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Emotional intelligence: not much more than *g* and personality ☆

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Abstract

Cognitive ability and personality have long played central roles in the investigation of determinants of human performance. Recently, the construct of emotional intelligence (EI) has emerged in the popular literature as an additional explanatory concept for human behavior and performance. The ability conceptualization of EI proposed by Mayer, Salovey, and their colleagues involves the perception, assimilation, comprehension, and management of emotions. Its proponents consider it to be distinct from either general cognitive ability (*g*) or personality. The purpose of this study was to investigate the construct validity of EI by examining its relations to *g* and the Big Five personality dimensions of Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. The observed correlation between scores on the Wonderlic Personnel Test (a measure of *g*) and EI was $r = 0.454$. A regression model that included three predictors representing *g*, the Big Five dimension of Agreeableness, and sex showed an R of 0.617. After correction for unreliability the multiple correlation became 0.806, showing a strong relationship. Based on these results, we question the uniqueness of EI as a construct and conclude that its potential for advancing our understanding of human performance may be limited. Implications and suggestions for future studies are discussed.

Keywords: Emotional intelligence; Intelligence; Personality; Construct validity; Big Five; Cognitive ability

☆ The opinions expressed are those of the authors and are not necessarily those of the United States Government, the Department of Defense, or the United States Air Force.

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1. Introduction

Over the past century, general cognitive ability (*g*) has played a central role in illuminating our understanding of human performance. Numerous studies have examined the relations between *g* and academic, training, and occupational performance (Gottfredson, 1997; Jensen, 1998; Ree & Carretta, 1998, 2002; Salgado, Anderson, Moscoso, Bertua, & de Fruyt, 2003; Salgado et al., 2003; Schmidt & Hunter, 1998), showing it to be the best single predictor of performance.

The role of personality in predicting human performance also has been extensively examined (McHenry, Hough, Toquam, Hanson, & Ashworth, 1990; Ones, Mount, Barrick, & Hunter, 1994; Schmidt & Hunter, 1998; Tett, Jackson, & Rothstein, 1991). In a study of enlisted US Army soldiers in nine jobs, McHenry et al. (1990) demonstrated the utility of temperament/personality measures for predicting job performance factors of effort and leadership, personal discipline, and physical fitness and military bearing. In a large-scale meta-analysis, Schmidt and Hunter (1998) demonstrated incremental validity for Conscientiousness for predicting training and occupational performance when paired with measures of *g*.

Over the last decade, the concept of emotional intelligence (EI; Mayer, Caruso, & Salovey, 2000; Mayer, Salovey, & Caruso, 1999, 2002) has received much attention in the popular literature. Mayer and his colleagues describe EI as the ability to recognize the meanings of emotions and relationships and to reason and solve problems. They contend that EI can be thought of having the same relations to emotional creativity, as *g* does to general creativity. Even though EI involves the ability to reason and solve problems, as does *g*, Mayer et al. (2000) do not consider EI and "other intelligences," such as *g* to be strongly related. Other researchers (Bar-On, 1997; Goleman, 1995, 1998) have broadened the EI construct by incorporating various personality characteristics (i.e., empathy, motivation, persistence, social skills, and warmth). Mayer and Salovey (Mayer et al., 2000) refer to models such as Bar-On's and Goleman's as "mixed models" and have stated their concern with integrating multiple attributes into the EI construct. McCrae (2000) performed a conceptual comparison between the Big Five factors of personality and aspects of emotional intelligence as proposed by Bar-On (1997) and Goleman (1995). Upon mapping features of these conceptualizations of emotional intelligence onto the Five Factor Model, McCrae noted several relationships. Although they were clearer for the Bar-On version which was derived from a review of personality characteristics, they also held for Goleman's version which was based more closely on Mayer and Salovey's ability-based conceptualization of emotional intelligence. McCrae concluded that "emotional intelligence should be associated with low scores for neuroticism and high scores for extraversion, openness, agreeableness, and conscientiousness" (p. 266). McCrae's (2000) proposed relations between personality and EI were subsequently tested by Petrides and Furnham (2001) and by Van der Zee, Thijs, and Schakel (2002).

Petrides and Furnham (2001) examined the relations between EI and the Big Five personality constructs in a sample of 166 undergraduate and post-graduate students. EI was measured by the Bar-On Emotional Quotient Inventory and personality by the NEO-PI-R. Modest correlations were observed between a factor representing trait EI and neuroticism (−0.29), extraversion (0.30), and conscientiousness (0.35). Trait EI showed little relation to either openness to experience (0.13) or agreeableness (−0.01). It should be noted, however, that no corrections were made for range restriction or reliability of the variables.

Van der Zee et al. (2002) examined the relations of academic intelligence and personality with emotional intelligence in a sample of 116 college students. Academic intelligence was measured using six subscales from the Dutch version of the General Aptitude Test Battery (GATB). Personality and emotional intelligence were measured using tests developed by PiMedia. An exploratory factor analysis of the 17 self-rating EI scales yielded three factors identified as Empathy, Autonomy, and Emotional Control. EI factor scores were created by selecting items with the highest loadings on each factor and averaging them. Stepwise regressions were performed to predict the EI factor scores separately using the GATB and Big Five scores as predictor sets. Multiple correlations using the GATB subscales as predictors were modest: Empathy (0.30), Autonomy (ns), and Emotional Control (0.24). Multiple correlations using the Big Five dimension scores as predictors were stronger: Empathy (0.53), Autonomy (0.77), and Emotional Control (0.70). Each of the Big Five dimensions significantly contributed to the prediction of at least one of the three EI factor scores. These correlations should be considered conservative estimates. As with Petrides and Furnham (2001), no corrections were made for range restriction or reliability of the measures.

Further, De Fruyt and Salgado (2003) have noted that all factors of personality are important for understanding human performance. They have called for a conjoining of the fields of personality and individual differences. The current study provides a partial answer to that call.

To improve our understanding of new or emerging constructs such as EI, it is often informative to study their relations to well known constructs such as *g* and personality. Doing so can provide insight into their construct validity, uniqueness, and utility in incrementing our understanding of human performance.

The purpose of this study was to examine the relations between cognitive ability, personality, and emotional intelligence. We investigated the contention by Mayer et al. (2000) that EI is distinct from *g* and personality. In particular, we tested whether emotional intelligence could be predicted from these other constructs. If EI can be well predicted from extant constructs, its uniqueness and potential for advancing our understanding of human performance may be limited.

2. Method

2.1. Participants

Participants were 102 individuals recruited primarily from two small colleges in south and east Texas. Many of the participants were graduate students who were also employed full time. The sample was almost evenly split between men (48.0%) and women (52.0%) and was mostly white (white, 63.7%; African–American, 15.7%; Hispanic, 14.7%; Asian, 3.9%; and other, 2.0%). Participants ranged in age from 18 to 60 years with a mean of 30.9 years; in education level from 12 to 30 years with a mean of 16.8 years; and in management experience from 0 to 31 years with a mean of 4.4 years.

2.2. Measures

Wonderlic Personnel Test (WPT). The WPT is a short measure of general cognitive ability (*g*) showing a correlation of $r = 0.92$ with the full-scale IQ score on the WAIS-R (Wonderlic, 2000, p.

19). Cognitive ability describes the level at which individuals learn, understand instructions, and solve problems. WPT scores provide insight into the ability to adapt, learn (trainability), and solve problems on-the-job (Hunter, 1989). Those who score high will tend to gain more from formalized training and be more likely to learn effectively from on-the-job experience. Low scorers will need detailed instructions, hands-on practice, and closer supervision (Wonderlic, 2000). Schmidt and Hunter (1998) have demonstrated that g is the most valid predictor of occupational performance with a meta-analytic average correlation of $r = 0.56$ for job training performance and $r = 0.51$ for overall job performance.

The WPT has 50 verbal, quantitative, and spatial questions that begin at moderate difficulty and gradually increase in difficulty. Test content includes word comparison, disarranging sentences, sentence parallelism, number comparison, number series, analysis of geometric figures, and word problems requiring mathematical or logical solution.

WPT alternate form reliabilities range from 0.73 to 0.95; odd–even item correlations range from 0.88 to 0.94; and test–retest reliability estimates range from 0.82 to 0.94 (Wonderlic, 2000). Dodrill (1983) estimated longitudinal reliability at 0.94.

NEO-Five-Factor Inventory (NEO-FFI). The NEO-FFI is a shortened version of the Revised NEO Personality Inventory (NEO PI-R) and provides a measure of the five domains of adult personality: Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C) (Costa & McCrae, 1992). Domain scores were used for all analyses. The 60 items are rated on a 5-point scale and require 10–15 min to complete. The NEO-FFI factors show correlations between 0.75 (C) and 0.89 (N) with the full-scale NEO-PI validimax factors and the domain scales show correlations between 0.87 (A and C) and 0.92 (N). Internal consistency reliabilities for the NEO-FFI range from 0.68 (A) to 0.86 (N) and test–retest reliabilities range from 0.79 (E and O) to 0.89 (N) (Costa & McCrae, 1992).

Neuroticism (N) is a general tendency to experience negative affects such as anxiety, hostility, depression, self-consciousness, impulsiveness, and vulnerability. Higher scores on the N domain are indicative of the presence of neuroses. Low scores are associated with emotional stability and the ability to handle stress (Costa & McCrae, 1992).

Extraversion (E) is associated with activity, assertiveness, excitement seeking, sociability, and positive emotions. Extraverts are generally energetic, optimistic, and upbeat. Introversion is not the opposite of extraversion and is more difficult to profile. Introverts may prefer to be alone but not suffer from social anxiety, and although not given to the exuberance and high spirits of extraverts, intraverts are not necessarily unhappy or pessimistic (Costa & McCrae, 1992).

Openness to Experience (O) subsumes characteristics such as aesthetic sensitivity, imagination, intellectual curiosity, and independent judgment (Costa & McCrae, 1992). NEO O scores are modestly associated with education and intelligence. Open individuals tend to be unconventional and willing to question authority and offer new ideas.

Agreeableness (A) is a dimension of interpersonal tendencies. Highly agreeable individuals tend to be altruistic, compliant, modest, and trusting, while disagreeable individuals tend to be egocentric, skeptical of others' intentions, and very competitive.

Conscientiousness (C) is associated with achievement striving, competence, dutifulness, and self-discipline (Costa & McCrae, 1992). High scores are positively related to academic and occupational performance (Schmidt & Hunter, 1998).

Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT). The MSCEIT is a self-report ability-based measure of the facility for recognizing the meanings and relationships of emotions, and for reasoning and solving problems using emotional information (Mayer et al., 1999, 2002). Varieties of tasks are employed to assess an individual's capability to manage, understand, use, and perceive and identify emotions. Test item content includes identifying the emotions in a design or as expressed by a face, generating a mood and solving problems using that mood, defining the cause of different emotions and understanding their progression, and determining how to optimally include emotion in thought during situations involving self and others.

Mayer et al. (2000) hypothesized a moderate relationship between EI and "intelligences in other domains." As evidence, they reported a correlation of 0.36 between a general EI factor and verbal intelligence. However, no correlation was provided between EI and general cognitive ability (g). Measures of general cognitive ability require items from several cognitive domains usually including verbal, mathematical, and spatial (Jensen, 1998). Mayer et al. reported a similar correlation between general EI and empathy ($r = 0.33$).

The on-line, computer-administered prepublication version of the MSCEIT was used in the current study. It has 141 items and preserves the factor structure and reliability of earlier forms of the test (Mayer et al., 1999, 2002). It is scored automatically and requires about 45 min to complete. Mayer, Salovey, Caruso, and Sitarenios (2003) conducted confirmatory factor analyses of the MSCEIT using one, two, and four factor models. All the models fit reasonably well with a progressively better fit from one factor to four correlated factors. For the four factor model, the factors were named Perceiving Emotions, Facilitating Emotions, Understanding Emotions, and Managing Emotions.

The test manual for the MSCEIT (Mayer et al., 1999) shows mean score differences between the sexes. For the overall score, the mean standardized difference between males and females was $d = 0.55$, favoring females. All of the subscale scores also favored females with standardized differences ranging from $d = 0.26$ to 0.52.

Internal consistency reliability for the MSCEIT full-scale score is reported to be 0.93 in the normative sample (Mayer et al., 1999). Brackett and Mayer (2001) reported a full-scale test–retest reliability of 0.86 for a sample of 62 participants.

2.3. Procedure

The paper-and-pencil tests (WPT and NEO-FFI) were administered in the classroom. The on-line computerized test (MSCEIT) was completed individually or as a class project.

2.4. Analyses

A correlation matrix (8×8) was computed that contained the WPT raw score [1] (WPT), the five personality dimensions of Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C), the MSCEIT full-scale score (EI), and a dichotomous score representing sex (males = 1 and females = 0). Regression models were examined to

[1] The WPT raw score is derived from the entire set of verbal, quantitative, and spatial questions.

explore the predictive utility of cognitive ability, personality, and sex with emotional intelligence as the dependent variable. Consistent with Mayer et al. (1999), Petrides and Furnham (2000) noted mean differences by sex on a measure of EI and reported sex differences from other studies of EI. Therefore, participant's sex was included as a predictor.

EI was predicted using several regression models. Model 1 consisted of WPT, sex, and the five personality scores (N, E, O, A, and C). Model 2 consisted of WPT, sex, and a composite of the five personality scores created through simple addition (Big Five = −N+E+O+A+C). This composite embodies McCrae's (2000) proposed theoretical conceptualization of the relations between the Five Factor personality dimensions and EI. Model 3 was based on theory and the predictors were WPT, sex, and the personality variable of agreeableness (A). Kellett, Humphrey, and Sleeth (2002) provided the impetus to include agreeableness based on their work on empathy.

Finally, one multiple correlation was corrected for unreliability of the EI measure and the predictors by the usual "correction for attenuation". This gives the correlation between EI and the regression-weighted predictors if they were measured without error. This corrected correlation is very important for understanding construct validity and the constructs being investigated: *g*, personality, and EI. Measurement error, also known as unreliability, has the effect of reducing correlations observed in all studies. Therefore, to know the true correlations among constructs the effect of measurement error, which is study dependent, must be removed. See Gulliksen (1987) for a comprehensive discussion of the correction for attenuation and examples. This is important for understanding the construct validity of EI.

3. Results and discussion

3.1. Descriptive statistics

The means and standard deviations of the observed scores are summarized in Table 1. The WPT full-scale sample mean (26.01) was elevated about 0.7 standard deviations above the 1992 normative population value (21.06). However, the standard deviations for the sample (7.20) and population (7.12) were nearly equal. In contrast, the sample mean for EI (84.08) was about one standard deviation *below* the population value (100.00), but the sample and population standard deviations were nearly equal (15.67 vs. 15.00). The average of the sample means for the five

Table 1
Descriptive statistics

Variable	Mean	SD	Skewness	Kurtosis
WPT	26.01	7.20	−0.187	−0.460
NEO-N	47.81	11.17	0.449	−0.783
NEO-E	58.39	9.55	−0.336	−0.662
NEO-O	52.20	11.19	0.136	−0.549
NEO-A	46.54	11.99	−0.036	−0.483
NEO-C	50.66	11.58	−0.318	−0.699
EI	84.08	15.67	−0.468	−0.083
Sex	0.48	0.50	0.080	−2.03

$N = 102$.

personality scales was 51.12 with an average standard deviation on 11.10, compared with population values of 50.00 and 10.00. Despite the elevated sample mean for WPT and the depressed sample mean for EI, the sample standard deviations were nearly identical to the population values, suggesting that the correlations among the variables were not affected by range restriction. Because of the apparent lack of range restriction, no correction was applied to the data.

Consistent with previous studies of EI (Mayer et al., 1999; Petrides & Furnham, 2000), females ($\overline{X} = 88.4$) scored higher on the overall EI score than did males ($\overline{X} = 79.3$) ($t(100) = 9.15$, $p < 0.01$). The standardized mean differences was $d = 0.58$.

3.2. Correlations

Table 2 shows the correlations among the variables. The correlations between the seven predictors and EI were all in the expected direction and significant at the 0.05 level. These results are consistent with previous studies. The observed correlation between cognitive ability and EI was stronger than reported elsewhere (Mayer et al., 2000; Van der Zee et al., 2002), but may be explained by differences in the measures used and sample characteristics. The relationship between participant's sex and EI is consistent with Mayer et al. (1999) and Petrides and Furnham (2000). The finding of significant relationships between the Big Five domain scores and EI is consistent with Petrides and Furnham (2001) and Van der Zee et al. (2002). The personality-emotional intelligence relationship appears robust as these three studies each used different measures of the Big Five and EI as well as different sources of participants.

After reflecting the negative signs due to N and the coding of sex, the average correlation between the seven predictors and EI was 0.282. The smallest correlation in magnitude was between E and EI (0.181) and the largest was between WPT and EI (0.454). Simply on the basis of the observed correlations, we expected to be able to predict EI using a combination of cognitive ability, personality, and sex.

3.3. Regression models

The regression analyses are summarized in Table 3. Model 1, which included WPT, the five personality scores, and sex, had a multiple correlation of 0.639 with EI ($p < 0.01$). The R dropped

Table 2
Correlation matrix

Variable	WPT	NEO-N	NEO-E	NEO-O	NEO-A	NEO-C	EI	Sex
WPT	1.000							
NEO-N	−0.242	1.000						
NEO-E	−0.010	−0.361	1.000					
NEO-O	0.255	−0.052	0.365	1.000				
NEO-A	−0.044	−0.272	0.279	−0.083	1.000			
NEO-C	0.022	−0.496	0.348	0.154	0.328	1.000		
EI	0.454	−0.282	0.181	0.270	0.270	0.225	1.000	
Sex	0.026	0.034	−0.005	−0.137	−0.019	−0.159	−0.294	1.000

$N = 102$.

Table 3
Summary of regression analyses

Model	Predictors	R	R^2	R^2 change	F change (df_1, df_2)
1a	WPT, N, E, O, A, C, and sex	0.639*	0.408		
1b	WPT and N, E, O, A, C	0.579*	0.335	−0.073	11.49* (1, 94)[a]
1c	WPT	0.454*	0.206	−0.129	3.70* (5, 95)[b]
2	WPT, Big Five composite, and sex	0.620*	0.384		
3	WPT, Agreeableness, and sex	0.617*	0.381		

$N = 102$, $^*p < 0.01$.
[a] Model 1a vs. Model 1b.
[b] Model 1b vs. Model 1c.

significantly when sex was removed ($R = 0.579$, $R^2_{\text{change}}(1\text{ df}) = -0.073$, $p(\text{change}) < 0.01$), and again when the five personality scores also were removed ($R = 0.454$, $R^2_{\text{change}}(5\text{ df}) = -0.129$, $p(\text{change}) < 0.01$). Results from these analyses demonstrated a moderate relationship between g and EI and that both personality and sex added to the predictiveness of g for EI.

Examination of the Model 1 regression weights showed that although they were in the expected direction, not all of the personality scores contributed significantly to the prediction of EI. Because of this, it was decided to create a summed composite of the five scores (Big Five composite = −N+E+O+A+C) to increase the reliability of the scores as predictors. The score for N receives a negative sign because high scores are associated with negative affect and this is not the case with the other personality scores. Model 2 included WPT, sex, and the Big Five composite. The resulting model was significantly related to EI ($R = 0.620$, $p < 0.01$).

Model 3 had three predictors: WPT, Agreeableness (A), and sex ($R = 0.617$, $p < 0.01$). Although the correlation between the Big Five personality composite and EI ($r = 0.391$) was greater than the correlation between Agreeableness and EI ($r = 0.270$), there was very little difference in the multiple R values when either was used along with WPT and sex (Model 2: $R = 0.620$; Model 3: $R = 0.617$). The greater validity of the Big Five composite may have been due to its increased reliability compared with Agreeableness (A) alone.

A test of the difference between Model 1 with seven predictors and Model 3 with three predictors yielded a non-significant result ($F = 1.097$, $\text{df}(4, 94)$). Further, when evaluated for cross-application shrinkage by Stein's Operator (Kennedy, 1988; Stein, 1960), Model 3 showed a *higher* post-shrinkage value than did Model 1 (Model 1 shrunken $R = 0.556$; Model 3 shrunken $R = 0.579$). Clearly, Model 3 was preferred based on theory, parsimony, and resistance to shrinkage.

Finally, Model 3 was corrected for the unreliability of the measures of A and EI. Fuller (1987) presents a comprehensive discussion of the effects of measurement error in statistical analyses. The effects of the unreliability of WPT and reported sex were ignored due to their very high reliabilities; correcting WPT and reported sex would have little to no effect. The usual effect of measurement error is to reduce observed effect sizes such as correlations or mean differences. Using the test–retest reliability of 0.86 for EI, the corrected multiple R was 0.665. We used the internal consistency reliability of 0.68 for A and the test–retest reliability of 0.86 for EI to correct for both simultaneously. After correcting for the reliability of both EI and A, the multiple R became 0.806.

4. Conclusions

Contrary to expectations raised by EI theorists (Mayer et al., 2000; Van der Zee et al., 2002), a moderate observed relationship was obtained between *g* and this measure of EI. Further, the personality construct of agreeableness and participant's sex also were related to EI. Our findings differ from previous findings because we have corrected the correlations for the effects of measurement error. These findings lead us to speculate about the usefulness of EI for enhancing our understanding of the determinants of human performance. If EI can be largely predicted (corrected multiple $R = 0.806$) from other well-known constructs, its uniqueness and expected incremental utility for predicting human performance may be limited. Before EI can be accepted as a mainstay in aptitude theory and in personnel measurement theory and practice, additional studies are required to examine its validity and incremental validity for predicting human performance in a variety of settings (i.e., academic, social, training, and occupational). An appropriate study would include multiple criteria measuring several dimensions of job performance (Campbell, McHenry, & Wise, 1990) and would conduct regressions at the level of constructs rather than at the level of observed variables. This would involve "residualizing" (Schmid & Leiman, 1957) the *g* and personality portions out of EI and testing to see if the non-*g* and non-personality portions of EI offer any incremental validity (see Olea & Ree, 1994).

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