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# A General Factor of Personality: Evidence from the HEXACO Model and a Measure of Trait Emotional Intelligence

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The purpose of the present study was to determine if a general factor of personality (GFP) could be extracted from the six dimensions of the HEXACO model and four factors of trait emotional intelligence. Participants were 1,192 pairs of twins (666 MZ pairs, 526 DZ pairs) between the ages of 19 to 86 years, who completed the Trait Emotional Intelligence Questionnaire — Short Form and the HEXACO Personality Inventory — Revised. Principal components analysis yielded a strong GFP accounting for 33% of the variance, on which all variables with the exception of honesty-humility from the HEXACO showed moderate to large loadings. Behavioral genetic (BG) analyses revealed that individual differences in the GFP were entirely attributable to additive genetic and non-shared environmental factors — results that are in accord with previous BG analyses of a GFP. The present study adds to the body of evidence in support of a heritable GFP but an alternative perspective is also discussed.

**Keywords:** general factor of personality, twin study, heritability

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Research examining the structure of personality has yielded several key models, each of which posits the existence of broad personality dimensions that are deemed to be essentially uncorrelated (e.g., Cattell, 1946; Eysenck, 1991; Goldberg, 1990; Wiggins, 1979). In recent years, however, assessments of these dimensions have noted associations and redundancy between them (e.g., Becker, 1999; Block, 1995; Eysenck, 1992). This has led some researchers to move toward more concise personality structures in which fewer factors are employed to account for individual differences in personality traits. For example, based on correlations observed between the Big Five dimensions, Digman (1997) proposed the existence of Alpha and Beta — two super-factors subsuming the Big Five. DeYoung et al. (2001) later renamed these as Stability and Plasticity. Musek (2007) went on to

reduce these super-factors further, proposing the existence of a single factor called the Big One.

Most recently, the Big One has been relabeled as the general factor of personality (GFP) by Rushton et al. (2008) and its existence has been supported by a number of empirical studies. Specifically, a GFP has been extracted from the Big Five factors across Canadian and Japanese populations (Rushton et al., 2009), from the Comrey Personality Scales (Rushton & Irwing, 2009) and from Cloninger's Temperament and Character Inventory (TCI; Rushton et al., 2009). A GFP has also emerged in assessments of humor styles (Rushton et al., 2009), as well as personality and emotional disorders (Rushton & Irwing, 2009). Recently, Veselka et al. (2009) reported a GFP from analyses of the Big Five and mental toughness, as well as the Big Five and trait emotional intelligence (trait EI). The authors further reported that individual differences in the GFP dimensions extracted in these analyses were attributable primarily to genetic and non-shared environmental factors. The addition of trait EI to the GFP added particularly strong support to the idea that the GFP is salient in the context of evolutionary adaptation, given that emotional expression is deemed to play an essential role in survival (Hess & Thibault, 2009).

## Present Study

Our goal is to extend the evidence supporting the GFP by assessing whether it can be extracted from a more elaborate model of personality, which includes an additional dimension of personality not captured by the Big Five. Specifically, we have employed the HEXACO model, which consists of six rather than five higher-order dimensions of personality. Five of

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the HEXACO dimensions are conceptually similar to the Big Five factors (extraversion, conscientiousness, agreeableness, openness to experience, emotionality), but the model also includes the sixth dimension of honesty-humility (Ashton et al., 2004). This additional dimension emphasizes trustworthiness, modesty, and a lack of greed — all desirable traits, and therefore suitable to the conventional definition of the GFP (Rushton et al., 2008).

The HEXACO dimensions will be subjected to a principal components analysis in conjunction with four trait EI factors which have already been incorporated into the GFP, and which embody well the theory underlying the nature and purpose of this higher-order factor. Given that the Big Five variables, all of which are represented within the HEXACO model, have yielded a GFP in past research (e.g., Rushton et al., 2009), and that trait EI has also been shown to load on a single higher-order factor (Veselka et al., 2009), it is predicted that a GFP will also emerge in the present analyses. The honesty-humility factor of the HEXACO is expected to load onto a GFP as well, in light of previous research by De Raad and Barelds (2008) in which a higher-order factor labeled ‘virtue’ was extracted from an extensive list of personality facets including the honesty-humility dimension. The virtue factor was proposed to represent sensible, reasonable, and friendly personality qualities and therefore bears a strong resemblance to the GFP.

A behavioral genetic (BG) analysis of any extracted higher-order factor will also be carried out, to determine the extent to which genetic and/or environmental effects account for individual differences in the factor. Similar results to those obtained in previous BG analyses of the GFP will further confirm that a heritable higher-order factor exists. Because previous BG analyses of extracted GFP factors have found that individual differences in these factors are attributable mainly to additive genetic and nonshared environmental effects, the same outcome is expected from the present analyses.

## Method

### Participants

Participants were 1,192 pairs of twins: 666 monozygotic (MZ) pairs (605 female and 61 male pairs) and 526 same-sex dizygotic (DZ) pairs (485 female and 41 male pairs). Twins ranged in age from 19 to 86 years ( $M = 60.15$ ,  $SD = 12.08$ ), and were participants in ongoing twin studies conducted by the Department of Twin Research and Genetic Epidemiology (DTR), King’s College, London, England. Annually, this Department mails out questionnaires to approximately 9000 individual twins, whose zygosity has previously been established either by genome scans (100% accurate), DNA tests (99.5% accurate) or by responses to the ‘Peas in the pod’ zygosity questionnaire (95% accurate). Twins taking part are not compensated for their participation.

### Materials

Individual differences in trait emotional intelligence were assessed via the short form of the Trait Emotional Intelligence Questionnaire (TEIQue-SF; Petrides & Furnham, 2006). This questionnaire comprises 30 items assessing four factors of trait emotional intelligence: wellbeing (e.g., happiness, optimism), self-control (e.g., low impulsivity, stress-management), emotionality (e.g., empathy, emotion expression), and sociability (e.g., assertiveness, social awareness). The measure also yields a global trait EI score, although this was not employed in the present analyses because it would have created linear dependencies. To complete the TEIQue-SF, participants responded to self-reflective items on a 7-point Likert scale (where 1 = *completely disagree* and 7 = *completely agree*).

Participants also completed the 60-item HEXACO Personality Inventory (HEXACO-60; Ashton & Lee, 2009), which assesses individual differences in six personality dimensions — conscientiousness, extraversion, agreeableness, openness to experience, emotionality, and honesty-humility. Participants responded to self-reflective statements on this questionnaire via a 5-point Likert scale (where 1 = *strongly disagree* and 5 = *strongly agree*).

### Procedure

In November 2008, approximately 9000 individual twins were mailed a questionnaire, which included the HEXACO-60 as well as additional questions that are not pertinent to the present study. Approximately 5000 individual twins (56%) returned the completed questionnaires and, of these, a total of 3012 were complete same-sex pairs (837 MZ pairs and 669 DZ pairs). Two years earlier, the questionnaire mail-out included the TEIQue-SF, and 666 MZ and 526 DZ twin pairs had completed this as well as the HEXACO. Twins completed the questionnaires in their own time at their homes, and returned them to the DTR.

### Analyses

Although most twins completed all items on both questionnaires, an item was occasionally left blank. Missing data such as these were replaced with the average of the Likert scale used. For the purpose of the present study, the 30 items of the TEIQue were converted into four scores corresponding to the four factors of trait emotional intelligence. Similarly, the 60 items of the HEXACO-60 were reduced to six scores — one for each dimension of personality as posited by the HEXACO model (Ashton et al., 2004).

For the principal components analyses that were conducted, one member of each MZ and DZ twin pair was arbitrarily designated as Twin 1 and their co-twin was designated as Twin 2. The data derived from all of the Twin 1 participants (MZs and DZs combined) and from all of the Twin 2 participants (MZs and DZs combined) were then subjected to separate principal components analyses using SPSS. This approach was

employed both to avoid the statistical dependence that exists between family members and to allow cross-replication of the factor(s) obtained from the two sets of twins. However, it should be noted that this cross-replication is not fully independent as the subjects in the two analysis groups were related.

For the behavioral genetic analyses, Pearson correlations were calculated separately among MZ and DZ twins. The software package Mx (Neale et al., 2006) was then employed to conduct univariate BG model fitting. Mx estimates the extent to which additive genetic (A), shared environmental (C), and non-shared environmental (E) factors contribute to individual differences via structural equation model fitting. Although reduced models (e.g., AE, CE) can be fit as well, we did not do so in the present analysis given the recent suggestion that estimates of full ACE models yield more accurate results for discrete traits, while reduced models lead to oversimplified results rather than to more parsimonious representations of the data (Sullivan & Eaves, 2002).

## Results

Principal components analyses among the Twin 1 and Twin 2 data yielded three factors with eigenvalues greater than 1. The first unrotated factor in each analysis, however, accounted for the majority of the variance: 32.8% for the Twin 1 data, and 32.9% for the Twin 2 data (see Table 1). This was more than twice as much of the variance accounted for by the second factors. As can be seen, all variables from the TEIQue-SF and the HEXACO-60 loaded on the first factor, with loadings ranging from .19 to .79 among the Twin 1 data, and from .19 to .77 among the Twin 2 data. In both analyses, these first factors received their highest loadings (greater than .60) from the four TEIQue factors and the HEXACO dimension of extraversion. The honesty–humility factor of the

HEXACO yielded the lowest loadings, while the HEXACO factors of emotionality, agreeableness, conscientiousness, and openness to experience exhibited moderate loadings in both analyses. There is substantial consistency between the two sets of first-factor loadings (Spearman's  $\rho = .94$ ,  $df = 8$ ,  $p < .001$ ), thereby showing excellent cross-replication of a GFP.

The correlation between MZ twins on the first unrotated (GFP) factor was .54, and the correlation between DZ twins on this factor was .17. Although the MZ correlation is more than twice as large as the DZ correlation, dominance genetic effects were not estimated due to the lack of power arising from our sample size (power = approximately 60% with  $\alpha = .05$ ). Instead, a full ACE model was fit, which revealed that additive genetic (.52) and nonshared environmental factors (.48) fully accounted for individual differences in the GFP.

## Discussion

In the present study a GFP was extracted from a combination of four factors from the TEIQue, and six factors from the HEXACO-60. The patterns of loadings on the GFP factor across two samples were very similar, revealing high scores on extraversion and trait EI (i.e., wellbeing, self-control, emotionality, and sociability), and low scores on neuroticism. These findings echo those obtained by Veselka et al. (2009) in their extraction of a GFP from 15 trait emotional intelligence facets and the Big Five factors of personality, although a high loading for conscientiousness (over .45) was not noted in the present analysis.

In addition to these replicated findings, the present study also added the HEXACO dimension of honesty–humility to the extracted higher-order factor, although the loading of this dimension on the GFP was quite modest. The addition of the honest–humility dimension to the GFP, albeit with its modest loading, is an important finding because it demonstrates that the GFP can be expanded to account for the correlations between factors in broader models of personality than the conventional Big Five. The honesty–humility dimension further adds to the original conceptualization of the GFP by supporting the evolutionary theory regarding the super-factor, as posited by Rushton et al. (2008). According to this theory, the positive pole of the GFP is made up of personality traits that allow for reproductive and competitive success. Previous literature has linked traits related to the honesty–humility dimension (e.g., modest, honesty, integrity) to outcomes such as greater workplace rewards (Dabul et al., 1997), improved job success (Blickle et al., 2008), greater sexual satisfaction (MacNeil & Byers, 2005), and greater marital satisfaction (Bograd & Spilka, 1996), and therefore the dimension is relevant to the GFP.

Univariate BG analyses further replicated previous studies of extracted GFP factors (e.g., Veselka et al., 2009) by noting that individual differences in the higher-order dimension were attributable to genetic

**Table 1**

First Unrotated Factors Extracted from the TEIQue-SF and the HEXACO-60

Variables	Twin 1	Twin 2
TEIQue-SF Factors		
Well-being	.79	.77
Self-control	.75	.76
Emotionality	.67	.67
Sociability	.77	.73
HEXACO-60 Factors		
Honesty–humility	.19	.19
Emotionality	-.42	-.41
Extraversion	.73	.74
Agreeableness	.25	.37
Conscientiousness	.40	.37
Openness to Experience	.32	.33

and non-shared environmental effects. Moreover, although non-additive effects were not assessed in the present study due to insufficient power, the pattern of twin correlations noted in the study suggests that such effects may, in fact, be operating. These results would support the findings reported in a BG analysis of the GFP by Rushton et al. (2008).

In spite of the presented evidence supporting the existence of a GFP, it is also appropriate to draw attention to a recently proposed alternative perspective. Specifically, Ashton et al. (2009) have suggested that although there may be associations between personality factors, these associations do not necessarily suggest the existence of a GFP. Rather, it may be the case that the noted correlations are attributable to the existence of lower-order variables within personality models that represent same-sign blends of two or more orthogonal factors. Ashton et al. (2009) empirically tested higher-order factor models against blended variable models that did not have a higher-order factor across three samples, and concluded that the blended variable models consistently showed better fit than the higher-order factor models. Their findings, therefore, suggest that it may be more parsimonious to explain the observed associations between personality factors using blended models that do not presuppose the existence of yet another personality factor, rather than to attribute them to a GFP.

In light of the varying views on the GFP, it is clear that further research is needed in the realm of a personality super-factor. Future studies may wish to expand further on the GFP by attempting to extract it from alternative models of personality and as well as additional personality measures — perhaps those that are less clearly conceptually related to the present definition of the GFP. Additional theoretical and empirical efforts are also required to clarify whether or not the GFP is a valid construct, in light of the parsimony attached to the recently proposed blended model.

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