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Fluid insight moderates the relationship between psychoticism and crystallized intelligence

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ABSTRACT

To elucidate potential relationships between personality and intelligence it is necessary to move beyond the ad hoc reporting of correlation coefficients and focus instead on testing deductions from well-established theories. To this end the present paper references Eysenck's (1995) theoretical work linking the dimension of psychoticism to both psychosis and creative genius. Drawing on this theory it was argued that the relationship between psychoticism and crystallized ability will be conditional on the level of fluid intelligence. Participants ($N = 100$) completed the Eysenck Personality Questionnaire-Revised (EPQ-R) and the Kaufman Brief Intelligence Test (K-BIT). Moderated multiple regression revealed a significant interaction effect. Crystallized ability (K-BIT vocabulary) was negatively related to psychoticism at low levels of fluid ability (K-BIT matrices) and positively related to psychoticism at high levels of fluid ability. These findings highlight the potential importance of psychoticism within GfGc investment theory.

1. Introduction

Intelligence lies in the cognitive domain, which is often treated as one of the 'two pillars' of differential psychology, the other being personality. In keeping with this view, Kline (1998) suggested that intelligence involves information processing and the solution of problems, as distinct from personality, which refers "to the way we do what we do" (p. 99). At the conceptual level, though, the distinction between intelligence and personality is seldom held to be absolute. Eysenck and Eysenck (1985), for example, argued for overlapping dimensional systems, in which, personality is seen as a superordinate construct that subsumes cognitive abilities. Even so, there are marked differences, both in the way these two constructs are routinely measured, as well as the practical contexts in which these measures are applied (Chamorro-Premuzic & Furnham, 2005). As a consequence, those studying intelligence and personality have tended to follow quite separate research paths.

In the sphere of intelligence research, Spearman (1927) used a statistical test known as the 'tetrad differences' criterion to confirm the presence of common variance across a range of diverse tests of cognitive ability. This general intelligence factor (g) was specifically linked to two eductive operations; the eduction of *relations*, and subsequent to that, the eduction of the *correlative idea* (i.e., an analogy). Spearman's pioneering method of factor analysis did not, however, permit the identification of factors related to subsets of cognitive variables (Robinson, 2009). Following advances in factor analytic methods, Cattell (1971) was able to show that non-verbal tests and verbal tests each had their own unique subset variance, a finding that underpinned his concepts of fluid and crystallized intelligence.

Prior to Cattell's factor analytic studies, earlier work in Spearman's laboratories had suggested that the perceptual versions of such tests as classification, matrices, and analogies provided the most 'saturated' measures of g (Cattell, 1971). According to Cattell these 'content free' tests require a relation-educing ability that can be fluidly directed to any new or unfamiliar task. This fluid intelligence (Gf) was understood to be a 'native wit' that depends on the efficient functioning of cortical neurons. Crystallized intelligence (Gc), in contrast, represents the *investment* of fluid intelligence in the learning of judgmental skills, particularly those associated with the "more abstract features of the school curriculum" (Cattell, 1971, p. 128). Crystallized intelligence then depends not only on one's level of *fluid insight*, but also on one's level of education and acculturation. As education in Western cultures is predominantly verbal the prototypical tests that define crystallized intelligence are verbal tests such as vocabulary, general information, and comprehension (Kline, 1998). Apart from these two *relations-perceiving* intelligence factors, Cattell (1971) identified several additional broad factors including cognitive speed and retrieval capacity. But these additional factors were considered lower level cognitive processes, lacking the eductive properties that define general intelligence (Cattell, 1971).

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The general structure of cognitive abilities, outlined by Cattell (1971, see also Cattell, 1987) has subsequently received strong endorsement (e.g., Carroll, 1993; Kline, 1998). When it comes to the structure of personality, though, there has been far less consensus. As with research in the intelligence sphere, factor analytic descriptions of personality cluster a multitude of primary factors, into a limited number of second-order dimensions. Debate, however, is ongoing as to the exact number and nature of these second-order personality dimensions (Zuckerman, 2005). The present discussion will focus on the 3 second-order personality dimensions identified in Eysenck's (Eysenck & Eysenck, 1985) influential model. One advantage of this model, over others, is that it provides a taxonomic framework for a number of causal theories of personality (e.g., Eysenck & Eysenck, 1985; Gray & McNaughton, 2000; Robinson, 2009).

The three second-order dimensions identified by Eysenck (Eysenck & Eysenck, 1985) are: psychoticism (P), extraversion (E), and neuroticism (N). Psychoticism is defined by a cluster of inter-correlated traits which include impulsivity, aggression, poor socialisation and poor behavioural control. At its extreme, this dimension is associated with a disposition towards psychotic syndromes including psychopathy, schizotypy, manic-depressive illness, and schizophrenia. The Eysenckian dimension of extraversion subsumes a range of inter-related traits that include sociability, warmth, dominance, and activity. Finally, the dimension of neuroticism is associated with such traits as anxiety, depressed feelings, low self-esteem and moodiness.

In simple bivariate analysis, few sizable correlations, have been reported between measures of intelligence and second-order personality dimensions. Ackerman and Heggestad's (1997) meta-analytic study provides the most comprehensive review to date. Their population estimates for the three superfactors are based on total aggregate sample sizes ranging between 2699 and 24,280. Both fluid and crystallized abilities were found to be negatively correlated with neuroticism (Gf = –.09; Gc = –.08) and psychoticism (Gf = –.15; Gc = –.17), and positively correlated with extraversion (Gf = +.06; Gc = +.11). Although all population estimates were significant, the effect sizes were universally small. Furthermore, later research has simply served to highlight the difficulties in replicating such weak associations (e.g., Wolf & Ackerman, 2005).

When considering the empirical associations that have been reported between personality and intelligence it may be tempting to conclude that personality is not related to intelligence in any meaningful way. However, as Eysenck (1993) observed much of the research in this area has simply correlated "... any old IQ test that comes to hand with any old personality test that happens to be available" (p. 176). To elucidate potential relationships between personality and intelligence it is necessary to move beyond examining patterns of inter-correlations in an ad hoc manner and focus, instead, on testing deductions from well-established theories. To this end the present discussion will turn to theories linking personality to intelligence with particular reference to the theoretical links Eysenck (1995) has drawn between psychoticism, psychoses and creative genius.

In Cattell's (1971) GfGc theory the successful crystallization of fluid abilities depends, not only on educational opportunity, but also on the influence of personality characteristics. For Cattell then, it is crystallized rather than fluid abilities that will be most strongly associated with personality. From the Eysenckian perspective the personality dimension most likely to regulate the successful development of crystallized abilities is the dimension of psychoticism. According to Eysenck (1995), psychoticism, psychosis and creative genius are all linked to the phenomena of latent inhibition. Latent inhibition is shown when non-reinforced pre-exposure of a CS (conditioned stimulus) subsequently retards conditioning when the CS and a US (unconditioned stimulus) are paired (Mackintosh, 1975). Mackintosh (1975) has suggested that during the pre-exposure phase the organism learns that the conditioned stimulus is unrelated to any reinforcing event. The to-be CS is then deemed irrelevant and ignored, thus retarding the capacity to develop subsequent predictive associations with the US during the conditioning phase. In Mackintosh's (1975) model, the latent inhibitory effect is likened to a filtering mechanism which allows the organism to ignore stimuli that are "poorly correlated with reinforcement".

According to Eysenck, failure of the latent inhibitory process to limit associationist spreading, would promote exactly the kind of "overinclusive" style of thinking that characterises schizophrenics. In detailing this argument Eysenck (1995) suggests that discrimination learning provides that basis for abstract concept formation. When a child hears a word in a certain context for the first time "the word is associated with the entire situation (stimulus compound). As the word is heard again and again, only certain aspects of the stimulus compound are reinforced. Gradually the extraneous elements cease to evoke the response (the word), having become 'inhibited' through lack of reinforcement" (Eysenck, 1995, pp. 246–247). Eysenck (1995) argues that due to their weak levels of latent inhibition, psychotic individuals are unable to maintain appropriate conceptual boundaries and instead overgeneralize to include in their concepts, elements that do not strictly belong. In keeping with this view and consistent with the notion of a psychosis continuum, a weakness in latent inhibition has been linked to schizophrenia (Baruch, Hemsley, & Gray, 1988a; Gray, Pilowsky, Gray, & Kerwin, 1995; Lubow, Kaplan, Abramovich, Rudnick, & Laor, 2000); psychometrically defined schizotypy (Allan, Williams, Wellman, & Tonin, 1995; Baruch, Hemsley, & Gray, 1988b; Lipp & Vaitl, 1992; Shrira & Tsakanikos, 2009); and high P scores (Baruch et al., 1988b; Gibbons & Rammsayer, 1999; Kumari et al., 1999; Lipp & Vaitl, 1992).

Assuming that associative learning provides the basis for abstract concept formation, individual differences in latent inhibition will have implications, not just for the way words are nuanced, but for the learning of crystallized abilities in general. If Eysenck's argument concerning the role of latent inhibition in psychoses has relevance for the domain of personality, one might anticipate that high P scorers, with a tendency to overgeneralize, will be less effective when it comes to investing their fluid intelligence in such abstract crystallized abilities as vocabulary or comprehension.

A second line of enquiry has implicated elevations in psychoticism with creative genius. P scores have been positively associated with both psychometric creativity test scores (e.g., Batey & Furnham, 2009; Eysenck & Furnham, 1993; Stavridou & Furnham, 1996; Woody & Claridge, 1977) as well as creative achievements (e.g., Booker, Fearn, & Francis, 2001; Gotz & Gotz, 1979; Rushton, 1990; Stephen, 2008). Eysenck (1995) suggests that, like psychotic individuals, creative individuals possess weak latent inhibition and consequently have "wide associative horizons" which allow them to perceive connections that others do not see. This notion has found some support in the literature. Dellas and Gaier (1970), for example, reported that creative individuals are less likely to screen out supposedly irrelevant details. Furthermore, a study of Harvard University students, found that weak latent inhibition was associated with greater creative achievements (Carson, Peterson, & Higgins, 2003).

So why might weak latent inhibition lead to a maladaptive overinclusive cognitive style in psychotic individuals; but to a controlled usefulness in creative individuals? According to Eysenck (1995) and others (e.g., Carson et al., 2003; Kaufman, 2009), the principal factor that distinguishes the "word salad" of the schizophrenic from the "utterances of the poet" is intelligence. Schizophrenic individuals are thought to have impaired intelligence and so are less able to reject any unusable associations. In keeping with