RE-EXAMINING THE POSTIVE CONSCIENTIOUSNESS-PERFORMANCE RELATIONSHIP: THE ROLE OF NEUROTICISM AND STRESS

by

Alexandra Marie Dunn

A thesis submitted to the faculty of
The University of North Carolina at Charlotte
in partial fulfillment of the requirements
for the degree of Masters of Arts in
Industrial and Organizational Psychology

Charlotte

2014

Approved by:

_____
Dr. Linda Shanock

_____
Dr. Eric Heggestad

_____
Dr. Lisa Walker

ABSTRACT

ALEXANDRA MARIE DUNN. Re-examining the conscientiousness-performance relationship: The role of neuroticism and stress. (Under the direction of DR. LINDA SHANOCK).

This study adds to the growing body of research on the interactive effects of personality traits. The researcher hypothesized that the relationship between conscientiousness and task performance would be weaker for individuals high in neuroticism. Consistent with trait activation theory, the achievement-oriented, anxiety-provoking condition contained task-relevant cues that enhanced stress to ensure that conscientiousness and neuroticism were activated. The three-way interaction between conscientiousness, neuroticism, and condition (achievement-oriented, anxiety-provoking versus achievement-oriented situation) was examined. The researcher hypothesized that the relationship between conscientiousness and task performance would be lowest when highly neurotic individuals were in an achievement-oriented, anxiety-provoking situation. Although the interaction was in the hypothesized direction, the results did not statistically support this hypothesis. However, the three-way interaction between conscientiousness, neuroticism, and the amount of perceived stress supported the hypothesis. Results from this interaction showed that performance was lowest when the individual was high on both conscientiousness and neuroticism and self-reported that they perceived stressed during the experiment. This study supports the idea of expanding personality research to consider the implications of trait interactions and provides evidence supporting trait activation theory. It was unique in using an experimental design to manipulate task-relevant cues to activate conscientiousness and neuroticism.

DEDICATION

This paper is dedicated to my parents, William and Lynne Dunn. I would not be where I am today without their constant support, dedication, and constantly believing in me. They have been behind me every step of the way and I can only hope that I have made them proud of my accomplishments.

ACKNOWLEDGEMENTS

I would like to acknowledge and thank all of the people that made this project possible. I would like to thank my advisor, Dr. Linda Shanock. Her advice and support has undoubtedly made me a better person, researcher, and scholar. I could not be luckier to call her a friend. I would also like to thank my committee members, Dr. Eric Heggestad and Dr. Lisa Walker. Specifically, I would like to thank Dr. Eric Heggestad for being like a second advisor to me, for always being open to new ideas, and to always willing to stretch the boundaries. Also, I would like to thank Dr. Lisa Walker for her expertise in experiments and constantly being open to new ways of thinking. Without the three of them, this study would not have come to fruition and I would not have been able to win the NSF GRFP.

I would also like to acknowledge the support of my family and friends. I would like to thank my mom and dad for their emotional support throughout this project and graduate school in general. I would also like to acknowledge the support of my classmates, Jessie Olien, Haley Myers, and Lea Williams, as well as the PALM Lab for giving me constant feedback. I would also like to thank my roommate, Kim Likman, for keeping me sane throughout the process and always listening to my crazy ideas.

TABLE OF CONTENTS

STATEMENT OF THE PROBLEM

Over the past 20 years, the Five-Factor Model of personality (FFM; Goldberg, 1990) has been used to explore the personality-job performance relationship (George & Zhou, 2001). Since the inception of this type of personality research, one of the most consistent, well-studied, and valid relationships has been between conscientiousness and job performance (Barrick, Mitchell, & Stewart, 2003; Hurtz & Donovan, 2000; Witt, Burke, Barrick, & Mount, 2002). More recently, heeding warnings about examining personality traits in isolation (Hogan, Hogan, & Roberts, 1996), personality researchers have begun to question what other factors may contribute to the functioning of personality traits as predictors of job performance. This has led to research examining the interactive effects of personality traits on performance (Judge & Erez, 2007; Penney, David, & Witt, 2011; Witt et al., 2002) and the context in which the individual may express certain personality traits (Tett & Burnett, 2003).

Most of the interactive personality trait studies to date have examined the interaction between conscientiousness and traits that may only be relevant in specific jobs, like extraversion or agreeableness (Witt et al., 2002). The goal of those studies was to better understand what combination of conscientiousness and another work-related trait may positively predict performance, above and beyond conscientiousness alone (Blickle, Meurs, Wihler, Ewen, Plies, & Gunther, 2012; Merz & Roesch, 2011; Penney et al., 2011; Witt et al., 2002). The purpose of the current study was to continue examining the interactive effects of personality and also how context plays a role in the functioning of personality traits. Drawing from person-situation interaction theory (Pervin, 1985) and trait activation theory (Tett & Burnett, 2003), the researcher examined the interactive

effects of two of the most consistent FFM predictors of performance (Barrick et al., 2003): conscientiousness and neuroticism and the role of an achievement-oriented, anxiety-provoking situation, which may activate both traits.

The current study considers neuroticism and an achievement-oriented, anxiety-provoking situation as boundary conditions, challenging the body of previous research that has found that conscientiousness is consistently positively related to task performance. More specifically, this study used an experimental design to consider how neuroticism, when activated by various stressful cues, may undermine the positive conscientiousness-performance relationship. Because conscientiousness is the most commonly studied personality characteristic and related to performance and neuroticism it is likely to cause anxiety and worry in a variety of work situations, the researcher aimed to better understand how this previously understudied trait interaction may incrementally predict task performance.

This study adds to the existing theoretical literature on personality by responding to calls for less focus on single trait models and more focus on holistic personality interaction models within a specific context. This study is a first step to better understand how each of the Five Factor Model traits may interact to predict job performance. This study is only a first step in understanding how two of the five traits interact, using the two most commonly studied of the five.. While there have been some recent studies that have begun to examine trait interactions, this is the first study that will examine a trait x trait x situation interaction. By building off of previous trait interaction research and incorporating the importance of the situation, a new, more holistic question arises: how

do individuals who are highly conscientious *and* highly neurotic differently perform when stressful situational cues are present?

PERSONALITY AND TASK PERFORMANCE

Over time, many personality researchers have embraced the five-factor model (FFM) as a consistent and reliable taxonomy of personality (Judge, Higgins, Thoresen, & Barrick, 1999). Because of this reliability, the FFM, also known as the 'Big 5,' has become widely used to explain how an individual's personality contributes to a variety of organizational behaviors (George & Zhou, 2001) including counterproductive work behavior (Jensen & Patel, 2011), work-family conflict (Bruck & Allen, 2003), burnout (Bakker, Van Der Zee, Lewig, & Dollard, 2006). These five traits, including conscientiousness, neuroticism, openness to experience, agreeableness, and extraversion, have been found to be relatively stable over time and have been shown to predict job performance across a variety of different jobs, industries, and skill levels (Mount & Barrick, 1998; Morgeson et al., 2007). Meta-analytic studies have also found a moderate personality-job performance relationship (i.e., Barrick et al., 2001), while recent research revealed that personality tests can account for a significant amount of incremental validity in job performance beyond that of biodata, mental ability, assessment centers, and interviews (Witt et al., 2002). Of the Big 5, conscientiousness and neuroticism are discussed in more detail because these two traits have been most strongly linked to workplace outcomes and have consistently predicted task performance (Barrick et al., 2003).

Conscientiousness

Conscientious individuals are known for being achievement-oriented and dependable (Barrick & Mount, 1991), which is further defined as being hardworking, persistent, responsible, and careful. Individuals with high conscientiousness have been

found to have technical expertise (Witt, 2002), be self-disciplined (Bakker et al., 2006), detail-oriented, and organized (Jensen & Patel, 2011). As compared to low conscientious individuals, high conscientious individuals are more likely to be motivated to complete work-related goals in a timely manner (Penney et al., 2011) to remain committed to work performance, and take initiative to solve work problems (Witt et al., 2002), which makes them excellent candidates for a majority of jobs. This trait has also been found to predict supervisor performance ratings across jobs (Barrick et al., 2003) and has been perceived as one of the most important traits related to hirability (Dunn, Mount, Barrick, & Ones, 1995); second only to cognitive ability. Because many of these behaviors tend to be necessary to perform high quality work, conscientiousness tends to be positively related to high performance in a majority of job contexts.

- Hypothesis 1a: There will be a positive relationship between conscientiousness and performance.

Neuroticism

Neurotic individuals are known for being anxious, worried, insecure, emotional, and have a tendency to get more depressed and angry (Andreassen, Hetland, & Pallesen, 2010; Mount & Barrick, 1991). A majority of research has shown a negative neuroticism-job performance relationship because highly neurotic individuals may become easily distracted by irrelevant tasks and put forth less effort to achieve their goals (Bipp & Kleinbeck, 2011), while also having high fear of failure (Ferris et al., 2011). Previous research has also found a positive neuroticism-counter productive work behavior relationship (Jensen & Patel, 2011), such that those who are high in neuroticism are also

less productive because they are less likely to comply with norms set by the organization (Dunlop & Lee, 2004) and are insecure about decision-making (Barrick et al., 2001).

- Hypothesis 1b: There will be a negative relationship between neuroticism and performance.

CONSCIENTIOUSNESS IN COMBINATION WITH NEUROTICISM

With the positive consequences of conscientiousness and the negative consequences of neuroticism on task performance in mind, this study tried to understand the intrapersonal tension that may arise when an individual is both highly conscientious and highly neurotic. By nature, personality is multifaceted and making selection decisions based on a single trait should be reconsidered (Witt, 2002; Witt et al., 2002) because "it is highly unlikely that only one dimension [of the five factor model] will be important for successful performance and even more unlikely that simple main effects will provide a complete picture" (Arthur, Woehr, & Graziano, 2001, p. 665). Over the past 15 years, personality research has been evolving and empirical evidence has supported a more holistic, realistic, and "constellation" view of personality traits (Blickle et al., 2012; Jensen & Patel, 2011; Merz & Roesch, 2011; Penney, David, & Witt, 2011; Witt et al., 2002) because performance can be incrementally explained by a variety of traits (Hogan et al., 1996). Jensen and Patel (2011) argue for the significance of trait interaction research because realistic behavior is reflected by a combination of personality traits and may be overlooked if only single traits are examined.

To date, the previous research on trait interactions has examined how the positive effects of conscientiousness may be enhanced in specific jobs because individuals were also high on traits like openness to experience (George & Zhou, 2001), agreeableness (Colbert et al., 2004; Witt et al., 2002), and extraversion (Witt, 2002). For example, Witt (2002) found that the interaction between extraversion and conscientiousness accounted for incremental variance when predicting job interview performance and job performance such that those high on both traits had the highest level of performance. Also, Witt et al.

(2002) found that the interaction between conscientiousness and agreeableness accounted for incremental variance when predicting supervisory performance ratings such that those high on both traits were also rated as having the highest performance.

On the other hand, very little research has examined how the positive effects of conscientiousness may be hindered by traits like neuroticism. Only a few studies have examined the interaction of conscientiousness with neuroticism, and none with regard to effects on task performance. Empirical evidence suggests there is an intrapersonal tension, formed when an individual is high on both conscientiousness and neuroticism, which may be disadvantageous because these individuals may engage in more counterproductive work behaviors (Jensen & Patel, 2011; Penney, Hunter, & Perry, 2011), less interpersonal helping (King et al., 2005) and have less resources to put towards achieving workplace goals (Penney et al., 2011). In their discussion for future research, Jensen and Patel (2011) proposed "conscientiousness may be beneficial to organizations only when it is accompanied by low neuroticism" (p. 470). This may be because the hard-working, conscientious individual may choke or become paralyzed with negative emotions, such as anxiety, worry, and fear of failure.

When an individual is highly neurotic, they are predisposed to experience frequent negative emotions, like worry and fear of failure (Penney et al., 2011a). When these negative emotions are combined with conscientious tendencies to work hard, do well, and pay attention to details, an individual is likely to get even more upset and anxious if they cannot meet work goals and they cannot perform to their best ability. Because individuals are motivated to reduce these negative emotions and the over-amplification of stress that comes with the pressure to do well, attention is likely to be

refocused on eliminating any potential disparity between existing and desired states, which will interfere with cognitive functioning and consume attention, energy, and other resources (Lord & Harvey, 2002) that could be used towards achieving the final goal of high task performance. Therefore, task performance should decrease if an individual is high on conscientiousness and high on neuroticism, because attention, energy, and cognition may be redirected towards reducing anxiety, worry, and fear of failure, which, in turn, will reduce the amount of resources directed at achieving the task goals.

- Hypothesis 2*:* Conscientiousness and neuroticism will interact in predicting performance, such that the relationship between conscientiousness and performance will be stronger when neuroticism is low than when it is high.

While all of the previously discussed studies examined trait interactions, many of the studies neglected to consider how the context might affect the activation of traits, which could affect performance. This study builds off of previous research on trait interactions by not only considering the interactive effects of conscientiousness and neuroticism on task performance, but also by adding another unique contribution. The researcher used an experimental design to examine how activating neuroticism with an achievement-oriented, anxiety-provoking situation may negatively affect the positive relationship between conscientiousness and task performance. Therefore, a contextual effect will be considered, in addition to the interaction of conscientiousness and neuroticism.

TRAIT INTERACTION AND THE SITUATION – THE CASE FOR TRAIT ACTIVATION

At least three primary studies (Barrick & Mount, 1993; Barrick, Mount, & Strauss, 1993; Gellatly, 1996), along with meta-analyses, have found that there are situational moderators of the conscientiousness-performance relationship. The present study built off of this work and attempted to identify a situational boundary condition under which the interaction between conscientiousness and neuroticism may decrease task performance. That is, this study used an experimental design to examine how activating both conscientiousness and neuroticism with task-related cues designed to enhance the stress of the situation may negatively affect task performance. To understand the behavioral outcome of task performance, one must understand not only the interplay of traits, but also the interplay between the traits and the situation (Barrick et al., 2003). Because individuals may present themselves differently across situations (Shaffer & Postlethwaite, 2012), it is important to consider how personality relates to work behaviors when certain traits are activated by trait-relevant cues at the task level (Christiansen & Tett, 2008). Two theories support the notion of contextualizing personality: person-situation interaction theory and trait activation theory.

According to person-situation interaction theory, personality is not always a consistent predictor of behaviors across a variety of situations. Instead, individual behaviors within specific contexts are a function of both personality and the situation (Shaffer & Postlethwaite, 2012). Therefore, individuals may have average levels of personality, but these levels may change when placed in specific situations. By including relevant task cues to activate neuroticism, one could examine if the additional anxiety

added to an already achievement-oriented situation better predicts behavior in that specific situation compared to a situation in which neuroticism should not activated. In fact, researchers have predicted that the person-situation interaction may provide better insight into performance than the separate main effects of the person and the situation (Schmitt, Eid, Maes, 2003).

Similarly, trait activation theory posits that the effects of traits can "only be expected in situations providing appropriate cues for the trait in question" (Bipp & Kleinbeck, 2011, p. 454). Therefore certain traits, while relatively stable, will become more prominent in certain situations. This activation will lead to an individual behaving in more predictable ways based on the situational demands in which they are placed (Tett & Burnett, 2003). This means that traits may be stable behavioral tendencies, but they are also triggered by some environmental stimuli and that the behavior these traits produced are context-dependent. It is important to consider the extent to which traits are activated in certain contexts, like neuroticism, because it will reduce large variability estimates and lead to a better understanding of which traits are activated during specific situations (Christiansen & Tett, 2008). Situation trait relevance is a term that refers to how a situation can "press" certain traits to become manifest by acting as cues for which a behavioral response, guided by traits, is expected. This study focused on manipulating task-relevant cues surrounding successful performance on the task (Tett & Burnett, 2003).

Activating Conscientiousness During Task Performance

An individual high on conscientiousness should want to work hard to complete tasks and complete the tasks to the best of their ability. Simply being placed in a situation that is going to resemble a work situation where the individual is going to have to learn something and then perform at an optimal level should activate conscientiousness. More specifically, cues that should activate conscientiousness at the task level (Christiansen & Tett, 2008) include how an individual should be motivated to improve scores on math problems, should want to work hard to complete the problems at an optimal level of performance, and should strive to solve the math problems in the least amount of time possible.

To date, there has been little research on the activation of conscientiousness during a situation where the individual should be motivated to achieve goals, but also feel pressure and anxiety (Miller et al., 1999; Vollrath, 2001). One study by Miller and colleagues (1999) found that conscientiousness was manifested in a high anxiety work environment if role clarity was low and workload was high. However, this effect was no longer significant once neuroticism was added into the model because neuroticism became the clear predictor of stress. When a highly conscientious individual is put in an achievement-oriented, anxiety-provoking situation where they have to perform well on a task, it is expected that the individual would be motivated to work hard and persevere. However, even with conscientiousness activated, the individual may not be able to perform as well as they would in the absence of high anxiety and pressure. One reason for this may be because conscientious individuals tend to set ambitious goals that may not be able to be reached when the situation has task cues that produce stress (Vollrath,

2001). For example, if an individual is trying to persevere, but time is an added anxiety-provoking cue and conscientious individuals tend to be detail-oriented (Barrick & Mount, 1991), that individual's performance may actually decrease because they have a high workload, but little time to pay attention to details. Therefore, the researcher hypothesizes the following:

- Hypothesis 3a*:* Conscientiousness and level of stress will interact to predict performance, such that the positive relationship between conscientiousness and performance will be stronger under the achievement-only condition than the achievement and anxiety-provoking condition.

Activating Neuroticism During Task Performance

Individuals who are high on neuroticism may not perform well because irrelevant aspects of the stressful environment may get in the way of their task performance. High neuroticism is predicted to manifest in a stressful situation (Bipp & Kleinbeck, 2011), which may negatively affect task performance because individuals who are high on neuroticism are expected to focus on the anxiety and pressure created by the context, instead of focusing on completing the goal and performing well (Rafferty & Griffin, 2006; Miller, Griffin, & Hart, 1999). Even though individuals may be motivated to complete work goals because they want to avoid failing, individuals may not be able to perform well because they feel anxious and self-conscious about their work, which takes away from energy and resources that could be put towards completing the task (Bipp & Kleinbeck, 2011).

- Hypothesis 3b*:* Neuroticism and level of stress will interact to predict performance, such that the negative relationship between neuroticism and

performance will be stronger under the achievement and anxiety-provoking condition than the achievement-only condition.

This study combines the trait interaction and trait activation research to examine how the interaction of conscientiousness and neuroticism is manifested differently in an achievement-oriented situation (i.e., only conscientiousness activated) versus an achievement-oriented, anxiety-provoking situation (i.e., conscientiousness and neuroticism activated). The intrapersonal tension of being highly conscientious and highly neurotic should decrease task performance (Hypothesis 2). However, this relationship may only be manifested when conscientiousness and neuroticism are both activated. Therefore, this study examined how neuroticism, when activated by a stressful situation, may affect the conscientiousness-performance relationship. Since it is hypothesized that an anxiety-provoking situation will create stress, activate conscientiousness (Hypothesis 3a), and activate neuroticism (Hypothesis 3b) and that these individuals will show decreases in performance, the interaction of these two traits in an achievement-oriented, anxiety-provoking situation are likely to be related to incremental detriments in performance. By using an experimental design, the researcher was able to examine both specific trait interactions and how the situation may play a critical role in explaining task performance. Therefore, the researcher hypothesizes the following:

- Hypothesis 4: Under conditions of high stress due to an achievement plus anxiety-provoking situation, the relationship between conscientiousness and performance will be more strongly negative when neuroticism is high. Under conditions of low stress due to an achievement situation, the relationship

between conscientiousness and performance will be more strongly positive when neuroticism is low.

METHODS

Sample and Procedure

Pilot Study

A pilot study was conducted to evaluate whether or not the experimental design (procedure and measures) and manipulations in the experimental condition were working in the way the researcher predicted. The purpose of the pilot study was to evaluate differences in perceived stress based on the experimental manipulation that was expected to activate both conscientiousness and neuroticism. The researcher used qualitative information collected in an experimenter's log to make informed decisions about changes and adaptations to the nature of the experiment. The experiment log included information about time to complete the study, any problems that occurred during the session, and an overall summary about the session. Please refer to "Appendix C: Pilot Study" for more information regarding the pilot study procedure, results, and changes that were made to the experimental design.

Sample

Participants were undergraduate psychology students recruited through a large, southeastern university's psychology research system. Students received credit towards the fulfillment of their general psychology research requirement. In total, the 205 students were 66% (N = 135) female and 34% (N = 70) male. Participants ranged in age from 18 to 46 years (M = 20.73, SD = 3.84); most (89.3%) were between 18 and 24. Participants were 55.1% Caucasian, 23.4% African American, 7.8% Pacific Islander, 7.8% Hispanic, and 5.9% other.

One hundred participants (68.0% female and 32.0% male) were randomly assigned to the experimental condition. Participants in the experimental condition ranged in age from 18 to 29 years (M = 20.40, SD = 2.54); most (92.0%) were between 18 and 24. Participants were 56% Caucasian, 24% African American, 9.0% Hispanic, 5.0% Pacific Islander, and 6.0% other. One hundred and five participants (63.8% female and 36.2% male) were randomly assigned to the control condition. Participants in the control condition ranged in age from 18 to 46 years (M = 21.04, SD = 4.75); most (86.7%) were between 18 and 24. Participants were 54.3% Caucasian, 22.9% African American, 6.7% Hispanic, 10.5% Pacific Islander, and 5.7% other. There were no significant differences between groups on sex, age, or race.

Procedure

This study was designed as a two-part study for multiple reasons. In an attempt to reduce common method bias, the study was designed to include two waves of data collection. Following recommendations from Podsakoff, MacKanzie, Lee, and Podsakoff (2003), the researcher created psychological and temporal separation by measuring one moderating variable, stress, and the outcome variable, performance, three to 14 days after measuring the predictor variables (conscientiousness and neuroticism). This separation also ensured that responding to personality items did not also activate conscientiousness and neuroticism. By splitting the data collection up into two parts, the personality items were no longer salient to the participants. Therefore when conscientiousness and/or neuroticism were activated, it was specifically due to the experimental design. Data collection also occurred in two sessions for efficiency purposes because the survey measures described in part 1 could be collected in groups

whereas the experimental manipulation described in part 2 had to be completed one-on-one since individuals may perform and react differently to the experimental manipulation. Therefore, to save the researcher and participants' time and to ensure that other survey measures or participants did not affect performance, the data collection was broken up into two parts.

Part 1 of Study

For the first part of the study, participants had 30 minutes to complete a 156-item survey, which included demographic items, a perceived academic competency scale, and the International Personality Item Pool (IPIP)-short scale, which measured conscientiousness and neuroticism. Participants were required to complete Part 1 in a proctored on-campus computer lab. For efficiency purposes, Part 1 study sessions were run in groups that were open to up to 25 students per session.

Part 2 of Study

When participants returned for the one-on-one 30-minute Part 2 sessions, participants learned how to complete modular arithmetic problems and completed a variety of survey measures. The modular arithmetic problems and experimental design were adapted from Beilock, Kulp, Holt, and Carr (2002) and Beilock and Carr (2005). To begin, the researcher explained that the purpose of the modular arithmetic problems was to understand how participants learned new math skills. Participants learned how to do these modular arithmetic (MA) problems by reading detailed instructions and running through examples about how to evaluate the validity of the problems on the computer. MA problems have previously been used in experimental lab settings because a majority of participants are inexperienced in solving MA problems (Beilock & Carr, 2005).

The purpose of MA problems was to evaluate the truth of a problem statement such as “51 = 19 (mod 4)” (Beilock & Carr, 2005) or “19 # 46 (mod 5)”. If a participant saw a problem with an “=”, they were to subtract the first number from the second number (i.e., 51 – 19). If a participant saw a problem with a “#”, they were to add the first number to the second number (i.e., 19 + 46). After subtracting or adding, the participant had to divide the answer by the last number (i.e., 32 ÷ 4 or 65 ÷ 5). If the dividend was a whole number (i.e., 8), the statement was true. If the dividend had a remainder (i.e., 8.3), the statement was false. Problems were defined as high difficulty because the problems were double-digit borrow operations (i.e., 51 = 19 (mod 4)) (Beilock et al., 2002).

In order to make the problems more difficult and to produce more variability in performance the participant was asked to provide the answer to the problem (i.e., the nearest whole number). For example, in the problem “51 = 19 (mod 4)” the participant would have to enter the number 8. If the problem was deemed false, the participant had to round the answer to the nearest whole number. For example, if the answer was 8.3, the participant would have to round down and enter 8, but if the answer was 8.6, the participant would have to round up and enter 9 for the problem to be correct.

Participants completed all MA problems on the computer. One MA problem would appear on the computer screen at a time and the participant would click “true” or “false”. On the next screen, using the keyboard, the participant would fill in the closest whole number for the answer to the MA problem. Participants were instructed to complete MA problems with the most accuracy as possible and in the least amount of time as possible. To begin, participants completed a set of 10 practice MA problems (Beilock & Carr, 2005). Once the participant finished the practice problems, the

researcher asked if they had any questions regarding the problems they had just completed. Depending on if the participant was randomly assigned to the experimental or control group, the researcher activated conscientiousness and neuroticism (experimental condition) or only activated conscientiousness (control condition) before beginning the test set of MA problems. During the test set of MA problems, participants completed 20 MA problems.

Experimental Manipulation

This study used an experimental design to compare how an achievement-oriented, anxiety-producing situation versus an achievement-oriented situation only may differentially affect performance. Having two different conditions that either activate or do not activate neuroticism ensured that there would be variability in trait activation across conditions, which gave the researcher an opportunity to compare how performance may change based on the trait combination being fully activated by the achievement-oriented, anxiety producing situation versus only conscientiousness being activated in the achievement-oriented situation only.

To activate conscientiousness in both conditions, individuals were put in a situation where they would be motivated to complete a math task and to complete the task to the best of their ability. In both conditions, the researcher explained that we were trying to learn how quickly students learn new math skills. Because the researcher was trying to observe how students learn these skills, the participants were asked to complete the math problems as quickly and accurately as possible. Since participants were receiving course credit to participate in the study, they should have been motivated to work hard, learn how to do the math problems, and do well on the math problems. This

task is also similar to a task that participants would complete in school, so the participants should want to meet the goal of the study: to learn the math task and complete the problems as quickly and accurately as possible to achieve a high score.

To activate neuroticism in the achievement-oriented, anxiety producing condition, a variety of stressors were added to the achievement-oriented situation. First, participants were told that the computer had been using a formula that takes into account reaction time and accuracy to compute a "MA score" for their practice MA problems. The participant was then told that if they can improve their MA score by 20% relative to the practice set, they would be entered into a drawing to win one of two $25 Target gift cards, but that being entered into the drawing was also going to be a "team effort."

Second, participants were told that they were randomly paired with "another participant" in the experiment who already improved their score by 20% on the test set of MA problems. Therefore, the participant needed to improve their own score by 20% in order for both the "other" participant and themselves to be entered to win one of the gift cards. Next, the researcher informed the participant that their performance was going to be videotaped during the test set of problems so that professors could evaluate their performance on this type of math task. A video camera was set up to include both the participant and the computer screen in the frame (Beilock et al., 2002). Once the video camera was set up, participants began the test set of MA problems.

Finally, while the participants were completing the test MA problems, three messages sporadically appeared. These messages were systematically built into the survey so that each participant in the achievement-oriented, anxiety-provoking condition saw the same messages after MA problem number 4, 13, and 17. Respectively, the

messages read: “So far, you are completing the problems too slowly for you to win the gift card. Try and speed up to make sure that you can be entered into the drawing”; “your score is not improving. Please make sure you are concentrating as much as possible on these simple problems”; and “that response just decreased your score by 3%. You must get the rest of the questions correct in order to increase your score by 20%.” These messages have been adapted from the Trier Social Stress Test protocol, which has been used in many psychological and neurobiological studies to induce moderate psychological stress (Kirschbaum, Pirke, & Hellhammer, 1993).

In both conditions, immediately following the test MA problems, the participant completed the manipulation check as well as the rest of the survey items (the general well-being scale, stress in general scale, perceived competence scale, PANAS mood scale, reaction measures, and math problem check). Once all of the survey items were completed, the researcher thoroughly debriefed the participant about the real purpose of the study, the fact that they were never really videotaped, and that each participant, no matter what their score, could choose to enter the gift card drawing.

Purpose of Experimental Manipulation

The purpose of activating both conscientiousness and neuroticism was to ensure that the researcher could examine the interactive effects of the two traits on performance compared to a situation in which only conscientiousness is activated. The additional anxiety-producing situational cues that were added to the achievement-oriented situation were likely to have activated conscientiousness and neuroticism because the two traits were relevant to the situation. Similar to the achievement-oriented situation, conscientiousness was activated because the participant should have felt obligated to

want to work hard, persevere, and achieve the goal of completing the math problems. The achievement-oriented, anxiety-provoking condition should have ensured that conscientiousness was activated because participants should want to work hard to try and receive the extrinsic reward and because others would be watching them achieve a goal on the video camera. Unlike the achievement-oriented situation, the achievement-oriented, anxiety-provoking situation also activated neuroticism because the participant should have become anxious and worried about failing to achieve the goal, especially because they may miss out on an extrinsic reward, someone else was relying on them, they were being videotaped, and messages were being displayed that they were failing. If the participant was in the achievement-oriented situation, conscientiousness should be activated because the participant should still be motivated to complete the task to the best of their ability, but neuroticism should not be activated any more during the test problems than they were during the practice problems.

The achievement-oriented, anxiety-provoking scenario should be relevant and strong enough to activate both conscientiousness and neuroticism because a variety of stressors including workload, time pressure, and emotional demands were introduced throughout the session. The participant should have felt pressured to increase the speed and accuracy of their work in order to increase their performance by 20%. The participant should have also felt emotional demands to do well because they knew that someone else, who had already succeeded, might not receive a reward if their own performance did not increase. The participant also did not have much control or autonomy over the task. Because of the nature of the math task, the participant was not able to use any other skills

besides mathematical and reasoning skills to succeed, which also could have been viewed as stressful.

Measures

- Conscientiousness. Conscientiousness was measured with 10 items from the 50-item version of the International Personality Item Pool (IPIP) Short (Goldberg, 1999). Participants were asked to respond to statements and describe themselves as honestly as possible on a 5-point Likert-type scale from 1 (*very inaccurate*) to 5 (*very accurate*). The alpha reliability was acceptable at .81. Sample items included “am always prepared”, “like order”, and “pay attention to details”.
- Neuroticism. Neuroticism was measured with 10 items from the 50-item version of the International Personality Item Pool (IPIP) Short (Goldberg, 1999). Participants were asked to respond to statements and describe themevels as honestly as possible on a 5-point Likert-type scale from 1 (*very accurate*) to 5 (*very accurate*). The alpha reliability was acceptable at .72. Sample items included “get stressed out easily”, “worry about things”, and “am easily disturbed”.
- Performance. The performance task was modeled after Beilock et al., (2002) and Beilock and Carr’s (2005) experimental designs. Participants were asked to evaluate modular arithmetic problems and indicate if each problem was true or false. Participants learned how to solve the modular arithmetic problems with the procedure described above. The number of correct true/false responses was summed to create a measure of task performance. Sample modular arithmetic problems included “45 = 27 (mod 4) (false)”, “19 # 46 (mod 5) (true)”, and “41 = 9 (mod 16) (true)”.

- Manipulation Check. Immediately after the participant had completed the test set of modular arithmetic problems, the participant was asked to assess how stressed they felt while completing the math problems. The level of perceived stress of the individual was used to determine whether the anxiety-provoking plus achievement condition was indeed perceived as more stressful than the achievement-only condition. While most manipulation checks occur before the dependent variable (Singleton & Straits, 2010), for this study, the manipulation check occurred after the dependent variable was measured because the manipulation and the measurement of the dependent variable coincide during the scenario. The participants responded to one item, "on a scale from 1 to 10, please indicate how stressed out you were you when solving the math problems", using a 10-point Likert-type scale ranging from 1 (*not stressed at all stressed*) to 10 (*extremely stressed*).
- Control Variables. The researcher assessed various demographic variables including age, sex, and race because they have been found to predict task performance (Witt, 2002). Because the task performance involved math problems, the researcher also controlled for perceived academic competence. Participants were asked to describe how competent they are, compared to their peers, in six academic areas (i.e., English, writing, math, science, history, and psychology) using a five-point Likert-type scale ranging from 1 (*not at all competent*) to 5 (*extremely competent*). This was used as a control because if participants perceive themselves as highly competent, neuroticism may not be activated during the math problems. If the participant is competent, they may be less worried and anxious about completing the math problems and get less stressed during the math problems. Finally, because Part 2 of the study was one-on-

one and participants were put under stress to perform well and had to answer questions regarding their stress levels, researcher gender was controlled for in order to control for potential social desirability effects.

RESULTS

Manipulation Check and Differences Between Groups

An independent samples t-test was conducted to compare stress levels of the achievement-oriented, anxiety-provoking and achievement-oriented group using the manipulation check item. There was a significant difference between the achievement-oriented, anxiety-provoking group (M = 5.90, SD = 2.45) and the achievement-oriented group (M = 5.10, SD = 2.37); $t(201) = 2.30$, p = .02. Further, Cohen's effect size value (d =.16) suggested a moderate practical significance. This means that participants in the achievement-oriented, anxiety-provoking group self-reported being statistically significantly more stressed out when completing the math problems than the achievement-oriented group. Independent t-tests were also used to compare differences between groups on age, sex, perceived academic competence, conscientiousness, neuroticism, and task performance. There were no significant differences between groups on any of the potential control variables or focal predictor variables, but there were significant differences on task performance between the achievement-oriented, anxiety-provoking (M = 16.88; SD = 2.69) and achievement-oriented group (M = 17.57; SD = 2.51); $t(203) = -1.91$, p = .05. Cohen's effect size value (d = -.27) suggested a moderate practical significance.

Descriptive Statistics and Correlations

Table 1 displays means, standard deviations, intercorrelations, and internal reliabilities. Correlations among study variables were consistent with the direction of the hypotheses. The researcher included age, sex, and perceived academic competence as control variables in the main analyses because they were each significantly correlated

with one or more focal study variables. Age correlated negatively with neuroticism and stress, sex correlated positively with neuroticism and stress and negatively with performance, and perceived academic competence correlated negatively with neuroticism. Therefore, all control variables were retained for the test of hypothesized relationships.

Test of Hypothesized Relationships

The researcher used hierarchical multiple regression to assess the incremental-explanatory power of variables in each step (Aiken & West, 1991) and to test for the moderating roles of neuroticism and experimental condition in the relationship between conscientiousness and performance (see Table 2). Following recommendations from Cohen, Cohen, West, and Aiken (2003), the independent variables were centered. In Step 1, the control variables were entered. In Step 2, the main study variables (conscientiousness, neuroticism, and condition) were entered. In Step 3, the two-way interaction terms created by multiplying conscientiousness with stress, neuroticism with stress, and conscientiousness and neuroticism were entered. In Step 4, the three-way interaction term between conscientiousness, neuroticism, and stress was entered. For Steps 3 and 4, the researcher examined the sign and significance of the slope of the relationship between conscientiousness and the focal-moderating variables. If the interaction was significant, the researcher plotted the slopes at one standard deviation above and below the mean for each continuous variable involved in the interaction (conscientiousness and neuroticism).

Main Effects

As can be seen in Table 2, the control variables, conscientiousness, neuroticism, and condition explained 9% of the overall variance in performance (R^2 = .09, *n.s.*). When considered with control variables, neither conscientiousness (*b* = -.35, *p* = .24) nor neuroticism (*b* = -.57, *p* = .08) were significantly related to task performance. Therefore, hypotheses 1a and 1b were not supported.

Two-Way Interactions

Table 2 shows the results for the hypothesized two-way interactions from the hierarchical regression analysis. By adding the three two-way interactions, the percent of variance explained in task performance increased to 14% (ΔR^2 = .04, *p* < .05). The conscientiousness x neuroticism interaction was negatively significantly related to task performance (*b* = -.87, *p* < .05). The conscientiousness x stress interaction was negatively significantly related to task performance (*b* = -1.25, *p* < .05). These significant interactions were plotted to aid in interpretation. The neuroticism x stress (*b* = .34, *p* = .56) interaction was not significant, thus not supporting hypothesis 3b.

The nature of the conscientiousness x neuroticism interaction and the conscientiousness x stress interaction were probed further following recommendations from Aiken and West (1991) and Dawson and Richter (2006). To aid in interpretation, the researcher plotted lines representing the relationship between conscientiousness and task performance at different levels of neuroticism (i.e., at one standard deviation above and below the mean) (cf. Cohen et al., 2003) in Figure 1. The form of the interaction is consistent with Hypothesis 2 indicating that the positive relationship between conscientiousness and task performance is weakened as the level of neuroticism increases. The slope of the line between low neuroticism and low conscientiousness

becomes negative when neuroticism and conscientiousness are both high (i.e., one standard deviation above the mean).

Additionally, simple effects tests (Aiken & West, 1991) were conducted to further test the nature and significance of the moderation effect (hypothesis 2). The effects test revealed non-significant relationships between conscientiousness and task performance at one standard deviation below the mean of neuroticism, $t(203) = .30$, $p > .05$. Also, the effects tests indicated a significant negative relationship between conscientiousness and task performance at one standard deviation above the mean level of neuroticism, $t(203) = -2.34$, $p < .05$. Finally, the slope of the line representing the relationship between conscientiousness and task performance when neuroticism was low was significantly different from the slope of the line representing the relationship between conscientiousness and task performance when neuroticism was high, $t(203) = -2.03$, $p < .05$.

The researcher also plotted lines representing the relationship between conscientiousness and task performance in the achievement-oriented, anxiety-provoking condition and the achievement-oriented condition (cf. Cohen et al., 2003) in Figure 2. The form of the interaction is consistent with Hypothesis 3a indicating that the positive relationship between conscientiousness and task performance is weaker for participants under high stress. The slope of the line for the high level of stress (i.e., the experimental condition) was actually negative compared to the positive slope of the line for the low level of stress (i.e., the control condition).

Additionally, simple effects tests (Aiken & West, 1991) were conducted to further test the nature and significance of the moderation effect (Hypothesis 3a). The effects test

revealed non-significant relationships between conscientiousness and task performance in low levels of stress (i.e., the control condition), $t(203) = .91$, $p > .05$. Also, the effects tests indicated a significant negative relationship between conscientiousness and task performance in high levels of stress (i.e., the experimental condition), $t(203) = -2.11$, $p < .05$. Finally, the slope of the line representing the relationship between conscientiousness and task performance in high levels of stress was significantly different from the slope of the line representing the relationship between conscientiousness and task performance in low levels of stress, $t(203) = -3.12$, $p < .05$.

Three-Way Interaction

In Table 2, it can be seen that the three-way interaction term, entered in step 4, did not significantly predict task performance ($b = -.45$, $p = .61$) and there was no additional variance explained in task performance ($\Delta R^2 = .00$, *ns*). Therefore, Hypothesis 4 was not supported. Although the significance level of the moderating effects of neuroticism and stress did not conform to standard statistical conventions, the researcher still plotted the three-way interaction for high stress (Figure 3) and low stress (Figure 4) at one standard deviation above and below the mean for both conscientiousness and neuroticism, which allowed the researcher to understand the nature of the relationship.

Despite the non-significance, the form of the interaction was consistent with the hypothesis indicating that the positive relationship between conscientiousness and task performance was lowest when neuroticism was high and there was a high level of stress. When neuroticism was low and stress was high, the slope of the line representing the relationship between conscientiousness and task performance was nearly flat (see Figure 3). Similarly, the relationship between conscientiousness and task performance was

highest when neuroticism was low and there was a low level of stress. When neuroticism was high and stress was low, the slope of the line representing the relationship between conscientiousness and task performance was nearly flat (see Figure 4).

Post-Hoc Analyses

Because the hypothesized three-way interaction was not significant, the researcher examined other potential variables that could be used as a proxy for how the traits were differentially activated by the situation. Specifically, the researcher examined the three-way interaction using the manipulation check as a rating of perceived stress. In Table 3, it can be seen that the three-way interaction term for conscientiousness, neuroticism, and perceived stress (as rated by each participant after they completed the math problems) significantly predicted task performance (b = -.39, p < .05). In total, this model accounted for 17% of the variance in task performance (R^2 = .17, p < .05). This suggests that the relationship between conscientiousness and task performance depends, in part, on the level of neuroticism and perceived stress of individuals. Following recommendations from Aiken and West (1991) the nature of the three-way interaction was probed further. To aid in interpretation, the researcher plotted lines representing the relationships between conscientiousness and task performance, when perceived stress was high, at different levels of neuroticism (i.e., at one standard deviation above and below the mean for both conscientiousness and neuroticism) (cf. Cohen et al., 2003) in Figure 5. The researcher also plotted lines representing the relationships between conscientiousness and task performance, when perceived stress was low, at (i.e., at one standard deviation above and below the mean for both conscientiousness and neuroticism) (cf. Cohen et al., 2003) in Figure 6.

Similar to the conscientiousness x neuroticism x condition interaction, when examining the figures, the form of the interaction is consistent with the hypothesis indicating that the positive relationship between conscientiousness and task performance was lowest when neuroticism was high and there was a high level of perceived stress. When neuroticism was low and perceived stress was high, the slope of the line representing the relationship between conscientiousness and task performance was slightly positive (see Figure 7). The relationship between conscientiousness and task performance was highest when neuroticism was low and there was a low level of perceived stress (see Figure 8).

Additionally, simple effects tests (Aiken & West, 1991) were conducted to further test the nature and significance of the three-way interaction (hypothesis 4). The effects test revealed non-significant relationships between conscientiousness and task performance when neuroticism was low and perceived stress was high, $t(203) = 1.46$, $p = .14$. The effects test also indicated that the slope of the line was not significant when perceived stress was low and neuroticism was high, $t(203) = -1.17$, $p = .24$. The slope of the line when perceived stress was low and neuroticism was low was also not significant, $t(203) = .96$, $p = .34$. The effects test showed a significant difference in the slope for the line when there was high perceived stress and when neuroticism was high, $t(203) = 9.68$, $p < .01$.

DISCUSSION

This study adds to the understanding of the interactive effects of conscientiousness and neuroticism, in the context of an achievement-oriented, anxiety-provoking situation, on task performance. Adding to the recent personality trait interaction research, this study allows researchers to better understand how conscientiousness, the most common predictor of job performance, interacts with neuroticism, a trait that could commonly be activated by stressful cues in the workplace. While conscientiousness is often viewed as a desirable trait for a wide variety of jobs, this study exposes an intrapersonal tension that may be detrimental to performance (i.e., when people are high on neuroticism in combination with high conscientiousness), especially when both traits are activated by task-relevant cues. This study added to the growing body of literature that considers how the interaction between personality traits may incrementally explain task performance. It is a first step in advancing personality research and better understanding how the Big 5 traits may be related to organizational behavior.

This study was also unique because it used an experimental design to better understand how traits may be activated in certain situations. It also sheds light on how the trait activation between conscientiousness and neuroticism may differentially affect how personality traits interact to produce different levels of task performance. That is, if conscientiousness and neuroticism are both activated by task-relevant cues, an individually is likely to perform differently than if both of those traits were not activated or if only one trait was activated. These findings are important because it is the first study to consider how trait interactions may also be affected by situational cues. While there has been recent research on trait interactions and recent research on trait activation, this is

the first study that connects these two lines of important personality research. Because there were differences in performance based on both interactions and activation, this study should encourage future researchers to continue looking at the trait x trait x situation interaction.

While the original three-way interaction hypothesis between conscientiousness, neuroticism, and condition (i.e., achievement-oriented, anxiety-provoking or achievement-oriented) was not statistically supported, when plotted, it was in the hypothesized direction. After post-hoc analyses, the three-way interaction between conscientiousness, neuroticism, and perceived stress levels was found to be statistically significant. That is, when an individual was highly conscientious, highly neurotic, and perceived high stress, the individual's task performance was lower compared to individuals who were not highly conscientious or highly neurotic in the same stressful situation. This study showed that the situation really does matter because any combination of the two traits had higher levels of task performance when the individual perceived lower stress compared to when individuals perceived high stress. Consistent with previous research, individuals who were low on neuroticism performed better than individuals who were highly neurotic, both when conscientiousness was high and low and in an achievement-oriented, anxiety-provoking situation. This is important to note because when organizations are hiring individuals solely because they are highly conscientious, they should also be considering the individual's level of neuroticism as well as the stressfulness of the job.

Implications for Trait Interaction Research

This study adds to the research and theory surrounding trait interactions. Building upon the single-trait research that has been popular since the 1990s, trait interaction research considers a more holistic view of personality traits. Many of the trait interaction studies completed to date have examined how the positive main effect between conscientiousness and performance may be enhanced, in certain situations (Blickle et al., 2012; Witt, 2002; Witt et al., 2002). For example, Witt (2002) found that the interaction between extraversion and conscientiousness enhanced job interview performance and supervisor ratings of job performance. Similarly, Witt and colleagues (2002) found that the relationship between conscientiousness and job performance was stronger for individuals high in agreeableness versus low in agreeableness in five out of seven different samples. In a sample of professional employees, Blickle et al. (2012) found support for a three-way interaction such that the positive conscientiousness-performance relationship was stronger when individuals were also high on openness and political skill. All of this research continues to support the single-trait research that has consistently found conscientiousness to be an excellent predictor of high task performance regardless of the other trait or situation under study.

Unlike the other trait interaction studies that have supported single-trait findings that the positive conscientiousness-performance relationship can be enhanced by other traits, this study took a different approach and examined how the intrapersonal tension created by being highly conscientious and highly neurotic may be detrimental to task performance. Previous studies have found that being highly conscientious and highly neurotic may contribute to more counterproductive work behaviors (Jensen & Patel,

2011; Penney et al., 2011), but have not examined how the conscientiousness-performance relationship may be affected by neuroticism. In this study, the results show that the positive conscientiousness-performance relationship is weakened by high neuroticism. This may be because the individual will put resources towards reducing anxiety and negative thoughts that they may be having about the task (Penney et al., 2011). This finding supports the idea of trait interactions and suggests that there may be more complex relationships, like the relationships between multiple traits, we should be considering besides the typical bivariate personality-performance research we see when making employee selection decisions.

When we think about the conscientiousness-performance relationship, we must consider how neuroticism may affect that relationship. Confirming Jensen and Patel's (2011) assertion, this study suggests that conscientiousness was more strongly related to performance among individuals who were also low on neuroticism, which may better explain some weak relationships in previous empirical studies and meta-analyses. While some researchers have questioned the utility of the five-factor model, this trait interaction research could better explain some of the mixed results for each trait or low effect sizes for each trait when related to performance. For example, Barrick and colleagues (2001) suggested that the main effects of the five-factor model were likely affected by moderating variables due to the relatively low effect sizes. This research begins to examine some of these moderating variables and suggests that the validity of each trait may depend on where the individual falls on the continuum for other personality traits. Therefore, by better understanding how conscientious individuals may behave, depending

on how neurotic they are, we are advancing trait interaction research and building a more accurate framework for predicting task performance.

Implications for Trait Activation Research

Using an experimental design, the findings from this study support trait activation theory because without the added anxiety, individuals were able to perform well on the task. The achievement-oriented condition, without the added anxiety, seemed to have only activated conscientiousness. Given that the math task was a situation requiring hard work, concentration, and motivation to achieve a goal and do well on a new task, simply being involved in the math task activated conscientiousness. However, in the achievement-oriented, anxiety-provoking situation when conscientiousness was activated by the math task and the added stressors activated neuroticism, there were significant decreases in task performance. Again, building off of Barrick et al.'s (2001) conclusion that there are likely moderating variables that may explain low effect sizes among main effect relationships, this study considered the situation as a potential moderator and found that the situation does affect how conscientious individuals behave. That is, by considering the situation, this study was able to account for more variability in the personality-performance relationship.

This study considered task-relevant cues that would activate conscientiousness and neuroticism because the manipulation altered the pressure that was added to the task. Not only did we get a better understanding of the personality-performance relationship by considering the situation, but we also were able to better understand how each trait, as well as the combination of traits, changed in light of task demands. More specifically, this study found that conscientiousness was positively related to task performance in an

achievement-oriented situation only, but actually became negatively related to task performance when stress and pressure was added to the situation. This pattern of results became even stronger when examining the interaction between conscientiousness and neuroticism.

This study was unique because it was able to use experimental conditions to evaluate and compare how the task-relevant cues affected the activation of these traits differently. Because there were clear and statistically significant differences in performance between groups, this study provides evidence for and bolsters support for trait activation theory, which allows us to better understand performance. Trait activation theory posits that the effect of traits can "only be expected in situations providing appropriate cues for the trait in question" (Bipp & Kleinbeck, 2011, p. 454). This study provides evidence for this claim because when placed in the achievement-oriented, anxiety-provoking situation, individuals behaved and performed differently than in just the achievement-oriented situation. The researcher expects that the task-relevant stressful cues, which were added to the achievement-oriented situation, activated neuroticism. Based on these situational demands, a different pattern of behaviors was produced because both conscientiousness and neuroticism were activated in the achievement-oriented, anxiety-provoking situation, but only conscientiousness was activated in the achievement-oriented condition.

Similarly, this study provided support for person-situation interaction theory. According to person-situation interaction theory, individual behavior is a function of both personality and the situation (Shaffer & Postlehwaite, 2012). This study was able to use an experimental design to support this idea because individuals' performance differed

based on the situation. When placed in an achievement-oriented, anxiety-provoking situation, individuals underperformed when they were high on both conscientiousness and neuroticism, but when individuals were in just the achievement-oriented situation, the interaction between these traits did not hurt performance. This finding supports person-situation interaction theory and trait activation theory because personality was not a consistent predictor of behavior (e.g., task performance) across situations. By taking the situation into account and manipulating task-relevant cues, we are able to explain incremental variance in performance, which helps us create a more accurate framework for predicting performance, and gives us more optimism for using personality tests in the workplace. Research needs to continue to examine the context and consider how behavioral tendencies may differ based on the situation that the individual is exposed to.

Implications for Practice

Although there has been a lot of empirical evidence suggesting that conscientiousness is the single trait that most consistently predicts job performance (Barrick et al., 2002), the present study suggests that selection criteria should consider a broader range of traits as well as the context or situation that the individual may encounter most often. High levels of neuroticism appear to detrimentally affect the task performance levels of highly conscientious individuals when they are in achievement-oriented, anxiety-provoking situations. However, these same detrimental results did not exist when the individual was not placed in that stressful situation. Therefore, if neuroticism is not assessed, individuals high on conscientiousness and high on neuroticism may be selected and these individuals may not perform well in specific situations. When organizations are designing selection systems, they should not only

consider a single trait, but multiple traits and how these traits may interact to affect the performance level of an employee in certain situations. This will create a more holistic view of the individual and how they may respond to various situations. By considering both the context of the job as well as multiple traits, employees who make hiring decisions may select better quality candidates who will meet the goals of the position and thrive in the context of the position. Without considering these other factors and only considering conscientiousness, hiring managers may actually be restraining organizational effectiveness and individual task performance when hiring those who may be exposed to stressful situations and those high on neuroticism.

As organizations become more competitive, have more deadlines to meet, and become leaner, employees are likely to feel more pressure and stress to work quickly and efficiently. These pressures, which are similar to the pressures that were experienced in the experimental condition, should elicit certain behaviors from individuals with certain combinations of personality traits. As organizations try to give employees more autonomy and flexibility in reaching the results that they need to achieve, while still having the internal and external pressure to do well, it may become increasingly important to understand how the interaction of personality traits may affect employee behavior.

Limitations and Future Research Directions

Future research that involves replications of the results are needed. Because this study was an experimental design with a student sample, these results need to be replicated in a variety of working samples and in a variety of work situations. The scenario had high experimental realism, or ecological validity, because the scenario had a

direct impact on the participants, the participants got involved in the scenario, and the participants took the scenario seriously. The various ways that stress was added ensured that the manipulation was having an impact on the participant (Singleton & Straits, 2010). However, the experiment had low mundane realism because the participant was not likely to complete MA problems in everyday life. While it is important that the experiment had high experimental realism, by using working samples to test the same interaction, the results of this study can become more generalizable to many different organizations, industries, and jobs and further help delineate the boundary conditions of the combined effects of conscientiousness and neuroticism on performance.

These results also need to be replicated in a variety of work situations with a variety of pressures and stressors. This way, we can better understand how stressful the situation may need to be for the interaction to actually become detrimental to task performance. Not only does the study need to be replicated with different samples and work environments, but it should also be replicated with different measures of task performance. This study used a very specific measure of task performance based on how many math problems each participant got correct. Many employees do not get evaluated simply on how many things they do right or wrong; there are many other factors that play into performance ratings. Therefore, these results should be replicated with both supervisor ratings of task performance and potentially organizational citizenship behaviors (OCBs). According to conservation of resource theory, if individuals are putting resources towards reducing anxiety and this is hurting their task performance, individuals who are highly conscientiousness and neurotic should also have lower levels of OCBs (Penney et al., 2011b). By replicating these results in different samples, work

environments, and with different measures of task performance, these results will become more generalizable and the results will increase the utility of personality tests for selection.

Even though we controlled for perceived academic competence in this study, we did not have a measure of general mental ability (GMA). Since GMA has been shown to be a very strong predictor of task performance, the effect of GMA on task performance cannot be completely ruled out as a potential influence on the results. GMA may have also influenced the conscientiousness by neuroticism interaction such that those who have higher GMA may not experience as much of an intrapersonal tension and may not get as anxious about tasks that they need to complete. That is, because an individual has high cognitive ability, the amplification of stress may not exist because the individual may be confident that they are capable of completing the task well. Future research should include a measure of GMA, if possible, in order to rule out this potential confound, especially if task performance will be measured with a math or logic task.

Finally, many theories that explain the personality-performance relationship use motivation as a mediating mechanism (Barrick & Mount, 2005; Hogan, 1996; Kanfer & Ackerman, 2000). More specifically, conscientious individuals should be motivated to meet work goals because they are hardworking and detail-oriented, while neurotic individuals should be motivated to meet work goals because of fear of failure. Future research could benefit from understanding if an individual's motivation to complete certain goals is aligned with the job requirement or requirements needed to complete a task. If personality traits drive motivation and the individual goals are not aligned with performance goals, then the individual's personality traits may not contribute to high task

performance. Therefore, future research should consider both individual and organizational goal congruency to better understand if personality traits should actually be enhancing performance.

Although common method variance is usually an important limitation to consider, this study followed methodological recommendations from Podsakoff et al. (2003) to reduce this concern. The predictor and outcome variables were collected at two different times, which means that it is less likely that the results can be explained because of items on a common instrument. This lag in collecting the outcome variable may actually make the results more persuasive because the temporal separation ensured that the individual was not thinking about how their personality may play a role in their performance on the task. Not only were the independent personality variables temporally separated from the moderator (stress) and the outcome variable, but also the outcome variable (performance) was not self-reported, which means that not all measures were from a common method. Plus, because of the experimental design the results of this study support stronger causal inferences than if the study was cross-sectional survey research.

To continue to advance personality research and to build stronger theory, researchers need to continue to advance trait interaction research. First, research needs to continue to examine boundary conditions. By considering the context and the situation, researchers can begin to understand when the personality trait interactions may be activated and affect performance in differential ways. Also, current research has only recently begun to explore three-way personality trait interactions (e.g., Blickle et al., 2012), while a majority of trait interaction research has only examined two-way interactions. As results are replicated and researchers continue to develop and expand

trait interaction research, three, four, and even all five big-5 traits could be considered simultaneously. For example, the detrimental effects of being highly conscientiousness and highly neurotic may be buffered by high agreeableness in a service context. The more we can understand how traits interact to influence behavior, the better we can design selection systems to select individuals that may thrive in certain environments based on the combination of their personality traits.

Researchers should also consider how different personality trait combinations might affect other outcomes besides task performance. For example, researchers should consider various employee attitudes including mood, burnout, intention to quit, commitment, and counterproductive work behaviors. If employees' personality combinations do not fit well with the job requirements, individuals may experience more negative moods and be more likely to quit or be less committed to the organization. This research would advance both trait interaction research as well as person-organization fit research.

Finally, researchers should consider future research directions with the conscientiousness-neuroticism interaction. To better understand how these individuals may react in stressful situations, researchers could bring participants in for future lab studies that collect various samples that could allow researchers to test cortisol levels. By connecting personality interactions to potential health outcomes, we could begin to better understand how different personality trait interactions may affect the health of employees over time. That is, if individuals who are highly conscientiousness and highly neurotic are prone to higher stress levels, this may be detrimental to not only their performance, but their health over time, especially if these individuals are constantly exposed to

stressful work environments. If this is the case, researchers could begin to explore potential interventions to reduce these stress levels based on individualized personality combinations.

Conclusion

This study advances both trait interaction and trait activation research. By using an experimental design, the researcher was able to provide novel insight and predict task performance on the basis of sound theoretical foundations of personality trait activation, the context, and the Big 5 personality traits. As hypothesized, the interaction between conscientiousness and neuroticism negatively affected task performance when individuals were put under pressure and were both highly conscientiousness and highly neurotic. This research builds on recommendations for future research by examining a situational moderator, combinations of traits, and by using something other than a cross-sectional design (Penney et al., 2011a). While future research is required before results can be generalized, these results add to the utility of personality in predicting workplace behavior and performance.

REFERENCES

Andreassen, C. S., Hetland, J., & Pallesen, S. (2010). The relationship between 'workaholism', basic needs satisfaction at work and personality. *European Journal of Personality*, *24*, 3-17.

Arthur, W., Woehr, D. J., & Graziano, W. G. (2001). Personality testing in employment settings: Problems and issues in the application of typical selection practices. *Personnel Review*, *30*, 657-676.

Bakker, A. B., Van Der Zee, K. I., Lewig, K. A., & Dollard, M. F. (2006). The Relationship between the big five personality factors and burnout: a study among volunteer counselors. *The Journal of Social Psychology*, *146*, 31-50.

Barrick, M. R., Mitchell, T. R., & Stewart, G. L. (2003). Situational and motivational Influences on trait-behavior relationships. *Personality and Work*, 60-82.

Barrick, M. A., & Mount, M. K. (1991). The big five personality dimensions and job performance: A meta-analysis. *Personnel Psychology*, *44*, 1-26.

Barrick, M. R., & Mount, M. K. (2005). Yes, personality matters: Moving on to more important matters. *Human Performance*, *18*, 359−372.

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? *Personality and Performance*, *9*, 9-29.

Barrick, M. R., Mount, M. K., & Strauss, J. P. (1993). Conscientiousness and performance of sales representatives: Test of the mediating effects of goal setting. *Journal of Applied Psychology*, *78*, 715.

Bartley, C. E., & Roesch, S. C. (2011). Coping with daily stress: The role of conscientiousness. *Personality and individual differences*, *50*(1), 79-83.

Beilock, S. L., & Carr, T. H. (2005). When high-powered people fail: Working memory and "choking under pressure" in math. *Psychological Science*, *16*, 101-105.

Beilock, S. L., Kulp, C. A., Holt, L. E., & Carr, T. H. (2004). More on fragility of performance: Choking under pressure in mathematical problem solving. *Journal of Experimental Psychology*, *133*, 584-600.

Bipp, T., & Kleinbeck, U. (2011). The effect of neuroticism in the process of goal pursuit. *Personality and Individual Differences*, *51*, 454-459.

Blickle, G., Meurs, J. A., Zettler, I., Solga, J., Noethen, D., Kramer, J., & Ferris, G. R.

(2008). Personality, political skill, and job performance. *Journal of Vocational Behavior*, *72*, 377-387.

Bruck, C. S., & Allen, T. D. (2003). The relationship between big five personality traits, negative affectivity, type a behavior, and work-family conflict. *Journal of Vocational Behavior, 63*, 457-472.

Cavanaugh, M. A., Boswell, W. R., Roehling, M. V., & Boudreau, J. W. (2000). An empirical examination of self-reported work stress among US managers. *Journal of Applied Psychology*, *85*(1), 65.

Christiansen, N. D., & Tett, R. P. (2008). Toward a better understanding of the role of situations in linking personality, work behavior, and job performance. *Industrial and Organizational Psychology, 1*, 312-216.

Colbert, A. E., Mount, M. K., Harter, J. K., Witt, L. A., & Barrick, M. R. (2004). Interactive effects of personality and perceptions of the work situation on workplace deviance . *Journal of Applied Psychology, 89*, 599-609.

Costa, P. T. (1996). Work and personality: Use of NEO-PI-R in industrial/organizational psychology. *Applied Psychology: An International Review, 45*, 225-241.

Costa, P. T., & McCrae, R. R. (1995). Domains and facets: Hierarchical personality assessment using the revised NEO personality inventory. *Journal of Personality Assessment*, *64*, 21-50.

Cox, T., Thirlaway, M., Gotts, G., & Cox, S. (1983). The nature and assessment of general well being. *Journal of Psychosomatic Research, 27*, 353-359.

Dunlop, P. D., & Lee, K. (2004). Workplace deviance, organizational citizenship behavior, and business unit performance: The bad apples do spoil the whole barrel. *Journal of Organizational Behavior*, *25*, 67–80.

Dunn, W. S., Mount, M. K., Barrick, M. R., & Ones, D. S. (1995). Relative importance of personality and general mental ability in managers' judgments of applicant qualifications. *Journal of Applied Psychology*, *80*, 500-510.

Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44*, 513–524.

Hogan, R. (1996). A socioanalytic perspective on the Five-Factor Model. In J. S. Wiggens (Ed.), The Five Factor Model of personality (pp. 163−179). New York: Guilford Press.

Gellatly, I. R. (1996). Conscientiousness and task performance: Test of cognitive process model. *Journal of Applied Psychology*, *81*(5), 474.

George, J. M., & Zhou, J. (2001). When openness to experience and conscientiousness are related to creative behavior: An interactional approach. *Journal of Applied Psychology*, *86*, 513-524.

Goldberg, L. R. (1990). An alternative" description of personality": the big-five factor structure. *Journal of personality and social psychology*, *59*, 1216-1229.

Kanfer, R., & Ackerman, P. L. (2000). Individual differences in work motivation: Further explorations of a trait framework. *Applied Psychology: An International Review*, *49*, 470−482.

Hewitt, P. L., & Flett, G. L. (1991). Perfectionism in the self and social contexts: Conceptualization, assessment, and association with psychopathology. *Journal of Personality and Social Psychology*, *60*, 456-470.

Hewitt, P. L., & Flett, G. L. (1991). Dimensions of perfectionism in unipolar depression. *Journal of Abnormal Psychology*, *100*, 98-101.

Hogan, R., Hogan, J., & Roberts, B. W. (1996). Personality measurement and employment decisions. *American Psychologist*, *51*, 469-477.

Hurtz, G. M., & Donovan, J. J. (2000). Personality and job performance: The big five revisited. *Journal of Applied Psychology*, *85*, 869-879.

Jensen, J. M., & Patel, P. C. (2011). Predicting counterproductive work behavior from the interaction of personality traits. *Personality and Individual Differences*, *51*, 466-471.

Judge, T. A., & Erez, A. (2007). Interaction and intersection: The constellation of emotional stability and extraversion in predicting performance. *Personnel Psychology*, *60*, 573-596.

Judge, T. A., Higgins, C. A., Thoresen, C. J., & Barrick, M. R. (1999). The big five personality traits, general mental ability, and career success across the life span. *Personnel Psychology*, *52*, 621-652.

King, E. B., George, J. M., & Hebl, M. R. (2005). Linking personality to helping behaviors at work: An interactional perspective. *Journal of Personality*, *72*, 585−607.

Kirschbaum, C., Pirke, K. M., & Hellhammer, D. H. (1993). The 'Trier Social Stress Test'–a tool for investigating psychobiological stress responses in a laboratory setting. *Neuropsychobiology*, *28*, 76-81.

Lord, R. G., & Harvey, J. L. (2002). An information processing framework for emotional regulation. In R. G. Lord, R. J. Klimoski, & R. Kanfer (Eds.), *Emotions in the*

workplace: Understanding the structure and role of emotions in organizational behavior (pp. 115–146). San Francisco: Jossey-Bass.

Merz, E. L., & Roesch, S. C. (2011). A latent profile analysis of the five factor model of personality: Modeling trait interactions. *Personality and Individual Differences, 51*, 915-919.

Miller, R. L., Griffin, M. A., & Hart, P. M. (1999). Personality and organizational health: The role of conscientiousness. *Work & Stress, 13*, 7-19.

Mischel, W. (1973). Toward a cognitive social learning reconceptualization of personality. *Psychological review*, *80*, 252.

Mount, M. K., & Barrick, M. A. (1998). Five reasons why the "big five" article has been frequently cited. *Personnel Psychology, 51*, 849-857.

Morgeson, F. P., Campion, M. A., Dipboye, R. L., Hollenbeck, J. R., Murphy, K., & Schmitt, N. (2007). Reconsidering the use of personality tests in personnel selection contexts. *Personnel Psychology*, *60*(3), 683-729.

Penney, L. M., David, E., & Witt, L. A. (2011a). A review of personality and performance: Identifying boundaries, contingencies, and future research directions. *Human Resource Management Review*, *21*, 297-310.

Penney, L. M., Hunter, E. M., & Perry, S. J. (2011b). Personality and counterproductive work behaviour: Using conservation of resources theory to narrow the profile of deviant employees. *Journal of Occupational and Organizational Psychology*, *84*, 58-77.

Pervin, L. A. (1985). Personality: Current controversies, issues, and directions. *Annual review of psychology*, *36*, 83-114.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*, 879–903.

Rafferty, A. E., & Griffin, M. A. (2006). Perceptions of organizational change: A stress and coping perspective. *Journal of Applied Psychology*, *91*, 1154-1162.

Schmitt, M., Eid, M., & Maes, J. (2003). Synergistic person x situation interaction in distributive justice behavior. *Personality and Social Psychology Bulletin*, *29*, 141-147.

Shaffer, J. A., & Postlethwaite, B. E. (2012). A matter of context: A meta-analytic Investigation of the relative validity of contextualized and noncontextualized personality measures. *Personnel Psychology, 65*, 445-494.

Singleton Jr, R. A., Straits, B. C., & Straits, M. M. (1993). *Approaches to social research.* Oxford University Press.

Stanton, J. M., Balzer, W. K., Smith, P. C., Perra, L. F., & Ironson, G. (2001). A general measure of work stress: The Stress in General Scale. *Educational and Psychological Measurement, 61*, 866–888.

Tett, R. P., & Burnett, D. D. (2003). A personality trait-based interactionist model of job performance. *Journal of Applied Psychology*, *88*, 500-517.

Tonidandel, S., Quiñones, M.A., & Adams, A.A. (2002). Computer-adaptive testing: the impact of test characteristics on perceived performance and test takers' reactions. *Journal of Applied Psychology*, *87*(2), 320-332.

Vollrath, M. (2001). Personality and stress. *Scandinavian Journal of Psychology*, *42*(4), 335-347.

Witt, L. A., Burke, L. A., Barrick, M. R., & Mount, M. K. (2002). The interactive effects of conscientiousness and agreeableness on job performance. *Journal of Applied Psychology*, *87*, 164-169.

Witt, L. A. (2002). The interactive effects of extraversion and conscientiousness on performance. *Journal of Management*, *28*, 835-851.

TABLE 1: Means, standard deviations, and zero-order correlations

Variables	*M*	*SD*	1	2	3	4	5	6	7	8
1. Age	20.73	3.83	N/A							
2. Sex	1.66	0.48	-0.1	N/A						
3. Perceived Academic Competence	3.81	0.53	0.06	-0.03	-0.59					
4. Conscientiousness	3.67	0.62	0.08	-0.01	0.11	-0.81				
5. Neuroticism	2.87	0.62	-.27**	.30**	-.15*	-.23*	-0.72			
6. Condition	0.49	0.5	-0.08	0.04	0.01	-0.01	0.07	N/A		
7. Manipulation check (perceived stress)	5.49	2.44	-.14*	.39**	0.01	-0.07	.19**	.16*	N/A	
8. Performance	17.23	2.61	0.09	-.23**	0.03	-0.04	-.21**	-0.13	-.29**	N/A

Note. N = 205. Alpha reliabilites are reported on the diagonal. *p < .05; **p < .01. For condition, 1 = achievement-oriented, anxiety-provoking situation and 0 = achievement-oriented situation.

TABLE 2: Hierarchical multiple regression of conscientiousness, neuroticism and condition (achievement-oriented, anxiety-provoking or achievement-oriented) as related to task performance

Model		*b*	S.E.	R^2	ΔR^2
Step 1				.06**	.06
	(Intercept)	17.65**	1.77		
	Age	.05	.05		
	Sex	-1.26**	.38		
	Perceived academic competence	.17	.35		
Step 2				.09	.03
	(Intercept)	18.20**	1.79		
	Age	.03	.05		
	Sex	-1.02**	.40		
	Perceived academic competence	.12	.35		
	Conscientiousness (centered)	-.35	.30		
	Neuroticism (centered)	-.57	.33		
	Condition	-.55	.36		
Step 3				.14*	.04
	(Intercept)	18.74**	1.77		
	Age	.02	.05		
	Sex	-1.11**	.39		
	Perceived academic competence	.04	.34		
	Conscientiousness (centered)	-.67	.41		
	Neuroticism (centered)	-.17	.45		
	Condition	-.53	.35		
	Conscientiousness x neuroticism (centered)	-.87*	.44		
	Neuroticism x condition (centered)	.34	.59		
	Conscientiousness x condition (centered)	-1.25*	.59		
Step 4				.14	.00
	(Intercept)	18.77**	1.77		
	Age	.02	.05		
	Sex	-1.10**	.39		
	Perceived academic competence	.03	.35		
	Conscientiousness (centered)	.18	.41		
	Neuroticism (centered)	-.69	.45		
	Condition	-.57	.36		
	Conscientiousness x neuroticism (centered)	-.66	.60		
	Neuroticism x condition (centered)	.36	.60		
	Conscientiousness x condition (centered)	-1.28*	.59		
	Conscientiousness x neuroticism x condition (centered)	-.45	.89		

Note. $N = 205$. *b* = unstandardized beta weight. *$p < .05$, **$p < .01$. For condition, 1 = achievement-oriented, anxiety-provoking situation and 0 = achievement-oriented situation.

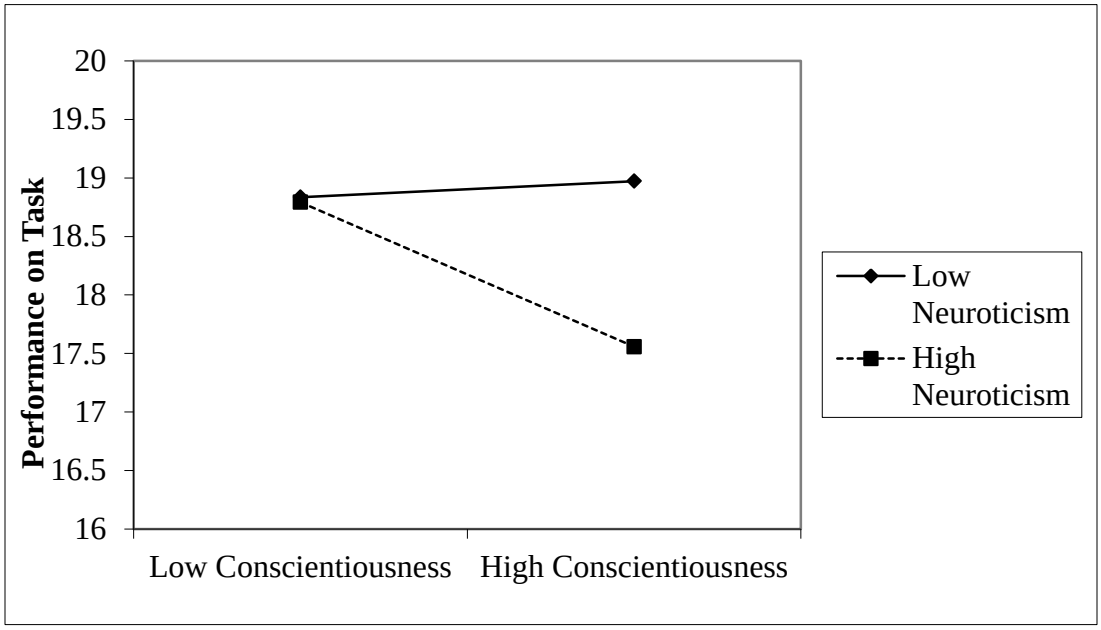

FIGURE 1: Graphed moderating effect of conscientiousness and neuroticism on task performance. Continuous predictor variables (conscientiousness and neuroticism) were centered prior to analyses.

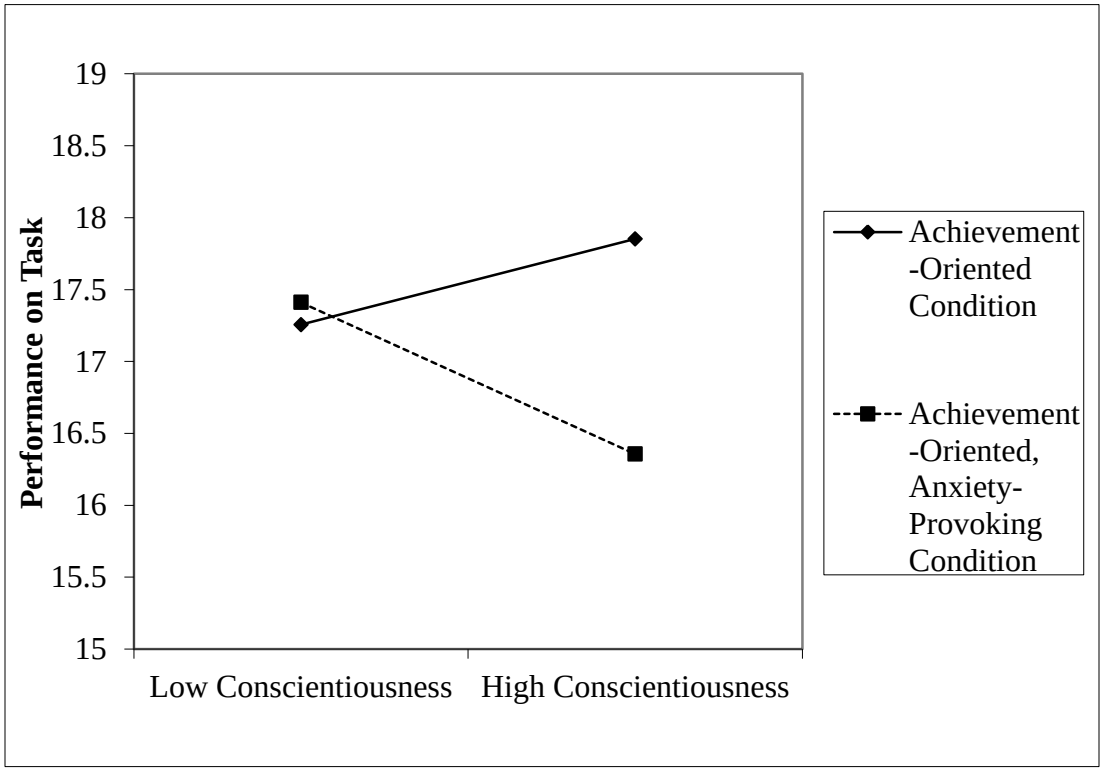

FIGURE 2: Graphed moderating effect of conscientiousness and condition (i.e., achievement-oriented, anxiety-provoking or achievement-oriented) on task performance. Conscientiousness was centered prior to analyses and is depicted at one standard deviation above and below the centered mean.

APPENDIX B: POST-HOC TABLES AND FIGURES

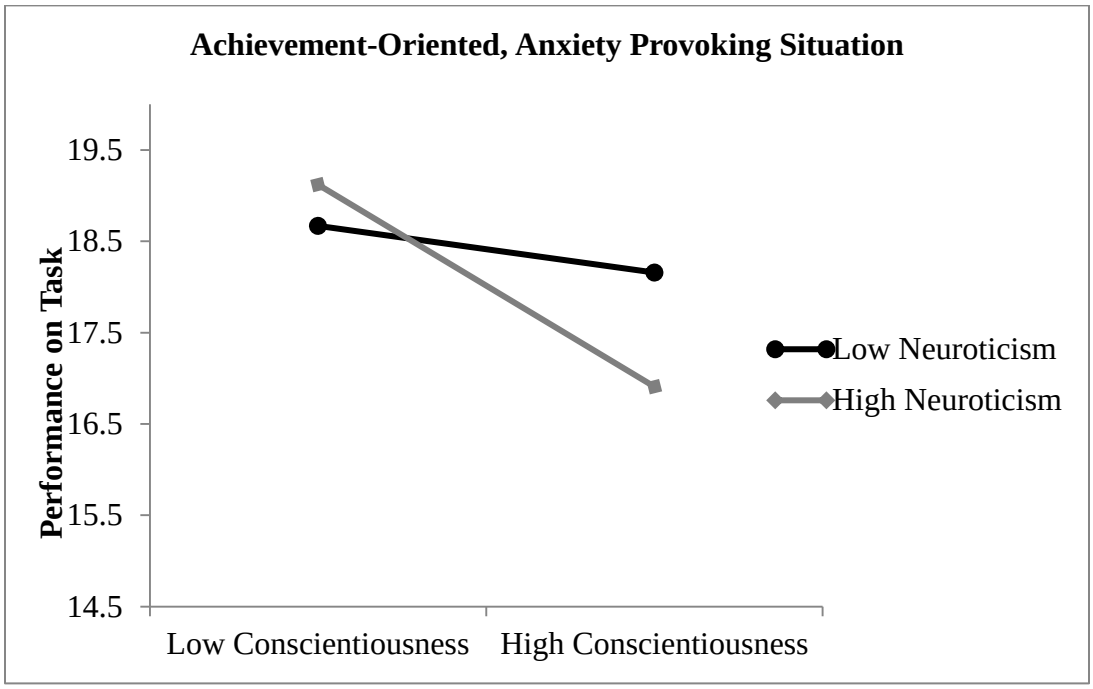

FIGURE 3: Graphed moderating effect of conscientiousness, neuroticism, and the achievement-oriented, anxiety-provoking situation on task performance (conscientiousness and neuroticism depicted). All continuous predictor variables (conscientiousness and neuroticism) were centered prior to analyses.

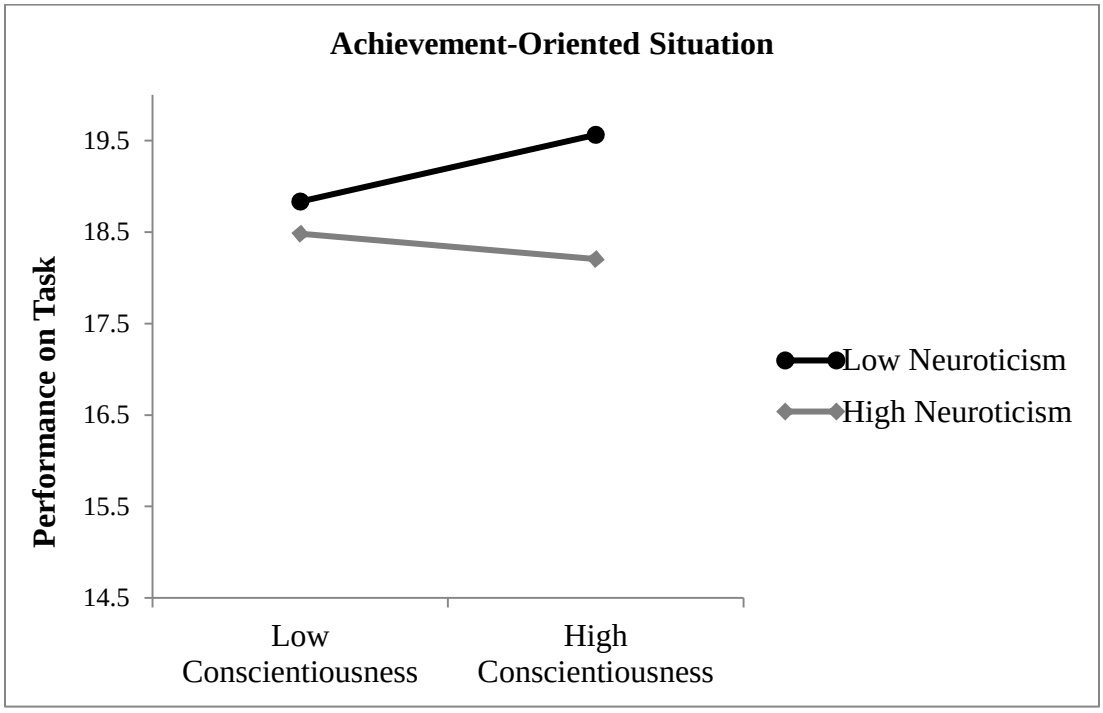

FIGURE 4: Graphed moderating effect of conscientiousness, neuroticism, and an achievement-oriented situation on task performance (conscientiousness activated depicted). All continuous predictor variables (conscientiousness and neuroticism) were centered prior to analyses.

TABLE 3: Hierarchical multiple regression of conscientiousness, neuroticism and perceived stress manipulation check item as related to task performance (controlling for condition)

Model		*b*	S.E.	R^2	ΔR^2
Step 1				.06*	.06
	(Intercept)	18.27**	1.72		
	Age	.04	.05		
	Sex	-1.12**	.37		
	Perceived academic competence	.06	.33		
	Condition	-.49	.35		
Step 2				.12**	.06
	(Intercept)	17.80**	1.73		
	Age	.01	.05		
	Sex	-.47	.41		
	Perceived academic competence	.05	.32		
	Condition	-.32	.35		
	Conscientiousness (centered)	-.38	.28		
	Neuroticism (centered)	-.62*	.31		
	Perceived Stress	-.22**	.08		
Step 3				.15	.03
	(Intercept)	18.01**	1.73		
	Age	.01	.05		
	Sex	-.45	.40		
	Perceived academic competence	-.03	.33		
	Condition	-.28	.34		
	Conscientiousness (centered)	-.46	.28		
	Neuroticism (centered)	-.58	.31		
	Perceived Stress	-.23**	.08		
	Conscientiousness x neuroticism (centered)	-.92*	.42		
	Neuroticism x perceived stress (centered)	-.04	.12		
	Conscientiousness x perceived stress (centered)	.03	.12		
Step 4				.17	.02*
	(Intercept)	17.89**	1.71		
	Age	.02	.05		
	Sex	-.46	.40		
	Perceived academic competence	-.04	.32		
	Condition	-.26	.34		
	Conscientiousness (centered)	-.45	.28		
	Neuroticism (centered)	-.55	.30		
	Perceived Stress	-.57	.08		
	Conscientiousness x neuroticism (centered)	-.90*	.42		
	Neuroticism x perceived stress (centered)	-.02	.12		
	Conscientiousness x perceived stress (centered)	.05	.12		
	Conscientiousness x neuroticism x perceived stress (centered)	-.39*	.16		

Note. $N = 205$. *b* = unstandardized beta weight. *$p < .05$, **$p < .01$. For condition, 1 = achievement-oriented, anxiety-provoking situation and 0 = achievement-oriented situation.

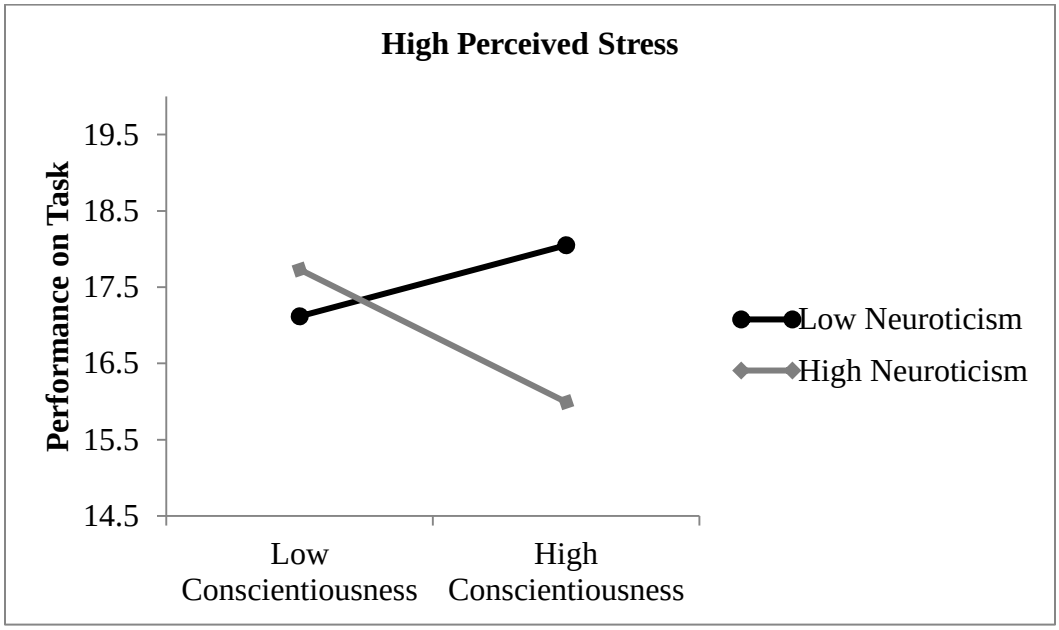

FIGURE 5: Graphed moderating effect of conscientiousness, neuroticism, and perceived stress on task performance (high stress depicted). All continuous predictor variables (conscientiousness, neuroticism, and stress) were centered prior to analyses.

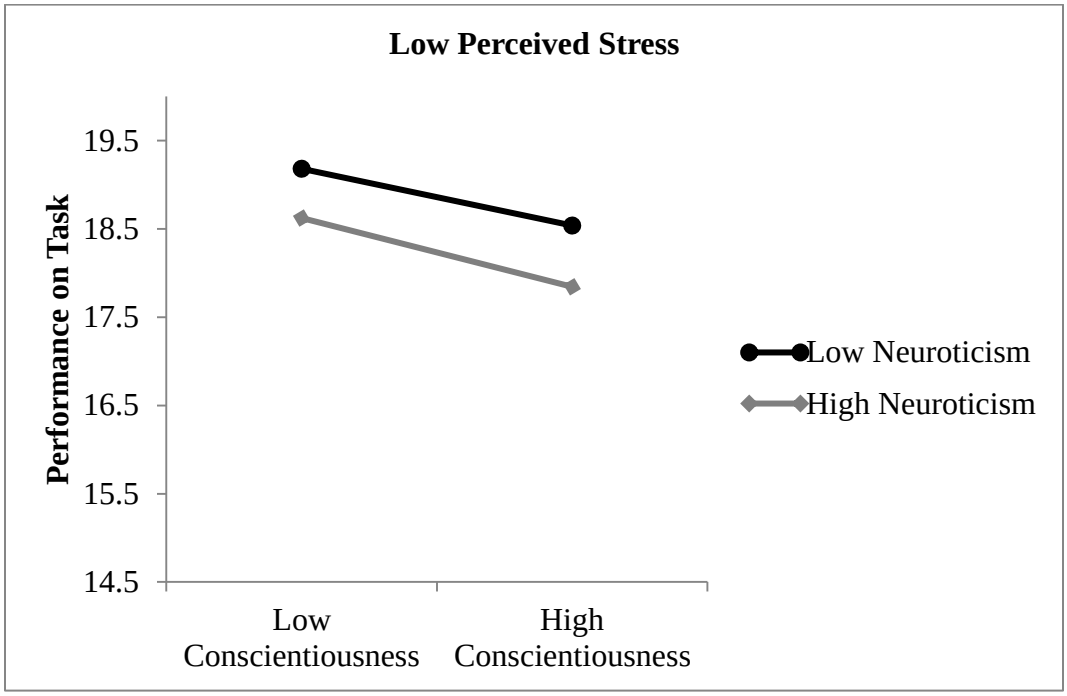

FIGURE 6: Graphed moderating effect of conscientiousness, neuroticism, and perceived stress on task performance (low stress depicted). All continuous predictor variables (conscientiousness, neuroticism, and stress) were centered prior to analyses.

APPENDIX C: PILOT STUDY

A pilot study was conducted in order to evaluate whether the experimental design (procedure and measures) would work (e.g., would there be any problems or issues with the procedure and are the measures reliable, etc.) and to assess whether the manipulations in the experimental condition appeared to work such that stress would be higher in the experimental versus control condition. Because of the small sample size in the pilot study, the purpose of the pilot study was not only to evaluate differences in stress based on the experimental and control conditions, but also, because of the small sample size, to examine whether or not the data showed trends in the hypothesized directions. I also used information from the experiment log that both research assistants and myself filled out after every participant completed the experiment. The experiment log included information about time to complete the study, any problems that occurred during the session, and an overall summary about each session.

Sample

Twenty-five participants completed the pilot study. Thirteen participants were randomly assigned to the experimental condition and 12 participants were randomly assigned the control condition. Participants ranged in age from 19 to 57; most (82.6%) were between 19 and 31. Thirteen participants (52%) were female and 12 participants (48%) were male. Fifteen participants (60%) were in their third year at the university and 10 participants (40%) were in their fourth year at the university. There were no significant differences between groups on age, sex, or year in school. On average, each participant took 41 minutes to complete the study.

Procedure

Prior to participant sign-ups, timeslots were created and the researcher randomly assigned each timeslot to the control or experimental condition. Participants signed up for individual one-hour time slots through a large, southeastern university's psychology sign-up system during the first summer session of 2012. Participants enrolled in the study either received course credit or extra credit for their respective psychology courses.

When the participant entered the room, they signed the consent form and voluntary participation was explained. When the study began, the participant sat down in front of a laptop computer to complete the first set of survey questions (demographics, stress in general scale, perfectionism scale, IPIP-short, and NEO-PI-R personality items). The questionnaires were presented in the same order for each participant to ensure high internal validity. The researcher remained in the room while the participant completed all parts of the survey. The researcher kept a log with the date and time of the session, how long each participant took to complete the experiment, any problems or distractions that may have occurred during the session, and a summary of the session.

The modular arithmetic problems and experimental design were adapted from Beilock et al., (2002) and Beilock and Carr (2005). Once the participant completed the first set of surveys, the researcher explained that the purpose of the modular arithmetic problems was to understand how participants learned new math skills. The participant was then directed back to the laptop, which provided detailed instructions and examples about how to evaluate the validity of modular arithmetic (MA) problems. MA problems were a good choice for an experimental lab setting because a majority of participants were inexperienced in solving MA problems (Beilock & Carr, 2005). The purpose of MA problems was to evaluate the truth of a problem statement such as "51 = 19 (mod 4)"

(Beilock & Carr, 2005). To solve the problem, the participant subtracted the first number from the second number (i.e., 51 – 19) and then divided the difference by the last number (i.e., 32 ÷ 4). If the dividend was a whole number (i.e., 8), the statement was true. If the dividend had a remainder (i.e., 8.3), the statement was false. Additionally, in order to increase the amount of stress on participants, after deciding if the MA problem were true or false, the participant was asked to provide the nearest whole number that would make the problem true. For example, in the problem "51 = 19 (mod 4)" the participant had to enter the number 8 to make the problem true. If the problem was false, the participant had to round to the nearest whole number. For example, if the answer was 8.3, the participant should have still entered 8.

Participants were instructed to complete MA problems with the most accuracy as possible in the least amount of time as possible. To begin, participants completed a set of 6 practice MA problems (Beilock & Carr, 2005, p. 102). Once the participant finished the practice problems, the researcher asked them if they had any questions regarding the problems they just completed. Depending on if the participant was randomly assigned to the experimental or control group, the researcher introduced stress (experimental condition) or did not introduce stress (control condition) before beginning the test set of MA problems. During the test set of MA problems, participants completed 24 MA problems. Eight problems were of high difficulty because they were double-digit borrow subtraction operations (i.e., 51 = 19 (mod 4)). Eight problems were of intermediate difficulty defined as a double-digit no-borrow subtraction operation (i.e., 19 = 12 (mod 7)). Eight problems were of low difficulty defined as a single-digit no-borrow subtraction operation (i.e., 7 = 2 (mod 5)) (Beilock et al., 2002).

Experimental Manipulation

Before the participant began the test set of MA problems and if the participant was randomly assigned to the experimental group, participants were told that the computer had been using a formula that took into account reaction time and accuracy to compute a "MA score" for their practice MA problems. Then, the participant was told that if they improved their MA score by 20% relative to the pretest, they would be entered into a drawing to win one of two $25 Target gift cards, but that being entered into the drawing was also going to be a "team effort."

Next, participants were told that they were randomly paired with "another participant" in the experiment who already improved their score by 20% on the test set of MA problems. Therefore, the participant would have to improve their own score by 20% in order for both the "other" participant and themselves to be entered to win one of two $25 Target gift cards. Finally, the researcher would inform the participant that their performance was going to be videotaped during the test set of problems so that professors could evaluate their performance on this type of math task. A video camera was set up to include both the participant and the computer screen in the frame (Beilock et al., 2002). Once the video camera was set up, participants began the test set of MA problems.

While the participants were completing the test MA problems, three messages sporadically appeared, which were designed to increase stress levels. These messages were systematically built into the survey so that each participant in the experimental condition saw the same messages after MA problem number 4, 13, and 20. Respectively, the messages read: "So far, you are completing the problems too slowly for you to win the Target gift card. Try and speed up to make sure that you can be entered into the

drawing." "Your score is not improving. Please make sure you are concentrating as much as possible on these simple problems." and "That response just decreased your score by 3%. You must get the rest of the questions correct in order to increase your score by 20%." These messages were adapted from the Trier Social Stress Test protocol, which has been used in many psychological and neurobiological studies to induce moderate psychological stress (Kirschbaum, Pirke, & Hellhammer, 1993).

Immediately following the control or experimental test MA problems, the participant completed the manipulation check as well as the rest of the survey items (the general well-being scale, stress in general scale, perceived competence scale, PANAS mood scale, reaction measures, and math problem check). Once all of the survey items were completed, the researcher thoroughly debriefed the participant about the real purpose of the study, the fact that they were never really videotaped, and that each participant (no matter what their score) had the option to enter the gift card drawing.

Measures

Control Variables

- Demographics: Each participant completed a basic demographic survey including information about their age, sex, race, and year in school. The researcher used this information as controls during analysis because age and sex have been found to predict performance (Witt, 2002). Race and year in school were also examined as potential control variables. These controls are expected to increase internal validity because it creates consistency across groups while eliminating alternative explanations for differences in task performance (Singleton & Straits, 2010).
- Pre-Stress in General Scale (Stanton, Balzer, Smith, Perra, & Ironson, 2001): Participants completed this 15-item scale before the modular arithmetic problems to

capture a general, affectively-oriented evaluation of the participant's feelings of stress at that specific moment in time. The pre-modular arithmetic problem scale was used as a potential control for the participant's current stress state because how people react to the situation may change based on their recent experiences (Mischel, 1973). The scale's directions were adapted to reflect how the participant was feeling before the modular arithmetic problems. Participants were asked to rate how well each item described their feelings at that moment in time using a 5-point Likert type scale ranging from 1 (*very poorly*) to 5 (*very well*). Sample items include: "pressured," "nerve-wracked," and "relaxed" (reverse scored). The internal consistency of this measure in the pilot study was acceptable ($\alpha = .94$).

Main Study Variables

- International Personality Item Pool (IPIP) Short: The Big-5 personality traits, including conscientiousness and neuroticism, were measured using the 50-item IPIP-Short scale. Participants were asked to respond to statements and describe themselves as honestly as possible on a 5-point Likert scale from 1 (*very inaccurate*) to 5 (*very accurate*). Sample items include: "Get stressed out easily," "am always prepared," and "worry about things." The internal consistencies for all five traits were acceptable in the pilot study. Specifically, conscientiousness ($\alpha = .79$) and neuroticism ($\alpha = .75$) were acceptable.
- NEO Personality Inventory-Revised (NEO PI-R) (Costa & McCrae, 1995): The NEO PI-R was used to measure specific facets of conscientiousness and neuroticism. The NEO PI-R consists of 243 items that assess the Big 5 traits as well as the six facets that comprise each hierarchical trait (Costa & McCrae, 1995, p. 23). The NEO PI-R,

which measures the most widely accepted five-factor model of personality, has high test-retest reliability because traits have been shown to be relatively stable overtime (Costa, 1995). The internal consistencies for the Big 5 traits are high and range from 0.86 to 0.92 (Costa, 1995). In the pilot study, the internal consistency of conscientiousness ($\alpha = .69$) was not acceptable, but the internal consistency of neuroticism ($\alpha = .93$) was acceptable.

Previous research has suggested that the facets of personality provide a more detailed explanation of personality (Costa & McCrae, 1995, p. 21). Therefore, facets of each trait were measured to see if they explain more of the variance in performance and reaction measures than the overarching big 5 traits. In order to limit fatigue of participants, subject matter experts (SMEs) rated the top three facets of conscientiousness and neuroticism that they thought would most likely be activated and pertinent to performance and stressful situations. The three facets of neuroticism were vulnerability ($\alpha = .68$), anxiety ($\alpha = .89$), and self-consciousness ($\alpha = .87$). The three facets of conscientiousness were orderliness ($\alpha = .69$), achievement-striving ($\alpha = .69$), and self-discipline ($\alpha = .90$). A total of 60 items were used to evaluate the facets of conscientiousness and neuroticism. Participants were asked to respond to statements and describe themselves as honestly as possible on a 5-point Likert scale from 1 (*very inaccurate*) to 5 (*very accurate*).

- Performance: Task performance was modeled after Beilock and colleagues (2002) and Beilock and Carr's (2005) experimental designs. Performance was measured based on the correct number of responses to blocks of modular arithmetic (MA) problems. Participants completed a set of 12 practice modular arithmetic problems

and a set of 24 test modular arithmetic problems. If a participant was randomly assigned to the experimental stress condition, stress was induced while the participant completed the test set of modular arithmetic problems. If a participant was randomly assigned to the control condition, the participant completed the test set of modular arithmetic problems without any added stress.

Task performance was calculated in a variety of ways. First, performance was calculated by summing the number of correctly identified true/false problems in the test set of modular arithmetic problems. Next, performance was calculated by summing the number of correct fill-in-the blank answers to the test set of modular arithmetic problems. Finally, performance was calculated by computing the average time it took each participant to complete the test set of modular arithmetic problems.

- Manipulation check: Immediately after the participant completed the test set of modular arithmetic problems, the participant was asked to assess how they felt during the experiment. While most manipulation checks occur before the dependent variable (Singleton & Straits, 2010), for this study, the manipulation check occured after the dependent variable was measured because the manipulation and the measurement of the dependent variable coincide during the experiment. The participants responded to one item, "On a scale from 1 to 10, please indicate how stressed out you were you when solving the math problems. 1 = not being stressed at all to 10 = extremely stressed out."
- Post-Stress In General Scale (Stanton, Balzer, Smith, Perra, & Ironson, 2001): Participants completed this 15-item scale after the modular arithmetic problems to capture a general, affectively oriented evaluation of the participant's feelings at that

specific moment in time. This scale was used as a dependent variable to assess how stressed the participant was after completing the modular arithmetic problems. The directions were adapted to ask participants about how they felt during the modular arithmetic problems once they were completed. Participants were asked to rate how well each item described their feelings during the modular arithmetic problems using a 5-point Likert type scale ranging from 1 (*very poorly*) to 5 (*very well*). Sample items include: "pressured," "nerve-wracked," and "relaxed" (reverse scored). The internal consistency of this measure in the pilot study was acceptable ($\alpha = .95$).

Exploratory Reaction Measures

- General Well-Being Questionnaire (Cox, Thirlaway, Gotts, & Cox, 1983): In order to assess the subjective psychological well-being or distress of the participant during the experiment, the 8-item General Well-Being Questionnaire was used. The items in this scale were used to assess feelings of "choking," anxiety, and need to achieve the participant's goal during the modular arithmetic problems. The directions were adapted to ask participants about how often they felt a certain way during the experiment on a 5-point Likert-type scale from 1 (*never*) to 5 (*very often*). Sample items included: "your thinking got mixed up when you had to do things quickly," "your face got flushed," and "you bit your nails." In the pilot study, the internal consistency of the scale was acceptable ($\alpha = .73$).
- Perceived Competence Scale: In order to understand if the participant thought they were competent in the modular arithmetic problems or not, 4-items assessed the perceived competence of the participants. Perceived competence was theorized to facilitate goal attainment and has been used to predict effective performance in

previous studies. Therefore, the perceived competence scale was used to assess the degree to which participants perceived they had achieved their goal or if there was any fear that the participant may have failed. The directions were adapted to ask participants to think about the modular arithmetic problems that they had just completed on a 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Sample items included: "I felt confident in my ability to perform the task" and "I was able to achieve my goals in this task." In the pilot study, the internal consistency of perceived competence was acceptable ($\alpha = .94$).

- Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988): The PANAS consists of two mood scales that assess positive and negative affect. The directions for the 20-item scale were modified to assess how participants were feeling during the modular arithmetic problems on a 5-point Likert scale from 1 (*very slightly or not at all*) to 5 (*extremely)*. Again, responses to this scale were compared across groups to assess if highly conscientiousness and highly neurotic individuals reacted to the stressful task differently than others. Sample items of positive affect included: "alert," "attentive," and "determined." Sample items of negative affect included: "nervous," "irritable," and "ashamed." In the pilot study, the internal consistencies of the positive mood ($\alpha = .91$) and negative mood ($\alpha = .85$) were acceptable.
- Reactions to study (Tonidandel, Quinones, & Adams, 2002): Fifteen items that measured perceived fairness, satisfaction with the problems, and the ability to concentrate were adapted to ask participants about their reactions to the modular arithmetic problems. Participants responded on a 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Sample items included: "The math problems were not

a good indicator of my math ability," "I liked doing the math problems," and "I got distracted while doing the math problems." In the pilot study, the internal consistency of the reactions to the study was acceptable ($\alpha = .85$).

- Modular Arithmetic Comprehension: In order to make sure that the participant understood how to complete the modular arithmetic problems and did not just guess the answers, one open-ended question asked participants to explain step-by-step how they would solve a final problem. Participants explained in words their strategy for solving the modular arithmetic problems and what they did mathematically to reach to a final decision. The participant's response to this question could also be used as a qualitative item to measure task performance because the participant will explain how they methodically completed the work (Tett & Burnett, 2003).

Quantitative Results

Manipulation Check: An independent samples t-test was conducted to compare stress levels of the experimental and control group. There was a significant difference between the experimental group ($M = 4.69$, $SD = 2.50$) and the control group ($M = 2.50$, $SD = 2.24$); $t(23) = 2.31$, $p = .03$, such that the experimental group reported being significantly more stressed than the control condition. Because there were differences in stress between groups, the experimental design and stress manipulation in the main study stayed very true to the pilot study procedure.

An independent samples t-test was conducted to compare gender differences and stress ratings for both the experimental and control groups. In the experimental condition, there was a significant difference between males (M = 2.80, SD = 1.48) and females (M = 5.88, SD = 2.30); $t(11) = -2.65$, $p = .02$. This means that females were rating the scenario

as being significantly more stressful than were males. In the control condition, there was not a significant difference between males (M = 1.86, SD = 1.35) and females (M = 3.40, SD = 3.05); $t(10) = -1.202$, $p = .25$. Even though there was not a significant difference, females were still rating the math problems as more stressful than males. Therefore, gender will definitely remain a control variable for the main study.

Performance: Performance was measured two different ways: (1) how many problems the participant got correct and (2) how long it took participants to complete the problems. First, an independent samples t-test was conducted to compare the number of correct test MA problems. A problem was considered correct if the participant correctly chose if the problem was true or false. There was no significant difference between the experimental group ($M = 20.69$, $SD = 1.38$) and the control group ($M = 20.50$, $SD = 2.58$); $t(23) = .235$, $p = .82$. An independent samples t-test was conducted to compare how long it took the participants in each condition to complete the test MA true/false problems. There was no significant difference between the experimental group ($M = 9.61$ minutes, $SD = 5.53$) and the control group ($M = 11.30$ minutes, $SD = 5.48$); $t(23) = -.77$, $p = .45$.

Reaction measures: Independent t-tests were conducted comparing the experimental and control group on each of the reaction measures (post-stress in general scale, general well-being scale, perceived competence scale, positive and negative affectivity, and general reactions to the math problems). No significant differences were found between groups on any of these scales. Means, standard deviations, and t-test values can be found in Table 1.

Personality traits: To get an idea of how many participants were needed for future data collection, the researcher examined how many participants were "high" or "low" on conscientiousness and neuroticism. Being "high" or "low" on one of the two traits was defined as being one standard deviation above or below the mean, respectively. Four participants were high on conscientiousness and 4 participants were low on conscientiousness, while 5 participants were high on neuroticism and 5 participants were low on neuroticism. There were no participants who were high on both traits or low on both traits and there were no significant differences between these individuals on performance, which means that the researcher will need a large sample size to get a variety of trait combinations and power to potentially find the hypothesized relationships assuming the effect sizes are small based on no significant differences in performance based on the pilot.

Personality trait interactions and sample size: Research has shown that sample size has one of the largest positive effects on statistical power, such that the larger the sample size, the greater the statistical power. To be able to detect an interaction between conscientiousness and neuroticism, there needed to be a sample size larger than 120 participants (Aguinis, 1995). To determine how many participants were needed to detect a three-way interaction, the program G*POWER 3.0 was used to predict a small effect size (.10). When the significance level was set at .05, with 6 total predictors and 6 predictors of interest, a sample size of approximately 180 participants was needed in order to have enough power (.90) to detect significant increases in the change in R^2. If the power was decreased to .80, with the same parameters as described above, a sample size of approximately 143 participants was needed in order to detect significant increases

in the change in R^2. Therefore, the researcher aimed to test between 140 and 180 participants for the full study.

Qualitative Results

Description of participant sessions and comments: The accumulation of observations from each session provided a variety of ways to make the experiment more believable and uniform for each participant. Some participants expressed their frustration, boredom, and fatigue with the first set of survey questions, particularly the personality items. Frequently, when the researcher asked if the participant had questions about the MA problems, they would take the time to go over the directions with the researcher. The researcher would have the participant walk through the steps aloud and the researcher would confirm or reiterate how to solve the MA problems.

During the experimental condition, a majority of participants nervously laughed the first time that the social stress message popped up on the screen. A number of participants even shook their heads and took a deep breath before continuing on to the next problem. After the entire experiment was over, participants reported being more stressed out about talking to the video camera than anything else. Overall, female participants expressed being nervous simply because they had to solve math problems. Two female participants reported being nervous that they would let their partner down. Two participants said that they had fun completing the math problems and reported being excited (instead of stressed) about having a chance to win a gift card. Some participants did ask if they could find out if their scores improved, which shows that participants were interested in the task and seemed to genuinely be trying to solve the MA problems. These

qualitative results made it clear that the experimental design and manipulation did not have to change drastically for the main study.

Changes to experimental set-up: During the pilot study, three participants used pen and paper to help complete the math problems. In future study sessions, the researcher made sure to say that the participant could not use pen and paper to ensure the reliability of the experimental protocol. A few participants reported being nervous about the math problems simply because they did not think they were good at math. Because a purpose of this study was to focus on how personality traits interact to affect performance, a perceived academic competence scale, which includes perceived math ability, was added into the first set of survey measures and used as a potential control variable.

In an attempt to enhance the efficiency of data collection, to reduce common method variance, and cuing of traits, the experiment was changed to include two waves of data collection. Following recommendations from Podsakoff, MacKanzie, Lee, & Podsakoff, (2003), the researcher created psychological and temporal separation by measuring the outcome variable, performance, and moderating variable, stress, three to 14 days after measuring the predictor variables, conscientiousness and neuroticism. During part 2 of the new study, the researcher explained that the math problems were part of a study examining cognition and how students solve math problems.

Changes to experimental task: Once the experiment was complete, a few participants commented that they did not believe the researcher was truly interested in how they performed on the math problems. A few changes were made to the task in order to make the experiment more deceptive and believable. Four MA problems were added to

the practice problems, increasing to 10 practice problems, and four MA problems were removed, decreasing to 20 test problems. By having a more even distribution of practice and test problems, participants were expected to believe that the researcher was focused on learning about math performance and participant's improving their math scores.

Not only did the number of math problems change, but the difficulty level of the math problems was also changed. There was little variance in performance scores based on levels of conscientiousness and neuroticism. Therefore, the easier math problems were removed and replaced with more difficult math problems. With more difficult math problems, there was expected to be more variance in how many problems each participant would get correct and how long it would take the participants to complete the math problems.

In order to make the task more difficult and potentially increase variance in performance, new types of math problems were added. Instead of only completing math problems in the form of "4 = 1 (mod 3)", individuals now had to learn how to solve problems in the form of "4 # 1 (mod 3)". The participants were taught that the "#" command meant to add, rather than subtract, before dividing by the mod number. By adding this complexity to the math problems, conscientiousness should stay activated and neuroticism should be activated because participants would need to pay attention to details to do well and the increased cognitive load was expected to make participants more anxious.

Because there were no significant differences between groups on performance, a few more quantitative questions regarding performance was added to the survey. The items that were added to the survey include: "Out of the next 20 test math problems, how

many do you predict that you will get correct?" "Do you think you increased or decreased your math score on the test set of math problems?" "Please indicate what percentage you think you increased/decreased your score." Some other possible performance questions may include: "How well do you think you did on the math problems?" "Do you think you met your goal number of number of math problems correct?" "How satisfied are you with your performance on the math problems?" and "If your score on the math problems were used as an exam grade in school, do you think you would be satisfied with your grade?"

Pilot Study Conclusions

Based on the quantitative and qualitative results of the pilot study, a few conclusions were drawn. First, the purpose of the pilot study was to make sure that the stress manipulation was working. Results showed that the experimental group was significantly more stressed out than the control group. Therefore, we decided to continue with the structure of the experimental deign and stress manipulation. Based on the qualitative results, numerous changes and improvements were made in order to make the study more uniform, realistic, and stressful. A summary of the major changes to the measures and experimental design included: adding a perceived academic competence scale to control for differences in perceived ability, making sure that the participant did not have an idea about what the study was really about (part 1/part 2 of study), adding a timer to the screen for the test modular arithmetic problems to increase stress, changing the number of math problems in the practice and test problems to make the cover story more believable, increasing the difficulty of the math problems to increase performance variability, making directions and anchors clearer, and adding additional items that would capture perceived performance differences.

These changes were intended to increase the variance in performance and increase stress in the experimental condition, which should have activated neuroticism. Because of the proposed analyses, approximately 200 students were tested over the course of the fall semester. With enough power to detect a three-way interaction, we were able to test if the interaction between high conscientiousness and high neuroticism has a negative impact on task performance or reactions to tasks.

TABLE 1: Means, standard deviations, and independent t-tests for reaction measures

	Stress		No Stress		
	M	SD	M	SD	*t*-test
1. Stress in general	2.80	.85	2.14	.84	1.94
2. General well-being	2.20	.58	1.88	.51	1.49
3. Perceived competence	3.40	.79	3.79	1.18	-.97
4. Positive affectivity	3.00	.89	2.98	.89	.09
5. Negative affectivity	1.62	.57	1.39	.52	1.02
6. Reactions to study	2.63	.64	2.43	.60	.77

Note. M = mean. SD = standard deviation. Stress in general ranges from 1 (very poorly) to 5 (very well). General well-being ranges from 1 (never) to 5 (often). Perceived competence ranges from 1 (strongly disagree) to 5 (strongly agree). Positive and negative affectivity range from 1 (not at all) to 5 (extremely). Reactions to the study range from 1 (strongly disagree) to 5 (strongly agree).