

Southern Adventist University  
School of Education and Psychology

*That's Just the Way I Am: Conscientiousness, Neuroticism, State-Trait Anxiety, and High-  
Pressure Exam Grades in Undergraduate Students*

Research Proposal

By

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***That's Just the Way I Am: Conscientiousness, Neuroticism, State-Trait Anxiety, and High-Pressure Exam Grades in Undergraduate Students***

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***That's Just the Way I Am: Conscientiousness, Neuroticism, State-Trait Anxiety, and High-Pressure Exam Grades in Undergraduate Students***

Why do some people shine under pressure while others crumble? The reason is unclear. Research about individuals performing under pressure (i.e., in situations where optimal performance is desired), is applied to athletic, musical, or corporate situations (Furuya et al., 2021; Kronenwett & Rigotti, 2019; Ötting et al., 2020). However, pressure research has natural implications to the world of academia, an environment where students strive to meet high expectations. Research offers contradictory evidence as to whether pressure is performance-enhancing or not. The following literature review defines types of pressure, highlights research from the last decade, and discusses conscientiousness, neuroticism, academic success, and anxiety. The Yerkes-Dodson Law is critiqued. The peer-reviewed articles included in this review were found using the key terms *performance*, *pressure*, *stress*, *motor w5 skills* or *motor w5 abilit\* or physiolog\**, *Big Five*, *neuroticism*, *personality traits*, *state anxiety*, *college or universit\** and *cognitive task*. Studies were accessed through interlibrary loan and EBSCO Host, at the McKee Library of Southern Adventist University.

**Differentiating Types of Pressure**

Pressure has been generally defined as a situation where optimal performance is strongly desired (Allsop et al., 2017; Ötting et al., 2020). McCoy (2014) stated that individuals experience pressure “when they must perform to their potential in order to achieve a goal” (p. 769). Pressure can be categorized by its cause, such as “situational incentives” (Kent et al., 2018) or “an individuals’ ambitions” (Ötting et al., 2020). In one study, Allsop et al. (2017) divided pressure into two categories: *internal pressure* (personal motivation) and *external pressure* (outside influences like social evaluation or monetary rewards).

At least two types of pressure could be expected during a timed, high-stakes undergraduate class exam: time pressure and outcome pressure. Pawar & Velaga (2021) defined time pressure as “an outcome of time constraint condition to complete a particular task ... [and] results in psychological stress” (p. 218). Outcome pressure is induced by a situation presenting challenging tasks or potential reward (McCoy et al., 2014). McCoy (2014) suggested that outcome pressure could hinder tasks that require complex, conscious mental processes (executive control processes). This same study gave evidence that differentiating among types of pressure and types of mental processes is helpful in predicting whether a pressurized situation will positively or negatively affect performance.

Some studies involving pressure in this literature review either fail to define “pressure”, fail to explain the type of pressure induced by their study, or loosely define pressure as “psychological stress” (Furuya et al., 2021; Kronenwett & Rigotti, 2019; Lee et al., 2019).

### **Pressure Research**

Considering the last decade of studies that manipulated stress or created pressurized situations yields more questions than answers about how pressure effects performance. On one hand, Kronenwett & Rigotti (2019) found a positive relationship between time pressure (which was considered a job difficulty) and occupational achievement. On the other hand, Pawar & Velaga (2021) found that drivers under acute time pressure make more adjustments to their steering wheel, suggesting a potentially more dangerous situation, not safer driving.

### ***Pressure and Motor Activity***

Lo et al. (2019) studied university students throwing darts and induced both incentive and social pressure in their “stress condition”. These researchers found that participants’ accuracy suffered under pressure. However, Ötting et al. (2020) examined professional dart throwers, who

compete in an environment with very little social pressure. The dart throwers' accuracy was unaffected by higher stakes.

### ***Pressure and Cognitive Processes***

When working with academic exams, it may be the most relevant to consider pressure and cognitive processes. Performing musicians carry out refined cognitive and motor processes under pressure. Furuya et al. (2021) analyzed what led to professional pianists choking under pressure. Notably, they found “failure of memory recall”—a cognitive process—and “erroneous motor activity”—a motor task—were both related to neuroticism, public self-consciousness, and lack of confidence. This suggests that personality traits (such as neuroticism) may be linked to choking under pressure (Furuya et al., 2021).

### **Neuroticism**

Neuroticism has been defined as a higher levels of anxiety and a greater propensity towards anxious thoughts (Saylik et al., 2018). The definition of neuroticism was said to have overlap with trait anxiety. Saylik et al. (2018) studied neuroticism and central executive tasks (i.e., memory, information recall, and attention). The researchers found that participants with high neuroticism scores performed significantly worse in an intra-extra dimensional shift task, which required filtering out stimuli that is distracting or unhelpful and “shifting attention between two tasks, operations, or mental sets” (p. 2). It should be noted that Saylik et al. (2018) measured neuroticism from Eysenck Personality Questionnaire, not as part of the “Big Five” factor model. The Eysenck Personality Questionnaire is based on Hans Eysenck's theories; he viewed neuroticism as performance-impairing (Saylik et al., 2018).

However, these researchers also concluded that some parts of working memory (in this case, visual-spatial) are unaffected by neuroticism. This suggests that the relationship between cognitive performance and neuroticism is more complex than a negative linear one.

### **Conscientiousness**

In a research article examining children's personality traits and academic performance, Andersen et al. (2020) called conscientiousness, "by far the most important predictor for educational performance" (p. 935). Jaber et al. (2022) studied fifth-year dental students and found that conscientiousness, out of all the "Big Five" factor traits, was most correlated with academic education and clinical training success. The researchers defined academic and clinical success by the participants' four-year, weighted GPA and their weighted GPA for their clinical course, respectively. Jaber et al. (2022) noted, "empirical evidence has demonstrated that conscientiousness is the most robust and most consistent Big Five personality trait for predicting achievement outcomes" (p. 2).

### **Trait and State Anxiety**

Zsido et al. (2020), the developers of a shortened version of the Spielberger State-Trait Anxiety Inventory differentiated between state and trait anxiety like this: "State anxiety... [is] how one feels at the moment; and Trait anxiety... [is] how one generally feels". According to Horikawa & Yagi (2012), those who report more trait anxiety usually experience more state anxiety. These researchers defined trait anxiety as "a general tendency to respond with anxiety to perceived threats in the environment, and is a relatively stable characteristic of an individual" (p. 1).

When a stress or pressure factor is introduced into a study, it is common to use state anxiety as a measurement (Banks et al., 2015; Furuya et al., 2021; Kent et al., 2018; Lo et al.,

2019; Qi & Gao, 2020; van Beurden et al., 2020). State anxiety has been associated with lower performance (Lo et al., 2019; Qi & Gao, 2020).

Ping et al. (2008) stated that test anxiety is a combination of state and trait anxiety that happens in response to the stimuli of a testing situation. For the purposes of the present study, general, not testing specific, state and trait anxiety will be examined. This way, anxiety stemming from other areas of a participants' life may have a greater likelihood of being taken into account.

Similar to neuroticism and performance under pressure, the relationship between State-Trait anxiety and performance is not always negative (Savci et al., 2021). Savci et al. (2021) found that the relationship between COVID-19 nurses' State-Trait anxiety score and clinical decision-making ability had no statistical significance.

### **Yerkes-Dodson Law**

The Yerkes-Dodson Law (YDL) is a conceptualization of the relationship between arousal/stress and optimal performance (White, 2021). The "inverted-U" graph begins with low stress resulting in low performance. As stress increases, "performance" also rises until it peaks at the top of the bell-curve (White, 2021). As stress continues to increase past this point, performance falls, representing the distress or burnout that comes from excessive stress (White, 2021). This YDL is referenced in pressure and performance literature (Furuya et al., 2021; Lo et al., 2019; Saylik et al., 2018). However, the bell-curve of the YDL allows for linear results to be integrated into either side of the curve (Corbett, 2015) and the widespread referencing of the Yerkes-Dodson Law may be a major weakness of the literature. In 2015, Corbett traced the YDL to its origins and concluded Yerkes and Dodson were studying habit-formation and punishment,

not performance and pressure. Studies reflecting the full bell-curve effect are few (Corbett, 2015).

Although often explained by an inverted-U graph, the last 10 years of research on the effects of pressure on performance have yielded inconclusive results. Furthermore, there is a gap in pressure research (Allsop et al., 2017) where personality traits are not taken into account. In literature about personality and academic success, academic success is often defined as an individual's GPA (Jaber et al., 2022). It is unknown if conscientiousness' predictive power translates to a smaller scale, such as an individual's exam grade.

### **Statement of the Problem**

Undergraduate students operate in a high-pressure environment. Amid potential stressors from students' academic lives, family situations, and personal health statuses, students are required to perform at their best under pressure in order to succeed. Understanding what components impact an undergraduate students' performance under pressure is critical in developing effective interventions and improving student's lives. To better understand this issue, the present study turns towards high-pressure undergraduate exams, a situation where participants are likely to experience pressure, and performance is easily measurable. State-trait anxiety has been historically used as a pressure indicator (Banks et al., 2015; Furuya et al., 2021; Kent et al., 2018), and it is used as a variable for this reason. The literature examining performance under pressure has not yet incorporated personality traits as a variable, and this study seeks to bridge that gap by measuring students' levels of conscientiousness and neuroticism. Neuroticism, a personality trait thought to measure a person's propensity for anxiety (Saylik et al., 2018), is included as a personality variable because it is relevant to a potentially anxiety-inducing situation. Conscientiousness has been identified as a predictor of academic

performance (Andersen et al., 2020) and incorporating it as a variable serves the dual purpose of integrating personality into pressure/performance literature, and examining conscientiousness' predictive power for academic success on a small scale.

The purpose of this study is to describe the relationship between undergraduate students' personality traits (conscientiousness and neuroticism), their anxiety before a high-pressure exam (state-trait anxiety scores), and their grade on that exam. Understanding how an individual's unique response to pressure may be related to their performance may inform beneficial interventions for students. A search of the current literature did not produce pressure studies that accounted for personality; nor did it produce conscientiousness and academic success studies that examined academic success on a small scale (i.e., class exam). Audiences that can benefit from this research are those in the scientific community (i.e., cognitive and educational psychologists), university professors and officials, and teachers who create and maintain data-informed courses and class environments.

### **Subproblems**

Eight subproblems will guide this study.

1. The first subproblem is to examine the relationship between undergraduate students' self-reported state anxiety scores and their grade on a high-pressure, timed exam.
2. The second subproblem is to explore the relationship between undergraduate students' self-reported trait anxiety scores and their grade on a high-pressure, timed exam.
3. The third subproblem is to describe the relationship between undergraduate students' conscientiousness scores and their grade on a high-pressure, timed exam.
4. The fourth subproblem is to examine the relationship between undergraduate students' neuroticism scores and their grade on a high-pressure, timed exam.

5. The fifth subproblem is to measure the relationship between undergraduate students' neuroticism scores and their self-reported state anxiety scores.
6. The sixth subproblem is to examine the relationship between undergraduate students' neuroticism scores and their self-reported trait anxiety scores.
7. The seventh subproblem is to examine the conscientiousness, neuroticism, and state-trait anxiety profiles for students at and above the 75<sup>th</sup> percentile of the exam grades.
8. The eighth subproblem is to describe the conscientiousness, neuroticism, and state-trait anxiety profiles for students at and below the 33<sup>rd</sup> percentile of the exam grades.

### **Hypotheses**

Three hypotheses will guide this study.

1. Undergraduate students' conscientiousness scores are positively related to their grades on a high-pressure, timed exam.
2. Undergraduate students' neuroticism scores are positively related to their self-reported state anxiety scores.
3. Undergraduate students' neuroticism scores are positively related to their self-reported trait anxiety scores.

Each of these hypotheses will be tested in its null form.

### **Research Questions**

Five research questions will be addressed in this study.

1. What is the relationship between students' state anxiety scores and their grades on a high-pressure, timed exam?
2. What is the relationship between students' trait anxiety scores and their grades on a high-pressure, timed exam?

3. What is the relationship between students' neuroticism scores and their grades on a high-pressure, timed exam?
4. What is the average conscientiousness, neuroticism, and state-trait anxiety score profile for higher scoring students (at or above the 75<sup>th</sup> percentile) on a high-pressure, timed exam?
5. What is the average conscientiousness, neuroticism, and state-trait anxiety score profile of the lower performing students (at or below the 33<sup>rd</sup> percentile) on a high-pressure, timed exam?

### **Definition of Terms**

The following terms are operationally defined for this study:

1. *State anxiety* is defined as a participant's a score on the STAIS-5 portion of the *Spielberger Shortened State-Trait Anxiety Inventory*, yielding a score from 5 to 20 (Zsido et al., 2020a).
2. *Trait anxiety* is defined as a participant's a score on the STAIT-5 portion of the *Spielberger Shortened State-Trait Anxiety Inventory*, yielding a score from 5 to 20 (Zsido et al., 2020a).
3. *Contentiousness* will be measured with the 9 conscientiousness questions from the 44-question *Big Five Personality Inventory* yielding a score from 9 to 45 (John et al., 2008).
4. *Neuroticism* will be measured with the 8 neuroticism questions from the 44-question *Big Five Personality Inventory* yielding a score from 8 to 4 (John et al., 2008).
5. *Gender* will be operationally defined as participants' self-reported gender.
6. *Age* will be operationally defined as participants' chronological, self-reported age.

### **Delimitations and Limitations of Study**

This study is delimited by the following:

1. This is neither a comprehensive nor exhaustive treatment of anxiety or anxiety experienced before an academic exam.
2. The classes used in this study were picked based on an assumption that students are more likely to experience pressure these classes than others.

There are five limitations in this study.

1. Many other variables may contribute to a student's exam performance (i.e., amount of studying, familiarity with content, amount of sleep the night before, time since eating, misreading questions, lucky guessing, etc.).
2. There may be commonalities among students who choose not to participate in this study (i.e., embarrassed of their grade or under extreme time-pressure).
3. There may be commonalities among students who are excluded from this study (i.e., arriving late to the exam)
4. The Big Five Personality Inventory may not best account for the variations in personality that may affect performance under pressure.

### **Assumptions of Study**

Three assumptions are made explicit in this study:

1. This study has scientific merit.
2. The timeframe for completing this project is adequate.
3. Participants will be honest in their self-report of personality and state-trait anxiety.

### **Importance of Study**

The conclusions of this study may inform interventions that help students be more aware of their thoughts and unique tendencies when they take a high-pressure exam. This study may be a first step in a program of research that explores what variables are involved with a student's success or failure while under pressure. The completion of this study will contribute to the incorporation of personality traits as a critical component of understanding performance under pressure.

### **Method**

#### **Participants**

At least 30 Southern Adventist University (SAU) male and female students who are enrolled in Anatomy & Physiology I, General Chemistry, and General Biology II will be invited to participate in this study. Participants will be at least 18 years of age. All participants will be treated in accordance with the Ethical Principles of Psychologists and Code of Conduct from the American Psychological Association (American Psychological Association, 2010).

#### **Materials**

This study involves two online surveys. The first survey, *Selected Inventories from the Big Five Inventory* has two demographic questions (gender and age), and the conscientiousness and neuroticism scales from Berkley Personality Lab's *The Big Five Inventory* (John et al., 2008). The conscientiousness (9 questions) and neuroticism (8 questions) portions of the inventory involve self-descriptive statements like "I am someone who tends to be disorganized". Questions are answered on a 1-5 Likert scale, with 5 representing "agree strongly". *The Big Five Inventory* has been found to have a test-retest stability of .83 and an overall mean intercorrelation of .21 (Rammstedt & John, 2007).

The second survey, developed by Zsido et al. (2020), is the *Spielberger Shortened State-Trait Anxiety Inventory*. This survey is an abbreviated version of the *Spielberger State-Trait Anxiety Inventory*. This inventory includes statements like, “I feel upset” on the state anxiety scale and “I worry too much over something doesn’t really matter” on the trait anxiety scale. Questions are answered on a 1-4 Likert scale, with 4 representing “very much so”. The *Spielberger State-Trait Anxiety Inventory* has been found to have sufficient validity on both state and trait anxiety scales (Cronbach’s alpha of .797 and .781, respectively), as well as a reliability score of .850 (Vitasari et al., 2011). The *Spielberger Shortened State-Trait Anxiety Inventory* was found to have a .88 correlation with the original scale (Zsido et al., 2020b). Both surveys and their scoring keys can be found in the appendix.

### **Design and Procedure**

The present study has a descriptive, quantitative, non-experimental, correlational, and comparative design. Professors at SAU who teach Anatomy & Physiology, General Chemistry, and General Biology II were invited to participate in this study. Their role in this study was explained: sending off prewritten emails to their students and providing a list of anonymous exam grades. Professor Noemi Gonzalez, Dr. Bruce Shilling, and Dr. Ben Thornton have agreed to participate in this study. Upon approval from the IRB, these professors will be given a prewritten email with a link to the informed consent form and the first survey, *Selected Inventories from the Big Five Inventory* (see the Appendix for copies of the prewritten emails and the surveys). This email will be forwarded to their students. If time allows, two prewritten reminder emails will be sent to the students before their exam. On exam day, in the 30 minutes before the exam, students will have two methods of taking the *Spielberger Shortened State-Trait Anxiety Inventory*. Students will receive an email, via their professor, with a link to the inventory

and multiple copies of a QR code leading to the *Spielberger Shortened State-Trait Anxiety Inventory* will be posted at the exam site. Two minutes before class begins, the QR codes will be removed, and the survey will be disabled. Following the exam, professors will send the coded grades to the principal researcher.

Each participant will have three pieces of data: *Selected Inventories from the Big Five Inventory*, *Spielberger Shortened State-Trait Anxiety Inventory*, and their exam grade. To anonymously link each participant's data together, each participant will create a five-digit, unique student code. The student code will be a combination of the day of the month the student was born and the last three digits of their phone number. For example, if someone was born on November 3<sup>rd</sup> and their phone number was (xxx) xxx-x891, their student code would be 03891. Students will be asked to enter their student code at the start of each survey and at the top of their exam. Grades will be delivered by professors to the principal researcher in a spreadsheet with students' codes in column 1 and their respective grades in column 2.

### **Data Analysis**

The conscientiousness and neuroticism scales will be scored and coded with their respective answer keys and analyzed in the following ways with SPSS.

1. *Conscientiousness* scores will be calculated by summing the responses for each question, presented on a Likert scale of 1 to 5. The numerical value of each question will be taken as-is, or reverse scored when appropriate. Lowest conscientiousness score = 9, highest conscientiousness score = 45.
2. *Neuroticism* scores will be calculated by summing the responses for each question, presented on a Likert scale of 1 to 5. The numerical value of each question will be

- taken as-is, or reverse scored when appropriate. Lowest neuroticism score = 8, highest neuroticism score = 40.
3. *State anxiety* scores will be calculated by summing the responses for each question, presented on a Likert scale of 1 to 4. Lowest state anxiety score = 5, highest state anxiety score = 20.
  4. *Trait anxiety* scores will be calculated by summing the responses for each question, presented on a Likert scale of 1 to 4. Lowest trait anxiety score = 5, highest trait anxiety score = 20.
  5. A participant's exam grade will be translated into percentages.

Demographic responses will be coded as follows:

1. Gender: 1=Male, 2=Female, 3=Other/Choose not to answer
2. Age: \_\_\_\_\_

After scoring, coding, and entering participant data into SPSS, the following statistical analyses will be used to test this study's hypotheses and answer the research questions.

PHASE 1: Descriptive Statistics will be calculated for all major variables.

PHASE 2: Statistical Inference:

Three research hypotheses will guide this study.

1. *Undergraduate students' conscientiousness scores are positively related to their grades on a high-pressure, timed exam.* Pearson's correlation will be calculated to determine the strength and direction of the relationship between a participant's conscientiousness scores and their exam grade. A coefficient and scatterplot will be generated.
2. *Undergraduate students' neuroticism scores are positively related to their self-reported state anxiety scores.* Pearson's correlation will be calculated to determine the strength

and direction of the relationship between a participant's neuroticism score and their self-reported state anxiety score. A coefficient and scatterplot will be generated.

3. *Undergraduate students' neuroticism scores are positively related to their self-reported trait anxiety scores.* Pearson's correlation will be calculated to determine the strength and direction of the relationship between a participant's neuroticism score and their self-reported trait anxiety score. A coefficient and scatterplot will be generated.

Each of these hypotheses will be tested in its null form.

Five research questions will be addressed in this study.

1. *What is the relationship between students' state anxiety and their grade on a high-pressure, timed exam?* Pearson's correlation will be calculated to determine the magnitude and direction of the relationship between a participant's self-reported state anxiety score and their exam grade. A coefficient and scatterplot will be generated.
2. *What is the relationship between students' trait anxiety and their grade on a high-pressure, timed exam?* Pearson's correlation will be calculated to determine the magnitude and direction of the relationship between a participant's self-reported trait anxiety score and their exam grade. A coefficient and scatterplot will be generated.
3. *What is the relationship between students' neuroticism scores and their grade on a high-pressure, timed exam?* Pearson's correlation will be calculated to determine the magnitude and direction of the relationship between a participant's self-reported trait anxiety score and their exam grade. A scatterplot and a line of best fit will be generated.
4. *What is the average conscientiousness, neuroticism, and state-trait anxiety score profile for higher scoring students (at or above the 75<sup>rd</sup> percentile) on a high-pressure, timed exam?* Descriptive statistics will be used to calculate mean, median, and standard

deviation of exam grades at and above the 75<sup>th</sup> percentile. The average conscientiousness, neuroticism, state anxiety, and trait anxiety scores will be calculated for all participants with an exam grade at the 75<sup>th</sup> percentile and higher. A table with measures of central tendency will be generated.

5. *What is the average conscientiousness, neuroticism, and state-trait anxiety score profile of the lower performing students (at or below the 33<sup>rd</sup> percentile) on a high-pressure, timed exam?* Descriptive statistics will be used to calculate the mean, median, and standard deviation of exam grades at and below the 33<sup>rd</sup> percentile. The average conscientiousness, neuroticism, state anxiety, and trait anxiety scores will be calculated for all participants with an exam grade at the 33<sup>rd</sup> percentile and lower. A table with measures of central tendency will be generated.

### **Results**

I predict a positive relationship between a undergraduate student's conscientiousness score and their grades on a high-pressure exam. I also predict a positive relationship between neuroticism and both state and trait anxiety scores from undergraduate students about to take a high-pressure exam.

### **Discussion**

The current study may have implications for how or whether undergraduate students are instructed to cope with the pressure of a challenging course. This study may also inspire other researchers to view personality as a critical component of understanding academic success and performance under pressure.

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**Appendix**