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Personality and Cognitive Abilities

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Synonyms

Aptitude; Disposition; Intelligence; Temperament

Definition

Personality is a set of characteristics that lead to consistent patterns of behaviors, thoughts, and feelings; cognitive abilities refer to an individual's general mental aptitude. This entry reviews the relationship between personality and cognitive abilities.

Introduction

Intelligence and personality are often considered to be largely separate domains, by psychologists and laypeople alike (DeYoung 2011). However, correlations between intelligence and personality have been known in the literature for at least 100 years (Webb 1915). Although these relationships have been a focus of investigation for some researchers (e.g., Ackerman and Heggestad 1997; DeYoung et al. 2014; Moutafi et al. 2004; Murray et al. 2014; Wolf and Ackerman 2005) and have served as integral parts of theories of adult intelligence (Ackerman 1996; Chamorro-Premuzic and Furnham 2005), they are more commonly investigated in isolation. Both intelligence and personality factors are known to predict academic (Poropat 2009; Richardson et al. 2012) and job performance (Barrick and Mount 1991; Schmidt and Hunter 1998). However, they usually have been treated as categorically different and unrelated variables, even when included in the same investigation.

In this entry, relevant theories of intelligence and personality will be reviewed, and an overview of the distinctions between intelligence and personality, as well as general explanations for intelligence-personality relationships, will be provided. Then, evidence for relationships between intelligence and each of the factors in the current dominant personality model (i.e., the Big Five; Costa and McCrae 1992) will be reviewed.

The treatment of the relationship between intelligence and personality in this entry is necessarily limited. Several reviews and meta-analyses (Ackerman and Heggestad 1997; DeYoung 2011; Zeidner and Matthews 2000) and edited volumes (Collis and Messick 2001; Saklofske and Zeidner 2013; Sternberg and Ruzgis 1994) have addressed this relationship, and the interested reader is encouraged to refer to these excellent sources for more detailed treatments of the issue.

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Personality

Personality is an organized set of characteristics of a person that contribute to behaviors, thoughts, and feelings that are relatively consistent across time and situations (Carver and Scheier 2004). Many competing theories and models of personality exist (see Ackerman and Heggestad 1997, for a review of theories often encountered in intelligence-personality relations research). The Big Five factor model (Costa and McCrae 1992) emerged in the last quarter of the twentieth century as a dominant model in differential psychology. It is commonly used and psychometrically well established, and much of the research on the relationship between personality and intelligence is based on this model (Zeidner and Matthews 2000). The model consists of five orthogonal factors: extraversion, neuroticism, conscientiousness, agreeableness, and openness. Theory and evidence relating intelligence to each of the five factors will be presented in separate sections below; a description of each factor will appear in the appropriate section.

While the Big Five model does not explicitly propose mechanisms for relationships between intelligence and the five factors, a different model of personality, Eysenck's (1967) three-factor model (which includes extraversion, neuroticism, and psychoticism), does provide such a link. According to Eysenck, personality is biologically based, and this biological component has been offered as an explanation for the relationship between intelligence and some personality traits, particularly extraversion (Eysenck 1994). This theory will be discussed further under the "extraversion" heading below.

Intelligence

The factor structure of intelligence is more settled than that of personality. Most psychometrically based models of intelligence are relatively similar to each other, in that most consist of a general ability factor (usually called *g* or general intelligence) at the highest level, somewhat more narrowly defined broad factors at the next lower level (e.g., fluid ability, crystallized ability, visualization ability), and still more narrowly defined specific factors at the next lower level (see Ackerman and Heggestad 1997, for a review of relevant theories). Only two second-order factors will be considered in this entry: fluid intelligence and crystallized intelligence. These two types of intelligence are central to Cattell's (1943) model, and similarly defined factors appear in many other models of intelligence, though often under different names. Fluid intelligence (*gf*) is a domain-general ability to solve new problems by recognizing patterns and manipulating relevant information (Cattell 1943). Crystallized intelligence (*gc*) refers to knowledge that an individual has acquired over time and is domain specific. Cattell (1943) posited that crystallized intelligence develops via the investment of fluid intelligence, which accounts for the substantial positive correlation between them. Later theorists (e.g., Ackerman 1996; Chamorro-Premuzic and Furnham 2005) have further developed this idea of investment to include personality and interest factors. According to Ackerman's (1996) PPIK (intelligence-as-process, personality, interests, and intelligence-as-knowledge) theory of adult intelligence, for example, personality and interests play a role in the development of intelligence-as-knowledge (*gc*) by influencing the types of activities into which a person is most likely to invest his or her intelligence-as-process (*gf*). However, most researchers studying cognitive abilities do not assess personality factors and even fewer attempt to integrate them into the same framework. This state of affairs is not merely because the two fields have evolved separately but because of theoretical and measurement considerations that make integrating the domains somewhat complicated. These considerations are discussed in the next section.

Relationship Between Personality and Intelligence: Theoretical and Methodological Issues

There are important differences between intelligence and personality, at both the theoretical and

measurement levels, that contribute to the perception that they are different (for a more extensive discussion of features that distinguish personality, intelligence, and their modes of assessment, see Zeidner and Matthews 2000). From a theoretical perspective, intelligence generally is considered to be less modifiable across situations than personality (Zeidner and Matthews 2000). That is, expression of personality is seen to be within the individual's control to some degree, meaning that personality is less consistent across situations compared to intelligence. This modifiability can cloud the relationship between intelligence and personality. From a measurement perspective, there are two important distinctions between intelligence testing and personality assessment. First, intelligence is measured using objective tests, whereas personality usually is assessed via self-report, although there have been some attempts to develop objective tests of personality (e.g., Schmidt 1988) and self-report measures of intelligence (e.g., Goff and Ackerman 1992). Second, intelligence tests usually are given under conditions intended to elicit the best possible (i.e., maximal) performance from the examinee. In contrast, personality inventories are designed to encourage responses that reflect the respondent's typical behavior (Cronbach 1990). Fiske and Butler (1963) explained that obtaining maximal performance on intelligence tests is desirable because intelligence test scores obtained under maximal performance conditions should be less contaminated by other factors (e.g., mood) and should be more stable compared to submaximal performance. On the other hand, Fiske and Butler (1963) argue, personality assessment is intended to elicit responses that will indicate a person's most likely behavior, for which maximal performance is not relevant. However, as Ackerman and Heggestad (1997) pointed out, investigators and practitioners may be interested not only in an examinee's maximal possible performance but also in the level of performance that he or she is most likely to exhibit in a real-world situation. With an eye toward predicting real-world behavior, which typically will arise from a combination of personality and intelligence factors, Wechsler (1950) argued that psychometricians would be better off integrating personality into the concept of intelligence, rather than attempting to develop tests that are completely unaffected by personality.

In discussing the relationship between intelligence and personality, it is important to distinguish between intelligence as a latent construct and psychometric intelligence (Chamorro-Premuzic and Furnham 2006). Intelligence as a latent construct refers to "actual" intelligence – in other words, it is an individual's "real" level of intelligence. Psychometric intelligence refers to a person's actual score on an intelligence test. Psychometric intelligence is assumed to *reflect* the latent factor of intelligence but cannot be expected to measure it perfectly. Many factors aside from latent intelligence can affect psychometric intelligence, such as fatigue, motivation, failure to understand or follow test instructions, and emphasis on speed or accuracy. Personality factors may be related to intelligence at the latent level, the psychometric level, or both (Chamorro-Premuzic and Furnham 2005). Another possibility for intelligence-personality relationships is that both share biological underpinnings. These possibilities are not mutually exclusive. For example, Eysenck (1994) proposed that positive extraversion-intelligence correlations are due to both being related to cerebral arousability, which may be paired with either a latent-level relationship (e.g., if cerebral arousability is indicative of higher latent intelligence) or a psychometric-level relationship (e.g., if high cerebral arousability increases distractibility, which depresses intelligence test performance).

In the rest of this entry, evidence for the relationship between intelligence and each of the Big Five personality factors will be reviewed.

Personality Factors and Cognitive Ability

Openness

A person high in Openness is imaginative, intellectual, curious, and creative (Carver and Scheier 2004). Given these defining characteristics, Openness is the personality factor that would be most expected to correlate with intelligence. In their

meta-analysis, Ackerman and Heggestad (1997) found a correlation of $r = 0.33$ between Openness and *g*. DeYoung (2011) reported an *N*-weighted average correlation of $r = 0.30$ in nine additional studies that were not included in Ackerman and Heggestad (1997).

Chamorro-Premuzic and Furnham (2005) suggested five possible explanations for the observed positive correlation between Openness and *g*. The first possibility (and the one that the authors favored) is an investment hypothesis of the type described above: Higher Openness leads people to spend more time engaging in activities that challenge them intellectually, which over time leads to greater intelligence at the latent level, and higher scores on intelligence tests. Although this hypothesis is difficult to test experimentally, patterns of correlations between Openness, *gf*, and *gc* can provide some support for this idea. Specifically, an investment hypothesis would predict that Openness should correlate more strongly with *gc* than with *gf*. Recall Cattell's (1943) proposal that *gc* develops through the investment of *gf*. According to Chamorro-Premuzic and Furnham (2005), people with high Openness are more likely to invest their fluid ability in intellectual pursuits, which increases their *gc* over time (see also Ackerman 1996). Therefore, Openness should correlate with *gc*, but not necessarily with *gf*, because Openness plays a role in the development of *gc* but not *gf*. This is indeed the observed pattern of relationships. Correlations between Openness and *gc* typically exceed $r = 0.3$ (e.g., Ackerman and Heggestad 1997), whereas correlations between Openness and *gc* are negligible ($r = 0.08$ in Ackerman and Heggestad 1997; but see DeYoung et al. 2014, for a more extensive discussion of the subfactors of Openness and their relationship with *gf* and *gc*).

Of course, directionality cannot be inferred from a correlation alone, and a second possibility noted by Chamorro-Premuzic and Furnham (2005) is that higher intelligence leads to higher Openness. However, given the low correlation between Openness and fluid intelligence, this seems unlikely. A third possibility, similar to the first, proposes an interaction between Openness and intelligence such that more intelligent people are more likely to engage in intellectual pursuits, which leads to higher intelligence. According to this view, intelligence and Openness participate in a feedback loop in which Openness makes a person more likely to engage in intellectual activities, and of these people, the more intelligent ones will be more likely to succeed in such undertakings. Successful people will be more likely to continue to engage in these activities, which leads to greater opportunity to increase intelligence, and so on. Conversely, people with low intelligence and low Openness can be caught in a negative loop in which low intelligence limits success in intellectual pursuits, which lowers the likelihood of future intellectual endeavors, which limits opportunities to further develop one's intelligence (Chamorro-Premuzic and Furnham 2005; see Matthews 1999, for a similar proposal regarding the relationship between skill acquisition and personality).

A fourth possibility posed by Chamorro-Premuzic and Furnham (2005) was that openness is effectively a self-report measure of intelligence (but they note that the Openness scale items mainly assess interests rather than actual skills). Finally, they suggest that intelligent people are more likely to score highly on openness measures because they are better able to see the intent of the items and respond with what they believe to be the "correct" answer. However, Chamorro-Premuzic and Furnham (2005) note that this possibility seems unlikely, given studies that have reported low correlations between intelligence and socially desirable responding.

The arguments reviewed above represent possible causes for the observed relationship between openness and intelligence. A separate issue regarding openness and intelligence is that some researchers (e.g., DeYoung 2011; Wechsler 1950) have proposed integrating intelligence and personality into the same framework. For those whose models mostly maintain the current Big Five structure (e.g., DeYoung 2011), intelligence becomes subsumed under the openness factor.

Due to its relatively close relationship with intelligence on a conceptual level, the openness-intelligence relationship has been the subject of much research. However, the relationship likely is

complex and perhaps not unidirectional. Much remains to be learned about the interface between intelligence and openness.

Neuroticism

The hallmark of neuroticism is anxiety (Carver and Scheier 2004). A person high in neuroticism is prone to nervousness, excitability, and tension. It is important to note here the distinction between states and traits, particularly in reference to anxiety. A trait is a general disposition toward a given behavior or emotional state. Neuroticism can be described as trait anxiety. This is contrasted with state anxiety, which is the experience of anxiety at a particular moment in time. Feeling anxious about an important test is an example of state anxiety, regardless of whether a person is high in neuroticism. In other words, people high in neuroticism are not always anxious at a given moment, and people low in neuroticism sometimes are anxious. This distinction is important to a discussion about the relationship between neuroticism and intelligence.

Neuroticism and intelligence test scores have a low negative correlation ($r = -0.15$; Ackerman and Heggestad 1997). It is likely that this correlation reflects a relationship between neuroticism and psychometric intelligence rather than latent intelligence (Chamorro-Premuzic and Furnham 2005). That is, higher neuroticism is associated with lower intelligence test *scores*, but not actually lower intelligence. The probable mechanism for this relationship is that neurotics are more prone to worrying, and worrying about one's performance consumes attentional resources that, if available, would have been dedicated to the test (Sarason 1988). The relatively low correlation between *trait* neuroticism and intelligence test performance is clarified by a much stronger correlation between *state* test anxiety and intelligence test scores ($r = -0.33$; Ackerman and Heggestad 1997). People high in neuroticism may or may not experience anxiety during testing situations, while people with test anxiety (or people who reported being anxious during a particular test) are much more likely to be anxious during testing. Anxiety can only interfere with test performance if it is experienced during the test. Therefore, it is to be expected that a state measure would correlate more strongly with test performance than a trait measure.

The possibility that neuroticism negatively impacts psychometric intelligence, but not latent intelligence, may lead some to conclude that neuroticism lowers the validity of intelligence tests. However, if the goal of the intelligence test is to predict real-world performance, this stance assumes that only latent intelligence, and not neuroticism or test anxiety, is relevant to performance on real-world tasks. This assumption probably is untenable, and to the degree that performance on the real-world task is prone interference from anxiety, neuroticism/text anxiety influences on test performance may *increase* test validity (DeYoung 2011). Indeed, Wechsler (1950) argued that intelligence tests that are influenced by personality factors in general may be more valid for predicting real-world performance, because behavior in the real world is never due to intelligence alone.

The above discussion has assumed that relationship between neuroticism/test anxiety and intelligence test scores is due to anxiety suppressing performance on intelligence tests. However, it is also possible that the causality runs in the opposite direction and that low intelligence leads to higher anxiety in testing situations (Muller 1992). That is, test anxiety is a marker of knowledge or expectation of poor performance, rather than a cause of it. This effect may also operate at the latent level: Anxious examinees may have low self-efficacy (whether due to generally low intelligence, in the case of ability tests, or poor preparation, for achievement tests), which can negatively impact test performance. Following poor test performance, self-efficacy may decrease further, leading the examinee to prepare less fully for future tests and be less likely to engage intellectually (Chamorro-Premuzic and Furnham 2005). Over time, low cumulative competence decreases test performance (via low actual *gc*) and increases anxiety (via low self-efficacy), resulting in a correlation between the two.

To summarize, the correlation between neuroticism and intelligence test scores likely is largely

mediated by test anxiety, which interferes with psychometric intelligence but not latent intelligence. However, it is possible that neuroticism may affect latent intelligence through a long-term process of poor performance, low motivation and engagement, subsequent poor performance, and even lower motivation and engagement. Given the much stronger text anxiety-intelligence correlation compared to the neuroticism-intelligence correlation, it seems likely that most of the effect is due to anxiety experienced in the testing situation.

Extraversion

A person high in extraversion is outgoing, bold, assertive, self-confident, and energetic (Carver and Scheier 2004). Evidence regarding the relationship between intelligence and extraversion is mixed. Ackerman and Heggestad (1997) reported a small but significant (in their very large meta-analytic sample) of $r = 0.08$. However, a follow-up meta-analysis several years later (Wolf and Ackerman 2005) found that studies published after 1997 reported progressively more negative correlations between extraversion and intelligence. In a review, Chamorro-Premuzic and Furnham (2005) noted that correlations typically hover around zero.

Despite the weak correlation between extraversion and intelligence, there are some theoretical reasons to expect a relationship. Eysenck (1967) suggested that introverts and extraverts differ in baseline levels of cortical arousal, with extraverts being chronically under-aroused and prone to seeking out stimulation. In contrast, introverts are chronically over-aroused and generally avoid external stimulation lest it raise their cortical arousal to an uncomfortably high level. In a review, Eysenck (1994) noted that some researchers have found that extraverts tend to prioritize speed over accuracy during cognitive testing, which affects scores on speeded tasks. In addition, Eysenck (1994) noted an interaction between extraversion and time-on-task. Specifically, extraverts tend to work more quickly than introverts in the earlier part of a test. Toward the end of the test, however, extraverts begin to exhibit slower response times and tend to abandon items more quickly, compared to introverts. In general, extraverts perform better on tests that emphasize speed, whereas introverts tend to have an advantage on longer or untimed tests, especially those that require reflection or insight (Chamorro-Premuzic and Furnham 2005). However, these findings have not always been replicated (see Chamorro-Premuzic and Furnham 2005, for a review).

A case can also be made for extraversion affecting intelligence on a latent level. Poropat (2009) reviewed two scenarios (he was specifically concerned with academic performance, but a similar case can be made for the develop of *gc* more generally). In the first scenario, extraverts develop higher *gc* by virtue of their higher levels of energy, positive affect, and general engagement with their surroundings in an educational setting. In the second scenario, extraverts would display greater interest in socializing than in studying, which would hinder their *gc* development. Given that the correlations between extraversion and intelligence (both *gc* and *gf*; Wolf and Ackerman 2005) are near zero, it is possible that neither of these scenarios is the case or that they both are true and their effects cancel each other out in the population.

Conscientiousness

High conscientiousness is characterized by cautiousness, seriousness, thoroughness, and a hard-working and responsible disposition (Carver and Scheier 2004). Conscientiousness did not correlate significantly with intelligence in Ackerman and Heggestad's (1997) meta-analysis, though some researchers have reported a significant negative correlation (e.g., $r = -0.26$ with abstract reasoning, a proxy for *gf*, and $r = -0.23$ with verbal reasoning, a proxy for *gc*; Moutafi et al. 2004). Moutafi et al. (2004) noted that the negative relationship between conscientiousness and intelligence seems counterintuitive: Both intelligence and conscientiousness correlate positively with job performance and academic performance in many studies (see Moutafi et al. 2004, for a review). They also note that a conceptual explanation for a negative relationship is difficult, and it seems unlikely that higher

conscientiousness somehow leads to lower intelligence (Moutafi et al. 2004). They proposed instead that intelligence influences the development of conscientiousness. Specifically, relatively less intelligent people develop higher levels of conscientiousness in order to keep up with their peers in academic settings, whereas people with higher intelligence do not have the same pressure to develop conscientious habits because they can accomplish most academic tasks with their intellect alone.

More recently, Murray et al. (2014) contended that the negative correlation reported by Moutafi et al. (2004) and others was due to selection effects. Most prior research had been based on samples of individuals drawn from populations that had been selected for academic or occupational achievement (college students, managers, and other professionals). In a selected population, people must meet some threshold level of performance in order to be admitted and retained. Therefore, people with relatively lower intelligence would have needed higher conscientiousness to compensate for their lower intelligence in order to make their way into the population from which the sample was drawn. This would lead to the observed negative relationship in such samples. However, in an unselected population, the relationship between conscientiousness and intelligence may be zero or even positive, because there is no threshold level of achievement required to be part of the general population. This indeed is what Murray and colleagues (2014) found. In addition, they demonstrated that setting an increasingly stringent achievement threshold for inclusion in the sample progressively reduced the conscientiousness-intelligence relationship.

The debate over the relationship between conscientiousness and intelligence illustrates the importance of attempting to replicate relationships in samples drawn from unselected populations after finding them in sample drawn from selected populations. However, the importance of this depends on one's research question. If the purpose of the research is to describe the relationship among people in general, then it is imperative to sample from an unselected population. However, if the goal is to examine the relationship between two traits in a selected setting (e.g., tertiary education), then drawing from this selected population is appropriate.

Agreeableness

Agreeable people prioritize maintaining relationships and are friendly, kind, and polite (Carver and Scheier 2004). Agreeableness has not been shown to be related to intelligence (Ackerman and Heggestad 1997; Chamorro-Premuzic and Furnham 2005), and there is no clear conceptual reason why it should be related to intelligence on a latent level (Chamorro-Premuzic and Furnham 2005, 2006). However, for the sake of completeness, a few mechanisms by which agreeableness might be expected to influence test performance are mentioned briefly here.

Agreeableness may be positively related to examinee motivation, especially in low-stakes situations, in which the experimenter can do little more than simply ask participants to do their best (Chamorro-Premuzic and Furnham 2005). Although the effect likely would be small, the fact that most psychological research is conducted under low-stakes situations means that this is not a trivial concern. Another argument for a positive agreeableness-intelligence relationship is that, as for openness, more intelligent people infer the purpose of the questions and respond with the "correct" response on an Agreeableness scale. However, as noted in the "Openness" section, the fact that more intelligent people tend to score lower on measures of socially desirable responding provides evidence against this claim.

Conclusion

The relationship between the Big Five personality factors and intelligence test scores is complex and far from settled. Some of the complexity arises from the different modes of assessment (maximal vs. typical) used in the two domains. Openness is conceptually the most closely related to intelligence, but possible mechanisms can be offered for neuroticism, extraversion, and conscientiousness. In some cases, reasonable but contradictory

hypotheses can be generated regarding the direction or cause of each trait's relationship with intelligence. Much remains to be learned if researchers continue to heed the call to further integrate the constructs of personality and intelligence in order to better understand and predict real-world behavior.

Cross-References

- Ability Traits
- Agreeableness
- Conscientiousness
- Extraversion
- Extraversion/Introversion (Eysenck's Theory)
- Neuroticism
- Openness
- Test Anxiety

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