**The Predictive Role of Temperament Dimensions and Attachment in the Five Factor Model of Personality**

There is a considerable body of literature investigating the determinants of personality traits in adults, which include both environmental and genetic factors (Kendler, 1995). A better understanding of the role of parenting behavior, as well as biological factors, in predicting individual differences in typical personality traits has far-reaching consequences for the development of personality disorders (Reti et al., 2002).

The Five Factor Model (FFM, Costa & McCrae, 1992) of personality has been consistently favored by personality psychologists over the past decades (Hirsh, DeYoung, & Peterson, 2009), and has been acknowledged as a useful measure for structuring individual differences in personality (e.g., Rothbart, Ahadi, & Evans, 2000). The FFM yields five dimensions: Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. Each dimension describes a broad factor of psychological functioning that is composed of a set of more specific facets or traits (Zhao & Seibert, 2006).

Examination of the etiological factors involved in the development of individual differences in personality highlights the importance of heritability (Jang, McCrae, Angleitner, Riemann, & Livesley, 1998), as well as early childhood experiences (Reti et al., 2002). Developmental theorists postulate that temperament and attachment styles play a key role in explaining individual differences in personality from an early stage of life (Vaughn & Bost, 1999). Temperament is defined as a heritable pattern of cognitive, emotional and behavioral dispositions. While research indicates that temperament is influenced by experience (Roberts & Mroczek, 2008; Terracciano et al., 2005); studies also show that temperament remains largely stable from childhood to adulthood (Roberts & DelVeccihio, 2000; Rothbart et al., 2000). Given that temperament is biologically-based, many psychologists have searched for its physiological foundations (e.g., Cloninger, 1987, 2000; Davis et al., 2003; Zuckerman, 2005). As part of this effort, Fisher and colleagues have recently suggested a novel temperament model, the Fisher Temperament Inventory (FTI), which includes four temperament dimensions: (1) Curious/Energetic, (2) Cautious/Social Norm Compliant, (3) Analytical/Tough-minded, and (4) Prosocial/Empathetic. Each of these dimensions are associated primarily with one of four chemical systems of the brain: (1) dopamine, (2) serotonin, (3) testosterone and (4) estrogen/oxytocin, respectively (Brown, Acevedo, & Fisher, 2013; Fisher et al., 2010a,b). Brown and colleagues (2013) demonstrated the association between the four temperament dimensions of the FTI and the activation of certain brain systems in the predicted brain regions. They found that scores on the Cautious/Social Norm Compliant dimension were associated with activation in the ventrolateral prefrontal cortex, specifically in regions linked with the serotonin system. Scores on the Analytical/Tough-minded scale were associated with activity in regions of the occipital and parietal cortices, which are associated with visual acuity and mathematical thinking, abilities that are linked to testosterone. Scores on the Prosocial/Empathetic scale were associated with activity in regions of the inferior frontal gyrus, anterior insula and fusiform gyrus. These are regions associated with empathy, a trait linked to the estrogen/oxytocin system. Finally, scores on the Curious/Energetic dimension were associated with activation in a region of the substantia nigra, which reflects activity in the dopamine system.

Temperament has been regarded as a direct precursor of personality (Graziano et al., 1998), with some studies suggesting that inheritance accounts for half of the variation in personality dimensions (Reti et al., 2002). Developmental studies using prospective approaches to investigate the relationship between child temperament and the FFM have demonstrated that temperament in infancy predicted personality traits in adolescence. For example, infants who showed high sociability were high in emotional stability and openness in adolescence, whereas those who showed resistance to control were less agreeable and more open as adolescents. Additionally, a difficult temperament in infancy was associated with low extraversion in adolescence (Lanthier & Bates, 1995). Personality studies conducted in adulthood provide further support for the links between temperament dispositions and the FFM (Rothbart et al., 2000).

Recently, Fisher and colleagues (Fisher, Island, Rich, Marchalik, & Brown, 2015) investigated the relationship between the FTI and the FFM. Analyses that were conducted with 215 participants showed that the Curious/Energetic scale of the FTI was positively correlated with Openness and Extraversion, and negatively correlated with Neuroticism. The Cautious/Norm Compliant scale was positively correlated with Conscientiousness and Neuroticism, and negatively correlated with Openness. The Analytic/Tough-minded scale was negatively correlated with Agreeableness and Neuroticism, and positively associated with Openness and Conscientiousness. Finally, the Prosocial/Empathetic scale was positively correlated with Neuroticism and Openness, and negatively correlated with Conscientiousness.

 Apart from the substantial role that temperament plays in the etiology of individual differences in the FFM, parental behavior, and especially the role of attachment to parental figures, has been suggested to be an important factor as well. Attachment theory emphasizes that early experiences with caregivers are crucial to the development of internal working models (IWMs), models that influence how individuals relate to significant others and cultivate interpersonal interactions throughout the life course (Bowlby, 1969; Simpsons, 1999). Developmental studies on the link between attachment styles in infancy and children’s emerging personalities have shown that attachment security predicted certain dimensions of personality. For example, Hagekull and Bohlin (2003) reported that infants’ attachment security (as measured by the Strange Situation Procedure at 15 months) predicted Extraversion, Neuroticism, and Openness when they were children (as measured by mothers’ and teachers’ ratings of the children’s personalities at 8-9 years old). The authors suggested that a secure IWM enables the activation of the exploratory system and, subsequently, the enjoyment that accompanies that exploration (Bowlby, 1969); therefore, behaviors that are indicative of extraversion can be seen as expressions of a secure IWM. Furthermore, a secure IWM fosters emotional stability (the opposite pole of Neuroticism), as well as creative and curious behaviors (which correspond to Openness). Adult personality studies using self-report measures provide additional support for these findings. For example, Picardi, Caroppo, Toni, Bitetti, and Di Maria (2005) investigated the relationship between adult attachment, measured by the Experiences in Close Relationships Questionnaire, and the FFM. They found that attachment-related anxiety was associated with low Extraversion scores and low emotional stability. In a similar vein, Reti and colleagues (2002) examined the influences of parental care on the FFM. They found that lower parental care and higher parental intrusiveness were correlated with higher scores on the Neuroticism scale and lower scores on the Conscientiousness scale.

The Present Study

Empirical studies have demonstrated the link between temperament and attachment to personality traits. However, very few studies have tested both the biological and environmental precursors of the FFM personality traits in one model. Among the few attempts was Hagekull and Bohlin’s (2003) study, in which they conducted a longitudinal study examining the role of attachment and temperament in infancy as predictors of mothers’ and teachers’ personality ratings in childhood. They found that temperament and attachment both predicted individual differences in personality traits, and that the proportion of variance explained by each predictor was relatively similar. Additionally, personality studies with adult participants have investigated temperament and attachment as predictors of personality traits. For example, Picardi and colleagues (2005) investigated the role of temperament in predicting attachment and the personality traits of the FFM among 222 adults. They demonstrated that attachment-related anxiety was correlated both with the personality traits of Extraversion and emotional stability, as well as with the temperament dimensions of harm avoidance, reward dependence, and low novelty seeking. Further, Richter, Eisemann, and Richter (2000) investigated a model with parental rearing and temperament as predictors of personality characteristics among 540 adults. A factor analysis confirmed the discriminant validity of parental rearing and personality characteristics as different factors. In addition, they found that there were more correlations between parental rearing and personality characteristics, as compared to temperament dimensions. Recently, Haselbeck and colleagues (2019) examined the moderating role of attachment style in the association between prenatal maternal stress and child temperament. The results showed that a secure attachment style served as a protective factor and attenuated the effects of prenatal maternal stress on difficult temperament.

The aim of the present study was to investigate the role of temperament and attachment security in predicting individual differences in personality traits. Furthermore, given previous findings suggesting the potential moderating role of attachment in the association between temperament and personality traits, the present study additionally examined the moderating effect of attachment.

**Method**

## Participants

In the current study, there were 1871 participants, of which 1151 were women (61.6ֵֵֵֵֵֵֵֵֵֵֵֵֵֵֵֵֵֵֵֵ%) and 719 were men (38.5ֵֵ%). Participants were between 13 to 82 years old (*M* = 29.32, *SD* = 9.98). The majority of participants (*n* = 1233) were undergraduate students in the Max Stern Academic College in the northern part of Israel. The rest of the participants were junior and high school students (*n* = 106) as well as individuals aged 30 and above (*n* = 532). The average age of the women was 28.78 (*SD* = 10.06; range: 13-75) and the average age of the men was 30.19 (*SD* = 9.80; range: 13-82).

## Instruments

Four online questionnaires were used in the study to capture basic demographic information as well as the three distinct personality dimensions.

**Demographic questionnaire.** Basic demographic information was collected regarding age and gender, as well as contact information for later follow-up and email addresses to signify participants’ consent to take part in the study.

***The Ten Item Personality Measure (TIPI)*** is a 10-item measure of the Big Five (or Five-Factor Model) personality traits (Rammstedt & John, 2007). It measures five personality factors: Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A), and Conscientiousness (C), with two items representing each factor. Participants were asked to rate statements on a Likert-type five-point scale, ranging from strongly disagree (1) to strongly agree (5). Sample items included: “I see myself as someone who tends to be lazy” (C) or “I see myself as someone who gets nervous easily” (N). The mean of the two responses for each factor was calculated to produce a numerical score for each personality trait. According to some researchers (e.g., Furnham, 2008), using 10-item measures are sometimes preferable to using the traditional and longer Big Five measures. The TIPI questionnaire was selected to assess both the temperament and character dimensions of participants’ personalities using a lexical-based personality mapping framework (Costa & McCrae, 1985).

Adult attachment style was assessed using the ***Relationship Questionnaire (RQ)*** (Bartholomew & Horowitz, 1991). The RQ extends the original attachment three-category measure (Hazan & Shaver, 1987) by rewording the descriptions of each of the attachment styles and by adding a fourth style – dismissing-avoidant. The RQ is a single-item measure consisting of four short paragraphs, each describing a prototypical attachment pattern as it applies to close relationships in adulthood. Participants were asked to rate their degree of agreement with each prototype on a 7-point scale. For example, an individual might rate him or herself a six on the Secure description, a two on Fearful, a one on Preoccupied and a four on Dismissing. These ratings (or scores) provide a profile of an individual's attachment feelings and behavior. The highest of the four attachment prototype ratings is then used to classify participants into an attachment category. Additionally, participants are asked to categorically mark their attachment style from a given forced-choice four options marking Secure, Preoccupied, Fearful Avoidant and Dismissing Avoidant. Completing the forced-choice paragraph first served as a counterbalancing effect to minimize order effects when participants rank the degree to which each prototype is self-characterizing. The Adult Attachment RQ questionnaire was used to capture participants’ “character–nurture” personality dimensions using Hazan and Shaver’s (1987) extrapolations of Bolby’s classic attachment theory framework (1969, 1973, 1980) for adults.

Fisher’s personality type was assessed using the ***Fisher Temperament Inventory (FTI)*** (Brown, Acevedo, & Fisher, 2013). The 56-item FTI questionnaire assesses the four broad temperament dimensions: Curious/Energetic, Cautious/Social Norm Compliant, Prosocial/Empathic, and Analytical/Tough-minded. Each dimension is associated with one of four chemical systems of the brain, respectively: 1) dopamine and the related norepinephrine system; 2) serotonin; 3) testosterone; and 4) estrogen and oxytocin. Each of the four categories were assessed with 14 items rated on 4-point rating scale: 1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree. One sample statement was: “I find unpredictable situations exhilarating” (Fisher et al., 2010b). The FTI questionnaire was selected to assess participants’ “temperament-nature” personality dimension using a biological neural systems based framework (Brown, Acevedo & Fisher, 2013).

## Procedure

Our study was approved by the Yezreel Valley College ethics committee (approval number: EMEK YVC 2019-18). Study participants were recruited by third-year B.A. students, who participated in a social science research seminar on personality during the years 2015-2018. After providing their written consent to participate in the study, participants completed four online questionnaires covering basic demographics details, as well as three personality questionnaires regarding temperament, character and lexical personality dimensions as outlined above.

**Statistical Analyses**

First, independent samples t-tests were conducted to test for gender differences in the dependent variables (i.e., personality domains) Additionally, bivariate correlations were conducted between participant age and the dependent variables. Next, partial correlation analyses (controlling for gender and age) were conducted in order to investigate the role of temperament dimensions and attachment security in predicting individual differences in personality domains. Bonferroni corrections for multiple comparisons were used. Finally, we tested for the moderating role of attachment security in the association between temperament dimensions and personality domains using moderated regression analyses. In order to avoid problems of multicollinearity, the predictor variables were centered before calculating the interaction terms (Aiken and West, 1991). Hierarchical regression was employed to determine if the addition of the interaction between attachment security and temperament dimensions improved the prediction of personality domains, over and above their separate effects . Significant interactions were probed using the procedures described by Aiken and West (1991).

**Results**

Gender Differences

We checked for gender differences in personality. Significant gender differences on each personality domain were found (see Table 1), such that women scored higher on each domain as compared to men. Therefore, gender was included as a covariate in all further analyses.

Partial Correlations

Table 2 shows the results of the partial correlation analyses conducted between attachment security and the Big Five personality traits, as well as the four temperament dimensions and the Big Five personality traits, controlling for gender and age.

Moderated Hierarchical Regression Analyses

In order to examine the potential moderating role of attachment security in the association between temperament dimensions and personality domains, a hierarchical regression was conducted. Gender was entered in the first step of the model, followed by each temperament dimension and the measure of attachment security in the second step. Finally, the third step included all interaction terms (see Table 3).

A multiple regression model with Extraversion as the dependent variable, and with the inclusion of the four interactions between attachment security and each of the temperament dimensions, revealed that the addition of the interaction terms did not account for a significant amount of additional variance in the Extraversion scale scores. Therefore, the relation between attachment security and the Curious/Energetic scale was the same for individuals with different temperaments: high security levels were associated with high scores on the Curious/Energetic scale.

A significant interaction was revealed in a multiple regression analysis with Agreeableness as the dependent variable and with the inclusion of an interaction term between attachment security and the Curious/Energetic scale. Simple slope analyses (Hayes, 2013) revealed that the Curious/Energetic scale was positively associated with Agreeableness for secure individuals (*b* = 0.01, *t* = 3.16, *p* < .01), whereas the Curious/Energetic scale was negatively associated with Agreeableness for insecure individuals (*b* = -0.01, *t* = 2.13, *p* < .05; see Figure 1). In other words, attachment security moderated the association between the Curious/Energetic scale and Agreeableness, such that secure individuals who scored higher on the Curious/Energetic scale also scored higher in Agreeableness as compared to those who scored lower on the Curious/Energetic scale, whereas insecure individuals showed the opposite pattern.

A multiple regression analysis with Agreeableness as the dependent variable and with the inclusion of the interaction between attachment security and the Cautious/Social Norm Compliant scale interaction, revealed a significant interaction. Simple slope analyses revealed that scores on the Cautious/Social Norm Compliant scale were positively associated with Agreeableness for secure individuals (*b* = 0.01, *t* = 3.47, *p* < .001); however, the association was not significant for insecure individuals (*b* = -0.00, *t* = .35, *p* > .05; see Figure 2). Therefore, a significant relationship between scores on the Cautious/Social Norm Compliant scale and Agreeableness was found only among secure individuals: higher Cautious/Social Norm Compliant scores were associated with higher scores in Agreeableness. We also found that the addition of the interactions between attachment security and scores on the Analytic/Tough-minded scale and Prosocial/Empathetic scale did not account for a significant amount of additional variance in Agreeableness scores. Therefore, the relation between attachment security and Agreeableness was the same for individuals with higher or lower scores on the Analytic/Tough-minded and Prosocial/Empathetic scales: high security levels were associated with high scores on agreeableness.

A multiple regression analysis with Conscientiousness as the dependent variable and with the inclusion of an interaction between attachment security and the Prosocial/Empathetic scale, revealed a significant interaction. Simple slope analyses revealed that scores on the Prosocial/Empathetic scale were negatively associated with Conscientiousness for secure individuals (*b* = -0.01, *t* = 5.91, *p* < .001), and for secure individuals (*b* = -0.00, *t* = 2.26, *p* < .05; see Figure 3). Therefore, an association between the Prosocial/Empathetic scale and Conscientiousness was found both in secure and insecure individuals: higher Prosocial/Empathetic scores were associated with lower scores on the Conscientiousness scale. However, the slope was stronger for secure individuals. We also found that the addition of the interaction between attachment security and the Explorer, Builder, and Director temperament dimensions did not account for a significant amount of variance in Conscientiousness scores. Therefore, the relation between attachment security and Conscientiousness was the same for individuals who scored both higher and lower on the Curious/Energetic, Cautious/Social Norm Compliant, and Analytic/Tough-minded scales: higher security scores were associated with lower scores on Conscientiousness.

A multiple regression model with Neuroticism as the dependent variable and with the inclusion of interactions between attachment security and each of the temperament dimensions, revealed that the addition of the interaction terms did not account for a significant amount of additional variance in Neuroticism. Therefore, the relation between attachment security and Extraversion was not significantly different for individuals across all four temperaments: higher security scores were associated with lower Neuroticism scores.

A multiple regression with Openness as the dependent variable and with the inclusion of interactions between attachment security and the four temperament dimensions, revealed that the addition of the interaction terms did not account for a significant amount of additional variance in Openness scores. Therefore, the relation between attachment security and extraversion was not significantly different for individuals across the four temperament dimensions: higher security levels were associated with higher Openness scores.

Discussion

Previous studies have demonstrated the role of parental behavior, as well as biological factors, in predicting individual differences in personality traits. The present study provided support for these findings by showing that attachment security and temperament dimensions were associated with personality traits. Specifically, the current study found that attachment security accounted for individual differences across all personality domains of the FFM. Attachment security was positively associated with Extraversion, Agreeableness, Conscientiousness and Openness, and negatively associated with Neuroticism. Based on the perspectives of both child and adult attachment, secure attachment is a crucial precondition for self-directed exploration (MacDonald, Berlow, & Thomas, 2013). Furthermore, DeYoung, Peterson, and Higgins (2002) proposed that the Big Five traits are defined by two higher-order meta-traits labeled as stability and plasticity. Stability reflects one’s motivation and ability to maintain stable relationships, and it is marked by higher emotional stability (i.e., lower Neuroticism), Agreeableness, and Conscientiousness scores. On the other hand, plasticity reflects one’s degree of flexibility in behavior and cognition, and it is marked by higher scores on the Extraversion and Openness scales. Recently, Young, Simpson, Griskevicius, Huelsnitz, and Fleck (2019) conducted a longitudinal study in which participants’ early attachment styles were assessed using the Strange Situation procedure at 12 and 18 months, and their personalities were later assessed with the Big Five at age 32. Participants who were categorized as having a secure attachment in infancy scored higher on Agreeableness and Conscientiousness, and lower on Neuroticism – traits that reflect the meta-trait of stability – at 32 years old. The present study provided partial support for these findings. The current findings showed that attachment security was associated with the Big Five traits, suggesting its ability to predict individual differences in personality traits. Moreover, the present findings demonstrated the important role of attachment security in predicting individual differences in the meta-traits of stability and plasticity. Thus far, the literature in the field provides similar results and conclusions.

The literature on temperament characterizes it as a stable trait, representing particular dispositions that influence behavior throughout the life span (Rothbart, Sheese, Rueda, & Posner, 2011). Furthermore, temperament has been regarded as a direct precursor of personality (Graziano et al., 1998). The present findings showed that the Curious/Energetic scale was positively correlated with scores on the Extraversion, Conscientiousness, and Openness scales. Additionally, the Cautious/Social Norm Compliant scale was positively correlated with Conscientiousness and negatively with Openness, and the Prosocial/Empathic scale was positively associated with Neuroticism and Openness. There were no significant correlations between the Analytic/Tough-minded scale and each of the FFM scales. These results partially support previous findings, which use the same inventories to assess temperament and personality traits among adults (Fisher et al., 2015). The authors suggested that the association between the Curious/Energetic scale and Extraversion scale may be explained by the energetic and risk-taking qualities that are consistent with dopamine system activity, which characterize both curious/energetic individuals (DeYoung & Gray, 2009) and extraverts (Depue & Collins, 1999). Furthermore, based on previous findings presenting the association between Openness scores with the structure and function of specific brain areas that predict working memory performance and attentional control (DeYoung et al., 2010), and other findings showing an association between Openness scores and intelligence (DeYoung et al., 2005), Fisher and colleagues (2015) suggested that these scales share intellectual characteristics which underlie the association between them. With regard to the association between the Cautious/Social Norm Compliant scale and the Conscientiousness scale, the authors suggested that they both evaluate self-control and self-regulation (Costa & McCrae, 1992), and the need to plan and organize (DeYoung and Gray, 2009). Other studies using different inventories assessing temperament in infancy (e.g., Hagekull & Bohlin, 2003) and in adulthood (e.g., Rothbart et al., 2000) have yielded varied results. Nevertheless, they emphasized the role of temperament in infancy in predicting adult temperament and personality (Halverson et al., 1994), and theorized about the corresponding brain infrastructure that underlies both temperament and personality traits (Rothbart et al., 2000).

 In light of the inconsistencies that characterize the literature on the role of temperament and attachment in predicting individual differences in personality traits, the present study further examined the potential moderating role of attachment in the association between temperament and personality traits through an interactive model. We found that attachment security moderated the association between the Curious/Energetic scale and the Agreeableness domain of the FFM. Among secure individuals, those with higher scores on the Curious/Energetic and Cautious/Social Norm Compliant scales also exhibited higher Agreeableness scores, whereas among insecure individuals, those with lower scores on the Curious/Energetic scale exhibited higher Agreeableness scores. Furthermore, attachment security moderated the association between the Prosocial/Empathetic scale and the Conscientiousness domain of the FFM. Among both secure and insecure individuals, those with higher scores on the Prosocial/Empathetic scale exhibited lower scores on the Conscientiousness scale, however the association was stronger for secure individuals. The moderating role of attachment security has been previously suggested in developmental studies. For example, Lickenbrock and colleagues (2013) have shown that toddlers high in negative reactivity benefitted from having secure attachment. The authors asserted that their results are in line with the differential susceptibility model (Belsky, Bakermans-Kranenburg, & Van IJzendoorn, 2007), which suggests that vulnerable children, temperamentally or genetically, would benefit from supportive environments.

To summarize, the present data are consistent with previous findings, especially developmental studies, suggesting an interplay between biological factors and parental behavior in predicting personality traits. The implications of the present study relate to both normative and psychopathological development. The etiology of psychiatric disorders includes temperament, attachment, and personality (MacDonald et al., 2013), among other factors (e.g., biological). Further research should investigate a broader model that includes the moderating role of social factors in the association between biological factors and personality traits which, in turn, may mediate the development of personality pathology. In order to address this future direction, longitudinal studies are needed to deepen our understanding of the antecedent factors that may influence psychological consequences throughout the life span.

Table 1

*Means (SD), t, and p values for gender differences in personality traits*

|  |  |  |  |
| --- | --- | --- | --- |
|  | *Men (n=719)* | *Women (n=1151)* | *t* |
| Extraversion | 3.92 (.89) | 4.02 (.85) | 2.41\* |
| Agreeableness  | 3.33 (.88)) | 3.43 (.92) | 2.20\* |
| Conscientiousness | 3.82 (.93) | 3.97 (.88) | 3.63\*\*\*mfkk\*\*\*\* |
| Neuroticism | 2.70 (.90) | 3.02 (.95) | 7.16\*\*\* |
| Openness | 3.65 (.91) | 3.75 (.94) | 2.44\* |

*\*p < .05, \*\*\*p* < .001*.*

Table 2

*Partial Correlations (controlling for gender and age)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Extraversion | Agreeableness | Consciousness  | Neuroticism | Openness |
| Secure Attachment | **.33\*\*\*** | **.31\*\*\*** |  **.16\*\*\*** |  **-.16\*\*\*** | **.08\*\*** |
| Curious/Energetic33 | **.09\*\*\*** | .04 | **.08\*\*** | -.04 | **.12\*\*\*** |
| Cautious/Social Norm Compliant | .00 | .05\* |  **.13\*\*\*** | .00 | **-.09\*\*\*** |
| Analytic/Tough-Minded | -.03 | -.03 |  .07\*\* | -.05\* |  -.01 |
| Prosocial/Empathetic | -.01 | .03 |  .01 |  **.09\*\*\*** |  **.11\*\*\*** |

*\*p* < .05, *\*\*p* < .01, *\*\*\*p* < .001.

*Note.* Correlations that remained significant after performing Bonferroni corrections for multiple comparisons are presented in bold.

Table 3

*Multiple regression models: Interactions between attachment security and temperament dimensions predicting personality traits of the FFM*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | *β* | *b* | *SE* | 95% CI | *R*2 | Δ *R*2 | *F* |
| ExtraversionSecure × Curious/EnergeticSecure × Cautious/Social Norm compliantSecure × Analytic/Tough-mindedSecure × Prosocial/Empathetic | -.02-.01.00.04 | -.00-.00.00.00 | .00.00.02.00 | [-.00, .00][-.00, .00][-.00, .00][-.00, .00] | .12.12.12.12 | .00.00.00.00 | .55.09.05.85 |
| Agreeableness Secure × Curious/EnergeticSecure × Cautious/Social Norm compliantSecure × Analytic/Tough-mindedSecure × Prosocial/Empathetic | .09.07-.05-.08 | .00.00-.00-.00 | .00.00.00.00 | [.00, .00][.00, .00][-.00, .00][-.00, .00] | .11.11.10.10 | **.01\*\*\*****.00\*\***.00.00 | 16.078.631.533.75 |
| ConscientiousnessSecure × Curious/EnergeticSecure × Cautious/Social Norm compliantSecure × Analytic/Tough-mindedSecure × Prosocial/Empathetic | .01-.01-.06-.10 | .00-.00-.00-.00 | .00.00.00.00 | [-.00, .00][-.00, .00][-.00, .00][-.00, -.00] | .04.05.04.04 | .00.00.00**.00\*** | .38.332.115.38 |
| NeuroticismSecure × Curious/EnergeticSecure × Cautious/Social Norm compliantSecure × Analytic/Tough-mindedSecure × Prosocial/Empathetic  | -.02-.02.04.03 | -.00-.00.00.00 | .00.00.00.00 | [-.00, .00][-.00, .00][-.00, .00][-.00, -.00] | .05.05.06.06 | .00.00.00.00 | .44.531.17.71 |
| OpennessSecure × Curious/EnergeticSecure × Cautious/Social Norm compliantSecure × Analytic/Tough-mindedSecure × Prosocial/Empathetic  | .03-.00-.01-.01 | .00-.00.00.00 | .00.00.00.00 | [-.00, .00][-.00, .00][-.00, .00][-.00, -.00] | .02.02.01.02 | .00.00.00.00 | 1.58.05.04.12 |

*Note. B* indicates unstandardized regression coefficients. β indicates standardized regression coefficients. CI indicates confidence interval (95% confidence intervals of unstandardized regression coefficients).

*\*p* < .05, *\*\*p* < .01, *\*\*\*p* < .001.

**References**

Belsky, J., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (2007). For better and for worse: Differential susceptibility to environmental influences. *Current Directions in Psychological Science*, *16*(6), 300-304.‏

Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment.* New York: Basic Books.

Brown, L. L., Acevedo, B., & Fisher, H. E. (2013). Neural correlates of four broad temperament dimensions: Testing predictions for a novel construct of personality. *PLoS ONE 8*(11), 1-9. doi:10.1371/journal.pone.0078734

Cloninger, R.C. (1987). A systematic method for clinical description and classification of personality. *Archive of General Psychiatry 44,* 573–588. doi: 10.1001/archpsyc.1987.01800180093014

Cloninger, R.C. (2000). Biology of personality dimensions. *Current Opinion in Psychiatry, 13*, 611–616. doi:10.1097/00001504-200011000-00024

Costa, P. T., & McCrae, R. R. (1992). Four ways five factors are basic. *Personality*

*and Individual Differences, 13*, 653–665.

Davis, K., Panksepp, J., & Normansell, L. (2003). The affective neuroscience personality scales: Normative data and implications. *Neuropsychoanalysis 5*, 57–69. doi:10.1080/15294145.2003.10773410

Depue, R.A., & Collins, P.F. (1999). Neurobiology of the structure of personality: Dopamine, facilitation of incentive motivation, and extraversion. *Behavioral and Brain Sciences*, *22*, 491–569. doi:10.1017/S0140525X99002046

DeYoung, C.G., & Gray, J.R. (2009). Personality neuroscience: Explaining individual differences in affect, behavior, and cognition. In P. J. Corr & G. Matthews (Eds.), *The Cambridge handbook of personality psychology* (pp. 323-346). New York, NY, US: Cambridge University Press.

DeYoung ,C.G., Hirsch, J.B., Shane, M.S., Papademetris, X., Rajeevan, N., & Gray, J.R. (2010). Testing predictions from personality neuroscience: Brain structures and the BigFive. *Psychological Science, 21*, 820–828 .doi: 10.1177/0956797610370159

DeYoung, C. G., Peterson, J. B., & Higgins, D. M. (2002). Higher-order factors of the big five predict conformity: Are there neuroses of health? *Personality and Individual Differences, 33*, 533–552.

DeYoung, C.D., Peterson, J.B., & Higgins, D.M. (2005). Sources of openness/intellect: Cognitive and neuropsychological correlates of the fifth factor of personality. *Journal of Personality, 73*, 825–858. doi:10.1111/j.1467- 6494.2005.00330.x

Fisher, H. E., Rich, J., Island, H.D., & Marchalik, D. (2010a). The second to fourth digit ratio: A measure of two hormonally-based temperament dimensions. *Personality and Individual Diff*erences *49*(7),773–777. doi:10.1016/j.paid.2010.06.027

Fisher, H.E., Rich, J., Island, H.D., Marchalick, D., & Silver, L.(2010b). *Do we have chemistry? Four primary temperament dimensions on mate choice*. Paper presented at the American Psychological Association 118th Annual Convention, San Diego, CA, USA.

Graziano, W. G., Jensen-Campbell, L. A., & Sullivan-Logan, G. M. (1998). Temperament,

activity, and expectations for later personality and development. *Journal of Personality and*

*Social Psychology, 74*, 1266-1277.

Hagekull, B., & Bohlin, G. (2003). Early temperament and attachment as predictors of the Five Factor Model of personality. *Attachment and Human Development, 5,* 2-18.

Halverson Jr, C. F., Kohnstamm, G. A., & Martin, R. P. (Eds.) (1994). *The developing structure of temperament and personality from infancy to adulthood*. Hillsdale, New Jersey, USA: Lawrence Erlbaum Associations, Inc.

Hayes, A. F. (2013). *Introduction to mediation, moderations, and conditional process analysis*. New York, New York: The Guilford Press.

Hirsh, J. B., DeYoung, C. G., & Peterson, J. B. (2009). Metatraits of the Big Five differentially predict engagement and restraint of behavior. *Journal of Personality, 77,* 1085-1102.

Jang, K.L., McCrae, R.R., Angleitner, A., Riemann, R., &Livesley,W.J. (1998). Heritability of facet-level traits in a crossculturaltwin sample: support for a hierarchical model ofpersonality. *Journal of Abnormal and Social Psychology 74*,1556–1565.

Kendler, K. S. (1995). Genetic epidemiology in psychiatry: taking both genes and environment seriously. *Archives of General Psychiatry, 52,* 895-899.

Lanthier, R. P., & Bates, J. E. (1995, May). *Infancy predictors of the Big Five personality*

*dimensions in adolescence,* Paper presented at the meeting of the Midwestern. Psychological

Association Chicago, IL.

Lickenbrock, D. M., Braungart‐Rieker, J. M., Ekas, N. V., Zentall, S. R., Oshio, T., & Planalp, E. M. (2013). Early temperament and attachment security with mothers and fathers as predictors of toddler compliance and noncompliance. *Infant and Child Development*, *22*(6), 580-602.‏

MacDonald, K., Berlow, R., & Thomas, M. L. (2013). Attachment, affective temperament, and personality disorders: A study of thir relationship in psychiatric outpatients. *Journal of Affective Disorders, 151,* 932-941.

Picardi, A., Caroppo, E., Toni, A., Bitetti, D., Di Maria, G. (2005). Stability of attachment-related anxietyand avoidance and their relationships withthe five-factor model and the psychobiologicalmodel of personality. *Psychology and Psychotherapy: Theory, Research, & Practice, 78,* 327-345.

Simpson, J. A. (1999). Attachment theory in modern evolutionary perspective. In J. Cassidy, & P. R. Shaver (Eds), *Handbook of attachment. Theory, research, and clinical applications* (pp. 115 – 140). New York: Guilford.

Reti, E. M., Samuels, J. F., Eaton, W. W., Bienvenu, O. J., Costa, P. T., & Nestadt, G. (2002).

Influences of parenting on normal personality traits. *Psychiatry Research, 111,* 55-64.

Roberts, B. W., & DelVecchio, W. F. (2000). The rank-order consistency of personality from childhood to old age: a quantitative review of longitudinal studies. *Psychological Bulletin, 126,* 3–25. doi:10.1037/0033-2909.126.1.3

Roberts,B.W.,&Mroczek,D.(2008).Personalitytraitchangeinadulthood. *Curr.Dir.Psychol.Sci*. *17*,31–35.doi:10.1111/j.1467-8721.2008.00543.x

Rothbart, M. K., Ahadi, S. A., & Evans, S. A. (2000). Temperament and personality: Origins and outcomes. *Journal of Personality and Social Psychology, 78*, 122 – 135.

|  |
| --- |
|  |
| Rothbart, M. K., Sheese, B. E., Rueda, M. R., & Posner, M. I. (2011). Developing mechanisms of self-regulation in early life. *Emotion review*, *3*(2), 207-213.‏ |

Terracciano,A.,Abdel-Khalek,A.M.,Ádám,N.,Adamovová,L.,Ahn,C.K.,Ahn, H. N.,etal.(2005).Nationalcharacterdoesnotreflectmeanpersonalitytrait levelsin49cultures. *Science, 310*, 96–100.doi:10.1126/science.1117199

Vaughn, B. E., & Bost, K. K. (1999). Attachment and temperament. Redundant, independent or interacting influences on interpersonal adaptation and personality adaptation? In J.

Cassidy, & P. R. Shaver (Eds), *Handbook of attachment. Theory, research, and clinical*

*applications* (pp. 198 – 225). New York: Guilford.

Young, E. S., Simpson, J. A., Griskevicius, V., Huelsnitz, C. O., & Fleck, C. (2019). Childhood attachment and adult personality: A life history perspective. *Self and Identity*, *18*(1), 22-38.‏

Zhao, H.,& Seibert, S. E. (2006). The Big Five personality dimensions and entrepreneurial status: a Meta-Analytical Review. *Journal of Applied Psychology, 91,* 259-271.

Zuckerman,M.(2005). *PsychobiologyofPersonality*. NewYork,NY:Cambridge UniversityPress.doi:10.1017/CBO9780511813733