



The genetics and evolution of the general factor of personality

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ABSTRACT

Three studies tested the hypothesis that a general factor of personality (GFP) underlies diverse individual differences including altruism, the Big Five factors of Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, and the EAS temperament traits of Emotional Stability, Activity, and Sociability. In Study 1, 214 university students completed 36 personality scales. In Study 2, 322 pairs of monozygotic (MZ) and dizygotic (DZ) twins completed 29 5-point rating scales plus questionnaires. In Study 3, 575 pairs of 2- to 9-year-old Korean twins were rated by their mothers on 25 temperament scales. Factor analyses revealed a hierarchical organization with GFP at the apex and the Big Five and/or EAS temperament scales intermediate. The twin data show GFP has an early age of onset with 50% of the variance attributable to non-additive (dominance) genetic influence and 50% to unique, non-shared environmental influence. We discuss a life history matrix encompassing brain size, maturational speed, and longevity, plus emotional intelligence and the personality disorders, and suggest natural selection acted directionally to endow people with more cooperative and less contentious personalities than their archaic ancestors, or nearest living relatives, the chimpanzees.

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1. Introduction

Twenty years ago, Rushton (1985, 1990) conjectured that “one basic dimension—*K*—underlies much of the field of personality” (1985, p. 445). He proposed that human social behavior is best understood as being part of a life-history—a suite of traits genetically organized to meet the trials of life—survival, growth, and reproduction. Building on Wilson (1975) theory of *r*-*K* reproductive strategies, which explains how animals colonize islands and reach population equilibrium, Rushton postulated that diverse personality traits covaried with altruism, intelligence, attachment styles, reproductive strategies, growth, longevity, and fecundity. Animals can adopt either of two strategies: produce a large number of fast maturing offspring but devote little parental care to ensure their survival (the *r*-strategy), or invest in a few slower-maturing, high quality offspring and devote considerable parental care to rearing them and ensuring that a much larger proportion survives (the *K*-strategy). Rushton dubbed his proposal “Differential *K* Theory” in order to emphasize that all humans were at the *K*-end of the continuum when compared against other species.

Research has confirmed many predictions from differential *K* theory. Among university students, Bogaert and Rushton (1989) found correlations between self-reported delinquency, sex guilt, mating effort (sexual permissiveness), general intelligence, and an aggregate *r*-*K* battery of items assessing family size, maturational speed, longevity, altruism, and reproductive effort. The results held when three separate measures of family background were statistically controlled. Although the average correlation between single indices of *K* was low, aggregate measures were predictive of a general factor on which single items loaded an average of +0.31.

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Additional support comes from a study by Rowe, Rodgers, Meseck-Bushey, and St. John (1989), who found that among adolescents, 36 to 49 percent of the variance in level of sexual intimacy engaged in by one sibling was predicted by the amount of delinquency engaged in by the other. Similarly, Rowe and Flannery (1994) found that high scores on measures of sexuality and delinquency loaded positively on measures of impulsivity, deceitfulness, and rebelliousness and negatively on parental affection and encouragement of achievement. Rowe, Vazsonyi, and Figueredo (1997) found that differences in delinquency correlated with mating effort (e.g., number of sexual partners) both within individuals and across siblings.

Figueredo, Vásquez, Brumbach, and Schneider (2004) provided further evidence for the *r*-*K* perspective by analyzing the National Survey of Midlife Development in the US (MIDUS), a nationally representative sample of 50,000 households that included 309 MZ and 333 DZ twin pairs aged 25- to 74-years. From 2000 questions, they grouped 253 into 30 life-history scales (e.g., quality of family relationships and altruism toward kin), medical symptoms (physical and psychological health), personality traits (the Big Five), and social background (e.g., financial security). The results showed a substantially heritable “Super-*K*” dimension comprising three lower-order (also heritable) factors (a lower-order *K* factor, a “co-vitality” health factor, and a general personality factor). In another analysis of the MIDUS data, Figueredo, Vásquez, Brumbach, and Schneider (2007) replicated these findings using a sub-sample of 2095 non-twin parents who by middle-age had chosen their life niches to marry (or not), to bear and raise offspring (or not), and to create social networks. In both studies, controlling for “social privilege” (by regressing out level of education, race, and family income) accounted for less than 10% of the variance and did not change the pattern of factor loadings.

Figueredo et al. (2006) also developed a 20-item Mini-*K* scale in which respondents stated their agreement with items such as “I do not give up until I solve my problems,” and “I am closely connected to and involved in my community.” Significant correlations were found between Mini-*K* and measures of delinquency, risk taking, impulsivity, and poor health. Rushton, Vernon, and Bons (2007) made a first attempt to find the genes underlying the *K* factor by examining whether polymorphisms of the brain regulator genes *MCPH1* and *ASPM* were associated with the Mini-*K* scale and measures of altruism and intelligence. Although the Mini-*K* scale correlated with altruism ($r = .25$, $P < .05$) and intelligence ($r = .23$, $P < .05$), no relationship was found between the genes and any of the criteria.

The issue of personality structure was recently brought to theoretical center stage by Musek (2007) who marshaled compelling evidence for what he dubbed “The Big One”—a general factor extracted from the Big Five (Goldberg, 1990). Following Costa and McCrae (1992), the Big Five consist of Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (Emotional Stability). Each factor is composed of six lower-level personality traits or facets. These are: for *Openness to Experience* (Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values); *Conscientiousness* (Competence, Order, Dutifulness, Achievement Striving, Self-Discipline, and Deliberation); *Extraversion* (Warmth, Gregariousness, Assertiveness, Activity, Excitement Seeking, and Positive Emotions); *Agreeableness* (Trust, Straightforwardness, Altruism, Compliance, Modesty, and Tender-Mindedness); and *Neuroticism* (Anxiety, Hostility, Depression, Self-Consciousness, Impulsiveness, and Vulnerability). Reverse keying the Neuroticism factor gives loadings on the Big One of Calm, Gentle, Optimistic, Confident, Cautious, and Robust.

Musek (2007) analyzed data from three samples of differently-aged subjects across several assessment methods including self-reports and observer ratings: 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. Factor analyses yielded first, a Big Two model composed of *Stability* (Conscientiousness, Agreeableness, and low-Neuroticism) and *Plasticity* (Openness and Extraversion), followed by a higher-order factor that explained 60 percent of the source variance. Individuals high on this dimension can be characterized as being emotionally stable, agreeable, conscientious, extraverted, and intellectually open as opposed to neurotic, disagreeable, careless, introverted, and closed-minded. Further, they expressed a sense of well-being, satisfaction with life, and self-esteem. Musek described the Big One as an optimum blend of all societally valued personality dimensions close to the evaluative factor of affective meaning reported by Osgood, Suci, and Tannenbaum (1957).

Although Musek (2007) did not cite the work on *r*-*K* life history theory, he conjectured that the general factor would be “deeply embedded in our evolutionary, genetic and neurological endowment” (p. 1228). On the other hand, Penke, Denissen, and Miller (2007) and 22 peer commentators discussed the evolutionary genetics of personality in detail. They concluded that whereas genetic variation in *cognitive ability* came about through *unidirectional selection*, genetic variation in *personality* was due to *environmentally contingent balancing selection*. Intelligence was seen as conferring fitness across all environments while personality traits conferred enhanced fitness to particular niches. For example, although low agreeableness typically brings about interpersonal difficulties, it might prove advantageous in a harsh social environment. Other hypotheses raised included: *negative frequency-dependent balancing selection*, a variant of balancing selection which occurs when intense competition within a niche favors individuals who opt out of the competition (Figueredo & Gladden, 2007); *stabilizing selection*, which favors middling rather than extreme scores (MacDonald, 2005); *sexual selection* for more charming mates (Miller, 2007); and *neutral selection*, which in effect, is no selection at all (Campbell, 2007).

In this paper, following Rushton (1985, 1990, 2004b), we hypothesize that a process of *unidirectional selection* has operated on a general factor of personality just as it has on one for cognitive ability. Neither Penke, Denissen, and Miller (2007) nor any of the commentators referred to directional selection or to a general factor in personality. Perhaps it is only after a super-factor such as *r*-*K* has been identified, with a clearly defined positive and negative pole (analogous to the high and low ends of the general factor of mental ability), that it becomes possible to see how unidirectional selection might occur for personality.

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