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The Big-5 ± 2? The impact of cognitive complexity on the factor structure of the five-factor model

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ABSTRACT

Despite the popularity and prevalence of the five-factor model (FFM) of personality, numerous questions regarding its psychometric properties have yet to be investigated. One issue of particular concern is the underlying premise that these five personality factors are universally shared by all individuals. The present study examined the impact of cognitive complexity on the FFM by directly assessing whether individuals with higher or lower levels of cognitive complexity have personalities comprised of a greater or lesser number of factors, respectively, than the five widely accepted factors outlined by the FFM. Results indicated that individuals with lower levels of cognitive complexity have personalities best described by a three-factor model, whereas individuals with higher levels of cognitive complexity have personalities best described by a seven-factor model. In light of these findings, the appropriateness of universally applying the FFM to individuals of differing levels of cognitive complexity is discussed.

1. Introduction

The five-factor model (FFM) is one of the most well-known models of personality (Matthews & Deary, 1998). It has been applied to numerous areas of psychology including, but not limited to, academic success (Trapmann, Hell, Hirn, & Schuler, 2007), alcohol abuse (Malouff, Thorsteinsson, Rooke, & Schutte, 2007), deviance (Berry, Ones, & Sackett, 2007), entrepreneurship (Zhao & Seibert, 2006), occupational and non-occupational accidents (Clarke & Robertson, 2005), job performance (Barrick & Mount, 1991), job satisfaction (Judge, Heller, & Mount, 2002), leadership (Bono & Judge, 2004), smoking (Malouff, Thorsteinsson, & Schutte, 2006), and team performance (Peeters, Van Tuijl, Rutte, & Reymen, 2006). Despite its remarkable popularity, several relatively unanswered concerns have been raised regarding the appropriateness of the self-report format and its psychometric properties (Block, 1995; Eysenck, 1991). Specifically, efforts to clarify the nature of the factor structure – the number of factors in particular – have garnered conflicting results (cf. Almagor, Tellegen, & Waller, 1995; Jackson, Paunonen, Fraboni, & Goffin, 1996; Simms, 2007; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). Nevertheless, tacit acceptance remains with regard to the fundamental assumption underlying the FFM, namely, that the personality structure of all individuals is best described by five factors. The present study seeks to test this assumption by addressing the following question: Does the personality structure of individuals with higher levels of cognitive complexity differ from those with lower levels of cognitive complexity?

2. The five-factor model

The development of the FFM began with the research of Webb (1915) and Garnett (1919). When evaluating instructors' ratings of student effectiveness, Webb identified two factors, intellect and will, that were believed to account for the differences among individuals. Garnett (1919) reexamined Webb's data and concluded that a three-factor model, including the additional factor of cleverness, represented an improvement over the two-factor model. Cattell (1933), in an attempt to identify individual differences that were independent of cognitive ability, expanded on this research by examining peer ratings of temperament. Using a set of 46 bipolar rating scales, Cattell identified four factors: adjustment, maturity, surgency, and will. Fiske (1949) later reanalyzed this data and identified five factors: confident self-expression, conformity, emotional control, inquiring intellect, and social adaptability. This five-factor structure – the precursor to today's factors of agreeableness, conscientiousness, emotional stability, intellect, and surgency – was further supported by Norman (1963), Borgatta (1964), and Smith (1967). Following several decades of research utilizing the FFM, Goldberg (1980) asserted that the FFM was incredibly stable across studies when compared to more complex solutions or simpler solutions, a contention that has been frequently reiterated (e.g., Aluja, García, García, & Seisdedos, 2005; Costa & McCrae, 1992).

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2.1. Current State of the five-factor model

Two of the most popular measures of the FFM are the NEO (Costa & McCrae, 1992) and Goldberg's unipolar markers (Goldberg 1992). Both of these measures use a variation of the typical self-report format. The NEO presents a series of short statements (e.g., "I am easily frustrated") to which the respondent indicates the degree to which he/she agrees with the statement (i.e., 1 = Strongly Disagree to 5 = Strongly Agree). Similarly, the Goldberg measure presents a series of single-word traits (e.g., generous, relaxed) and the respondent is asked to indicate the degree to which the trait accurately describes himself/herself (i.e., 1 = Extremely Inaccurate to 9 = Extremely Accurate). The NEO measures agreeableness, conscientiousness, extraversion, neuroticism, and openness to experience, whereas the Goldberg measure assesses agreeableness, conscientiousness, emotional stability, intellect, and surgency. For the purpose of this study, Goldberg's terms will be used.

2.2. Criticisms of the five-factor model

Beyond the traditional criticisms that are often raised regarding self-report measures – acquiescence and response distortion (Barrick & Mount, 1996; Holden, 2008) – several criticisms have been voiced that are specific to the FFM. For example, Mischel (1968) argued that the five factors were superficial stereotypes held by observers of others and had little relation to authentic behavior. Similarly, Block (1995) argued that the dimensions were not insightful and that their definitions lacked precision. This is evidenced by the discrepancies between the definitions researchers use to describe the five factors and their subfacets (cf. Costa & McCrae, 1992; Goldberg, 1992). Further criticisms of the FFM have focused on the validation of the model itself. For example, Fiske (1994) disputed the relevance of the five factors in personality psychology, arguing that they do not extend to the interests typically associated with personality theory (i.e., are lacking in content validity). In addition, Fiske also questioned the comparability of the FFM with other instruments used in personality (i.e., the convergent and discriminant validity of the FFM). Waller and Ben-Porath (1987) argued that empirical support for the FFM stems from a series of studies that demonstrate the internal consistency rather than the construct-related validity of the model. Furthermore, Ashton, Jackson, Helmes, and Paunonen (1998) noted that the five scales are considerably less valid than their associated facet scales. Evidence of this lack of criterion-related validity has been repeatedly demonstrated via a weak relationship between the FFM and job performance, as rarely do any of the factors account for more than 10% of the variance in job performance (Barrick & Mount, 1991; Mount, Barrick, & Stewart, 1998).

The most substantial criticisms of the FFM address the utilization of factor analysis in developing its factor structure (Block, 1995). Although this technique has been used for almost a century, there is still no unequivocal method for establishing the appropriate number of factors to extract (i.e., the problems associated with subjective scree plot interpretation), nor is there a clearly accepted method for obtaining an optimum rotation for a particular set of factors. Nevertheless, a substantial amount of research supports the robustness of the "five" in the FFM. With few exceptions, factor analysis of responses (e.g., self ratings, peer ratings, supervisor ratings, teacher ratings) yields a five-factor structure that parallels the typical dimensions of the FFM (e.g., Goldberg, 1992; Miller, Pilkonis, & Morse, 2004; Ployhart, Lim, & Chan, 2001). Moreover, the FFM has been shown to exist across cultures (Church & Katiback, 1989), media (Costa & McCrae, 1988), and age groups (Digman & Takemoto-Chock, 1981). However, although some research suggests that the factor structure may range from three to seven factors (cf. Almagor et al., 1995; Jackson et al., 1996; Simms, 2007; Zuckerman et al., 1993), this research unfortunately fails to provide an explanation for the differing number of factors cited and, more specifically, the individual differences that may engender different factor structures. One particular individual difference that appears to be extremely relevant to the robustness of the FFM is cognitive complexity.

3. Cognitive complexity

Cognitive complexity (CC) refers to the degree to which an individual differentiates and incorporates multiple elements of his or her environment (Kelly, 1955; Labouvie-Vief & Diehl, 2000; Vannoy, 1965). Essentially, individuals can perceive and organize a finite number of social behaviors. Those who demonstrate high levels of CC are able to distinguish many essential elements and proceed to investigate the connections among these elements. In contrast, those who display low levels of CC distinguish fewer essential elements. A substantial amount of research supports the assertion that CC reflects the dimensionality of an individual's thought (cf. Bieri et al., 1966; Feixas, Moliner, Montes, Mari, & Neimeyer, 1992). Thus, as CC constrains the dimensionality of an individual's thought, it may also restrict the dimensionality of his or her personality.

3.1. Cognitive complexity and the FFM

Although many studies have examined the relationship between *cognitive ability* and the factor structure of personality measures (e.g., Austin, Deary, & Gibson, 1997; Austin et al., 2002; Toomela, 2003), we are unaware of any studies that have directly assessed the impact of CC on the factor structure of personality. Thus, we sought to directly evaluate the impact of differing levels of CC on the factor structure of a conventional FFM measure. Specifically, we wished to determine if the personality of individuals with low levels of CC is comprised of fewer than five factors and, in contrast, if the personality of individuals with high levels of CC is comprised of more than five factors.

4. Method

4.1. Participants

Participants were 718 students drawn from a research pool at a large southeastern university. The sample included both undergraduate (63% freshmen, 23% sophomores, 10% juniors, and 3% seniors) and graduate student (1%) volunteers. The mean age of participants was 19.54 years (SD = 3.52, range 17–60 years) and 65% were female. Furthermore, 68% of the participants identified themselves as Caucasian, 23% as African American, 3% as Asian American, and 3% as Hispanic, with the remaining 3% preferring not to disclose this information.

4.2. Measures

4.2.1. Five-factor model

The FFM was measured using Goldberg's 100 Unipolar Big Five Markers (Goldberg, 1992). This measure is comprised of 100 adjectives, with 20 adjectives purportedly measuring each of the following five factors: (1) surgency, (2) agreeableness, (3) conscientiousness, (4) emotional stability, and (5) intellect. The adjective list includes items such as assertive, active, quiet, and timid for the surgency factor; distrustful, kind, rude, and warm for the agreeableness factor; careless organized, sloppy, and thorough for the conscientiousness factor; irritable, nervous, relaxed, and unemotional for the emotional stability factor; and artistic, crea-