 shows that even after controlling for the tendency to lie or to provide socially desirable responses, the correlations between the GFPs and TEI remained high ranging (in absolute values) from $r = .65$ to $r = .78$.

4. Discussion

Our current study addressed the consistency and interpretation of the GFP. Reliable GFPs that were robust for extraction methods were confirmed in measures of the Big Five and Giant Three. In the EPQ, the GFP-loading of the Neuroticism factor reached almost unity (with the ML method). Nevertheless, for several reasons, the EPQ–GFP likely is more than just a latent Neuroticism factor. First, the two other factors (P and E) also showed appreciable loadings on this factor indicating variance that is shared by *all* three EPQ factors. Second, the GFP from the EPQ showed relevant correlations with other Big Five dimensions of the TPQue (ranging from −.09 to .34, Table 1), indicating that it involves a general factor reflecting a *mixture* of different traits, not only Neuroticism.

Regarding the consistency of the GFP, we found that the general factors from the two different personality inventories strongly overlapped. This was true, independent of the extraction method or of the type of variables (factor or facet/parcel scores) used in the analysis. This overlap between GFPs is important for research on this topic because it has previously been suggested that the general factors extracted from different personality measures may arise from instrument-specific statistical artifacts (Ashton, Lee, Goldberg, & de Vries, 2009; De Vries, 2011). If that were true, the main implication would be low correlations between different GFPs (Hopwood et al., 2011). The results from the present study, however, are at odds with this interpretation and showed that the average correlation between two GFPs from different inventories was as high as $r = .60$, which actually comes relatively close to the average correlations found among general factors in the cognitive ability domain (Jensen, 1998).

Regarding the nature of the GFP, we found that the GFPs extracted from the two personality inventories showed considerable overlap with trait EI. This overlap remained strong even after controlling for socially desirable responding as operationalized by the Lie scale of the EPQ. In our view, the overlap between the GFP and trait EI makes perfect sense. For example, high scores on trait EI have been linked with adaptive behavior across a wide range of situations, such as coping with stress and maintaining positive moods, job satisfaction, and with general mental health (see Petrides, 2011). High trait EI individuals tend to describe themselves as empathetic, optimistic, and well-adapted in general, which translates into a high GFP score, when the GFP has been positively keyed (Veselka et al., 2009).

The associations between the GFPs and the Lie scale of the EPQ were much lower than their corresponding associations with trait EI. The EPQ Lie scale assesses socially desirable responding which does not necessarily reflect how a person would truly behave in a situation. Considering the relatively weak associations between the GFPs and the Lie scale, it becomes less likely that the GFP would emerge merely as a consequence of a specific response set. In addition, controlling for Lie scale scores did not lead to substantial decreases in the correlations between the GFP and trait EI. Thus, in our view, a more plausible interpretation is that the GFP reflects a substantive factor with real-life consequences. This notion is in accordance with several recent studies showing that the GFP is related to a range of real-life outcomes such as supervisor-rated performance and social status (Van der Linden, te Nijenhuis, et al., 2010; Van der Linden, Scholte, et al., 2010).

In interpreting the present findings, we must take into account the potential limitations of common method variance. Although we partly dealt with this limitation by testing for the effects of socially desirable responding, there may be other method biases that might have played a role (e.g., a tendency to seek the higher or lower ends of the Likert scale). On the other hand, the overlap between measures of GFP and trait EI was quite large, namely 42% to 61% of the variance. Although future studies using multiple source data may be useful, we consider it unlikely that the large amount of overlap between GFP and trait EI in this study can be entirely attributed to common method artifacts beyond those already controlled for (i.e., social desirability).

5. Conclusion

The debate about the GFP is currently ongoing and probably will not be settled quickly. The current study contributes to this debate by showing consistency in GFPs from two inventories, their overlap with trait emotional intelligence, and the relative insensitivity to measures of social desirability as a bias (faking).

The existence of a GFP does not mean that lower-level personality factors lose their relevance. For example, in the present study we found that the unique variance of the Big Five or Giant Three explained significant levels of trait EI variance beyond the GFP. Thus, each of the lower-order factors can still have a unique contribution to behavior and may sometimes even be the best predictor of a specific type of behavior (Van der Linden, 2011). This does not contradict the notion that there may be a substantive personality factor that has a broad influence on most of the lower-level traits. Although additional research is necessary to elucidate the nature of this general factor, the present study indicates that trait emotional intelligence is a possible candidate to describe the psychological meaning of this construct.

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