The General Factor of Personality, BIS–BAS, expectancies of reward and punishment, self-esteem, and positive and negative affect

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ABSTRACT

In two studies, we explore the neurobiological basis of the General Factor of Personality (GFP) by correlating it with measures of the Behavioral Inhibition System–Behavioral Activation System (BIS–BAS), generalized expectancies of reward and punishment, self-esteem, and positive and negative affect. The GFP was measured by aggregating across the scales of the Big Five Inventory (reverse keying Neuroticism to reflect Emotional Stability). Self-report measures from undergraduate students ($Ns = 128, 88$) revealed a single GFP dimension with positive loadings on BAS, expectations of reward, self-esteem, and positive affect, and negative loadings on BIS, expectations of punishment, and negative affect. The results were robust, replicating across the studies, the sexes, and after controlling for social desirability. The measures of BIS–BAS, generalized expectancies, self-esteem, and positive and negative affect accounted for 59% and 56% of the variance in the GFP. BIS–BAS may provide a neurobiological basis of the GFP.

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1. Introduction

In recent years, increasing discussion has focused on the amount of overlap and redundancy found among measures of personality. Many researchers are becoming "lumpers" rather than "splitters" in the debate over broad versus specific traits. For example, in 12 studies ($N = 15,000$) of four widely researched traits—self-esteem, neuroticism, locus of control, and generalized self-efficacy—Judge, Erez, and Bono (1998) found an average corrected inter-correlation of .60, with a single factor explaining 71% of the variance in these traits, indicating a broad dimension of Emotional Stability. Subsequently, Judge, Erez, Bono, and Thoresen (2002) examined 75 studies of the same traits and found an average correlation of .60, with each of the traits also showing moderate to strong correlations with the other Big Five dimensions (i.e., .14 to .33 with Openness and Agreeableness, and .26 to .43 with Conscientiousness and Extraversion).

As in the case of cognitive ability, an integration of broad and narrow traits can be achieved by combining them hierarchically. The most recent development in this regard has been the proposal that a General Factor of Personality (GFP) occupies the apex of the hierarchy in a similar way that g, the general factor of mental ability, occupies the apex in the organization of cognitive abilities (Musek, 2007; Rushton, Bons, & Hur, 2008). A GFP has now been extracted from the inter-scale correlations of several sets of the Big Five, the California Psychological Inventory, the Comrey Personality Scales, the Dimensional Assessment of Personality Pathology, the EAS Temperament Scales, the Guilford–Zimmerman Temperament Survey, the HEXACO Personality Inventory, the Millon Clinical Multiaxial Inventory-III, the Minnesota Multiphasic Personality Inventory-2, the Multidimensional Personality Questionnaire, the Personality Assessment Inventory, the Personality Research Form, the Temperament and Character Inventory, and the Trait Emotional Intelligence Questionnaire (Erdle, Irwing, Rushton, & Park, 2010; Musek, 2007; Rushton et al., 2009, 2008; Rushton & Irwing, 2008, 2009a, 2009b, 2009c, 2009d; Schermer & Vernon, 2010; Veselka et al., 2009; Veselka, Schermer, Petrides, & Vernon, 2009).

The GFP has been found across diverse samples and procedures. The largest sample consisted of 628,640 Internet respondents who completed the Big Five Inventory (Erdle et al., 2010). One study found the GFP was independent of method variance using a multi-trait–multimethod analysis of self-, teacher-, and parent-ratings of 391 13- to 14-year-olds on the Big Five Questionnaire—Children (Rushton et al., 2009). Several cross-national twin studies have found 50% of the variance on the GFP is attributable to genetic influence and 50% to non-shared environmental influence including 322 pairs of twins from the UK, 575 pairs of 2- to 9-year-old twins from South Korea, 651 pairs of 14- to 30-year-old twins from Japan, and 386 pairs of 18- to 74-year-old Canadian and US twins (Rushton et al., 2008, 2009; Veselka et al., 2009a; Veselka,

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Schermer, Petrides, & Vernon, 2009). The South Korean twin data showed the GFP had emerged by 2- to 3-years of age (Rushton et al., 2008).

The main alternative interpretation of the GFP is that it is due to artifacts of evaluative bias and scale construction (Ashton, Lee, Goldberg, & de Vries, 2009; Bäckstrom, Bjorklund, & Larsson, 2009). So far, however, the evidence shows that even after controlling for these and other artifacts, much substantive variance remains. Bäckstrom et al. (2009) found that social desirability contributed to higher-order factors above the Big Five, but that they were still recovered after controlling for these effects. Similarly, Erdle, Gosling, and Potter (2009) found higher-order factors were related to self-esteem but controlling for self-esteem left the Big Two intact, as it also did the GFP (Erdle et al., 2010). Schermer and Vernon (2010) found that while the GFP was related to social desirability, it had an independent substantive component.

The explanation we favor for the GFP is that, like *g*, it arose through evolutionary selection for adaptive traits that facilitate performance across a wide range of contexts (Rushton et al., 2008). Consistent with the fast–slow life-history theory dubbed Differential *K* Theory by Rushton (1985), individuals high on the GFP are characterized as altruistic, agreeable, relaxed, conscientious, sociable, and intellectually open, with high levels of well-being, satisfaction with life, self-esteem, and emotional intelligence. Musek (2007) found that high scores on the GFP were related to self-esteem and positive affect and low scores to negative affect. Given a GFP, with a well-defined positive and negative pole (the positive pole being more cooperative and prosocial; the negative pole more antagonistic and inefficient), the question arises as to the relation of the GFP to other measures of temperament and the underlying neurobiology of personality.

The present study extends the research on the GFP by exploring measures of the underlying conceptual nervous system. One possibility, suggested by Rushton et al. (2009), is an adaptation of Gray's (1987) Behavioral Inhibition System–Behavioral Activation System (BIS–BAS) and the fundamental process of approach-avoidance. Based on sensitivity to different kinds of reinforcement, Gray's approach attempts an integration starting at the genes, working up through brain anatomy and physiology, and culminating in learning and experiential outcomes including positive and negative emotionality and motivation. Corr (2008) has outlined many of the findings and implications.

In the original Reinforcement Sensitivity Theory (RST), Gray (1971, 1987) postulated three independent biological systems to regulate behavior: a behavioral approach/behavioral activation system (BAS), a behavioral inhibition system (BIS), and a fight/flight system (FFS). BIS is the aversive motivational system that controls the experience of anxiety and negative feelings such as fear, frustration, and sadness, and is sensitive to signals of punishment, nonreward, and novelty. BAS is the behavioral activation system causing movement towards goals and results in feelings such as hope, elation, and happiness. FFS is responsible for organizing behavior in response to unconditioned punishment and is related to the far extremes of negative emotion such as panic and rage. Although Jackson (2009) has recently provided a set of theoretically and empirically derived scales to measure Gray and McNaughton's (2000) revised Reinforcement Sensitivity Theory (r-RST; with similar names: r-BAS, r-BIS, and r-FFFS, the latter referring to the fight/flight/freezing system), the most widely used measure of RST remains the BIS–BAS scales of Carver and White (1994).

We are unaware of any previous study that has examined the relationship between the GFP and measures of BIS–BAS. Based on prior theory and research, we predict the GFP will correlate positively with measures of BAS, self-esteem, positive affect, and generalized expectancy of reward, and correlate negatively with measures of BIS, negative affect, and generalized expectancy of punishment. We also predict the GFP and measures of BIS–BAS, self-esteem, positive and negative affect, and expectancy of reward and punishment, will load on a single factor. To increase confidence in the results, we carry out a replication study one year after the first and (in both studies) we control for social desirability, and examine the results separately for men and women.

2. Study 1

2.1. Method

One hundred and twenty-eight mainly middle-class Caucasian University student volunteers from introductory psychology classes (78 women, 50 men; median age = 18 years) completed paper-and pencil-measures in a large classroom in November 2008. After reading a letter of information about the study, participants signed an informed consent form if they were willing to take part. They were then given a booklet containing the Big Five Inventory (BFI), the Behavioral Inhibition System–Behavioral Activation System (BIS–BAS) scales, the Generalized Reward and Punishment Expectancy Scales (GRAPES), the Single-Item Self-Esteem (SISE) scale, the Positive and Negative Affect Schedule (PANAS), and the Marlowe–Crowne (M–C) social desirability scale. Participants were told they could omit any questions or end their participation at any time. Upon completion of the booklet, participants were given a debriefing form describing the hypotheses.

The GFP was measured using the Big Five Inventory (BFI: John & Srivastava, 1999). The BFI is a 44-item self-report measure comprised of short items assessing the Big Five factors (OCEAN: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism). Items are responded to on a 5-point scale ranging from "strongly disagree" to "strongly agree". The scales of the BFI are widely used and found to be reliable and valid (John & Srivastava, 1999). Scores for the GFP were calculated by aggregating across the Big Five scales, reverse keying Neuroticism to reflect Emotional Stability. An alpha coefficient of .80 was found for the GFP based on the BFI items.

The BIS–BAS constructs were measured using the 20-item BIS/BAS scales (Carver & White, 1994). Items are scored on a 4-point scale ranging from "strongly agree" to "strongly disagree". These scales are widely found to be reliable and valid.

The 30-item Generalized Reward and Punishment Expectancy Scales (GRAPES: Ball & Zuckerman, 1990) measure cognitive constructs related to BIS–BAS. Items on the Generalized Expectancy of Reward (REW) and Generalized Expectancy of Punishment (PUN) scales are rated as "true" or "false". The scales of the GRAPES have internal consistency reliability.

Self-Esteem was measured by the Single-Item Self-Esteem Scale (SISE: Robins, Hendin, & Trzesniewski, 2001). The item "I see myself as someone who has high self-esteem" was rated on a 5-point scale ranging from "strongly disagree" to "strongly agree". The SISE has high test–retest reliability and criterion validity above .80 with the Rosenberg Self-Esteem (RSE) scale and shows a similar pattern of validity coefficients as the RSE across 37 constructs.

Positive and negative affect were measured using the 20-item Positive and Negative Affect Schedule (PANAS: Watson, Clark, & Tellegen, 1988). Positive and negative affective adjectives are rated on 5-point scales ranging from "very slightly or not at all" to "extremely" based on how one generally feels. The Positive Affect (PA) and Negative Affect (NA) scales of the PANAS have been widely shown to be reliable and valid.

Social desirability was measured using the 33-item Marlowe–Crowne social desirability scale (M–C: Crowne & Marlowe, 1964). Socially desirable but infrequent behaviors are rated "True" or