

Assessment of Test Anxiety on the OSU Lima Campus: Prevalence, Intensity, and Coping
Methods

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By

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Abstract

Prior Research has suggested that test anxiety is a common dilemma faced by a large percentage of university students. The purpose of this study is to better understand test anxiety within the confines of the Ohio State University Lima campus. Students completed a series of questionnaires and generated narratives about test anxiety in a take-home booklet. We allowed students one week to complete the booklet. Within our sample of $N= 231$ undergraduates, women reported higher levels of test anxiety than males across our scales. Unsurprisingly, we found that males and females reported utilizing different coping mechanisms at different frequencies both before and during a hypothetical exam. Our male and female participants provided different ratings on how helpful different coping methods were when dealing with test anxiety both before and during an exam. As expected, our test anxiety measures positively correlated with one another and negatively correlated with the ability to regulate cognitions and with GPA. Women wrote longer narratives and used more negative emotional words when describing how test anxiety affects them and how they typically cope with test anxiety. When categorized by major, women in STEM programs reported greater test anxiety levels relative to women in non-STEM majors. Consistent with our hypothesis, we found that students high in test anxiety reported greater difficulty with emotional regulation and less ability to regulate cognitions.

Test anxiety was a concept first proposed by Sarason and Mandler (1952) as, “the anxiety response to examinations or assessment situations.” These researchers noted that those with high-level test anxiety significantly underperformed academically, compared to those with low-level test anxiety. Sarason and Mandler (1952) further showed that test anxiety was negatively correlated with several intelligence variables. Since this initial definition, there has been newer and updated definitions of test anxiety. Lowe and colleagues (2008) expanded the definition of test anxiety to include the negative psychological, emotional, physiological, and behavioral reactions to testing situations. In 1995, Spielberger and Vagg coined the transactional process model of test anxiety. This model stated that, “the appraisal of stressors (e.g., examination), the interpretations of the situations (e.g., threat), the emotional states that are experienced during evaluative situations (e.g., anxiety), and the styles of problem-solving (e.g., avoidance) play important roles in development and expression of test anxiety” (Abdollahi et al., 2016, p. 1). Abdollahi and colleagues further stated that, “test anxiety evokes interfering thoughts, emotional disorganization, extreme worry, or off-task behaviors in evaluative situations (Zeidner, 1998) that increase maladaptive cognitions and contribute to feelings of hopelessness (Putwain 2007; Sarason 1980; von der Embse et al. 2013), lower competence beliefs (Goetz et al. 2008), poor academic performance (von der Embse et al. 2013), and stronger avoidant goal orientations (Putwain and Daniels, 2010)” (Abdollahi et al., 2016, p. 1). Further research has supported the negative correlation between test anxiety and academic performance first seen by Sarason and Mandler in 1952. This correlation is predicted by the cognitive interference model (Sung, Chao, & Tseng, 2016; Sarason & Mandler, 1952; Hembree 1988; Cassady & Johnson, 2002; Zeidner, 1988; Seipp, 1991; Beilock, 2008; Chapell et al., 2005; Worthy, Markman, & Maddox, 2009). Test anxiety triggers cognitive interference, explaining the negative correlation between test

anxiety and performance (Sung et al., 2016). This interference is thought to, “distract students or induc[e] irrelevant thoughts during testing, thus resulting in worse performance (Beilock, 2008; Beilock & Carr, 2005; Hembree, 1988; Hong & Karstensson, 2002; Musch & Broeder, 1999; Zeidner, 1998)” (Sung et al., 2016, p. 249). Further, test anxiety decreases selective attention and decreases concentration (Fernandez-Castillo & Caurcel, 2015). Newer researchers have discovered an interesting connection between sleep deprivation/reduction and aggressiveness and test anxiety (Fernandez-Castillo, 2013). Researchers have found evidence that increases in sleep reduction can result in increased test-anxiety (Fernandez-Castillo, 2013). Fernandez-Castillo (2013) further pointed out that increases in aggressive behaviors can also result in increased rates of test anxiety. In addition, researchers have found that levels of test anxiety peak directly before an exam (Lotz & Sparfeldt, 2016).

To better understand its symptoms, test anxiety has been studied by medical professionals. Test anxiety is a specific form of performance anxiety that has shown to affect students in all levels of education (Test Anxiety, 2005, n.p.). Test anxiety manifests itself through a combination of physical, emotional, and behavioral (or cognitive) symptoms (Test Anxiety, 2010, n.p.). Physical symptoms of test anxiety include, “Headache, nausea, diarrhea, excessive sweating, shortness of breath, rapid heartbeat, light-headedness and feeling faint,” (Test Anxiety, 2010, n.p.). Importantly, these physical symptoms have, in extreme cases, lead to panic attacks (Test Anxiety, 2010, n.p.). Students’ reactions to test anxiety are thought to be the manifestations of the emotional symptoms of test anxiety. These responses include things such as, “feelings of anger, fear, helplessness and disappointment,” (Test Anxiety, 2010, n.p.) in addition to, “self-doubt, stress hopelessness, and inadequacy,” (Test Anxiety, 2005, n.p.). Perhaps the most debilitating aspect of test anxiety, however, are the behavioral/cognitive

symptoms. The behavioral/cognitive symptoms of test anxiety include, “difficulty concentrating, thinking negatively and comparing [themselves] to others” (Test Anxiety, 2010, n.p.). Students commonly describe the cognitive/behavioral symptoms as “blanking” or “freezing” while taking the exam (American Test Anxieties Association (ATAA), n.y., n.p.). Some researchers have further noted that test anxiety, “reduces working memory, confuses reasoning, increases mistakes, and lowers test scores,” (ATAA, n.y., n.p.). Notably, researchers have found that students who experience test anxiety, “perform around 12 percentile points below their low anxiety peers (about half of a letter grade below)” (ATAA, n.y., n.p.).

A plethora of research on test-anxiety has been conducted since Sarason and Mandler’s (1952) initial research. Researchers have indicated that rates of test-anxiety are higher in females than males (Sung et al., 2016; Hembree, 1988; Chapell et al., 2005). Importantly, however, evidence does not support the idea that women perform significantly worse than males do on most academic tasks (Sung et al., 2016). In fact, women have consistently out-performed males in many academic settings (Sung et al., 2016). Research has also indicated that freshmen students are more prone to higher rates of test anxiety than upper-classmen (Brady, Hard, & Gross, 2017). Further, students’ prior exam scores and future worry have been shown to be negatively correlated (Brady et al., 2017). In essence, higher achieving students tend to report less test anxiety.

There is often confusion regarding the link between test anxiety and perfectionism. This may be due in part to different aspects or dimensions underlying the broader construct of ‘perfectionism.’ For example, researchers have suggested that students who score high in *evaluative concern* perfectionism are more likely to experience test anxiety; however, those students with high *personal standards* perfectionism and academic hardiness have *lower* levels

of test-anxiety (Brady et al., 2017). Researchers suggest that students who set unreasonably high standards for themselves and who self-blame when those standards aren't met, experience higher and more debilitating test anxiety (Abdollahi et al., 2016). In contrast, academic hardiness and high personal standards appear to act as a buffer against test anxiety (Abdollahi et al., 2016). While age is not considered to be a risk factor for test anxiety, education level is (Fernandez-Castillo & Caurcel, 2015). Researchers have suggested that higher education levels act as a buffer against test-anxiety so that those with in higher degree programs have less test anxiety (e.g., masters students display lower test anxiety than undergraduate students; Fernandez-Castillo & Caurcel, 2015).

Researchers have shown that the test itself is not the *sole* cause of students' anxiety. The rates of anxiety seem to be highest directly before the performance phase (Numan & Hasan, 2017). Numan and Hasan (2017) created a hierarchy of the 22 most stressful exam situations. This list is presented in table 1.

More recent data has suggested that the cognitive interference model was too simple of an explanation for the effect of test anxiety on performance. A second theory, the motivational enhancement model, proposed that test anxiety might actually enhance learning motivation, thereby stimulating performance (Sung et al., 2016; McDonald, 2001; Kofman et al., 2006). Some researchers have suggested that motivation is a more important factor than cognitive factors in determining students' performance (Sung et al., 2016 ; Sung et al., 2014).

Treatments for test anxiety are numerous and well supported. A newer, unconventional treatment for test anxiety involves modifying students' perception of test anxiety. According to Brady and colleagues (2017), "it is actually worry about performance and anxiety- not bodily feelings of anxiety (emotionality)- that impairs performance." These researchers, along with

others (e.g., Johns, Inzlicht, & Schmader, 2008) recommend that students reappraise symptoms of test anxiety and view them as neutral or even helpful- as opposed to the usual perception that test anxiety is a negative state with automatic harmful consequences. Based on this perception, students are often told to simply “calm down” (Brady et al., 2017; Brooks, 2014; ACT, 2012). Brady and her colleagues acknowledge that this is a difficult proposition, for a couple of reasons: “first, suppressing negative emotions is often difficult, requiring attention and effort...second, the recommendation to calm down relies on an overly simplified model of how anxiety affects performance” (Brady et al., 2017, p. 1; see also Gross, 2014). These researchers note that test anxiety has two components: emotionality and worry. Emotionality involves the emotional activation and physiological arousal; while worry refers to the cognitive concerns (Brady et al., 2017). Brady and her colleagues argue that worry causes the negative effects of test anxiety (Beilock, 2011; Cassady & Johnson, 2002). They proposed that emotionality, on its own, can facilitate performance students’ performance (see also Cassady & Johnson, 2002; Eysenck, 2012). For this reason, Brady and her colleagues argued that cognitive reappraisal is an essential treatment for test anxiety. Cognitive reappraisal is defined as, “an emotion-regulation strategy in which an individual reinterprets the meaning of an emotion-eliciting situations or physiological sensation (Brady et al., 2017; Gross, 2002). As noted earlier, the researchers proposed that shifting the perception of test anxiety from harmful to potentially beneficial, can help students perform better (Brady et al., 2017). Based on their hypothesis, Brady and colleagues (2017) conducted a study to test their hypothesis. In the study, students were divided into the experimental (reappraisal-intervention) or control (standard) groups (Brady et al., 2017). Students in the control group received an e-mail from professors with exam reminders and phrases such as, “We know that taking an exam can be a stressful experience, so we wanted to

remind you of exam details” and, “We look forward to seeing how much you’ve learned tomorrow” (Brady et al., 2017 p. 6). In contrast, students in the experimental group received messages such as, “We know that taking an exam can be a stressful experience, and so before reminding you of exam details, we wanted to provide a note of research-based encouragement” and, “If you find yourself feeling anxious, simply remind yourself that your arousal could be helping you do well” (Brady et al., 2017 p. 6). Through their research, Brady and colleagues (2017) found that a targeted-anxiety reappraisal e-mail from professors significantly decreased freshmen year students’ levels of test anxiety; however, in upperclassmen, the email produced an opposite effect. The researchers thereby proposed that there is a “sensitive period” where cognitive reappraisal is successful in helping students (Brady et al., 2017). Brady and colleagues (2017) proposed that freshmen students have little to no experience with university exams and, as such, these students were more responsive to these messages. In contrast, upperclassmen may have already developed successful coping strategies and the emails may have inadvertently caused the students to become more anxious (Brady et al., 2017).

Researchers have suggested that those who suffer from high levels of cognitive test anxiety employ avoidant coping strategies (e.g. avoidant emotion-focused coping), and this is an obstacle to successfully encoding academic information (Thomas, Cassady, & Heller, 2016; Stöber, 2004; Zeidner & Matthews, 2005). An example of avoidant emotion-focused coping would be utilizing alcohol to cope with test-anxiety symptoms or avoiding studying to avoid triggering test-anxiety symptoms. Negative emotion-focused coping strategies are correlated with decreased four-year GPA and have been shown to magnify academic failure (Thomas et al., 2016). Treatment programs for students with test anxiety attempt to educate students about this problem so that they can employ more successful coping strategies (Thomas et al., 2016). In

addition, increasing students' emotional intelligence can help provide a buffer against the negative effects of test anxiety (Thomas et al., 2016; Fernandez, Salamonson, & Griffiths, 2012; Jaeger & Eagan, 2007). Researchers suggest that treatments to increase active coping could increase academic success (Thomas et al., 2016; Schunk, 1999). Thomas and colleagues (2016) define active coping as behavioral responses that attempt to adapt to and manage stressors. In addition, lessons on how to implement such coping strategies are essential to ensure success (Thomas et al., 2016; Nonis & Hudson, 2010; Okpala, Okpala, & Ellis, 2000).

Researchers have generated a variety of therapeutic strategies for students dealing with test-anxiety. A common therapy, systematic desensitization, has been shown to have positive effects on self-reports of test anxiety but minor effects on academic performance (Neuderth, Jabs, & Schmidtke, 2008; Deffenbacher and Michaels, 1981; Harris and Johnson 1980; Deffenbacher et al. 1980). Similar results were found for vicarious desensitization (Neuderth, et al. 2008; Altmeier and Woodward, 1981; Denney, 1974), cognitive restructuring (Wachelka and Katz, 1999), positive self-instruction (Arnkoff, 1986), imagination techniques (Harris & Johnson, 1980), attentional training (Wise & Haynes, 1983), and relaxation techniques (Neuderth, et al. 2008; Cooley and Spiegler, 1980). Implementing study skills has proven effective when combined with other forms of treatment (Neuderth, et al. 2008; Benjamin et al., 1981). Eye movement desensitization and reprocessing (EMDR) therapies have proven inconsistent (Neuderth, et al. 2008; Baumann and Melnyk, 1994). Expressive writing is a well-supported treatment (Neuderth, et al. 2008; Ramirez & Beilock, 2011; Frattaroli, 2006).

A pilot treatment in Germany employed *advancement of exam-preparation and prevention of test anxiety* (Neuderth, et al. 2008). This treatment utilized classroom lessons along with peer coaching (Neuderth, et al. 2008). This treatment proved successful and was well-

received amongst students (Neuderth, Jabs, & Schmidtke, 2008). Some researchers have found that students' levels of test anxiety are significantly impacted by the type of appeals teachers/professors use (von der Embse, Schultz, & Draughn, 2015). von der Embse and his colleagues (2015) found that fear appeals significantly increased their students' levels of test anxiety relative to efficacy appeals, after students' intrinsic motivation was controlled for. von der Embse and colleagues (2015) define fear appeals as "...messages that repeatedly remind students about the importance of passing exams and the consequences of failure" (p. 622). In contrast, efficacy appeals were, "...messages intended to reinforce how capable an individual is of reaching a goal or outcome" (von der Embse et al., 2015, p. 622).

Mindfulness-based interventions are a relatively new, but they appear effective for test anxiety (Hjeltnes et al., 2015). Researchers have found that mindfulness-based interventions not only decrease rates of test-anxiety in students', but they also impact their broader lives of students in a positive way (Hjeltnes et al., 2015).

Study Design

In the current study, we looked at the prevalence rates of test anxiety on the campus along with students' coping strategies. Students completed a take-home booklet that took approximately 60 minutes to complete. The booklet contained a variety of questionnaires and narrative responses aimed at answering our research questions. Students also provided demographic information including their gender, rank, age, major, minor, and race.

We predicted that students who were STEM majors would have higher rates of test-anxiety compared to those in non-STEM majors. In addition, consistent with results reported by Brady and colleagues (2017), we predicted that students who were more advanced in their degrees would display lower rates of test-anxiety. Based on prior research (e.g., Sung, Chao, &

Tseng, 2016; Hembree, 1988; Chapell et al., 2005), we also predicted that women would display higher rates of test-anxiety. Based on the idea that better performing students might employ more action-oriented coping resources lowering the intensity of test anxiety (e.g., Thomas et al., 2016), we predicted that high school and college GPA would negatively correlate with test anxiety levels. Finally, we predicted that students with high test anxiety would report greater difficulty with emotional regulation and report less ability to regulate their cognitions (Zeidner, 1998; Goetz et al. 2008; Sung, Chao, & Tseng, 2016).

Method

Participants

We recruited participants from a variety of introductory and higher-level courses from the Ohio State University at Lima campus. These courses included, English, history, psychology, math, biochemistry, and biology. Final data analyses were based on $N=231$ participants. Participants ranged in age from 18 to 47 with a mean age 20.40 ($SD=4.381$). There was a total of $n=84$ males and $n=147$ females. There were a total of $n=140$ freshmen, $n=47$ sophomores, $n=24$ juniors, $n=25$ seniors, and $n=3$ advanced high-school students enrolled in college classes. Students reported a variety of racial backgrounds. Caucasians accounted for 95.7% of our sample, African-Americans accounted for 2.2%, Latinos accounted for 0.9%, and Asian Americans accounted for 0.9%. Less than 1% of our population reported being biracial, multiracial, or listed “other” as their race.

Materials

GAD-7 questionnaire (Spitzer, Williams, & Kroenke, 2006). The GAD-7 is a questionnaire that assesses levels of Generalized Anxiety Disorder. It contains seven questions on a Likert-type scale from zero to three- with zero being “Not At All Sure” and three being

“Nearly Every Day”. Students are then scored as having mild, moderate and severe anxiety, with 5, 10, and 15 being the cut-offs, respectively.

Brief Fear of Negative Evaluation Scale (BFNES; Lear, 2013). The BFNES is a scale that assesses students’ reactions to being in social settings. The BFNES contains 12 questions that are scored on a Likert-type scale from one to five- with one being “Not at all characteristic of me” and five being “Extremely characteristic of me”. Students are rated as either “typically relaxed in social situations” (a score of 0-12), “fearful in some social or evaluative situations” (a score of 13-20), or “generally apprehensive about what other people think of them” (a score of 21 to 30).

Westside Test Anxiety Scale (WTAS; Driscoll, 2004). The WTAS is a scale that assesses students’ test anxiety levels. It contains ten questions scored on a Likert-type scale from five to one, five equals “extremely or always true” and one equals “not at all or never true.” Based on their responses, students are ranked on a scale with six levels. These levels are *comfortably low test anxiety* (scores of 1.0 to 1.9), *normal or average test anxiety* (scores of 2.0 to 2.5), *high normal test anxiety* (scores of 2.5 to 2.9), *moderately high* (scores of 3.0 to 3.4), *high test anxiety* (scores of 3.5 to 3.9), and *extremely high test anxiety* (scores of 4.0 to 5.0).

Abbreviated Math Anxiety Scale Re-Worded for Social Science (AMAS-SS) and the Abbreviated Math Anxiety Scale (AMAS ; Hopko, Mahadevan, Bare, & Hunt, 2003). We created the social science version of the AMAS by substituting “social science” for math references across questions on the AMAS. Collectively, these scales assess how test anxiety affects students in specific areas- social science and math respectively. Each scale contains nine questions scored on a Likert-type scale from one through five (1= “not at all anxious”; 5=“very much anxious”). Students’ scores were totaled and higher scores indicated a higher level of test anxiety.

Marlowe-Crowne Social Desirability Scale (MCSD; Crowne & Marlowe, 1960). This scale has 33 true/false questions that assesses how concerned students are regarding social approval. Students' responses were recorded and then scored. Items 3, 5, 6, 9, 10, 11, 12, 14, 15, 19, 22, 23, 28, 30, and 32 were reversed scored. If students answered *true* on the remaining items they gained another point. Based on their scores, students can be classified as low (0-8), average (9-19), or high scorers (20-33).

Two Narrative-Form Writing Exercises. In two separate tasks, students wrote out, in narrative form, how test anxiety *affected* them and how they *coped* with test anxiety. We asked students to write for 10 minutes on each of these topics. These narratives were analyzed by a computer program to measure rates of anxiety-related words.

Ratings of Test Anxiety *Before* and *During* an Exam. Following completion of the narratives, students completed two questionnaires dealing with coping techniques. The first list had 32 questions regarding how students cope with test anxiety *before* taking an exam. The second list had 28 questions regarding how students cope with test anxiety *during* an exam. Students answered both how frequently they used a given coping technique and how helpful the technique generally is for them regarding lowering test anxiety. Responses to both versions of these questionnaires were on a Likert-type scale ranging from one to five. Responses for the frequency questions ranged from 1=never to 5=always. Responses on the helpfulness questions ranged from 1=not at all helpful to 5=always helpful.

Difficulties in Emotional Regulation scale (DERS; Gratz, K. L., Roemer, L., 2004). The DERS scale assesses how students deal with emotional regulation through 36 questions scored on a Likert-type scale from 1= "almost never" to 5= "almost always". Items 1, 2, 6, 7, 8, 10, 17, 20, 22, 24 and 34 were reversed scored. Scores were then summed for a total score. Higher totals

indicate that students have more problems with emotional regulation. Although not used in the present study, the DERS can be divided into six subscales. These include: *nonacceptance of emotional responses*; *difficulty engaging in goal-directed behavior*; *impulse control difficulties*; *lack of emotional awareness*; *limited access to emotion regulation strategies*; and, *lack of emotional clarity*.

Metacognitive Awareness Inventory (MAI; Schraw, G., Dennison, R. S., 2004); This scale assesses students' understanding about their cognitions as well as regulation of their cognitions. There are 52 "true" or "false" questions. Total scale score reflects the sum of *true* responses with higher scores equaling better ability to regulate cognition. Although not used in the present study, the two subsets can be broken down into smaller topics. Questions are broken into two smaller subsets: *knowledge about cognition* and *regulation of cognition*. Further, the *knowledge about cognition* subset can be broken down into *declarative knowledge*, *procedural knowledge*, and *conditional knowledge*. The *regulation of cognition* subset can be broken down into *planning*, *information management strategies*, *comprehension management*, *debugging strategies*, and *evaluation*.

Procedure

Students completed the scales and the written narratives as part of a take-home assignment. Students completed their questionnaire booklet at their own pace. We explicitly instructed students to spend 10 minutes on each written narrative exercise. We estimated that it would take students about 60 minutes to complete the entire booklet.

The study was announced in individual classes by a member of the research team. We used a standardized script to announce the study. Interested participants were given a consent form and a booklet and asked to return it within one week. Students were instructed to drop off

their booklets and consent forms in a pre-designated office. Students could earn extra credit points for their participation (the amount varied by instructor). Participants' data was coded with an assigned research number. Data was then entered, double checked, re-entered, and analyzed. Staff personnel within the OSU Lima records office provided Dr. Green with students' academic information and he coded this information into our data file. He then scrambled the research numbers, along with the organization of the data file, so that research assistants could not match a particular student to the data.

Results

Gender differences on self-reported test anxiety levels. A multivariate analysis of variance (MANOVA) conducted between gender and our various anxiety scales revealed that, on average, women tended to report higher levels of test anxiety than males (see table 2). As you can see from Table 2, women reported higher levels of test anxiety on the GAD-7, BFNES, WTAS, AMAS-SS, and the AMAS. We did not find any significant mean difference for gender on the MCSD, MAI, or DERS.

Frequency and helpfulness ratings. We conducted separate MANOVAs on the frequency and helpfulness ratings of test anxiety coping strategies before an exam (32 items) and after an exam (28 items). Given the number of dependent variables within these analyses, we used a Bonferroni correction and adopted a critical value of $p < .001$. We found some gender-related differences on the frequency of using certain coping methods. For example, women reported that they were more likely than men to do the following *before* an exam: take deep breaths, look at notes, talk about material related to exam, and think that others are stressed (see table 3). Women also rated taking deep breaths, talking about the material related to the exam, and thinking that others are stressed *before* taking an exam as being more *helpful* than men (see table

4). Across the frequency questions about experiences and coping strategies *during* and exam, we found that women were more likely to expect the worst, think others were stressed, and solved the easiest problems/questions first. Men, on the other hand, reported using more humor and thinking of a favorite song as ways to cope with test anxiety *during* an exam (see table 5). A few ratings on how helpful the various strategies were for lowering test anxiety *during* an exam also differed by gender. Whereas women gave higher helpfulness ratings for solving the easiest problems first, men reported that using humor and thinking of a favorite song helped more than women. Not surprisingly, participants ratings on how helpful a particular coping method was tended to reflect how often they used that method. Table 7 lists the top 5 coping by gender according to frequency and helpfulness ratings.

Anxiety levels by major area (STEM vs. non-STEM). Using the DHS 2017 list of STEM majors, we classified the following majors as falling under the umbrella term, STEM: Biology, animal science/zoology, engineering (all types), computer science, architecture, psychology, radiologic sciences, and chemistry. All other majors were coded as non-STEM. Within our sample, 100 students were majoring in STEM areas and 128 were in non-STEM areas. We conducted two separate MANOVAs (one for each gender) on social desirability, emotional regulation, cognitive regulation, and our test anxiety measures by STEM vs. non-STEM majors. Among our male participants, those in STEM majors reported being relatively more concerned about social approval on the Marlow-Crowne Scale of Social Desirability than those in non-stem majors. Male STEM majors also reported less difficulty with emotional regulation on the DERS compared to male participants in non-STEM majors (see table 8). Among our female participants, STEM majors reported greater test anxiety levels on the GAD-7, relative to non-

STEM majors. Similarly, female STEM majors reported experiencing higher test anxiety levels relative to non-STEM majors on the Westside scale (see table 9).

Correlations across our various measures. We generated a number of Pearson-Product Moment Correlations across our various measures (see Table 10). Not surprisingly, our different measures of test anxiety correlated with one another. Collectively, our measures of test anxiety negatively correlated with the ability to regulate cognitions (as measured by the MAI). For example, correlations between GAD-7, WTAS, ABMAS-SS, and the ABMAS and the MAI was ranged from $r=-.13$ to $r=-.26$. As expected, scores on the DERS (difficulty regulating emotions) and the MAI (ability to regulate cognitions) correlated (i.e., $r=-.37$). Scores on the DERS positively correlated with our five measures of test anxiety: the GAD-7, BFNES, WTAS, ABMAS, and ABMAS-SS. This means that test anxiety is associated with greater difficulty regulating emotions. Both the DERS and the MAI correlated with social desirability ratings.

Inconsistent with our predictions, self-reported test anxiety levels did not correlate with students' rank. Not surprisingly, we found a positive correlation between high school GPA and college GPA ($r=.42$). We also found a positive correlation between a student's composite ACT score and college GPA ($r=.46$). As we predicted, students' college GPA correlated with test anxiety scores and their high school GPA. The correlation between the student's current cumulative GPA and high school GPA was $r=.42$. Correlations between students' cumulative GPA and scores on the GAD-7, WTAS, ABMAS-SS, and the ABMAS ranged from $r=-.15$ to $r=-.39$. We did not find significant correlations between cumulative GPA and scores on the BFNES, MCSD, and MAI. There was a correlation of $r=-.17$ between the DERS and cumulative GPA, meaning that students with higher grade point averages reported less difficulty regulating their emotions.

Written narratives. We found that women wrote longer narratives, and tended to use more negative emotional words when describing how test anxiety affects them and how they cope with test anxiety. Although not addressed in this paper, we plan to conduct a qualitative analysis on the content of these written narratives to further illuminate coping strategies for test anxiety among men and women.

Discussion

Prior research (Lotz & Sparfeldt, 2016; Brady, Hard, & Gross, 2017; Fernandez-Castillo & Caurcel, 2015) provided clear evidence that test anxiety is an issue faced by students on large college campuses. Our data – obtained from a relatively small, regional campus consisting of a larger proportion of non-traditional college students - suggests that test anxiety is not restricted to large college campuses. We believe that test anxiety is an important concern to many students and that it is critical to study it. Counseling services centers on college campuses are aimed at helping students cope with the challenges experienced throughout the university and we think that our findings might be helpful to broadening awareness and the discussion about the impact of test anxiety and how to effectively deal with it.

Consistent with prior research, we found that women had higher levels of test anxiety than men. It is important to note, however, that these results could be due to the fact that women are more willing to admit to having anxiety, rather than necessarily reflecting a true sex-based difference. The social stigma of suffering from any mental health problem may differentially affect men and women, and perhaps male students might be less willing to disclose that they suffer from test anxiety relative to female students. The fact that women wrote more and used more negative-emotional words in their narratives may reflect this willingness to more easily admit to anxiety relative to men. Of course, there very well may be a true sex-linked difference

here as well. Future research will need to more carefully examine this issue before we can say with confidence that the prevalence of test anxiety is greater among women than men.

We found that men and women employed somewhat different coping strategies to cope with their test anxiety, and generated somewhat different ratings of helpfulness. While there certainly are likely to be individual differences in terms of what strategies are most helpful to reduce test anxiety, it is also likely that some strategies are likely more helpful than others generally. Being able to educate students as to what strategies are most likely effective and which ones are less likely effective generally speaking, and *why* this is the case, might prove beneficial for those suffering from test anxiety. Knowing that test anxiety impairs performance and that building emotional resources (e.g., action oriented coping responses) can lessen the impact of test anxiety on exam performance is useful information. Our data about the various methods used by students might also be helpful in a wider discussion about test anxiety and how to cope with it. These discussions might be led by campus counselors, professors, and other staff personnel.

Researchers at Cornell University have defined emotional regulation as, “a person’s ability to effectively manage and respond to an emotional experience” (Rolston & Lloyd-Richardson, n.d.). Consistent with this idea, we found that students who had higher rates of test anxiety had more difficulty in engaging in successful emotional regulation (as measured by the DERS). Future research should try and investigate whether rates of test anxiety cause emotional-regulation problems, or emotional-regulation problems lead to high rates of test-anxiety, or if it is an endless cycle between the two. Either way, it is clear that coping skills aimed at increasing emotional regulation could help students better cope with their test anxiety. This information can also aid in developing plans in counseling centers and within the classrooms.

The Oxford dictionary defined cognitions as, “the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses” (Oxford, 2018). Our results indicated that students high in test anxiety had a greater difficulty in regulating their cognitions (as measured by the MAI). In regards to testing, cognitions involve a broad category of information. Cognitions include students’ knowledge of the material, knowing how to apply it to the exam, knowledge about what strategies work best and how to implement them, and understanding what went wrong in an exam and how to improve in the future. In essence, we suspect that students high test anxiety encounter a great number of challenges when taking an exam. Extrapolating from our findings, we think that students that are supported to develop greater cognitive flexibility and to tolerate negative thoughts without becoming overwhelmed by them might do better when dealing with test anxiety and fears about not performing well. Similar to developing greater emotional regulation skills, cognitive-behavioral therapy tries to teach cognitive abilities and expand mental resources (e.g., using logical, fact-based reasoning versus emotional reasoning) to help people cope with negative thoughts and feelings. We think that programs or therapies designed to help students avoid the pitfalls of emotional reasoning and catastrophic thinking might be useful when dealing with test anxiety.

Our results regarding STEM vs. non-STEM majors was interesting, yet not easy to interpret. For example, women in STEM majors reported higher anxiety levels than women in non-STEM majors on a couple of our measures. We also found that male STEM majors are better at regulating their emotions (according to self-reported scores on the DERS). Male STEM majors also scored higher on the Marlow-Crowne Scale of Social Desirability than their non-STEM counterparts. It could be the case that women in STEM programs face greater pressure to perform academically, perhaps because they are pursuing a major that historically has not

been open to women or socially acceptable for them to pursue. However, we are reminded that extrapolating from correlational data should be done with caution as additional unexplored variables might affect the relation between the variables of interest. More work is needed to more fully tease out how students pursuing different majors might differentially experience test anxiety.

Not surprisingly, we found that success in high school (as measured by GPA, ACT) is a relatively good indicator of success in the university setting. Our findings that higher high school GPA resulted in lower test-anxiety scores (as measured by our various scales) are important pieces of evidence that can help universities tease out and help identify what students may experience the most test anxiety. If universities can pinpoint students who are most at risk for having higher rates of test anxiety, intervention programs may be able to teach them successful coping skills. This, in turn, could affect a university's retention rates.

In sum, our study provided a great amount of data that helps us better understand how test anxiety manifests itself and how students cope with test anxiety. Our research can be useful to professors, campus counselors, and future researchers. Our research also nicely supports some of the existing research on test anxiety. However, as we previously noted, our finding that women suffer from test anxiety more often and more intensely than men could reflect a reporting bias (as is perhaps the case with STEM vs. non-STEM majors). That is, perhaps women are more likely to admit to test anxiety symptoms more so than men. Still, our results were consistent with previous research showing that female college students endorse more test-anxiety symptoms on these types of scales. A larger and more diverse sample would have allowed us to explore whether test anxiety varies by racial identity or individual majors. Future research might employ an experimental design (versus a correlational design) that could help shed more light on

differences between men and women and STEM and non-STEM majors in terms of the frequency of test anxiety and the implementation of various coping strategies.

Table 1: Most Frequently Reported Test-Anxiety-Provoking Stimuli in Ascending Order (Numan & Hasan, 2017).

1.	Waiting for the question paper
2.	Lengthy exam paper
3.	Night before exam
4.	Poor preparation
5.	Less time for preparation
6.	Lengthy syllabus
7.	Day before exam
8.	Incomplete or poor exam paper
9.	Difficult exam paper
10.	Date sheet displayed
11.	Going for exam
12.	Forget material during exam
13.	Performance pressure
14.	Exam morning
15.	Strict environment of exam hall
16.	Consecutive exam papers
17.	Few minutes before exam
18.	Fear of poor results
19.	Question paper in hand
20.	No cheating while taking exam
21.	Better preparation of other students
22.	Attempting exam paper

Table 2: Scores on Test Anxiety Measures by Gender

Measure	Females (SD)	Males (SD)	P
MCSD Total	15.37 (.46)	15.96 (.61)	.437
MAI Total	36.25 (.70)	37.45 (.93)	.345
GAD7 Total	9.69 (.46)	7.08 (.60)	.001
BFNES Total	32.47 (.56)	28.83 (.74)	.000
WTAS Total	3.06 (.07)	2.54 (.10)	.000
AMAS-SS Total	23.49 (.56)	19.02 (.74)	.000
AMAS Total	25.83 (.68)	21.52 (.90)	.000
DERS Total	92.90 (2.08)	85.17 (2.75)	.026

Table 3: Differences in Coping Strategy by Gender

Before Frequency	Females (SD)	Males (SD)	<i>F</i>	<i>p</i>
Deep Breaths	3.74 (1.21)	3.13 (1.43)	11.95	.001
Look at Notes	4.68 (.58)	4.19 (.95)	23.51	.000
Talk Related	3.59 (.90)	3.12 (1.08)	12.77	.000
Think Others are Stressed	3.12 (1.35)	2.33 (1.28)	18.65	.000

Table 4: Differences in Coping Strategy by Gender

Before Helpfulness	Females (SD)	Males (SD)	<i>F</i>	<i>p</i>
Deep Breaths	3.61 (1.20)	3.12 (1.36)	7.95	.005
Talk Related	3.73 (.91)	3.33 (1.09)	8.71	.003
Think Others are Stressed	2.67 (1.31)	2.23 (1.19)	6.49	.012

Table 5: Statistically Significant Differences in Coping Strategy by Gender

During Frequency	Females (SD)	Males (SD)	<i>F</i>	<i>p</i>
Expect the Worst	2.97 (1.18)	2.55 (1.24)	6.16	.014
Use Humor	2.14 (1.20)	2.55 (1.27)	5.87	.016
Think of Favorite Song	1.56 (.90)	1.88 (1.02)	6.06	.015
Think Others are Stressed	2.90 (1.24)	2.40 (1.20)	8.96	.003
Solve Easy First	3.74 (1.07)	3.18 (1.29)	12.33	.001

Table 6: Statistically Significant Differences in Coping Strategy by Gender

During Helpfulness	Females (SD)	Males (SD)	<i>F</i>	<i>p</i>
Use Humor	2.17 (1.25)	2.64 (1.28)	7.43	.007
Think of Favorite Song	1.64 (1.02)	2.06 (1.24)	7.53	.007
Solve Easy First	3.65 (1.09)	3.19 (1.25)	8.25	.004

Table 7: Top 5 Coping Strategies by Gender

	Male (Most Useful)	Female (Most Useful)	Male (Most Frequent)	Female (Most Frequent)
Before	Concentrate on Exam Problems	Concentrate on Exam Problems	Look at Notes	Look at Notes
	Do Not Become Preoccupied by 1 Problem	Solve Easy Problems First	Be Confident in Abilities	Take Deep Breaths
	Be Confident in Abilities	Take Deep Breaths	Imagine Themselves Getting a Good Grade	Be Confident in Abilities
	Take Deep Breaths	Be Confident in Abilities	Take Deep Breaths	Talk about Material Related to Exam
	Solve Easy Problems First	Rest Body and Mind	Talk about Material Related to Exam	Imagine Themselves Getting a Good Grade
During	Look at Notes	Look at Notes	Concentrate on Exam Problems	Concentrate on Exam Problems
	Talk about Material Related to Exam	Talk about Material Related to Exam	Do Not Become Preoccupied by 1 Problem	Solve Easy Problems First
	Be Confident in Abilities	Take Deep Breaths	Be Confident in Abilities	Take Deep Breaths
	Rest Body and Mind	Be Confident in Abilities	Take Deep Breaths	Do Not Become Preoccupied by 1 Problem
	Take Deep Breaths	Rest Body and Mind	Imagine Getting Good Grade	Be Confident in Abilities

Table 8: Major by Gender (Male)

	STEM (SD)	Non-STEM (SD)	<i>F</i>	<i>p</i>
MCSDS	17.24 (5.43)	14.80 (5.25)	4.30	.04
DERS	79.26 (21.28)	89.78 (23.90)	4.40	.04

Table 9: Major by Gender (Female)

	STEM (SD)	Non-STEM (SD)	<i>F</i>	<i>p</i>
GAD-7	11.15 (5.93)	8.64 (5.27)	7.22	.01
WTAS	3.27 (.088)	2.88 (.093)	6.36	.01

Table 10. Correlational Analyses

	GPA	HS GPA	ACT	MCSD Total	MAI total	GAD7 Total	BFNE S	WTAS	ABM AS-SS	ABM AS	DERS
Cum. GPA	1	.42**	.46**	-.21	.62	-.19**	-.10	-.39**	-.20**	-.15**	-.17**
HS GPA	.42**	1	.37**	.00	.14	-.00	.10	-.13	-.01	-.08	.01
ACT Comp	.46**	.37**	1	-.19*	.02	-.13	-.00	.38**	.32**	-.21**	-.46
MCSD	-.02	.00	-.19*	1	.27**	-.17*	-.21**	-.12	-.12	-.08	-.41**
MAI	.06	.14	.02	.27**	1	-.20**	-.10	-.26**	-.16**	-.13*	-.37**
GAD7	-.19**	-.00	-.13	-.17*	-.20**	1	.50**	.66**	.62**	.57**	.61**
BFNE S	-.10	.10	-.00	-.21**	-.10	.50**	1	.43**	.44**	.40**	.48**
WTAS	-.39**	-.13	-.38**	-.12	-.26**	.66**	.43**	1	.71**	.58**	.49**
ABM AS-SS	-.20**	-.01	-.32**	-.12	-.16*	.62**	.44**	.71**	1	.69**	.48**
ABM AS	-.15*	-.08	-.21**	-.08	-.13*	.57**	.40**	.58**	.69**	1	.43**
DERS	-.17**	.01	-.05	-.41**	-.37**	.61**	.48**	.49**	.48**	.43**	1
Rank (self-rep)				.11	.01	.13*	.08	.04	-.09	.02	-.11

Note: *p<.05; **p<.01.

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