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A Behavior Genetic Analysis of Trait Emotional Intelligence and Alexithymia: A Replication

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This replication study examines relations between alexithymia and trait emotional intelligence (trait EI) at the phenotypic, genetic, and environmental levels. A sample of 1,444 same-sex twin pairs (850 MZ pairs and 594 DZ pairs) completed the Toronto Alexithymia Scale-20. A subset of 494 same-sex twin pairs (287 MZ pairs and 207 DZ pairs) had earlier completed the Trait Emotional Intelligence Questionnaire. Individual differences in alexithymia were attributable to genetic, non-shared environmental, and shared environmental factors. All but one of the facets of alexithymia were negatively and significantly correlated with the factors of trait EI, and these phenotypic correlations were entirely attributable to correlated genetic and correlated non-shared environmental factors. These bivariate results provide a valuable replication of those of Baughman et al. (*Twin Research and Human Genetics*, Vol. 14, 2011, pp. 539–543), which was conducted with substantially smaller samples of twins.

■ **Keywords:** trait emotional intelligence, alexithymia, behavioral genetics

Alexithymia is characterized by the inability to identify and express one's emotions, an incapacity to distinguish between one's emotions and bodily sensations, and a tendency to engage in externally oriented thinking (EOT) — a cognitive style that shows a preference for the external details of everyday life rather than for content related to a person's inner experience (Bagby et al., 1994a). Alexithymia has been linked to various physical and mental health conditions, such as posttraumatic stress disorder, somatic illness, substance abuse, and cancer (Krystal et al., 1986; Taylor et al., 1997; Todarello et al., 1989). Less research, however, has been conducted in the area of individual differences in alexithymia or regarding alexithymia's relations with other personality traits, such as emotional intelligence.

Emotional Intelligence

Emotional intelligence (EI), also referred to as interpersonal intelligence, concerns the ability to understand and manage oneself and others in social situations (Thorndike, 1920). EI can be operationalized either as a trait or as an ability. Trait EI is concerned with individuals' perceived capacity to understand, process, and use information about emotions in everyday life, and is therefore assessed by self-report measures. Ability EI is characterized by people's actual abilities and is measured by performance tasks (Petrides & Furnham, 2001). However, researchers have encountered psychometric difficulties when measuring ability EI (Pérez et al., 2005), so the present study will focus on emotional intelligence as a personality trait rather than as an ability. Previous studies pertaining to trait EI have reported positive associations between the construct and numerous other variables, including life satisfaction, well-being, and social support (Austin et al., 2004).

Trait Emotional Intelligence and Alexithymia

Given that EI and alexithymia are conceptually similar in their shared focus on emotion-related understanding (Parker et al., 2001), the relation between them has been of some interest. Researchers have commonly assessed EI using the BarOn Emotional Quotient Inventory (EQ-i) and Schutte et al.'s (1998) self-report measure of EI, both of which define the trait as an ability, and therefore offer limited scope in its assessment (Petrides et al., 2004). That

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being said, this line of research has consistently reported moderate-to-strong negative correlations between EI and alexithymia, as measured by the Toronto Alexithymia Scale (e.g., Austin et al., 2004; Parker et al., 2001; Saklofske et al., 2003), suggesting an inverse relation between the variables of interest.

In order to study EI as a personality trait, the short form of the Trait Emotional Intelligence Questionnaire (TEIQue-SF) was employed in the present study. Few studies have examined this measure of trait EI in relation to alexithymia. Pham et al. (2010) reported a strong negative correlation between the TAS total score and TEIQue in a forensic sample of psychopaths. At the subclinical level, Mikolajczak et al. (2007) reported significant negative correlations between all factors of alexithymia and trait EI. Similarly, Baughman et al. (2011) found significant negative correlations between all factors of alexithymia and trait EI, with the exceptions of alexithymia's EOT factor and the trait EI dimensions of emotion regulation and stress management.

Behavior Genetic Studies of Alexithymia

Relatively little research has been conducted regarding the etiological underpinnings of alexithymia. Early researchers reported various risk factors for alexithymia, which were primarily environmental or familial in nature (Berenbaum, 1996; Fukunishi et al., 1997). More recent studies, however, have supported the role of genetic factors. To date, five behavior genetic (BG) studies of alexithymia have been conducted, with inconsistent findings.

A study by Heiberg and Heiberg (1977) suggested that alexithymia is influenced solely by genetic factors. Valera and Berenbaum (2001) demonstrated that the EOT factor of alexithymia is influenced by genetic factors, but also reported that remaining dimensions — difficulty identifying feelings (DIF) and difficulty describing feelings (DDF) — were influenced by both genetic and non-shared environmental factors. These studies suffered a number of limitations, including small sample sizes and measurement problems.

A large-scale adult twin study of 8,785 twin pairs suggested that individual differences in all three factors of alexithymia are attributable to genetic and non-shared environmental factors (Jørgensen et al., 2007). Two recent BG studies reported similar results (Baughman et al., 2011; Picardi et al., 2011). Baughman et al. (2011) further reported that the phenotypic correlations that they observed between alexithymia and trait EI were attributable to correlated genetic and correlated non-shared environmental factors. The sample sizes in the study by Baughman et al. (2011), however, were very small and the results of what they referred to as a pilot study need to be replicated with a larger sample.

The Present Study

The present study aimed to replicate the findings of Baughman et al. (2011) using a larger sample of twins. Based on Baughman et al.'s results, it is predicted that individual differences in alexithymia will be attributable to genetic and non-shared environmental factors. It is also predicted that all facets of alexithymia will be negatively correlated with all factors of the TEIQue-SF, and that these correlations will themselves be due to correlated genetic and correlated non-shared environmental factors.

Method

Participants

Participants were 850 monozygotic (MZ) pairs (771 female and 79 male pairs) and 594 dizygotic (DZ) same-sex twin pairs (556 female and 38 male pairs) who completed the Toronto Alexithymia Scale-20 (TAS-20). A subsample of 287 MZ same-sex twin pairs (257 female and 30 male pairs) and 207 DZ (191 female and 16 male pairs) had previously completed the TEIQue-SF. The average age of the twins was 60.5 years ($SD = 13.37$), and they ranged in age from 18 to 89 years. Participants were recruited from the Department of Twin Research and Genetic Epidemiology at Kings College London in the United Kingdom. The twins' zygosity was previously established either by genome scans (100% accurate), DNA tests (99.5% accurate), or via their responses to the 'Peas in the Pod' zygosity questionnaire (95% accurate).

Self-report questionnaires were sent to these adult twins, who are all volunteers from the Twins UK Adult Twin Registry (Spector & Williams, 2006). All were ascertained from the general population and shown to be comparable to age-matched population singletons. These unselected MZ and DZ twins have been recruited since 1992 using twin registers and national media campaigns, and have been used in a wide variety of studies (www.twinsuk.ac.uk). For historical reasons, the cohort is predominantly female. The twins in the registry are not selected for any particular trait and they volunteer to take part in studies that cover a wide range of traits and common medical conditions (Andrew et al., 2001). The study was approved by the St Thomas Hospital research ethics committee, and all twins in the study provided their informed consent.

Measures

Toronto Alexithymia Scale-20 (TAS-20). The TAS-20 (Bagby et al., 1994a) is a 20-item self-report questionnaire that requires participants to rate items on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). The TAS-20 yields a global alexithymia score, as well as scores on three dimensions of alexithymia: difficulty identifying feelings (DIF, seven items), difficulty describing feelings (DDF, five items), and externally oriented thinking (EOT, eight items). Example items for each of the facets are as follows: 'I am often confused about what emotion I am feeling' (DIF), 'I am able to describe my feelings easily' (DDF- reverse coded), and 'I prefer to analyze problems rather than just

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describe them' (EOT). The TAS-20 has also been found to have excellent psychometric properties (Bagby et al., 1994b; Parker et al., 2003).

Trait Emotional Intelligence Questionnaire–Short Form (TEIQue-SF). The TEIQue-SF (Petrides, 2009) is a self-report questionnaire consisting of 30 items to which participants respond on a five-point Likert scale (1 = completely disagree; 5 = completely agree). The measure yields a global trait EI score, as well as scores on four factors: well-being, self-control, emotionality, and sociability. Internal consistency reliability coefficients for the global and factor scores have been reported to range from .66 to .89 in the UK twin sample (Veselka et al., 2010).

Procedure

In 2011, all volunteers in the Twins UK Adult Twin Registry were asked to complete a battery of self-report questionnaires. A total of 6,552 individuals agreed to participate and, of these, 1,444 adult same-sex twin pairs (850 MZ; 594 DZ) completed the TAS-20 and a number of other measures not pertinent to the present report. A subsample of 494 same-sex twin pairs (287 MZ; 206 DZ) had previously completed a battery of questionnaires in 2009, which included the TEIQue-SF. All participants provided their informed consent and were mailed a debriefing form upon completion of the study.

Analyses

We conducted univariate and bivariate behavioral genetic analyses using the Mx software package (Neale et al., 1999) to determine the extent to which individual differences in alexithymia and the phenotypic correlations between alexithymia and trait EI can be accounted for by common genetic and/or common environmental factors. For the bivariate analyses, we used the method of Cholesky or triangular factor analysis (Neale & Cardon, 1992) to assess the cross-correlations within twin pairs (i.e., the correlation between one twin's score on one variable with their co-twin's score on another variable). We began by fitting a full ACE model to our data to investigate potential correlated genetic (A), common environmental (C), and/or unique environmental (E) effects. Subsequently, reduced AE and CE models were tested. The models with the lowest χ^2 change value (relative to the full model) and the lowest AIC value were selected as the best-fitting models. For each of the correlations presented in Table 2, a reduced AE model was found to have the best fit. Consequently, genetic (rg) and non-shared environmental (re) correlations were estimated.

Due to the very large number of female twins in our samples, we also re-ran the univariate analyses separately among just females. We also tested for sex differences in alexithymia and trait EI and examined correlations between these variables and age.

TABLE 1

Twin Correlations and Univariate Model-Fitting Results for the TAS-20

	Correlations		Parameter estimates (95% CI)		
TAS-20 scale	r_{MZ}	r_{DZ}	a^2	c^2	e^2
DIF	.67	.50	.27 (.15–.39)	.39 (.27–.49)	.34 (.31–.38)
DDF	.63	.47	.32 (.19–.45)	.31 (.19–.42)	.37 (.33–.41)
EOT	.70	.51	.25 (.14–.37)	.43 (.31–.53)	.32 (.29–.36)
Total TAS	.70	.54	.30 (.19–.42)	.40 (.28–.50)	.30 (.27–.34)

Note: DIF = difficulty identifying feelings; DDF = difficulty describing feelings; EOT = externally oriented thinking; a^2 = additive genetic effects; e^2 = non-shared environmental effects.

Results

Shown in Table 1 are the MZ and DZ twin correlations and the results of univariate BG analyses on the TAS-20, which were carried out with the software package Mx (Neale et al., 1999). These results are based on the full sample of 1,444 twin pairs. As can be seen, MZ correlations are larger than DZ correlations for all four dimensions of alexithymia, and, in each case, the best-fitting model showed that individual differences were attributable to additive genetic (a), shared environmental (C), and non-shared environmental (E) factors. Heritabilities range between .25 and .32 and all parameter estimates are significant at the .05 level. All reduced models (i.e., AE, CE, and E only) yielded significantly poorer fits. When these analyses were re-run among just the female twins, the results were virtually identical. Moreover, although there were significant mean differences between males and females on several facets of alexithymia and trait EI (females scoring significantly higher than males on emotionality; males scoring significantly higher than females on self-control, sociability, DDF, EOT, and total TAS), the actual effect sizes for these differences were very small: the largest effect size (for emotionality) was .36. Finally, we did not correct the data for age because all correlations between facets of alexithymia and age were less than .10 (averaging just .05 in absolute value).

Shown in Table 2 are the phenotypic correlations (rp) between the four alexithymia dimensions and the five factors of the TEIQue-SF. As expected, all correlations are negative, and all but one of these 20 correlations are significant at the .001 level. Specifically, the correlation between alexithymia's EOT scale and trait EI self-control did not reach significance. Also shown in Table 2 are the results of bivariate BG analyses, which were also run with Mx. These results reveal that the significant phenotypic correlations that we observed are entirely attributable to correlated genetic and correlated non-shared environmental factors. Genetic correlations range between −.06 and −.69 and all but two are significant at the .05 level. Non-significant genetic correlations were observed between the EOT subscale of the TAS-20 and trait EI emotionality and self-control. Non-shared environmental correlations range between −.02 and −.38. All but one of these correlations — the association between

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TABLE 2

Phenotypic, Genetic, and Environmental Correlations Between the TAS-20 and the TEIQue-SF

	TAS-20 scales			
TEIQue-SF scales	DIF	DDF	EOT	Total TAS
Emotionality	rp = −.28* rg = −.47 (−.30 to −.63) rc = – re = −.16 (−.05 to −.26)	rp = −.29* rg = −.47 (−.28 to −.63) rc = – re = −.23 (−.13 to −.33)	rp = −.11* rg = −.12 (−.29 to .06) rc = – re = −.11 (−.01 to −.22)	rp = −.30* rg = −.43 (−.27 to −.57) rc = – re = −.22 (−.15 to −.32)
Self-control	rp = −.34* rg = −.41 (−.24 to −.56) rc = – re = −.24 (−.13 to −.33)	rp = −.28* rg = −.49 (−.31 to −.67) rc = – re = −.13 (−.02 to −.23)	rp = −.03 rg = −.06 (−.23 to .12) rc = – re = −.02 (−.12 to .09)	rp = −.29* rg = −.39 (−.24 to −.54) rc = – re = −.18 (−.07 to −.28)
Sociability	rp = −.30* rg = −.48 (−.30 to −.64) rc = – re = −.18 (−.07 to −.28)	rp = −.47* rg = −.63 (−.47 to −.77) rc = – re = −.38 (−.28 to −.47)	rp = −.36* rg = −.57 (−.40 to −.72) rc = – re = −.17 (−.06 to −.28)	rp = −.48* rg = −.66 (−.52 to −.78) rc = – re = −.34 (−.24 to −.43)
Well-being	rp = −.28* rg = −.45 (−.29 to −.61) rc = – re = −.13 (−.02 to −.23)	rp = −.39* rg = −.68 (−.53 to −.84) rc = – re = −.23 (−.13 to −.33)	rp = −.23* rg = −.42 (−.26 to −.58) rc = – re = −.12 (−.02 to −.23)	rp = −.39* rg = −.60 (−.47 to −.72) rc = – re = −.22 (−.12 to −.33)
Total trait EI	rp = −.39* rg = −.56 (−.41 to −.69) rc = – re = −.23 (−.13 to −.33)	rp = −.47* rg = −.69 (−.56 to −.81) rc = – re = −.34 (−.24 to −.43)	rp = −.24* rg = −.36 (−.20 to −.50) rc = – re = −.16 (−.05 to −.26)	rp = −.48* rg = −.63 (−.51 to −.73) rc = – re = −.33 (−.23 to −.43)

Note: rp = phenotypic correlation; rg = genetic correlation; rc = shared environmental correlation; re = non-shared environmental correlation; DIF = difficulty identifying feelings; DDF = difficulty describing feelings; EOT = externally oriented thinking. For all of the paired variables, the best-fitting model was an AE-only model.
*$p < .001$, two tailed.

the self-control and EOT scales — are also significant at the .05 level.

Discussion

In this study, our goal was to replicate the findings of Baughman et al. (2011). Specifically, we used a large twin sample to investigate the contributions of genetic and environmental factors to individual differences in alexithymia. We further assessed the phenotypic, genetic, and environmental correlations between alexithymia and trait EI. Univariate BG analyses of alexithymia showed that individual differences in the trait were influenced by genetic, shared environmental, and non-shared environmental factors. These findings are in contrast to those of Baughman et al. (2011), where only significant genetic and non-shared environmental factors were noted. The genetic component observed supports previous suggestions that biological underpinnings may contribute to the development of alexithymia (e.g., Ham et al., 2005; Larsen et al., 2003). The contribution of shared environmental factors in the present study is an unusual finding, given that most BG studies of personality show no shared environmental effects (see Johnson et al., 2008, for a review of over 50 years of research). In a study of MZ and DZ twins reared together and reared apart, however, Tellegen et al. (1988) noted that there may be situations in which reared-together co-twins are themselves an important shared environmental source of within-pair similarity. This could only occur, however, among DZ twins and not among MZ twins, because only DZ twins have genetically determined within-pair differences in the first place. It is possible that such an effect is operating with respect to alexithymia, and was not noted by Baughman et al. (2011), given the small sample size they used. Additional research, however, should be conducted to investigate whether this is a real effect or merely an anomaly.

Looking at relations between alexithymia and trait EI, with the exception of alexithymia's EOT factor and the self-control dimension of trait EI, all phenotypic correlations were statistically significant. The negative correlations we found between the two sets of variables are consistent with previous research (e.g., Mikolajczak et al., 2007; Pham et al., 2010). At a conceptual level, such associations make sense, as high scores on trait EI reflect proficiency in understanding and communicating emotional information, whereas high scores on alexithymia imply a state of deficiency in processing or describing emotions. The non-significant correlation between EOT subscale and the self-control factor of the TEIQue-SF does imply a lack of association between a cognitive style that is more attuned to practical life details than to the inner experience and one's ability to self-regulate in an emotional context. That being said, the EOT factor did correlate significantly and moderately with the remaining trait EI factors, and therefore it does show the expected inverse relation with trait EI overall. It should be noted that participants in the present report completed the TEIQue and the TAS-20 approximately 2 years apart, so all of the correlations that we observed are likely lower-bound estimates of the true population correlations between these measures.

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Our bivariate BG analyses revealed that the phenotypic correlations between trait EI and alexithymia are entirely attributable to genetic and non-shared environmental factors. These results provide a valuable replication of Baughman et al.'s (2011) small-sample pilot study, in which similar results were reported. The findings allow us to conclude that, although alexithymia and trait EI are distinct, they do also share common attributes. Furthermore, many of the genetic correlations we reported between the trait sets were large, suggesting that neurobiological studies of alexithymia and trait EI may identify underlying biological factors common to both.

The present study is, of course, not without its limitations. The manner by which responses were obtained was self-report in nature, which could have resulted in response biases despite participants being encouraged to answer all items honestly and that they were not aware of the traits being studied. This potential is especially possible given the socially undesirable nature of alexithymic traits, and the socially desirable nature of high trait EI. To check for these response effects, it is suggested that future studies explore alexithymia and trait EI using peer report or multitrait–multimethod formats. Additionally, the nature of the sample may have further impacted our results. Specifically, the over-representation of female participants, which is due to historical reasons, may have resulted in more extreme scores given that females tend to score higher on a number of trait EI factors (Petrides & Furnham, 2000) and lower on alexithymia (Levant et al., 2009) in comparison to males. These scores could, in turn, have led to more pronounced negative correlations between the variables in our sample. That being said, the findings were largely in line with previous investigations of alexithymia and trait EI (e.g., Mikolajczak et al., 2007; Pham et al., 2010) and therefore are likely to be accurate representations of the true nature of the associations.

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