Examining the relationship between anxiety and test performance: Is personality a moderator?

By

Jacob Leslie

Honors Thesis

Appalachian State University

Submitted to the Department of Psychology

In partial fulfillment of the requirements for the degree of

Bachelor of Science

May, 2022 of graduation

Approved by:

Yalcin Acikgoz
_____

Yalcin Acikgoz, Ph. D., Thesis Director

Kemp Ellington
Kemp Ellington (Nov 27, 2020 08:34 EST)
_____

Kemp Ellington, Ph. D., Second Reader

Examining the relationship between anxiety and test performance: Is personality a moderator?

Jacob Leslie

Appalachian State University

Abstract

The Big Five personality traits have been broadly researched within the literature for decades with emphasis on job performance, job satisfaction, anxiety, and academic achievement. The Big Five are now being examined in a more nuanced manner to increase the current body of knowledge and understanding surrounding these topics. Our current study examines the moderator effects the Big Five personality traits have on the test anxiety-test performance relationship. Participants were randomly assigned to a manipulated low, moderate, or high anxiety condition and asked to complete a task of alphabetizing sentences as quickly and accurately as possible. Two separate regression analyses were performed, one using the aforementioned ordinal anxiety variable the other measuring state anxiety, and both models produced partial support for our hypotheses. Specifically, low extraverted individuals were affected by anxiety more so than others and therefore performance suffered. Low emotional stability and low openness both demonstrated similar results to the previous findings but only within the model using measured state anxiety. A richer understanding of the role personality plays within this relationship requires a stronger anxiety manipulation, assessments of specific personality facets within the Big Five personality traits, and a diverse pool of testing situations, both academic and job oriented.

Personality has been a topic of interest within the social sciences for the last century with specific emphasis on how individual differences in character traits affect our lives on a day to day basis. Throughout the years research has emerged that systematically defines personality such as the Big Five Personality Model (Barrick, 1991) or the Positive and Negative Affect Scales (Watson, 1988). These measures revolutionized the ability of researchers to study the complexities of personality in a systematic manner. Barrick and Mount (1991) meta-analytically examined the relationship between the Big Five (Neuroticism/Emotional Stability, Extraversion, Openness, Agreeableness, Conscientiousness) and overall job performance over the last few decades and concluded significant correlations between conscientiousness and work performance across five different occupational groups (professionals, police, manager, sales, skilled/semi-skilled labor). They surmised, "That is, those individuals who exhibit traits associated with a strong sense of purpose, obligation, and persistence generally perform better than those who do not" (Barrick, 1991, p.18). Extraversion was the second-best predictor of performance but only for managerial occupations and sales representatives.

Similarly, Judge, Heller, and Mount (2002) reviewed the Big Five in relation to overall job satisfaction. Inspired by Barrick and Mounts research, Judge et. al. hypothesized the strongest relationships for conscientiousness and neuroticism as they relate to job satisfaction. Their findings supported their hypothesis with neuroticism demonstrating the largest correlation ($p=-.29$) and conscientiousness ranking a close second ($p=.26$) (Judge et. al., 2002). These results are complimented by a meta-analytic work by Tait, Padgett, and Baldwin (1989), which examined the job-life satisfaction relationship and how it differs by gender. Baldwin reviewed thirty-four different studies and found a moderate correlation ($r = .44$) between job and life satisfaction for both men and women however, correlations for men were stronger ($r = .39$) than

their female counterparts ($r = .28$). Both personality and gender affect our job performance, job satisfaction, and overall life satisfaction exemplifying the dynamic influence individual characteristics play in our lives.

These meta-analyses created a strong framework for personality research to expand upon in a more nuanced manner. More recently, Truxillo, Baur, Campion, and Paronto (2006) examined the relationship between the Big Five and job applicants' fairness perceptions regarding an organization's selection process. Once again, conscientiousness and neuroticism showed moderate correlations with self-perceptions of their selection performance, and specifically for neuroticism, perceptions of social fairness of the organization. This implies that personality can affect an applicant's selection test taking ability, which impacts their chance of being hired, while simultaneously altering their perceived level of fairness associated with an organization.

Another variable that greatly influences test-taking performance, not measured in the aforementioned study, is test anxiety (Cassady & Johnson, 2002; Lawrence &Williams, 2013; Sommer & Arendasy, 2015). Behavior is often influenced by both situational and personal factors and each must be examined to comprehend the topic of interest (Bonaccio, 2010). Truxillo and colleagues (2006) measured a person's individual characteristics but they missed the second half of the equation; environmental influences. Sommer and Arendasy (2015) found that people experience more test anxiety in high stakes situations which can affect the correlation between test anxiety and test performance. Similarly, McCarthy, Iddekinge, Lievens, Kung, Sinar, and Campion (2013) investigated dispositional and situational factors that influence test performance and job performance. They found that when test taking reactions were situational in nature, test beliefs, test taking anxiety, and test taking self-efficacy all have an indirect effect on

job performance as a consequence of poor test scores. Additionally, Reeve, Bonnacio, and Charles (2008) examined influences on test anxiety and found that the purpose of the test or the consequence of good or bad performance had the largest effect on someone's expected level of test anxiety. Extension of a job offer, being accepted into your dream school, and passing a difficult class needed to graduate are all examples of high stakes testing situations which could induce a greater level of anxiety.

This brings us to the topic of our current study. We examined the role personality plays, in relation to the big five, on affecting a participant's level of anxiety and ultimately influencing their performance on a selection test. A plethora of meta analyses and empirical studies have examined the relationship between personality and job performance (Barrick, 1991; Hurtz & Donovan, 2000; Judge & Zapata, 2015), job satisfaction (Judge, 2002), applicant reactions (Viswesvaran, 2004; McCarthy 2013), and selection fairness (Truxillo, 2006). Despite this, little research has been done which examines personality as a moderator between the test anxiety and test performance relationship.

One such study performed by Chamorro-Premuzic, Ahmetoglu, and Furnham (2008), found that neuroticism and extraversion were better predictors for high and low levels of test anxiety respectively, than other constructs such as core-self evaluations or self-assessed intelligence. Although this study shed some light on which personality traits influence test anxiety it did not assess actual test performance in conjunction with these findings. Similarly, Furnham, Moutafi, & Chamorro-Premuzic (2005), investigated the relationship between the Big Five and Self-Estimated Intelligence (SEI) which has been shown to moderately correlate with Test Measured Intelligence. Multiple regression analyses between the Big Five and SEI showed neuroticism and agreeableness were the only two significant predictors of SEI. This result

intensifies when examining individual facets of neuroticism and agreeableness, specifically

anxiety and modesty. Both anxiety and modesty when coupled with gender, significantly

explained 18% and 22% of the variance in Self-Estimated Intelligence respectively. Our current

research aims to bridge the gap between these two studies and simultaneously examine the

triumvirate relationship between personality, test anxiety, and test performance.

Conscientious individuals have been described as responsible, reliable, and dependable

people who strive to work hard and achieve their goals (Costa & Mcrae, 1992). For example,

Jackson, Wood, Bogg, Walton, Harms, and Roberts (2010) found that students high in

conscientiousness self-reported better organization methods, greater impulse control, and

industrious work habits, which correlated with inventories of actual daily conscientious behavior.

Similarly, Mcilroy and Bunting (2002) found that both conscientiousness and test anxiety are

significantly associated with academic test performance and those individuals with greater levels

of academic conscientiousness reported lower levels of worry and test irrelevant thoughts. These

findings imply that people with higher levels of conscientiousness would be better suited to

handle high anxiety during testing situations. Accordingly, I hypothesize the following:

Hypothesis 1: Conscientiousness will moderate the relationship between test anxiety and test

performance such that the relationship will be nonsignificant at higher levels of

conscientiousness and negative and significant at lower levels.

Conor-Smith and Flachsbart (2007) define Emotional Stability and its inverse

Neuroticism to include negative emotionality, self-consciousness, and emotional responses to

stress. They conclude individuals with low levels of emotional stability tend to engage in less

effective coping strategies during adversely stressful situations (Connor-Smith & Flachsbart,

2007). On the contrary, individuals with high levels of emotional stability tend to perform

exceptionally well in professions dealing with disgruntled people such as social workers,

counselors, or customer service and are less likely to appraise stressful situations as threats

(Judge & Zapata, 2015). Lastly, Barrick, Mount, and Judge (2001) explain emotional stability as

the "lack of anxiety, hostility, depression, and personal insecurity." This research indicates that

individuals with higher levels of emotional stability could better cope with high anxiety

predicaments resulting in superior performance. Therefore, I hypothesize the following:

Hypothesis 2: Emotional Stability/Neuroticism will moderate the relationship between test

anxiety and test performance such that the relationship will be nonsignificant at higher levels of

emotional stability and negative and significant at lower levels.

Extraversion includes characteristics such as sociability, ambition, positive emotionality,

and excitement (Barrick et al., 2001) and individuals who are highly extraverted tend to view

stressful social situations as less intimidating as their introverted counterparts (Judge & Zapata,

2015). Hurtz and Donovan (2000) found relatively weak yet stable relationships between

extraversion and job performance for certain occupations such as sales and managerial positions,

which exemplifies the key characteristics extraverts display. In a study done by Bolger and

Eckenrode (1991), the relationship between extraversion, neuroticism, social support, and test

anxiety was examined. They found that extraverted individuals perceived they had adequate

social support which has been shown to cushion the effects of stress and therefore led to better

examination outcomes. Extraversion was a confound in this particular instance and wasn't the

main topic of this research, which leads us to our third hypothesis:

Hypothesis 3: Extraversion will moderate the relationship between test anxiety and test performance such that the relationship will be nonsignificant at higher levels of extraversion and negative and significant at lower levels.

Agreeableness and extraversion share similar qualities as they both require exceptional interpersonal skills and interactions. Agreeable individuals can be described as cooperative, trustworthy, and compliant and they tend to thrive in workplaces that focus heavily on helping and nurturing others (Barrick et al, 2001). In conjunction with this idea, given their non-confrontational disposition, agreeable individuals don't seem to thrive in competitive environments (Judge & Zapata, 2015). In a study done by Ross, Rausch, and Canada (2003) participants personalities were measured using the NEO-PI-R (Costa & McRae, 2008) and were then given questionnaires in regard to hyper competition, cooperation, and personal development competition. Agreeableness was negatively correlated with hyper competition and positively correlated with cooperation demonstrating their tendency to minimize barriers between themselves and others and maintain positive personal relationships. Given the somewhat competitive nature of our current study I hypothesize the following:

Hypothesis 4: Agreeableness will moderate the relationship between test anxiety and test performance such that the relationship will be significant and negative at higher levels of agreeableness and nonsignificant at lower levels.

Individuals high in openness to experience can be characterized as intellectual, curious, autonomous, and innovative (Judge & Zapata, 2015; Barrick, 2001). Despite these exceptional qualities, openness has somewhat disappointed in meta-analytic research in terms of predicting overall job performance (Barrick, 1991; Barrick, 2001; Hurtz & Donovan, 2000) with low

predictive validities and weak correlations. One area open individuals excel is on the innovation front. Raja and Johns (2010) examined the big five in relation to job performance, organizational citizenship, and creativity and found openness to be the only valid predictor of creativity. Furthermore, Woo, Chernyshenko, and Conz (2013), performed an in-depth meta-analysis on six facets of openness and how they interact with various organizational outcomes. The ingenuity facet of openness showed a weak to moderate correlation with task performance ($r = .15$, $p = .18$) and had a relatively strong relationship with leadership effectiveness and adaptive performance. Cognitive ability was also correlated with openness facets of intellectual efficiency ($r = .24$, $p = .28$) and ingenuity ($r = .10$, $p = .12$) as well (Woo, 2013). This research demonstrates individuals with greater levels of openness tend to adapt to their environment and cognitively out perform their low openness counterparts. Accordingly, I hypothesize the following:

Hypothesis 5: Openness to Experience will moderate the relationship between test anxiety and test performance such that the relationship will be nonsignificant at higher levels of openness and negative at and significant lower levels.

Methods

Procedure

Participants signed up for our study using the SONA website and were given one ELC credit for their participation. Upon arrival participants were informed that this was a preliminary study in which we were investigating their logical reasoning skills. If they performed well enough on this task, they would be eligible to partake in our main study which evaluates logical reasoning training modules for high schoolers preparing to take the ACT. They were told they would be compensated fifty dollars per session up to ten sessions for participating. This was a

deceptive tactic used to create a high stakes atmosphere to encourage participants to try their best during the experiment and to hide the true hypotheses of the study regarding test anxiety, test performance, and personality. Participants were informed of the deception during a full debrief at the end of the study. We then allowed participants time to review and sign the consent form and moved on to the experimental procedures.

Participants were then instructed to fill out survey questions on Qualtrics regarding demographic information and dispositional anxiety levels measured with the Cognitive Test Anxiety Scale (Cassady & Johnson, 2002). More information regarding this measure and all other measures can be found below. They were verbally instructed to stop on the page labeled "Logical Reasoning Task" (which was color-coded to indicate different anxiety conditions, as explained below) and notify the researcher for further instruction. Once here, Qualtrics randomly assigned participants to one of three conditions; High Anxiety, which was indicated on the computer screen in red letters, Moderate Anxiety with black lettering, or Low Anxiety with green lettering. The colors were used by the research assistant running the session to know which condition the participant was assigned to. From here, instructions differed depending on which condition the participant was designated, but all participants were about to complete the Logical Reasoning Task (See **Appendix**). This was our experimental stimulus which instructed participants to put a list of 50 sentences in alphabetical order as quickly and accurately as possible. Performance on this task is quantified based on how long it took to complete and the number of errors the participant made. All participants were informed that performing well on this task determined if they would progress to our main study, which included compensation. Prior to completing the Logical Reasoning Task every participant was shown by the researcher how to rearrange the sentences using a computer mouse on a practice page and then given time

to practice themselves. This was done to ensure all participants began the task with the same understanding of the stimulus and to decrease the chance of confounds on performance from technological disadvantages.

High Anxiety Condition

In this condition, participants were presented with four anxiety inducing stimulus. The researcher informed the participant that performance on the logical reasoning task was strongly correlated with cognitive ability and one's ability to get a job right out of college. The second manipulation was a large timer placed directly in front of the participant that began when they started the task. The third manipulation was a dummy webcam placed on the computer with the instruction that we're interested in studying facial expressions during high stakes testing situations so they would be recorded for the entirety of the task. Lastly, the researcher stood directly behind the participant during the task and took notes on their performance. All of these manipulations and deceptions were explained thoroughly during the debrief at the end of the study.

Moderate Anxiety Condition

In this condition participants were presented with three of the aforementioned anxiety inducing stimuli with minor changes made for this context. The researcher informed the participant that performance on the logical reasoning task was somewhat correlated with cognitive ability and one's ability to get a job right out of college. Secondly, the timer was used but it was placed further away from the participant toward the end of the table. Lastly, the researcher sat in the corner of the room further away from the participant and took notes on their

performance. Once again, all manipulations and deceptions were disclosed during the debrief concluding the experiment.

Low Anxiety Condition

The low anxiety condition contained none of the extra anxiety manipulations mentioned previously. Participants were only given the initial instructions regarding the logical reasoning task and the consequence of good or bad performance. The researcher asked if they had any questions and then left the room for the entirety of the experiment. Once finished the participant notified the instructor and the debrief began.

Once the Logical Reasoning Task was completed participants answered the remaining survey questions on Qualtrics. The first questionnaire measured their state-test anxiety and gauged how they felt during the task using the State-Test Anxiety, Evaluation Apprehension, and Efficacy measure (Lawrence & Williams, 2013). The next measure examined their self-regulatory processes during the task (Kanfer & Ackerman, 1989) followed by an inventory of their off-task cognition (Sarason et. al., 1986). The International Personality Item Pool (Goldberg,1992) came next followed by the final page of demographic questions. A full debrief concluded the study in which we explained any deception used during the experiment along with our true hypotheses between test anxiety, test performance, and personality.

Transition to Online Data Collection

Due to Covid-19 all in person data collection was cancelled and our study moved completely online. This presented us with several challenges and required multiple changes to be made to the experiment mainly regarding the initial instructions and the use of deception. All

instruction normally given by the researcher was moved entirely online with specific instructions bolded, underlined, or a combination of both. We also added a statement in bold and underlined at the very beginning of the study urging participants to use a computer mouse for the experiment. Without one a participant would be severely disadvantaged which could result in poor performance and potentially confound our results. The computer still randomly assigned participants to the three anxiety levels and before beginning they were reminded once again on the aforementioned practice page to use a mouse. The high anxiety condition received minor changes mainly by adding bolded instructions explaining the task has been highly correlated with cognitive ability and one's ability to get a job right out of college. Once the task began a timer was added to the top right corner that counted down from ten minutes. The moderate anxiety condition was given a set of bolded instructions similar to the previously stated instruction but modified for this context. A timer was also added to the top right corner during the task but this one counted up from zero instead of down from ten. The low anxiety condition remained unchanged except for the reminder to use a mouse. After completing the Logical Reasoning Task all participants were asked if they used a mouse followed by the remainder of the previously stated survey questions on Qualtrics. A full debrief concluded the study with all deceptive tactics explained in bold lettering.

Participants

Participants included 239 undergraduate students from Appalachian State University who received course credit for their successful completion of the study. The majority of the participants reported being female (75.7%) and the mean age of the full sample was 19.64 ($SD =$ 2.20). The data collected by means of face to face interaction was ultimately disregarded due to the small sample size and inequivalent anxiety manipulations compared to the online sample.

Therefore, only data collected online was used within the analyses to eliminate potentially

confounding our results.

Measures

As previously stated, a composite performance score was quantified based on how

quickly and accurately a participant could arrange the fifty sentences in alphabetical order. In

order to create a numerical score for each participant, I created an answer key with each sentence

in its correct sequence being assigned a number between one and fifty. For each statement I then

took the absolute value of the difference between where a participant placed a sentence and its

correct numeric position. These differences were summed to create a total accuracy score with

zero being the best score possible. I then transformed these accuracy scores along with the

duration on the task in seconds into z scores in order to standardize both measures of

performance. Lastly, the z scores for the accuracy and duration variables were summed to create

the composite performance score variables which were then inverted for ease of analysis

purposes.

State Test Anxiety

State test anxiety was measured with four items from Lawrence & Williams (2013) state

test anxiety, evaluation apprehension, and self-efficacy inventory, each of which were answered

on a 7-point Likert-type scale (1 = strongly disagree, 7 = strongly agree). This scale

demonstrated strong internal consistency ($\alpha = .93$) with one example item being "I felt anxious

while completing this test". (Lawrence & Williams, 2013).

International Personality Item Pool

Goldberg (1992) initially created the International Personality Item Pool (IPIP), which measures the Big Five personality domains of conscientiousness, neuroticism/emotional stability, extraversion, agreeableness, and openness to experience. The fifty item self-report inventory demonstrates moderate convergent validity with the NEO-PI inventory which measures the same five personality constructs (Goldberg, 1992). Ten items were devoted to each domain and were answered on a 5- point Likert type Scale (1 = strongly disagree, 5 = strongly agree), with two example items being "I get chores done right away (conscientiousness)" and " I have a rich vocabulary (openness)" (Constantinescu, 2016). A strong internal consistency was observed for each domain and are as follows: Conscientiousness (α = .85), Emotional Stability (α = .89), Extraversion (α = .90), Agreeableness (α = .84), Openness (α = .78).

Attention Checks

Our study consisted of two attention checks spread throughout the questionnaires and were answered on the corresponding Likert scale. The questions are as follows: "I believe wood burns when put in fire" and "I can hold my breath for two days". Participants that answered the first question with "Strongly Disagree" or "Somewhat Disagree" were removed from the data while the inverse is true for the second statement (Strongly Agree, Somewhat Agree).

Results

Means, standard deviations, and intercorrelations between the variables are presented in Table 1. Personality variables with similar characteristics demonstrated significant weak to moderate intercorrelations with conscientiousness-agreeableness demonstrating the strongest relationship r = 0.26, p <.01 and conscientiousness-emotional stability portraying the weakest r = 0.17, p < 01. Our correlations were weaker than previous findings from meta-analytic research

performed by Linden, Nijenhuis, & Bakker (2010), but they still align with the overall trend of

relationships found in this analysis. State anxiety had a negative moderate correlation with

emotional stability $r = -0.37$, $p < .01$ which intuitively aligns with the traits of individuals with

higher levels of neuroticism or inversely, low levels of emotional stability. Openness also had a

significant negative weak correlation with state anxiety $r = -0.20$, $p < .01$ which coincides with

the traits associated with highly open individuals.

A 2-step hierarchical moderated multiple regression analysis was used to examine if the

relationship between anxiety and performance depended on personality traits. In running these

analyses, anxiety condition was transformed into an ordinal variable with 0 for the low anxiety

condition, 1 for the moderate anxiety condition, and 2 for the high anxiety condition. Next,

anxiety condition and personality traits were entered in step one, and the anxiety X personality

trait interaction was entered in step two, with both steps predicting the composite performance

score. Both the anxiety and personality variables were mean centered. I also examined the

interaction affects of state anxiety scores as a substitute for our ordinal anxiety variable, but we'll

explore that further into the results. I reported R^2 and the change in R^2 along with the

standardized beta coefficients, the change in the F statistic, and significance level. Regression

statistics are presented in Table 2.

The Big Five and Performance

Hypothesis 1: Conscientiousness

Results of the regression analysis for conscientiousness and anxiety as our product

variable were found to be non-significant and, therefore hypothesis one was not supported, $\beta = -$

.08, $t (235) = -1.23$, $p = .211$. The model hardly explained any additional variation in the

composite score and the change in R^2 was also non-significant, $R^2 = .01$, $F (3, 236) = 1.58$, $p =$ .211. Consequently, we conclude that conscientiousness did not significantly moderate the test anxiety and test performance relationship and we fail to reject the null.

Hypothesis 2: Emotional Stability/Neuroticism

Emotional stability did not significantly change the regression model as well, $\beta = .05$, $t (235) = .83$, $p = .406$. Approximately the same non-significant change in R^2 occurred in this model as the previous hypothesis, $R^2 = .00$, $F (3, 236) = .69$, $p = .406$. We conclude that emotional stability did not significantly moderate the test anxiety-test performance relationship and therefore, we fail to reject the null hypothesis.

Hypothesis 3: Extraversion

The relationship between extraversion, anxiety, and the composite score was found to be significant, $\beta = .14$, $t (235) = 2.23$, $p < .05$. This model explained an additional 2% of the variance and this change was significant, $R^2 = .02$, $F (3, 236) = 4.95$, $p < .05$. Accordingly, extraversion did successfully moderate the test anxiety-test performance relationship supporting hypothesis 3 and therefore, we reject the null.

Hypothesis 4: Agreeableness

Agreeableness and anxiety as our product variable produced non-significant results, $\beta = .09$, $t (235) = 1.44$, $p = .15$. A non-significant increase in R^2 explained an additional 1% of variance in composite scores, $R^2 = .01$, $F (3, 236) = 2.08$, $p = .15$. This moderation effect was close to being marginally significant due to the underlying relationship between agreeableness and composite performance. In both models the standardized beta coefficient for agreeableness

was marginally significant, $\beta = .12$, t (235) $= 1.85$, $p = .06$ in step 1 and $\beta = .11$, t (235) $= 1.75$, p $= .08$ in step 2. Based off this model we conclude that, agreeableness failed to significantly moderate the test anxiety-test performance relationship, and we therefore fail to reject the null hypothesis.

Hypothesis 5: Openness

Openness failed to produce significant interaction effects when added to the regression model, $\beta = -.08$, t (235) $= -1.23$, $p = .221$. A small non-significant increase in R^2 occurred, explaining an additional 1% of variance in the composite score, $R^2 = .01$, F (3, 236) $= 1.51$, $p = .221$. Correspondingly we presume, that openness did not significantly moderate the test anxiety-test performance relationship, therefore we fail to reject the null hypothesis.

State Anxiety and Performance

It is possible that our anxiety manipulation was not very strong and thus state anxiety didn't differ between conditions. We tested this with an ANOVA and found the difference was non-significant F (2,236) $= .01$, $p = .99$, with means for each condition being Low $= 4.17$, Moderate $= 4.15$, and High $= 4.19$. Accordingly, we retested our hypothesis with centralized scores from the state anxiety measure as our independent variable. Table 3 represents the regression statistics for this new model. The first difference between the two regression analyses is state anxiety as opposed to the ordinal anxiety variable produced marginally significant results, $\beta = -.12$, t (237) $= -1.65$, $p = .10$ and accounted for 1% of the variance in composite score, $R^2 = .01$, F (1, 238) $= 2.72$, $p < .1$.

Secondly, in regard to the personality variables, extraversion lost all significance within this model while the emotional stability X state anxiety and openness X state anxiety interactions produced marginally significant results. The moderator of ES X SA accounted for an additional 1.3% of variance in the regression model, $R^2 = .01$, $F (3, 236) = 3.11$, $p = .08$, and had the second strongest effect out of all the other interaction variables, $\beta = .11$, $t (235) = -1.76$, $p = .08$. The O X SA interaction was the strongest moderator within this model, $\beta = .12$, $t (235) = 1.84$, $p = .07$ and explained an additional 1.4% of variance in composite performance, $R^2 = .01$, $F (3, 236) = 3.37$, $p = .07$ The final difference between the two models with competing anxiety variables relates to agreeableness and its overall strength of effect. In this model agreeableness alone produced statistically significant results within both steps of the regression, $\beta = .13$, $t (235) = 2.07$, $p < .05$. In step one with agreeableness and state anxiety independent of one another, the model predicted a significant 3% of the variance in the composite score, $R^2 = .03$, $F (3, 236) = 3.60$, $p < .05$.

Discussion

The results of this study demonstrate partial support for our overarching hypothesis that personality traits moderate the test anxiety-test performance relationship. Extraversion produced significant interaction effects within our ordinal anxiety regression model supporting hypothesis three. Figure 1 depicts the relationship between anxiety condition and composite performance based on low or high levels of extraversion. The correlation between the two variables was stronger for individuals with low levels of extraversion ($r = -.18$, $p < .05$), indicating that less extraverted individuals were affected by anxiety condition more so than highly extraverted participants, and therefore performance diminished. This aligns with previous research findings

that extraversion not only predicts test anxiety more so than other Big Five traits (Chamorro-

Premuzic, 2008) but higher levels of E can also act as a buffer between anxiety and performance

(Bolger, 1991).

     Both emotional stability and openness exhibited marginal significance within the state

anxiety regression model, providing partial support for hypothesis two and hypothesis five,

respectively. The most profound relationship in the study, although only marginally significant,

was that of emotional stability and its overall impact on the test anxiety-test performance

relationship. Figure 2 represents the impact of high and low levels of emotional stability on the

relationship between state anxiety and composite performance. There was a moderate negative

correlation between state anxiety and composite performance for individuals with low levels of

emotional stability ($r = -.24$, $p < .1$). When ES is partitioned based on low and high magnitudes,

we clearly see the interaction effects of ES on the anxiety-performance relationship. This finding

is consistent with previous research that low ES is a reliable predictor of test anxiety (Chamorro-

Premuzic, 2008) while exemplifying the moderation effect this trait has on reducing the impact

of an individual's experienced anxiety, resulting in superior test performance. Given the

characteristics of low emotionally stable individuals, this finding intuitively aligns and reinforces

the ideologies within the current literature, but is distinctive due to the interaction occurring

between ES and the test anxiety-test performance relationship. Whereas the literature mostly

examines the direct effects of ES on test anxiety or ES on test performance, this study examined

the interaction between these variables, helping bridge the gap between the two topics to create a

more comprehensive understanding of the association between the variables.

     As previously stated, the openness interaction demonstrated marginal significance within

the state anxiety model. Figure 3 portrays the relationship between state anxiety and composite

performance based on low or high degrees of openness. State anxiety and composite

performance were weakly correlated based on low openness ($r = -.19$, $p < .1$). This negative and

weak correlation between state anxiety and performance exhibits the interaction effect of

openness on the relationship. Essentially, lower levels of openness resulted in inferior

performance compared to highly open individuals. However, this relationship differs from the ES

and E regression models in a peculiar way. Both the high open and low open regression

equations have a negative slope while the high E and high ES equations have positive slopes.

This insinuates a general decrease in composite performance score regardless of openness level

and could potentially be explained by the lack of predictive power openness generally exhibits in

regard to performance outcomes.

Although the agreeableness interaction term produced non-significant results, the direct

effect agreeableness had within both models is noteworthy nonetheless. Agreeableness alone was

a significant predictor of performance, albeit standardized beta coefficients were generally weak

in nature. Figure 4 is a graphical representation of the relationship between anxiety condition and

composite performance on the basis of high or low levels of agreeableness. For participants with

low agreeableness, anxiety and composite performance had a weak negative correlation, ($r = -$

$.16$, $p < .1$). This correlation indicates that lower levels of A resulted in poorer performance

while high agreeableness appeared to lessen the influence of anxiety condition, eliciting superior

performance. Within our state anxiety regression model at both high and low levels of

agreeableness the correlation between state anxiety and composite performance was weak and

negative ($r = -.11$, $p < .05$). Past research has not shown agreeableness to be a valid predictor of

overall test or job performance unless in context specific roles requiring cooperation (Ross,

2003; Barrick, 2001). Penley and Tomaka (2002) found an association between high

agreeableness and stress reducing coping strategies such as passive endurance and seeking social

support. Accordingly, individuals with low A may have utilized less effective coping techniques

such as escape-avoidance, hasty completion, or instruction negligence, therefore resulting in

subpar performance. These results, although relatively weak, provide some evidence that

agreeableness may predict performance under certain conditions more so than originally

expected and future research would benefit from examining individual facets of agreeableness in

relation to test performance within various contexts.

These findings suggest several theoretical and practical implications within the field of

personality, anxiety, and performance research. On a macro level these results demonstrate

personality may influence performance to a greater extent than previously proclaimed.

Personality traits may not have that strong of a direct effect on performance (Barrick, 1991;

Hurtz, 2000), but it can impact other phenomenon like test anxiety which subsequently affects

performance outcomes. Interactions between personality traits and other variables related to

job/test performance, organizational citizenship, or job satisfaction could prove to be fruitful

avenues of future research in order to expand our understanding of the influence that personality

traits have on these relationships.

On a more practical note, these results imply extraversion, emotional stability, and

openness act as a buffer to test anxiety, resulting in preferable performance outcomes.

Organizations could use these findings to implement a selection process that's custom tailored

for roles with greater anxiety inducing responsibilities. Bing, Davison, and Smothers (2014)

found personality inventories contextualized for specific work settings were valid predictors of

performance more so than noncontextualized measures. A hiring process that incorporates a

personality inventory coupled with job specific questionnaires could prove to be a constructive

and valid predictor of performance within certain roles. Doctors, police officers, and managerial

professions are potentially high stress occupations that require strong interpersonal skills

(Barrick 1991), and all of these professions could benefit from this type of robust selection

system.

There were several limitations in the current study that should be considered when

conducting future research. Our anxiety manipulation may not have been strong enough to

induce an efficacious anxiety response meaningful enough to hinder one's performance. A

stronger manipulation coupled with two anxiety conditions, one low the other high, as opposed

to three could be advantageous as well. Our sample consisted of only undergraduate college

students at Appalachian State University and therefore any generalizations to other settings

should be tentative at best. Finally, the transition to online data collection due to Covid-19 may

have interacted with the effect of the manipulations, potentially contributing to a pseudo-floor

effect within our sample and essentially inducing a heightened level of anxiety amongst

participants regardless of anxiety condition.

Despite these limitations, our results indicate personality traits can moderate the test

anxiety-test performance relationship. Greater levels of emotional stability, extraversion, and

agreeableness appear to buffer the effects of high anxiety testing situations, and therefore these

individuals outperform those with lower levels of these traits. This study takes the impact the Big

Five traits have on our lives one step further by examining the interaction effects within the

anxiety and performance relationship. Future studies should advance this topic by conducting

research in multiple contexts, both academic and job oriented, while continuing to examine the

moderation effects of the Big Five on different relationships. Analyzing independent facets of

each personality trait in conjunction with that research would be a beneficial contribution to the general body of knowledge surrounding personality research as well.

Conclusion

Personality arguably defines who we are as individuals and is a rather abstract phenomenon therefore making research surrounding the topic somewhat ambiguous. When examining the Big Five personality traits and their moderating influence on the test anxiety-test performance relationship our findings help strengthen previous research within the domain of personality. Higher levels of extraversion, emotional stability, openness, and agreeableness were found to successfully lessen the effects of test anxiety resulting in superior performance. Low levels of emotional stability and extraversion exhibited the largest moderation impact on the relationship while the openness moderator and the direct effects of agreeableness on anxiety and performance were weaker in nature. These results enhance our understanding on the obscure nature of personality and its important impact on our lives, while providing an optimistic outlook for future research to explore the moderation effects of personality within different contexts.

References

Barrick, M. R., & Mount, M. K. (1991). The Big Five Personality Dimensions And Job

      Performance: A Meta-Analysis. *Personnel Psychology*, *44*(1), 1–26. doi: 10.1111/j.1744-

      6570.1991.tb00688.x

Barrick, M. R., Mount, M. K., & Judge, T. A. (2001). Personality and Performance at the

      Beginning of the New Millennium: What Do We Know and Where Do We Go Next?

      International Journal of Selection and Assessment, 9(1&2), 9-30. doi:10.1111/1468-

      2389.00160

Bing, M. N., Davison, H. K., & Smothers, J. (2014). Item-level Frame-of-reference Effects in

      Personality Testing: An investigation of incremental validity in an organizational setting.

      International Journal of Selection and Assessment, 22(2), 165-178. doi:10.1111/ijsa.12066

Bolger, N., & Eckenrode, J. (1991). Social relationships, personality, and anxiety during a major

      stressful event. *Journal of Personality and Social Psychology, 61*(3), 440-449.

      doi:10.1037/0022-3514.61.3.440

Bonaccio, S., & Reeve, C. L. (2010). The nature and relative importance of students' perceptions

      of the sources of test anxiety. *Learning and Individual Differences*, *20*(6), 617–625. doi:

      doi.org/10.1016/j.lindif.2010.09.007

Cassady, J. C., & Johnson, R. E. (2002). Cognitive Test Anxiety and Academic

      Performance. *Contemporary Educational Psychology*, *27*(2), 270–295. doi:

      10.1006/ceps.2001.1094

Chamorro-Premuzic, T., Ahmetoglu, G., & Furnham, A. (2008). Little more than personality:

Dispositional determinants of test anxiety (the Big Five, core self-evaluations, and self-

assessed intelligence). *Learning and Individual Differences, 18*(2), 258-263.

doi:10.1016/j.lindif.2007.09.002

Connor-Smith, J. K., & Flachsbart, C. (2007). Relations between personality and coping: A

meta-analysis. *Journal of Personality and Social Psychology, 93*(6), 1080-1107.

doi:10.1037/0022-3514.93.6.1080

Constantinescu, Petru & Constantinescu, Iuliana. (2016). THE ADAPTATION OF THE BIG-

FIVE IPIP- 50 QUESTIONNAIRE IN ROMANIA REVISITED. Bulletin of the

Transilvania University of Braşov. 9. 1-2016.

Costa, P. T., Jr., & McCrae, R. R. (2008). The Revised NEO Personality Inventory (NEO-PI-

R). In G. J. Boyle, G. Matthews, & D. H. Saklofske (Eds.), *The SAGE handbook of

personality theory and assessment, Vol. 2. Personality measurement and testing* (p. 179–

198). Sage Publications, Inc. https://doi.org/10.4135/9781849200479.n9

Embse, N. V., Jester, D., Roy, D., & Post, J. (2018). Test anxiety effects, predictors, and

correlates: A 30-year meta-analytic review. *Journal of Affective Disorders, 227*, 483-493.

doi:10.1016/j.jad.2017.11.048

Furnham, A., Moutafi, J., & Chamorro-Premuzic, T. (2005). Personality and Intelligence:

Gender, the Big Five, Self-Estimated and Psychometric Intelligence. *International

Journal of Selection and Assessment, 13*(1), 11-24. doi:10.1111/j.0965-

075x.2005.00296.x

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure.

    Psychological Assessment, 4(1), 26-42. doi:10.1037/1040-3590.4.1.26

Hunsley, J. (1985). Test anxiety, academic performance, and cognitive appraisals. *Journal of*

    Educational Psychology, 77(6), 678-682. doi:10.1037/0022-0663.77.6.678

Hurtz, G. M., & Donovan, J. J. (2000). Personality and job performance: The Big Five revisited.

    Journal of Applied Psychology, 85(6), 869-879. doi:10.1037/0021-9010.85.6.869

Jackson, J. J., Wood, D., Bogg, T., Walton, K. E., Harms, P. D., & Roberts, B. W. (2010). What

    do conscientious people do? Development and validation of the Behavioral Indicators of

    Conscientiousness (BIC). *Journal of Research in Personality, 44*(4), 501-511.

    doi:10.1016/j.jrp.2010.06.005

Judge, T. A., Heller, D., & Mount, M. K. (2002). Five-factor model of personality and job

    satisfaction: A meta-analysis. *Journal of Applied Psychology*, *87*(3), 530–541. doi:

    10.1037/0021-9010.87.3.530

Judge, T. A., & Zapata, C. P. (2015). The Person–Situation Debate Revisited: Effect of Situation

    Strength and Trait Activation on the Validity of the Big Five Personality Traits in

    Predicting Job Performance. *Academy of Management Journal, 58*(4), 1149-1179.

    doi:10.5465/amj.2010.0837

Kanfer, R., & Ackerman, P. L. (1989). Motivation and cognitive abilities: An

    integrative/aptitude-treatment interaction approach to skill acquisition. *Journal of Applied*

    Psychology, *74*(4), 657–690. doi: 10.1037/0021-9010.74.4.657

Lawrence, J. S., & Williams, A. (2013). Anxiety explains why people with domain-contingent

      self-worth underperform on ability-diagnostic tests. *Journal of Research in*

      Personality, *47*(3), 227–232. doi: 10.1016/j.jrp.2013.01.004

Linden, D. V., Nijenhuis, J. T., & Bakker, A. B. (2010). The General Factor of Personality: A

      meta-analysis of Big Five intercorrelations and a criterion-related validity study. *Journal*

      of Research in Personality, 44(3), 315-327. doi: 10.1016/j.jrp.2010.03.003

MacArthur SES & Health Network: Research. (n.d.). Retrieved from

      https://macses.ucsf.edu/research/psychosocial/anxiety.php

Mccarthy, J. M., Iddekinge, C. H., Lievens, F., Kung, M., Sinar, E. F., & Campion, M. A.

      (2013). Do candidate reactions relate to job performance or affect criterion-related

      validity? A multistudy investigation of relations among reactions, selection test scores,

      and job performance. *Journal of Applied Psychology, 98*(5), 701-719.

      doi:10.1037/a0034089

Mccrae, R. R., Costa, J. P. T., & Martin, T. A. (2005). The NEO–PI–3: A More Readable

      Revised NEO Personality Inventory. *Journal of Personality Assessment*, *84*(3), 261–270.

      doi: 10.1207/s15327752jpa8403_05

Mcilroy, D., & Bunting, B. (2002). Personality, Behavior, and Academic Achievement:

      Principles for Educators to Inculcate and Students to Model. *Contemporary Educational*

      Psychology, 27(2), 326-337. doi:10.1006/ceps.2001.1086

Penley, J. A., & Tomaka, J. (2002). Associations among the Big Five, emotional responses, and

    coping with acute stress. *Personality and Individual Differences, 32*(7), 1215-1228.

    doi:10.1016/s0191-8869(01)00087-3

Raja, U., & Johns, G. (2010). The joint effects of personality and job scope on in-role

    performance, citizenship behaviors, and creativity. *Human Relations, 63*(7), 981-1005.

    doi:10.1177/0018726709349863

Reeve, C. L., Bonaccio, S., & Charles, J. E. (2008). A policy-capturing study of the contextual

    antecedents of test anxiety. *Personality and Individual Differences*, *45*(3), 243–248. doi:

    10.1016/j.paid.2008.04.006

Ross, S. R., Rausch, M. K., & Canada, K. E. (2003). Competition and Cooperation in the Five-

    Factor Model: Individual Differences in Achievement Orientation. *The Journal of*

    Psychology, 137(4), 323-337. doi:10.1080/00223980309600617

Sarason, I. G., Sarason, B. R., Keefe, D. E., Hayes, B. E., & Shearin, E. N. (1986). Cognitive

    interference: Situational determinants and traitlike characteristics. *Journal of Personality*

    and Social Psychology, *51*(1), 215–226. doi: 10.1037/0022-3514.51.1.215

Seipp, B. (1991). Anxiety and academic performance: A meta-analysis of findings. *Anxiety*

    Research, 4(1), 27-41. doi:10.1080/08917779108248762

Sommer, M., & Arendasy, M. E. (2015). Further evidence for the deficit account of the test

    anxiety–test performance relationship from a high-stakes admission testing

    setting. *Intelligence*, *53*, 72–80. doi: 10.1016/j.intell.2015.08.007

Tait, M., Padgett, M. Y., & Baldwin, T. T. (1989). Job and life satisfaction: A reevaluation of the

strength of the relationship and gender effects as a function of the date of the

study. *Journal of Applied Psychology*, *74*(3), 502–507. doi: 10.1037/0021-9010.74.3.502

Truxillo, D. M., Bauer, T. N., Campion, M. A., & Paronto, M. E. (2006). A Field Study of the

Role of Big Five Personality in Applicant Perceptions of Selection Fairness, Self, and the

Hiring Organization. *International Journal of Selection and Assessment*, *14*(3), 269–277.

doi: 10.1111/j.1468-2389.2006.00351.x

Viswesvaran, C., & Ones, D. S. (2004). Importance of Perceived Personnel Selection System

Fairness Determinants: Relations with Demographic, Personality, and Job

Characteristics. *International Journal of Selection and Assessment*, *12*(1-2), 172–186.

doi: 10.1111/j.0965-075x.2004.00272.x

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures

of positive and negative affect: The PANAS scales. *Journal of Personality and Social

Psychology*, *54*(6), 1063–1070. doi: 10.1037/0022-3514.54.6.1063

Woo, S. E., Chernyshenko, O. S., Stark, S. E., & Conz, G. (2013). Validity of Six Openness

Facets in Predicting Work Behaviors: A Meta-Analysis. *Journal of Personality

Assessment, 96*(1), 76-86. doi:10.1080/00223891.2013.806329

Zhang, N., & Henderson, C. N. (2014). Test anxiety and academic performance in chiropractic

students*. *Journal of Chiropractic Education, 28*(1), 2-8. doi:10.7899/jce-13-20

Table 1

Means, Standard Deviations, and Correlations among the Variables

	1	2	3	4	5	6	7	8
1. Composite Score	---							
2. Anxiety Condition	-.05	---						
3. State Anxiety	-.12	.01	---					
4. Extraversion	-.04	-.02	-.09	---				
5. Agreeableness	.12	-.04	.10	.12	---			
6. Conscientiousness	-.09	-.08	.02	-.07	.26**	---		
7. Emotional Stability	-.03	-.07	-.37**	.09	-.01	.17**	---	
8. Openness	-.04	-.02	-.20**	.10	.12	-.02	.06	---
Mean	.26	.97	4.17	3.10	4.18	3.71	2.74	3.61
SD	.32	0.85	1.66	0.90	0.61	0.69	0.86	0.56

Note. ** $p < .01$.

Table 2

Summary of Hierarchical Regression Analysis for Variables Predicting Composite Score

	β	ΔR^2	ΔF
Step 1		.00	.56
Anxiety	-.05		
Step 1		.01	1.23
Anxiety	-.06		
Conscientiousness	-.09		
Step 2		.01	1.57
Anxiety	-.06		
Conscientiousness	-.09		
Interaction	-.08		
Step 1		.00	.39
Anxiety	-.05		
Emotional Stability	-.03		
Step 2		.00	.69
Anxiety	-.05		
Emotional Stability	-.03		
Interaction	.05		
Step 1		.00	.46
Anxiety	-.05		
Extraversion	-.04		
Step 2		.02	4.95**
Anxiety	-.06		
Extraversion	-.04		
Interaction	.14**		
Step 1		.02	2.04
Anxiety	-.05		
Agreeableness	.12*		
Step 2		.01	2.08
Anxiety	-.05		
Agreeableness	.11*		
Interaction	.09		
Step 1		.00	.45
Anxiety	-.05		
Openness	-.04		
Step 2		.01	.84
Anxiety	-.05		
Openness	-.04		
Interaction	-.06		

Note. $* p < .1.$ $** p < .05.$

Table 3

Summary of Hierarchical Regression Analysis for State Anxiety and Personality variables.

	β	ΔR^2	ΔF
Step 1		.01	2.72*
State Anxiety	-.12*		
Step 1		.02	2.23
State Anxiety	-.12		
Conscientiousness	-.09		
Step 2		.00	.18
State Anxiety	-.12		
Conscientiousness	-.09		
Interaction	-.03		
Step 1		.02	1.97
State Anxiety	-.14		
Emotional Stability	-.08		
Step 2		.01	3.11*
State Anxiety	-.13		
Emotional Stability	-.08		
Interaction	.11*		
Step 1		.01	1.64
State Anxiety	-.11		
Extraversion	-.05		
Step 2		.00	.48
State Anxiety	-.11		
Extraversion	-.05		
Interaction	.05		
Step 1		.03	3.60**
State Anxiety	-.12		
Agreeableness	.13**		
Step 2		.00	.10
State Anxiety	-.12		
Agreeableness	.13**		
Interaction	.02		
Step 1		.02	1.79
State Anxiety	-.12*		
Openness	-.06		
Step 2		.01	3.37*
State Anxiety	-.13*		
Openness	-.06		
Interaction	.12*		

Note. $* p < .1.$ $** p < .05.$

Figure 1

Relationship Between Extraversion Level, Anxiety Condition, and Composite Performance Score.
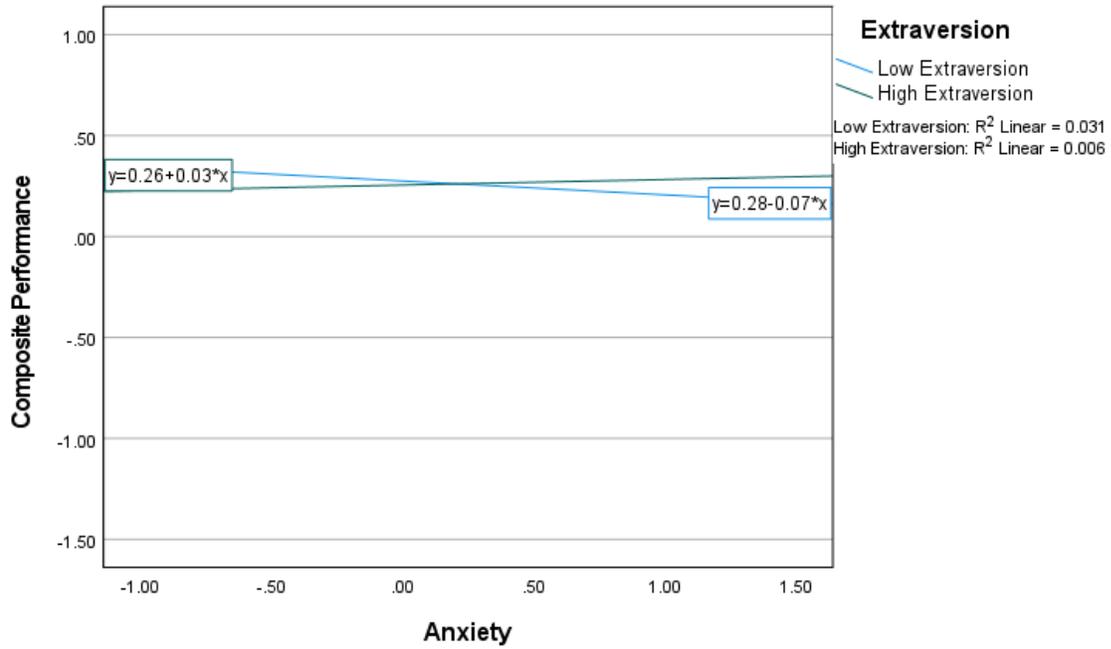

Figure 2

Relationship Between Emotional Stability Level, State Anxiety, and Composite Score.
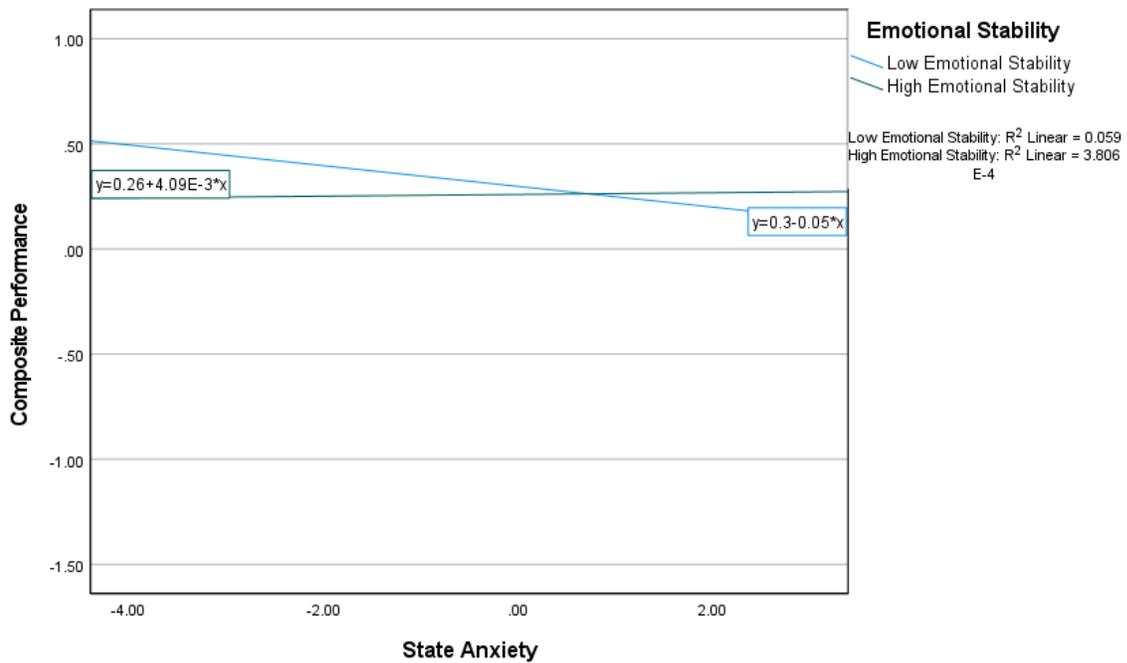
Figure 3

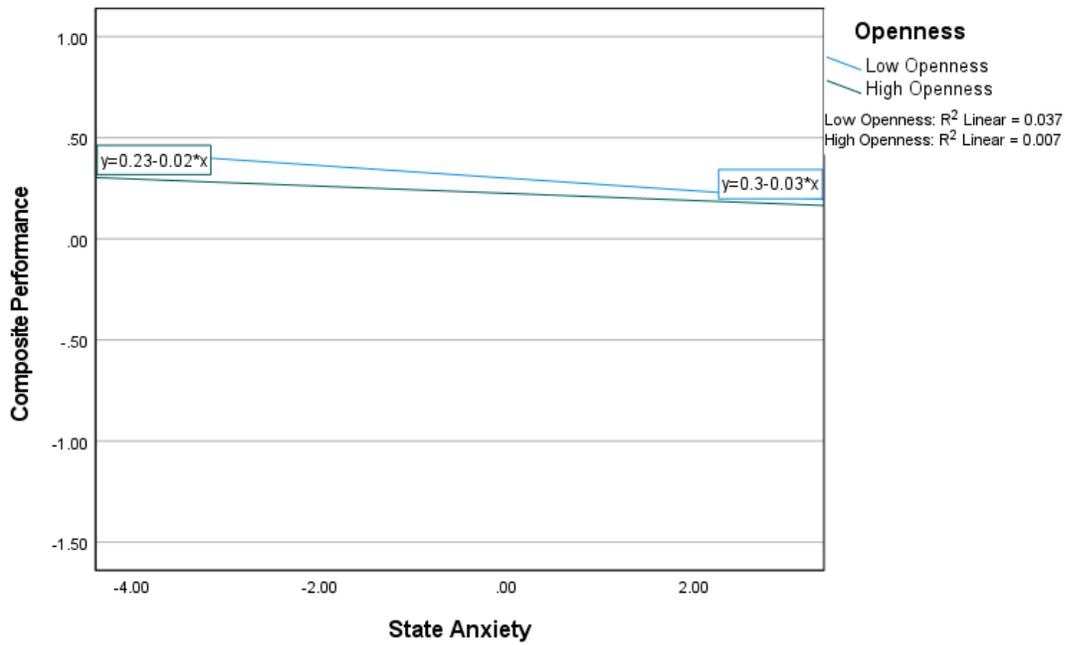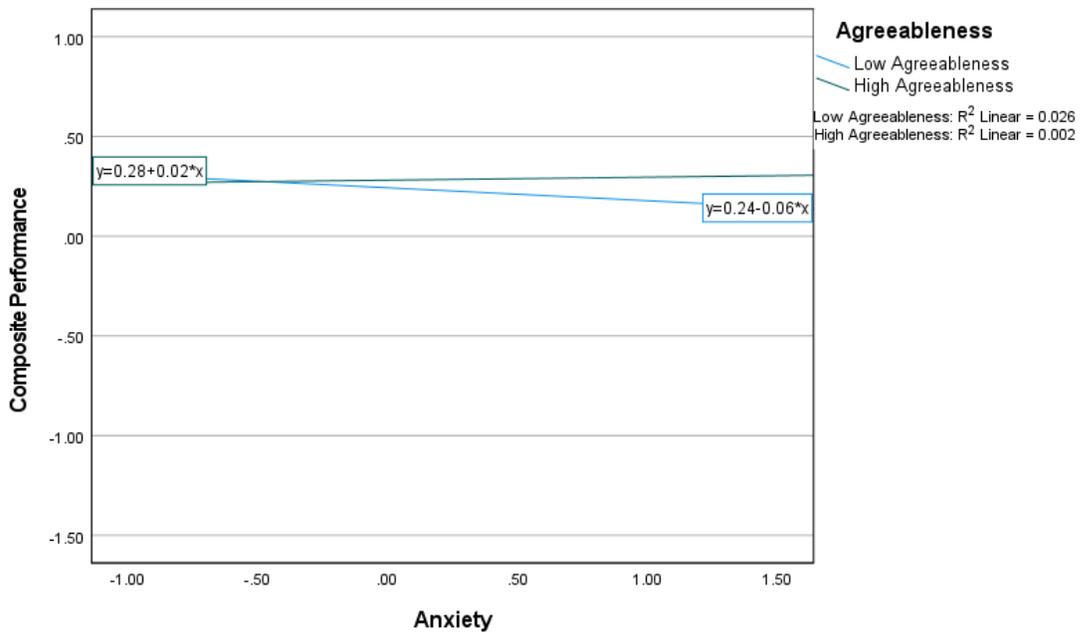*Relationship Between Openness Level, State Anxiety, and Composite Score.*

Figure 4

Relationship Between Agreeableness Level, Anxiety Condition, and Composite Performance Score.

Appendix

LOGICAL REASONING TASK

Place the following sentences in alphabetical order as quickly as possible. If sentences start with the same letter, move to the second letter to decide which will come first. All of the sentences must be in the correct order for the task to be completed. If there are any errors, the time will continue running until all of the errors are corrected.

_____ Vacation is only two days away!

_____ Alexa was excited for the festival.

_____ Lying is hard to forgive.

_____ Bachelor in Paradise premieres on Monday.

_____ Professor Green's assignment was due yesterday.

_____ James wants to take a nap.

_____ Haley was extremely homesick.

_____ Certain songs remind me of my childhood.

_____ What was your dream about?

_____ Nerves always got the best of him.

_____ Kari's favorite band is coming to town.

_____ Formal is right around the corner.

_____ How did the Panthers play yesterday?

_____ Should I cook dinner tonight?

_____ Greta organized the climate strike.

_____ Where is the World Cup being held?

_____ Failure is her biggest fear.

_____ Roderick suffered a knee injury.

_____ Netflix released a new documentary.

_____ Seeing old pictures made him sad.

_____ Bonfires are my favorite fall activity.

_____ Breakfast is my favorite meal.

_____ Game of Thrones is a great show.

_____ Erica's baby shower was a blast!

_____ Tailgating is a game day tradition.

_____ Thrift stores have great deals.

_____ Catherine forgot to water her plants.

_____ My student loans are overwhelming.

_____ Hiking is his favorite hobby.

_____ Coffee helps me start my day.

_____ Emails were flooding into my inbox.

_____ Debbie studied abroad in Italy

_____ Living with a roommate is hard.

_____ Can you come to my party?

_____ Oscar joined a dating app.

_____ Meditation is important for mental clarity.

_____ Mario Kart is his favorite game.

_____ Kayla was ready to graduate.

_____ Psychology is a unique field.

_____ Daphne really needed a vacation.

_____ Ross and Rachel were on a break.

_____ Drinking and driving is against the law.

_____ Quinn ran for club president.

_____ Being in love is fun!

_____ Group projects are scary.

_____ Homework is piling up.

_____ Nancy was heartbroken after the breakup.

_____ This game will decide their season.

_____ Three tests on the same day is hard!

_____ Chris was craving some Mexican food.