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Effects of an Expressive Writing Intervention Aimed at Improving Academic Performance by Reducing Test Anxiety

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Abstract

This study examined the effectiveness of a brief, class-wide, expressive writing intervention aimed at improving academic performance and decreasing test anxiety. This study included 110 students from six undergraduate psychology classes. In the first phase of the study, students completed a trait test anxiety measure and a demographic survey. In the second phase of the study, students completed a pre-intervention state test anxiety measure, responded to a 10-minute writing prompt (expressive or neutral), and completed the same state test anxiety measure, and then were administered an in-class exam. Approximately half the students were randomly assigned to the expressive writing group, and asked to write about their concerns and worries regarding the exam; and the other half assigned to the neutral writing group, and asked to write about how they used their time during the past 24 hours. Contrary to some previous studies (Ramirez & Beilock, 2011; Park, Ramirez & Beilock), this study found no significant group differences between the expressive writing group and the neutral writing group in academic performance or change in test anxiety. This expressive writing intervention was found to be ineffective in improving academic performance and at decreasing test anxiety. Interestingly, the strongest predictor of exam performance was previous exam performance, and test anxiety was a very weak predictor of exam performance. Possible reasons for disparate research findings are discussed.

Keywords: test anxiety, expressive writing, intervention, exam performance, college
EFFECTS OF AN EXPRESSIVE WRITING INTERVENTION AIMED AT
IMPROVING ACADEMIC PERFORMANCE AND REDUCING TEST ANXIETY

by

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B.S., SUNY College at Oneonta, 2012

THESIS

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Effects of an Expressive Writing Intervention Aimed at Improving Academic Performance by Reducing Test Anxiety

“We live in a test-conscious, test-giving culture in which the lives of people are in part determined by their test performance” (Sarason, 1959, p. 26). As early as the 1950’s, test scores have served as a means of determining qualifications or goodness of fit of an applicant for a job or educational program (Sarason, 1959). More recently, there has been a significant push toward standardized testing on a national level as a means of assessing performance of schools and students’ learning outcomes (Nichols, 2007; U.S. Department of Education, 2002). For example, the No Child Left Behind Act (NCLB) of 2002, aimed to improve student performance, curriculum, and pedagogy. This mandate focused on achieving equality of educational opportunities among students by increasing the accountability of teachers and schools. As such, the NCLB required states to measure students’ performance annually in the areas of reading, math, and science (Brickhouse, 2006; U.S. Department of Education, 2002). Unfortunately, one unintentional consequence associated with NCLB is an increased emphasis on testing, resulting in increased pressure on stakeholders, including both students and teachers (Nichols & Berliner, 2007).

Test performance remains pertinent as students seek entry into colleges / universities and compete for scholarships largely based on standardized test scores. The likelihood of being admitted into a higher education setting (e.g., undergraduate and graduate), passing a bar or board exam, and of obtaining professional licensure are all predicated on the quality of one’s test scores (Birenbaum & Nasser, 1994). As such, test performance is an important determinant of students’ post-secondary success and, therefore, has received a great deal of research attention (Bertrams, Englert, Dickhauser & Baumeister, 2013).
The pressure to perform well on exams has often been associated with test-related anxiety (McDonald, 2001). This anxiety is comprised of physiological, behavioral, and cognitive symptoms that are experienced before, during, or after examinations (McDonald, 2001; Putwain, 2008). Additionally, studies have investigated the effects of these symptoms and have found an inverse relationship between levels of anxiety and test performance (Hembree, 1988). Given the potential negative effects of test anxiety on students, researchers have developed interventions to help reduce test anxiety. Studies that were conducted to examine the effectiveness of these interventions and have yielded mixed results, therefore, additional research attention is warranted to clarify these findings (Blank-Spadoni, 2013, Frattaroli, Thomas, & Lyumbomirsky, 2011; Lepore, 1997; Park, Ramirez, & Beilock, 2014; Ramirez & Beilock, 2011).

In this introduction, I will provide a review of the test anxiety literature. First, the various definitions of test anxiety will be provided, and the common elements will be synthesized into a general definition that has been agreed upon by most researchers. After defining test anxiety, I will discuss ways researchers have assessed the number and intensity of test anxiety symptoms. Next, the research documenting the negative effects (e.g., lowered exam scores) of heightened test anxiety on students’ performance will be reviewed, as well as theoretical models that attempt to explain the impact of test anxiety. This introduction will conclude with a review of test anxiety interventions, including a rationale for investigating the effectiveness of an expressive writing intervention aimed at decreasing test anxiety and improving exam performance among college students.

**Definition of Test Anxiety**

Test anxiety is often referenced in the academic testing literature, however, a universally accepted definition is still lacking. Several researchers agree that test anxiety is comprised of
two key elements: worry and emotionality (Bodas & Ollendick, 2005; Hembree, 1988; Hagtvet, Man, & Sharma, 2001; Liebert & Morris, 1967; Tryon, 1980). Generally, symptoms of anxiety are grouped into three categories: cognitive, behavioral, and physiological (Huberty, 2009; Salend, 2011; Zuriff, 1997). Worry is the cognitive component that typically includes concern about one’s performance and the consequences associated with failure (Bodas & Ollendick, 2005; Hagtvet, Man, & Sharma, 2001; Tryon, 1980). Cognitive symptoms include intense feelings of fear, apprehension, intrusive negative thoughts (i.e., “I can’t answer this question,” “I’m going to fail this course”), memory difficulties, attention / concentration difficulties, and task avoidance. Emotionality is the affective component of test anxiety, which includes physiological arousal, unpleasant feelings, and restless behaviors (Bodas & Ollendick, 2005; Hagtvet, Man, & Sharma, 2001; Tryon, 1980). Physiological symptoms include tension, stomach discomfort, rapid heart rate, and nausea, whereas behavioral symptoms include fidgeting, squirming, and tapping; and could be included under either worry or emotionality. Although these symptoms have been identified and referred to frequently by researchers, there still is no operational definition of test anxiety.

Without a formal definition, test anxiety has been conceptualized differently across studies, which has made it difficult to measure consistently let alone obtain an accurate prevalence rate (LeBeau et al., 2010). Hembree (1988) found that at least 20% of college students experience an increased level of discomfort due to their test anxiety, such as experiencing tension or uneasiness before, during, or after a test. More recent estimates of test anxiety have ranged between 10% and 40% of students (Cassady, 2010; Cizek & Burg, 2006; Putwain, 2007). However, the prevalence of test anxiety differs based on sex. A number of studies indicated that females report higher levels of test anxiety than males (Chapell et al., 2005;
DiMaria & DiNuovo, 1990; Hembree, 1988). Despite these apparent sex differences, Seipp (1991) synthesized 126 studies with over 36,000 participants and found that sex was not a moderating factor for the anxiety-performance relationship (mean difference = .03). This finding suggests that males and females are similarly affected by test anxiety in terms of performance.

Although there is a relatively high estimated prevalence rate, there has been considerable debate regarding whether test anxiety should be recognized as a psychological disorder. Zuriff (1997) proposed two criteria required to classify an individual with test anxiety. First, individuals must report higher than average symptoms before, during, or after exams; second, they must have below average exam performance. Specifically, Zuriff conceptualized individuals with high test anxiety as those whose performance was significantly below what was expected based on their knowledge or skill level. For example, a student with high test anxiety who receives straight A’s in classes, scores 900 on her SAT’s and complains of “shutting down” during the test. In this example, Zuriff may consider this as underperformance due largely to test anxiety. However, this is a subjective rather than an empirical determination in that there is no score threshold or symptom severity measure that denotes clinically significant test anxiety.

Currently, the Diagnostic and Statistical Manual-Fifth edition (DSM-5) does not recognize test anxiety as a disorder (American Psychiatric Association, 2013). Some researchers believe that test anxiety is most closely related to the disorder of social phobia (Bogels et al., 2010; McDonald, 2001). McDonald (2001) claimed that test anxiety is similar to social phobia because test anxiety can also be characterized as an individual’s persistent fear of others assessing their performance and potential embarrassment. Over time, these symptoms may become serious enough to develop into an anxiety disorder (Bogels et al., 2010). In addition, test anxiety has been compared to specific phobia (e.g., fear of heights, spiders, etc.) and tests have
been thought to function similarly to a phobic object where individuals experience the same type of anxiety and fear reactions that they would with a specific phobia (LeBeau et al., 2010). Surprisingly, researchers have not devoted much attention to further identifying test anxiety as a type of social anxiety disorder or type of specific phobia. This could be a worthwhile area for future investigation, given that many individuals experience heightened levels of test anxiety and claim to perform below their potential on tests. One could argue that anxiety is “impairing” their ability to access the test, one of the criteria of an anxiety disorder (e.g., performance or social anxiety).

Even though test anxiety is not considered a disorder, clinicians and researchers continue to view it as a valid construct. More specifically, researchers have delineated and tried to measure symptoms that comprise the construct. To date, a number of studies have assessed the degree to which individuals experience test anxiety using a variety of symptom checklists (Cassady & Johnson, 2002; Mandler & Sarason, 1952; Spielberger, Gonzalez, Taylor, Anton, Algaze, Ross & Westberry, 1980; Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1977).

**Assessment of Test Anxiety**

A variety of test anxiety measures have been developed and they have mainly been utilized for research purposes. In this section I will provide a brief overview of the types of measures and highlight the differences in measuring test anxiety. The earliest methods for measuring test anxiety, proposed test anxiety as a unidimensional construct (e.g., Test Anxiety Questionnaire; TAQ; Mandler & Sarason, 1952), focusing solely on an individual’s experience during an exam. Other measures focus solely on the cognitive component of test anxiety (Cognitive Test Anxiety Scale; CTAS; Cassady & Johnson, 2002), whereas some test anxiety
measures assessed two components, worry and emotionality (Test Anxiety Questionnaire; TAI; Spielberger, Gonzalez, Taylor, Anton, Algaze, Ross, & Westberry, 1980).

Some of the most commonly used self-report scales include the TAQ (Mandler & Sarason, 1952), CTAS (Cassidy & Johnson, 2002), and the TAI (Spielberger, Gonzalez, Taylor, Anton, Algaze, Ross, & Westberry, 1980). All of the aforementioned measures have good reliability and limited validity evidence. The CTAS (Cassady and Johnson, 2002) is a 27-item scale that has high internal consistency, $\alpha = .91$, and construct validity evidence was attained by comparing the CTAS to the Reactions to Tests (Sarason, 1984), a previously developed test anxiety scale, and the two scales were found to be significantly correlated (.78) (Cassady & Johnson, 2002). The TAQ (Mandler & Sarason, 1952) is a 37-item rating scale and has good split-half (.91) and test-retest (.82) reliability (Tryon, 1980). Additionally, the TAQ appears to be strongly correlated with the TAI (.82 for males and .83 for females) (Tryon, 1980).

Another self-report measure of test anxiety, the Test Anxiety Inventory (TAI; Spielberger et al., 1980), is particularly well-suited as a brief measure of trait test anxiety and was utilized in this study. The TAI is multidimensional (worry, emotionality), brief (about 5-10 minutes to administer) and has empirical support for the two-factor structure (Everson, Millsap & Rodriguez, 1991). The TAI is a 20-item, standardized self-report measure containing a 4-point Likert scale ranging from 1 (Almost Never) to 4 (Almost Always). Individuals respond to items about whether they experience specific symptoms of anxiety before, during, and after an examination, and then three composite scores are produced: Total (TAI-T), worry (TAI-W) and emotionality (TAI-E). The TAI has been found to have good test-retest reliability for 2-3 week periods ($r = .80$; Spielberger, 1980) as well as having relatively high internal consistency (Cronbach’s alpha = .95) (Croyle, Weimer, & Eisenman, 2012).
The TAI was also found to be a valid measure of test anxiety. TAI-T scale was compared to another test anxiety scale, the Test Anxiety Scale (TAS; Sarason, 1978), and the two scales were found to be highly correlated (.82), suggesting that they were equivocal scales, measuring the same construct. Additionally, construct validity has been evidenced in that the TAI was moderately correlated with the State Trait Anxiety Inventory-Trait Scale (.46) (STAI-Trait; Spielberger & Baker, 1979). There is also a relatively high correlation of the TAI-T scale with the State-Trait Anxiety Inventory (STAI)-State scale (males = .86, females = .77) (Spielberger et al., 1980). Further evidence of concurrent validity of the TAI as a measure comes from the relatively high correlations of the worry (.74) and emotionality (.71) scales of TAI with the Worry and Emotionality Questionnaire (WEQ; Liebert and Morris, 1967).

Although the TAI has demonstrated good reliability and validity, there are a couple weaknesses that should be noted. Since the TAI is a self-report measure, it may be subject to bias. Although previous studies have confirmed the presence of two factors (worry and emotionality), there has been criticism because of the strong overlap between the two factors (Ware, Gallasi, & Dew, 1990). However, researchers have empirically tested the proposed two-factor structure. Everson, Millsap and Rodriguez (1991) examined the factor structure of the TAI as well as whether there were possible sex differences. Everson et al. recruited over 500 participants (219 males and 282 females) from an urban university and their findings were consistent with the two factor structure proposed by Spielberger et al. (1980) and the structure did not vary between the sexes. Everson and colleagues did find that sex played a role in the factor means, females reporting higher levels of worry \( t(499) = 1.94, p < .05 \) and emotionality \( t(499) = -2.51, p < .05 \) compared to males. The TAI is one of the most commonly used measures of test anxiety, often cited in the literature, and has been shown to be a reliable and
valid measure. Across the literature, many studies have assessed test anxiety, and for the most part, have found a negative relationship between test anxiety and test performance; this will be discussed in the following section.

**Negative Impact of Test Anxiety**

Symptoms of anxiety are experienced by everyone, and at times can serve as an adaptive function. Individuals have a sympathetic nervous system that recruits necessary resources when placed in a threatening or dangerous situation (e.g., natural disaster, predator, etc.). This is referred to as flight or fight, and might be advantageous if experienced at certain levels (Curtis & O’Keefe, 2002). Appropriate and intermittent stimulation of the sympathetic nervous system produces immediate improvement in a variety of bodily functions (fatigue, weakness), however, a high level of anxiety is often negatively correlated to academic performance (Curtis & O’Keefe, 2002; Eum & Rice, 2011). Additionally, the Yerkes-Dodson Law (1908) illustrates that some anxiety pertaining to examinations may be beneficial to student performance (Bodas & Ollendick, 2005), however, at this time it is unknown how much anxiety may benefit or harm students’ performance. Furthermore, there are likely individual differences in reactions to experiencing anxiety symptoms. It is likely that certain test contexts might generate high levels of anxiety in some individuals, and not generate high levels of anxiety in other individuals. Additionally, this high level of anxiety that some individuals experience may produce negative effects for some people in some contexts, but clearly does not affect everyone the same across all testing situations. Subsequently, participants in group studies are likely heterogeneous regarding their anxiety level and how they are affected by their anxiety, which may explain why many intervention studies produce moderate treatment effects.
Studies have shown that high levels of test anxiety can impair students’ academic performance (Eum & Rice, 2011; Hembree, 1988; Ramirez & Beilock, 2011; Zeidner, 1998). One such study, conducted by Birenbaum and Nasser (1994), examined characteristics of high school students who scored high on several test anxiety measures. Participants in this study included 431 10th grade students. On the day of their scheduled mathematics test, researchers came into each classroom to administer the test anxiety scales prior to their exam. As typical classroom procedures, students were asked to show all of their work necessary to answer each question. In order to assess participants’ test anxiety, Birenbaum and Nasser used the Reactions to Tests Questionnaire (RTT; Sarason, 1984) as well as the Test Irrelevant Thoughts Scale (Sarason, 1984). Academic performance was measured by students’ performance on a multiplication and division tests consisting of 38-items (Nassar, 1989). The authors conducted a detailed error analysis where they identified “serious” and “non-serious” errors. Serious errors represented a profound misunderstanding of the procedures, and non-serious errors were errors that occurring during the final stages of the problem, suggesting computational errors, rather than a misunderstanding of how to solve the problem. Results from Birenbaum and Nasser’s (1994) study suggested that students who achieved high test scores, and who had high test anxiety, tended to solve fewer complex items correctly and committed more “non-serious errors” compared to low test anxious students who achieved high test scores. Based on their results, Birenbaum and Nasser concluded that there was substantial intra-individual variation among individuals with high levels of test anxiety. The variation of results highlights the heterogeneity of test anxiety and the reactions to it. This also suggests that some individuals are more negatively impacted by experiencing high test anxiety symptoms than others.
Another study investigating the effects of test anxiety on exam performance was conducted by Cassady and Johnson (2002). Their study had two aims: (a) to establish the reliability and validity of a new measure of the cognitive symptoms of test anxiety, and (b) to examine the relationship between students’ test anxiety and several individual variables, including performance on classroom exams. The Reactions to Tests questionnaire (RTT; Sarason, 1984), a previously established measure, was used to assess the validity of the authors’ new measure, the Cognitive Test Anxiety Scale (CTAS; Cassady & Johnson, 2002). Cassady and Johnson recruited 168 undergraduates from a large university. Several days before the students’ in-class examinations, students completed the two anxiety measures in addition to the Test Procrastination Questionnaire, and a demographic survey. Students also were asked to report their Scholastic Aptitude Test (SAT) scores. Cassady and Johnson then examined the CTAS scores and divided students into high (top 33%) and low (bottom 33%) test anxiety groups. Results indicated that SAT performance was inversely related to scores on anxiety measures, such that individuals who reported higher levels of test anxiety reported lower SAT scores $F(4, 212) = 3.97, p < .01$. Cassady and Johnson concluded that these findings represented a clear disadvantage for individuals who reported high test anxiety. This study was unique in that Cassady and Johnson used an actual classroom examination as a dependent measure; however, their measure of test anxiety was not a situation specific measure since it was administered days before the actual examination, therefore, it may not have been sensitive enough to measure participants’ current level of test anxiety (state test anxiety). Additionally, although Cassady and Johnson found a correlation between test anxiety and test performance, an alternative explanation could be that students who have weaker academic skills also have higher test anxiety.
and it could be possible that their poorer performance could be due to a lack of skills rather than anxiety.

In a more recent study, Eum and Rice (2011) investigated the relationship between cognitive test anxiety, perfectionism, and goal orientation in relation to academic performance. Participants included 134 undergraduate students recruited from psychology courses at a large public university. Participants completed self-report questionnaires, including the Cognitive Test Anxiety Scale (CTAS; Cassady & Johnson, 2011), and a word list recall task, the Rey Auditory-Verbal Learning Test (RAVLT; Spreen & Strauss, 1991), which served as a measure of academic performance. Results from this study indicated a modest, inverse correlation between cognitive test anxiety and academic performance ($r = -.18$). Specifically, they found that the higher test-anxious students performed lower on the recall tasks and had lower grade point averages. Overall, these results suggest that students with high test anxiety perform less well than students with low test anxiety. However, there are limitations to this study, in particular, the authors assessed test anxiety generally (i.e., not state test anxiety), and they used neuropsychological tests (RAVLT) rather than classroom exams. This may not be as representative of students’ test anxiety in the natural environment (i.e., students taking an in-class exam where their performance yields consequences).

Another more recent study investigating the negative effects of test anxiety examined the specific factors contributing to test anxiety (Segool, von der Embse, Mata, & Gallant, 2014). Participants in this study included 1,248 11th grade students from 6 high schools in the Midwest (48.6% male, 51.4% female). Students completed a questionnaire which included questions about their self-efficacy, school climate, perceived test importance, and demographic information. Additionally, researchers obtained their state test scores as well as measured
students test anxiety using the FRIEDBEN Test Anxiety Scale (FBTAS; Friedman & Bendas-Jacob, 1997). One week prior to their scheduled state tests, researchers administered all study questionnaires.

This study investigated the utility of a cognitive-behavioral framework to better understand the factors contributing to students experiencing test anxiety. Segool and colleagues proposed a four factor model of test anxiety that included: (1) cognitive perceptions (e.g., self-efficacy), (2) learning experiences (e.g., academic achievement), (3) demographic characteristics (e.g., gender), and (4) social context (e.g., climate or states of the test). Segool et al. hypothesized that contingencies (e.g., importance, career goals) directly impact test anxiety, however, they did not find contingencies to have an impact on one’s expression of test anxiety. Segool et al.’s study has helped to better identify and understand the components effecting individuals with test anxiety, however, more studies are necessary to fully understand the contributing factors and negative effects of test anxiety. This study highlights the heterogeneity in students’ reactions to test anxiety and the numerous factors that likely play a role in the degree to which test anxiety impacts students’ performance. These aforementioned studies suggest that test anxiety is likely experienced differently by each individual, multiple factors contribute to one’s experience of test anxiety, and that the degree to which test anxiety interferes with functioning also varies from one student to another.

Theories Explaining Test Anxiety

Test anxiety appears to be a construct that has measureable symptoms (e.g., physiological, cognitive, emotional, behavioral, etc.) and these symptoms can impact students functioning in various domains (e.g., academic, social, occupational). Researchers have attempted to understand the reasons why test anxiety can impair performance, and several
perspectives or theories have been proposed; however, there has been limited empirical evidence to support these theories. Some theories hold that test anxious students experience worry and this worry causes cognitive interference and/or a division of cognitive resources. Whereas other theories suggest that test anxious students are deficient in their knowledge or skills, which is why they underperform on exams. Several of the most recognized theories include: the deficit model, conservation of resources theory, processing efficiency theory, and the attentional control theory.

**Deficit theory.** The deficit model presumes that low test performance is a result of students’ deficient knowledge of the material coupled with awareness of their inadequate knowledge (Musch & Broder, 1999; Paulman & Kennelly, 1984). Musch and Broader (1999) explained that students with high test anxiety are ineffective in learning test material during the acquisition stage of learning, rather than having difficulty retrieving the material during the exam. This suggests that the material was not successfully learned or retained and that students may not be utilizing efficient study skills. In addition to poor study skills, Paulman and Kennelly (1984) found that poor test taking skills also contribute to processing deficits and self-regulated anxiety by itself seems to signal lowered cognitive effectiveness when task demands are high.

Findings from Benjamin, McKeachie, Lin, and Holinger’s (1981) study provided further support for the deficit model. Highly-anxious individuals in the study shared a number of negative symptoms including: performing poorly on take home exams, difficulty learning material throughout the course, trouble identifying important aspects of text, and superficial encoding of information. High test anxious individuals had difficulties in a wide range of tasks may imply that they have an inadequate knowledge of the subject, as opposed to difficulty retrieving the information due to anxiety. More recently, Cassady (2004) also found support for the deficit model, in that even in low-anxiety producing situations (i.e., homework assignments),
students’ academic performance does not improve, suggesting more of a skill deficit since highly test anxious individuals generally do not improve their performance in non-evaluative situations. However, it is important to note that in opposition to the deficit model, Hembree’s meta-analysis indicated that less stressful situations can benefit highly test anxious students. In particular, students with high test anxiety demonstrated enhanced performance under lower stress conditions (i.e., low-stress instructions, memory support, background music, and minimal distractions), suggesting that their anxiety, was not likely a skill deficit, that was causing a decrement in performance (Hembree, 1988). It appears that the perceived stress of a test situation interacts or modulates their test anxiety and either interferes with performance in high stress situations and / or does not interfere with performance in low stress situations. Overall, there is very limited empirical research to support the deficit model of test anxiety; this theory has not been fully evaluated and currently there is not substantive evidence to support this theory.

Conservation of Resources theory. Hobfoll (1989) originally described the basic tenets of the conservation of resources theory. He explained that individuals often work to protect themselves, especially when they are in threatening situations by safeguarding their resources, and, therefore, their attention is directed toward themselves rather than the exam. Buchwald (2010) identified four general categories of the conservation of resources theory that includes: objects, conditions, energies, and personal resources. Buchwald described that our primary motivation during a testing situation is to use the resources available to best protect ourselves and the social bonds that support us. He explains that the anxiety experienced before and during an examination can become so excessive that it hinders an individual’s ability to prepare properly and perform effectively. Specifically, during an exam some individuals experience a
decrease in self-confidence, which likely leads to lowered performance. This loss is often exacerbated with the increased pressure to perform well, combined with a lack of self-efficacy. Conservation of resources theory proposes that the depletion of cognitive and emotional resources affects not only exam performance but also preparation for the exam. Similar to the deficit theory, the conservation of resources theory lacks empirical support.

**Processing Efficiency Theory.** Eysenck and Calvo (1992) proposed another theory of test anxiety, the processing efficiency theory, which suggests that there is a relationship between the effectiveness of performance (e.g., accuracy and quality) and the resources spent working on the task. The processing efficiency theory argues that when individuals with high trait anxiety are faced with a stressful situation, their state anxiety and worry related symptoms would increase (Hadwin, Brogan, & Stevenson, 2005). The increase in worry related symptoms would then result in a decrease in the availability of cognitive resources required to complete various tasks (i.e., exams). Eysenck and Calvo (1992) also explained that these worrisome thoughts tend to consume the limited storage and resources of working memory, which in turn, lessens the capacity for processing information adequately and responding to test items. Specifically, these worrisome thoughts appear to result in additional processing activities (i.e., dividing attention, inhibiting negative thoughts) that must be carried out by the central executive in addition to the demands imposed by the examination itself. A limitation of the processing efficiency theory is that it does not identify the way that anxiety affects working memory. Subsequent research has resulted in a better understanding of the ways in which anxiety effects individual’s working memory and revisions to the processing efficiency have been made and referred to as the attentional control theory.
**Attentional Control Theory.** Owens, Stevenson, Hadwin and Norgate (2012) built upon the processing efficiency theory in their development of the attentional control theory. Both the processing efficiency theory and the attentional control theory assume that anxiety impairs the efficiency of the central executive component of the working memory system (Derakshan & Eysenck, 2009). Owens et al. proposed that high levels of anxiety negatively affect an individual’s performance on cognitive tasks, especially for tests demanding high levels of cognitive resources. The attentional control theory proposes that anxiety disrupts working memory processes which often lead to lowered cognitive performance and reduced efficiency in processing information, especially on more complex tasks. Additionally, the attentional control theory is supported by the notion that anxiety disrupts the functioning of goal-directed attention resulting in various effects including: reduced ability to inhibit responses, increased susceptibility to distraction, and impaired task-switching performance (Eysenck et al., 2007).

Darvishadeh, Aguilar-Vafaie and Moradi (2012) sought to empirically test the attentional control theory among graduate students who were asked to complete tasks of attention since they hypothesized that high anxiety individuals in comparison to low anxiety students will demonstrate less ability to inhibit dominant responses as well as difficulty in changing their mental set, specifically, this study utilized the were using the Emotional Stroop Test (ETS; Neshat-Doost, Taghavi, Moradi, Yule & Dalgeleish, 1997) and the Wisconsin Sorting Card Test (WSCT; Grant & Berg, ). Darvishadeh and colleagues study included 40 female graduate students with a mean age of 27 years. From this, they found that participants with high anxiety had more difficulty inhibiting their responses as well as switching processing efficiency. This study provides preliminary support for the attentional control theory in that it provides evidence for the linear relationship between anxiety and attentional bias, resulting in higher interference in
inhibitory and switching executive functions. There is clearly a lack of studies that empirically test the attentional control theory, and this remains an area for future research.

Overall the majority and most recent theories suggest that there is a cognitive component to test anxiety. For individuals with higher test anxiety, there may be a lack of resources or difficulty processing information, which could negatively impact exam performance. These aforementioned theories have attempted to explain how test anxiety works, however, there continues to be insufficient empirical research to evaluate these theories. Future studies should seek to better understand the underlying mechanisms that for some individuals have an impact on exam performance. Although there is a lack of research on the validity of these theories, there has been considerable research attention devoted to developing and evaluating interventions that aid individuals who are negatively affected by test anxiety.

**Test Anxiety Interventions**

Interventions to reduce test anxiety have been an important consideration in test anxiety research. Since there are different ways of conceptualizing the underlying mechanisms of test anxiety, there have been a variety of interventions developed to treat test anxiety. Additionally, there is a lack of consensus in terms of the scientific theory of test anxiety as well as acceptance of test anxiety as a disorder; however, there continues to be much effort by researchers and practitioners to develop interventions to help individuals with test anxiety. Early interventions focused on reducing physiological arousal using behavioral techniques; whereas, more recent work has placed a greater focus on cognitive and academic interventions (Ergene, 2003). Hembree (1988) conducted a meta-analysis that examined 137 test anxiety treatment studies in the areas of behavioral, cognitive-behavioral, pseudo-therapy, and facilitated (e.g., systematic desensitization) treatments. In 78% of the studies, individuals receiving interventions for test
anxiety demonstrated higher test scores compared to pre-treatment. In general, there was a negative correlation between test anxiety and test performance, however, certain interventions were more closely related to ameliorating specific components of test anxiety. In particular, behavioral interventions were aimed at reducing the emotionality component, whereas the cognitive treatments attempted to alleviate the worry component. Hembree concluded that individuals with high test anxiety who participated in the cognitive and behavioral treatments, demonstrated improved performance, comparable to participants who had low test anxiety and who did not receive treatment.

Similarly, Ergene (2003) conducted a meta-analysis to examine the effectiveness of test anxiety interventions between 1990 and 1998. Ergene included 56 empirical test anxiety reduction studies \((N = 2,482)\) with participants ranging in age from 10 years to 32 years \((M = 18.86)\). The interventions in Ergene’s meta-analysis included: behavioral, cognitive, cognitive-behavioral, skill-focused, cognitive and skill-focused, and Gestalt techniques. Across these studies, Ergene found an overall mean effect size of 0.65 (range, 0.58 to 0.73). Further, his results indicated that 74% of individuals demonstrated stronger performance on tests compared to the individuals in the control or neutral groups. Ergene found the most effective interventions in reducing test anxiety were those that used cognitive restructuring \((d = 1.11)\) (all effect sizes in this manuscript report Cohen’s \(d\)), and those that combined both cognitive (e.g., cognitive restructuring, rational emotive therapy) and skill-focused (study skills training, test-taking skills training) components for treatment \((d = 1.07)\). Moreover, large effect sizes were associated with interventions that did not go beyond six sessions \((d = 0.91)\), suggesting briefer interventions may be ideal since they are both effective and efficient treatment options. Additionally, Ergene found that interventions that used both individual and group formats produced a large effect size \((d = \)
whereas interventions that only used a group format produced a moderate effect size \((d = 0.60)\), and the individual format produced small effect sizes \((d = 0.34)\). Ergene suggested that students in group therapy likely benefit because they can learn about other students’ perceptions and alternative solutions to solving problems. This allows students to see that they are not alone and that others experience similar problems, and they can gain therapeutic benefit from as well as a reduction in anxiety.

Hembree’s (1988) and Ergene’s (2003) meta-analyses have added to the evidence supporting the efficacy of test anxiety interventions. As for the interventions that were shown to be effective, they tended to focus on the cognitive component, worry, and reducing the interferences this likely has on students’ performance on tests. In general, these studies suggest that the psychological treatment of test anxiety has been fairly effective in reducing participant’s level of symptoms. Interestingly, the interventions that had greatest effect sizes are those that have a cognitive or cognitive behavioral component in addition to a skills component. Additionally, the length of the interventions also appeared to play a role in that the interventions that were relatively brief, were more effective than the longer treatments. Overall, cognitive-focused, group interventions have been effective in mitigating the symptoms of test anxiety. One such intervention, expressive writing, appears to be ideally suited to an academic setting, and was chosen as the focus of the current study.

**Expressive Writing Interventions for Test Anxiety**

Expressive writing is a technique that was formally developed in the 1980’s and requires individuals to write about their experiences, feelings, and / or thoughts (Pennebaker, 1997). This treatment technique has been applied to a variety of psychological problems (e.g., anxiety, depression, stress, loss) with varying degrees of success (Pennebaker, 1997). There are several
expressive writing intervention studies that are pertinent to the current study and worthy of more detailed analysis; they will be reviewed in chronological order. The studies conducted between 1997 and 2011 on test anxiety did not pertain to expressive writing and therefore did not warrant review in this document.

The first, conducted by Lepore (1997), investigated the effects of an expressive writing on intrusive thoughts and depressive symptoms. Participants included 44 males and 30 females, who were on average 22 years old. Participants were mainly students enrolled in a 4-year institution and were scheduled to take one of the following exams: Medical College Admissions Test (MCAT), Graduate Record Examination (GRE), Law School Admissions Test (LSAT), Graduate Management Admissions Test (GMAT) or the National Council Licensing Exam (NCLEX). Several measures were administered over the course of three structured telephone interviews which occurred: one month before the exam, three days before the exam, and one week following the exam. During each of the interviews, researchers assessed participants’ depressive symptoms with a 13-item depressive symptom subscale of the SCL-90-R (Derogatis, 1983), along with their intrusive thoughts about the examination using 10-items from both the Impact of Events Scale (IES; Horowitz, Wilner & Alvarez, 1979) and the Intrusive Thoughts Scale (Lepore, Silver, Wortman & Wayment, 1996). Additionally, participants presented to the laboratory to take part in a writing assignment approximately ten days before their exam. When in the laboratory, participants were each provided a private, comfortable room with a low level of lighting and then were provided with either an expressive or the neutral writing prompt and instructed to write for 25 minutes.

Lepore (1997) instructed participants in the expressive writing group to write about their feelings about the exam, the effect of the exam on their life, and the implications of the exam on
their future goals. He instructed the neutral writing participants to write in detail about the activities they took part in during the past 24 hours and not to mention their feelings, emotions, or opinions; their descriptions were intended to be as objective as possible. Results from this manipulation indicated that individuals in the expressive writing group experienced less psychological distress regarding the approaching examination as the exam date approached, as evidenced by their scores on the IES (Horowitz, Wilner, & Alvarez, 1979). Based on the results of the depression symptoms scale (SCL-90-R; Derogatis, 1983), Lepore concluded that there were significant group score differences from time one to time two. However, on the intrusive thoughts scale there was no significant interaction between the writing group and the intrusive thoughts over time. Results suggested that the individuals who were able to express their feelings and thoughts related to their examination, were better protected from the impact of their intrusive thoughts. Although intrusive thoughts were not significantly lessened, the reported impacts of the intrusive thoughts were lessened.

Lepore’s (1997) study was interesting in that he found expressive writing to reduce depressive symptoms and not intrusive thoughts. He suggested that expressive writing might offset the negative emotional reactions that students have toward examinations. A shortcoming of this study is that Lepore did not assess the effect of the manipulation on exam performance or test anxiety level. Although participants in the expressive writing group seemed to experience lower levels of distress, Lepore was unable to determine whether experiencing less distress also correlated with better exam performance or decreased anxiety.

In another type of intervention study, Frattaroli, Thomas and Lyubomirsky (2011) investigated the effects of an expressive writing intervention for students who were preparing to take graduate school entrance exams. Specifically, Frattaroli et al. examined whether
“experimental disclosure” (i.e., expressive writing) could improve exam performance. Participants included 104 undergraduate students from the University of California, 70% of which were female and the average age of the participants was 20 years, and they were scheduled to take one of the following: GRE General, GRE subject, MCAT, LSAT, or PCAT. The authors hypothesized that experimental disclosure would help participants decrease their maladaptive thoughts and improve their ability to regulate emotions by gaining insight into their problems. Frattaroli et al. had two main research aims. First, they investigated whether exam performance could be improved by using expressive writing shortly before taking a graduate school examination (e.g., Graduate Record Examination (GRE), Medical College Admissions Test (MCAT), Law School Admissions Test (LSAT) or Pharmacy College Admissions Test (PCAT)). Second, they examined whether expressive writing could reduce participants’ symptoms of test anxiety and depression.

Frattaroli et al. (2011) hypothesized that individuals in the expressive writing group would demonstrate increased examination performance and that both depression and anxiety would act as mediators between expressive writing and test performance. Participants engaged in a baseline interview (17-40 days before exam), an in-person interview (3-15 days before exam), and had previously taken an undergraduate entrance exam (i.e., SAT or ACT). Experimenters interviewed participants three times via telephone, the first was approximately 27 days before their exam (Time 1). During each telephone interview, the researchers assessed symptoms of depression, intrusive thoughts, and cognitive test anxiety. To assess these psychological factors Frattaroli and colleagues used a seven-item Depression subscale of the General Health Questionnaire (Goldberg & Hillier, 1979), a ten-item scale for intrusive thoughts (Lepore, 1997), and a 27-item cognitive test anxiety measure (Cassady & Johnson, 2002).
Following the first telephone interview, participants were brought into the laboratory, on average nine days before their exam, and were randomly assigned to a writing group (expressive writing prompt). Participants were asked to write for 30 minutes about both their thoughts and feelings regarding to their upcoming exam (expressive prompt) or about the activities that they took part in for the past 24 hours (neutral prompt). A second phone interview was conducted about three days prior to their exam (Time 2). The last telephone interview (Time 3) was conducted about eight days after the examination. All interviews measured participants’ symptoms of depression, intrusive thoughts, and cognitive test anxiety.

Results from Frattaroli et al.’s (2011) study suggest that individuals who wrote about their feelings and anxiety to the upcoming exam performed better than individuals who simply wrote about what they had done in the past 24 hours. Specifically, for the MCAT and LSAT, neutral writers’ performances were in the 46th and 24th percentiles respectively compared to the expressive writing individuals who performed in the 58th and 43rd percentiles, respectively. However, in Frattaroli et al.’s study, they did not find that individuals in the expressive writing group to have lowered anxiety levels. This could have been due to the lack of sensitivity of the test anxiety measure, or that engaging in a writing intervention a week before the exam did not reduce test anxiety level at the time of the exam. One of the limitations of this study was that the anxiety measure was a trait anxiety scale, indicating one’s general level of anxiety, not necessarily the level of anxiety in the specific situation. Therefore, this measure may not have been sensitive enough to detect incremental changes in anxiety levels or in a specific circumstance, such as a test. Another limitation was that there may have been inadequate power to detect group differences due to low sample size.
A further study, Ramirez and Beilock (2011) examined the effects of an expressive writing intervention on a mathematics examination for college and high school students. They conducted two similar experiments, the first, with a sample of college students and the second, with high school students. In the first study, college students were administered the mathematics examination serving as a baseline measure, and were told to do their best work. The math exam was comprised of modular arithmetic questions, which the researchers choose because it is based on “common mathematical procedures” and that most students had not been exposed to, therefore making it a novel task. After the participants took the first mathematics examination, the same participants were then presented with a “high pressure” scenario based on what Ramirez and Beilock considered being common pressures (i.e., monetary incentives to represent scholarships, peer and social pressure to represent teacher and peer judgments based on performance). Following this anxiety manipulation, half of the participants were randomly assigned to either sit quietly (control group) or to write about their fears or anxiety pertaining to the upcoming examination (expressive writing group) for ten minutes before being administered a second modular arithmetic examination.

Results from this study revealed that participants in the expressive writing group outperformed the control group. That is, on average, participants in the expressive writing group performed significantly better than those in the control group, $d = 2.48$. However, the authors were concerned that writing in general may improve exam performance; therefore to assess whether this was the case, Ramirez and Beilock conducted a second experiment, with a slightly different population and created three groups: expressive writing, neutral writing, and a control group.
The second experiment followed the same method except that there were three groups of students: control, expressive writing, and an additional group of students who were provided with a neutral writing prompt. Results from this experiment demonstrated that the expressive writing group on average, showed a 4% gain in accuracy, $d = 0.47$, compared to both the control and neutral groups which showed a 7% decrease in accuracy, $d = 0.17$. The authors suggested the decrease in accuracy was due to the high pressure scenario that participants encountered. They claimed that participants who received the expressive writing intervention did not demonstrate decreases in performance due to the increased pressure. However, for the participants who did not receive the expressive writing intervention, their overall performance was lower. Ramirez and Beilock’s findings suggested that using this expressive writing intervention, participants’ exam performance improved significantly which they suggested was likely due to a decrease in participants’ test anxiety, however, they did not measure this. It is also important to note that when Ramirez and Beilock replicated the study using actual classroom exams, the effect size dropped from 2.47 to 0.47.

Blank-Spadoni (2013) replicated and extended the work of Ramirez and Bielock by examining whether expressive writing would improve exam performance and whether expressive writing would also reduce test anxiety. Specifically, Blank-Spadoni applied a similar brief expressive writing intervention to two populations prior to their midterm or final exam. The first sample of students included 1st and 2nd year dental hygiene students and the second sample was comprised of non-dental hygiene undergraduate students. Blank-Spadoni assessed students’ change in anxiety by administering Marteau and Bekker’s (1992) short form of the State-Trait Anxiety Inventory before and after the intervention. Contrary to the author’s initial hypotheses, only in the sample of dental hygiene students were state test anxiety levels lower during post-
intervention among individuals in the expressive group. When examined as a whole, Blank-Spadoni found that, across participants, there were no statistically significant group differences in the reduction of state anxiety pre- and post-intervention. Additionally, results indicated that there was no significant interaction between condition and exam performance even when controlling for previous exam score as a covariate.

Most recently, Park, Ramirez, and Beilock (2014) conducted an analogue study of the effects of a shorter period of expressive writing on improving exam performance. For this study, Park et al. randomly assigned half of the participants to either a 7-minute expressive writing condition or to a control condition in which participants were required to sit quietly for 7 minutes prior to taking a mathematics exam. They found that highly anxious participants performed significantly worse compared to participants with low anxiety. However, when the high test anxious participants were provided the expressive writing intervention prior to the test administration, their performance was not significantly worse than the low anxious participants. This suggests that expressive writing may be an effective means to improving exam performance for highly test anxious students.

Summary

Previous research indicates that test anxiety has been a longstanding and ongoing concern for many individuals. Additionally, it has become evident that if test anxiety is experienced at a heightened level, it can, and often does affect students’ test performance. Several theories suggest that test anxiety is accompanied by worry, which causes cognitive interference and / or a division of cognitive resources that negatively affects test performance. Researchers who are interested in test anxiety continue to develop treatment techniques in order to mitigate the negative effects of test anxiety and a variety of those interventions have been demonstrated to be
moderately effective. More recently researchers have demonstrated some positive results from expressive writing interventions, with regard to improved test performance; however, less is known about the effects on test anxiety. Although writing intervention studies have demonstrated some positive effects, the methods and samples have varied and the robustness of results have ranged from minimal to very large. As such, there is a need for replication and clarification of these intervention studies. It is also important to establish whether expressive writing actually reduces test anxiety.

**Purpose of the Present Study**

This study was designed to examine whether writing about test related anxiety immediately prior to taking an examination would both decrease test anxiety and improve test performance. Expressive writing, as used in the current study, was intended to improve test performance, presumably by mitigating cognitive worry or interference that student’s likely experience during exams and therefore making cognitive resources more available during the exam. The primary research hypotheses were informed by previous research and cognitive-focused theories that predict expressive writing will reduce anxiety and free up cognitive resources that should improve test performance. The primary research hypotheses were:

1. Expressive writing prior to taking an exam will significantly decrease students’ test anxiety, while neutral writing will have no effect on students’ test anxiety.

2. Expressive writing prior to taking an exam will significantly improve students’ exam performance, while neutral writing will have no effect on students’ exam performance.

In addition to answering the primary research hypotheses, two relationships that pertained to the internal and external validity of the study were examined. In line with previous literature, a moderate positive correlation was expected between the state test anxiety measure (SRAS-1)
created for this study and the well-established measure of trait test anxiety (TAI-T). In addition, based on previous research findings (Hembree, 1988), it was hypothesized that there would be a moderate yet significant negative correlation between test anxiety and exam performance (TAI and Baseline Exam). A hierarchal multiple regression analysis was also conducted to examine the extent to which certain variables (sex, TAI-T, SRAS-D, baseline exam, and writing condition) predict target exam performance.

Method

Participants

Approval from the university’s Institutional Review Board (IRB) was obtained prior to data collection. Participants (n = 110) were recruited from six undergraduate psychology courses at a large, private university in the Northeast United States. The majority of the students enrolled in these classes were juniors or seniors and 65% female. Six classes were necessary to obtain sufficient power to detect a moderate effect size (see Table 1). Participants were enrolled in either: Foundations of Human Behavior (PSY 205), Brain and Behavior (PSY 323), Psychology of Children (335), Health Psychology (382), Behavioral Analysis in Children (PSY 432) or Behavior Disorders in Children (PSY 445).

Classes were selected based on the instructors’ willingness to allow this study to take place in their classrooms. For all classes, instructors administered several exams throughout the semester that accounted for a majority of students’ course grade. Classes ranged in size from 5 to 60, and most students were psychology majors. All students in a class were given the opportunity to participate in this study; students received credit towards their course grade upon completion. Some students took their classroom exams in a private setting, and some took
make-up exams, while some students chose not to participate in the study. Approximately 20% of students enrolled in the classes did not participate in the study for one reason or another.

Within each class, participants were randomly assigned to either the control group or the intervention group. Analyses indicated that there were no significant differences across the classes on sex distribution, GPA, and writing (e.g., number of total words written and number of anxiety related sentences), therefore, the six classes were merged into one sample, consisting of one treatment and one neutral group for all analyses.

A total of 110 undergraduate students participated in the study, including 53 in the expressive writing group and 57 in the neutral writing group. There were four participants who dropped out of the study due to absence from class during the day of the target exam. A power analysis was performed using G*Power 3.1.5 (Faul, Erdfelder, Lang & Buchner, 2007) and indicated that in order to have a power of .80, the total participant pool would have to include at least 102 participants (51 per group) to detect moderate effects ($d = 0.50$).

Demographic data revealed that the racial and ethnic composition of the sample was 62.7% ($n = 69$) Caucasian, 11.8% ($n = 13$) Asian, 8.2% African American ($n = 9$), 5.5% ($n = 6$) Hispanic, 0.9% ($n = 1$) Native American, 5% ($n = 5$) Other, and 6.4% ($n = 7$) endorsed two or more races. Participants included in the study were asked to report whether they had any psychological diagnoses and 23.6% ($n = 26$) of participants endorsed having some type of psychological diagnosis (anxiety disorder, ADHD, depression, learning disability, and / or other psychological disorder). The mean GPA from the sample was 3.2 and the mean age was 20.86.

**Measures**

**Classroom Examinations.** All participants included in this study agreed to have their baseline and the target classroom examination scores disclosed to the researchers. All classroom
examinations were comprised of multiple-choice questions and short essay questions. Examinations were scored based on each instructor’s rubric and scores were provided to the researcher in the form of a percentage (0% - 100%). Two exam scores were obtained from the instructors for each participant. Baseline exam scores were the first exam that semester in the class and were used as an indicator of the participant’s general test performance. The target exam was the exam immediately following the intervention and scores were used as an outcome measure in order to determine the effectiveness of the expressive writing intervention.

**Demographic Questionnaire.** All participants were asked to complete a demographic questionnaire. Participants provided information about their age, sex, ethnicity, GPA, year in college, and any previous psychological or medical diagnoses. This information was used to describe the sample and examine group similarity. As this was a college student study (ages 18-25), one participant (age 60) was removed from the study.

**Test Anxiety Inventory (TAI; Spielberger et al., 1980).** The Test Anxiety Inventory (TAI) is a 20-item standardized, self-report inventory measuring individual differences in test anxiety. Each item asks how frequently participants experience specific symptoms of test anxiety before, during, and after examinations (e.g., “During tests I find myself thinking about the consequences of failing”). Items employ a 4-point Likert scale with the following options: almost never, sometimes, often and almost always. The TAI produces three scores: Total (TAI-T), Worry (TAI-W) and Emotionality (TAI-E). The TAI has been found to have good test-retest reliability for 2-3 week periods ($r = .80$; Spielberger et al., 1980). According to Custodero (2013), the TAI has adequate validity as judged by strong correlations to established anxiety measures. The TAI-T was compared to Sarason’s (1978) Test Anxiety Scale (TAS), Liebert and Morris’s (1967) Worry and Emotionality Questionnaire (WEQ) and Spielberger et al.’s (1983)
State Trait Anxiety Inventory (STAI). Correlations between these measures ranged from .61 to .69, suggesting that there is a relationship between the measures and that they are likely measuring the same construct. In addition, each TAI subscale (e.g., total, worry, and emotionality) correlated more highly with the subscale intended to measure the same aspect of test anxiety on the WEQ, and this was demonstrated across both genders (Spielberger et al., 1980).

The TAI-T was selected for use in this study. This measure was used to assess participants’ general test anxiety prior to the intervention, in part to determine group equality in terms of their self-reported test anxiety level. Also previous studies have suggested that test anxiety and test performance were inversely correlated. Therefore, the current study examined whether students’ test anxiety scores on the TAI-T were related to their test performance.

**Self-Report Anxiety Scale (SRAS).** Participants were asked to report their current anxiety level pertaining to their upcoming test on a scale of 1-10, 1 being not at all anxious, and 10 being extremely anxious (see Appendix D). This scale was designed to assess participants’ state test anxiety level. Other studies have not assessed participants’ test anxiety levels using a brief, one-item measure, therefore, validity and reliability data are lacking. Previous studies (except Blank-Spadoni, 2013) have not utilized pre- and post-intervention state test anxiety levels to assess for the effectiveness of expressive writing; therefore, it was a unique addition to this area of research. SRAS at time 1 (SRAS-1) was administered immediately before the intervention and again at time 2 (SRAS-2) immediately after the intervention. In order to determine whether the intervention had an effect on test anxiety, and to compare differences between the two groups, a difference score ((SRAS-1) - (SRAS-2) = (SRAS-D)) was computed and used in the regression analysis.
Procedures

Data collection was conducted in two phases and participants were administered all measures in each of their regular classrooms. All procedures were conducted in a group format during scheduled class times. Before researchers went into any of the classrooms, all students had already taken their first exam (Baseline Exam). Phase one occurred one week prior to their target exam. During phase one, students were provided information about the study and what participation entails. All questions participants had about the study were answered prior to their participation. Following consent, participants completed the TAI and demographic questionnaire, which took approximately ten minutes.

Phase two occurred on the day of the target exam for each class. Participants were handed a packet that included the measures and instructions. The order of activities was as follows: (a) record test anxiety level (SRAS-1), (b) write for 10 minutes in response to a prompt (neutral writing or expressive writing), (c) record post-writing test anxiety level (SRAS-2). Researchers collected the student packets and left the classroom prior to administration of the target exam. Instructors scored all exams and provided an excel file to the researcher that contained the students’ research identification number and test scores.

Experimental Design and Analytic Plan

To examine the effects of expressive writing on academic performance, this study implemented an expressive writing intervention in six undergraduate psychology classes. Using a random number generator, all eligible student participants were randomly assigned to either the neutral writing group or the expressive writing group. The independent variable in this study was the writing prompt to which participants were assigned. The key outcome variables were: SRAS, and Exam scores (Baseline and Target). In addition, I measured trait test anxiety (TAI-T)
to examine general test anxiety of each group prior to the intervention, and to examine its relationship to the SRAS. Performance on the first exam was used as a baseline measure to compare to target exam performance. Before the target exam, participants were administered the SRAS-1, followed by a writing task (either the expressive writing intervention or neutral writing task) and then the SRAS-2. The pre-and post-measures of state test anxiety were obtained in order to determine the effect of the intervention on students’ test anxiety.

To address the first research hypothesis, whether expressive writing will decrease test anxiety, a 2 Group [Expressive vs. Neutral] X 2 Anxiety measurement [SRAS-1 vs. SRAS-2] repeated measures ANOVA was conducted to examine changes in reported test anxiety (SRAS) from time 1 to time 2. An interaction was predicted such that only the expressive writing group would decrease in test anxiety and the neutral writing group would remain the same. To address the second research question, whether expressive writing will improve academic performance, a 2 Group [Expressive vs. Neutral] X 2 Exam Conditions [Baseline vs. Target] repeated measures analysis of variance (ANOVA) was conducted to examine changes in academic performance from Baseline to Target Exam. A group by exam condition interaction was predicted. Specifically, individuals in the expressive writing group were expected to demonstrate an increase in their exam performance from baseline to target, whereas academic performance for individuals in the neutral writing group was expected not to change.

Additional correlation analyses were conducted in order to examine the relationships between all variables, especially those pairs of interest. Then hierarchical multiple regression was used to assess the ability of group to predict target exam performance after controlling for the influence of sex, anxiety (trait and state), and baseline exam performance. In particular I was interested in the degree to which these specific variables predicted exam performance.
Results

Distribution of Data

All data were entered into a SPSS 21 (SPSS Inc., 2012) file and inspected for outliers, resulting in the removal of one participant (about 40 years older than the mean age of the sample). Following the data inspection, the data were examined for violations of the assumptions of normality. The assumptions of ANOVA are normal distribution, independence of observations, linearity, and homogeneity of variance. To assess the distribution of normality, skew and kurtosis were examined for the dependent variables (target exam performance, state test anxiety-scores (SRAS-1, SRAS-2, SRAS-D) and trait test anxiety (TAI-T)). All variables were found to be normally distributed according to examination of Q/Q plots. The kurtosis of the target exam, state test anxiety difference and trait test anxiety were -.32, -.16, and .80, respectively, and the skewness was -.34, 1.87, and .38, respectively. Data were considered normal if skewness and kurtosis were found to be within the range of -1.0 to +1.0. Based on these analyses, SRAS-D was not considered to be normally distributed; therefore, a natural log transformation was employed to the SRAS-D score. After the transformation, kurtosis was -.61 and skewness was .60.

Procedural Integrity

In order to assess the extent to which procedures were reliably completed, a procedural script (see Appendix F) was completed for all data collection sessions. There were a total of 12 experimental sessions, 6 of which were observed by a trained research assistant and rated for integrity. Procedural integrity was calculated by totaling the number of steps followed correctly divided by the total number of steps and then multiplied by 100. Phase 1 contained 6 steps and
Phase 2 contained 11 steps, across 6 sessions (3 from each phase), and they were followed correctly 93.6% (range, 91% to 100%) of the time.

**Manipulation Check**

Prior to data analysis, a manipulation check was conducted to determine whether participants demonstrated an understanding of, and compliance with, the writing prompt instructions (see Table 2). If the writing prompt was successful, it was hypothesized that the participants in the expressive writing group would write more sentences about their anxieties and worries. Each writing sample was scored for the total number of sentences written, the number of the sentences that contained anxiety related words (e.g., worried, nervous, etc.) and the number of sentences that contained non-anxiety related words. Participants in the expressive writing group wrote on average 11.27 (SD = 4.63) sentences and 3.85 (SD = 2.34) anxiety related sentences compared to participants in the neutral writing group who wrote on average 14.70 (SD = 4.64) sentences and .33 (SD = .95) anxiety related sentences.

For each participant, a percentage score was calculated to determine the number of sentences written about anxiety compared to the total number of sentences written. The mean percentage of anxiety related sentences written for the expressive writing group was 38.38% (SD = 22.30) as compared to the neutral writing group, which was 2.29% (SD = 7.98). Next, an independent samples t-test was conducted to compare the percentage of anxiety related sentences between the expressive and neutral groups t (104) = 11.23, p = .01. These results indicated that the manipulation was effective, meaning that participants in the expressive writing group wrote a significantly higher percentage of anxiety-related sentences and that the intervention influenced the emotional content of the essays.
Demographic Analyses

Demographic data were analyzed to examine for group differences on the following variables: age, GPA, and sex. Means and standard deviations were calculated for each variable (see Table 3 and Table 4). The participants in the expressive writing group had a mean age of 21.09 years old ($SD = 1.71$) and 66% were female. The average reported GPA for the expressive writing participants was 3.31 ($SD = .42$). Participants in the neutral writing group were on average 20.65 years old ($SD = 1.30$) and 73.7% female. The reported GPA of participants in the neutral writing group was a mean of 3.34 ($SD = .44$). Group comparisons indicated that there were no significant group differences regarding GPA, $t(107) = -.34, p = .74$ or Age, $t(108) = 1.54, p = .13$. Further analyses indicated no significant differences between the two groups regarding sex distribution $\chi^2 (1, N = 110) = .53, p = .47$ (see Table 3).

Descriptive Analyses

Assuming the groups are equivalent due to the randomization process, groups should have similar scores on the three variables not influenced by the writing intervention: trait test anxiety (TAI-T), baseline exam performance (Exam 1) and state test anxiety (SRAS-1) (see Table 4). On the TAI-T, participants in the expressive writing group had a mean score of 40.02 ($SD = 1.57$) and the neutral writing group had a mean score of 38.95 ($SD = 11.30$). An independent samples t-test indicated that there was no significant difference between the two groups on the TAI-T, $t (107) = .46, p = .65$. Mean exam scores (Baseline) were 78.34% ($SD = 13.82$) for the expressive writing group and 80.12% ($SD = 10.33$) for the neutral writing group. An independent samples t-test was conducted to compare differences between the two groups on their baseline exam performance and there was no significant difference found, $t (104) = -.76, p = .45$. With regard to pre-intervention test anxiety level (SRAS-1), the expressive writing group
had an average state test anxiety level of 5.43 ($SD = 2.26$) and the neutral writing group had an average state test anxiety level of 5.51 ($SD = 2.20$). An independent samples t-test was conducted and did not find significant group differences on the SRAS-1, $t (102) = -.18$, $p = .86$. In summary, these analyses demonstrated that the expressive writing and neutral writing groups were comparable regarding state test anxiety, trait test anxiety and baseline exam performance.

**Hypothesis 1**

The first hypothesis of interest predicted that only participants in the expressive writing group would show a reduction in test anxiety. It was hypothesized that only participants assigned to the expressive writing intervention would report a decrease in state test anxiety as measured by a change from SRAS-1 to SRAS-2. A Repeated Measures ANOVA was used in order to assess whether there was a statistically significant group difference on the SRAS variable. Mean SRAS went from 5.42 to 5.28 for the expressive writing group (see Table 4). Results indicated that there was no significant group by test anxiety interaction $F (1, 102) = .80$, $p = .37$ on the SRAS. Additionally, there were no main effects for the group on SRAS 1, $F (1, 102) = .03$, $p = .86$, or on SRAS 2, $F (1, 106) = .12$, $p = .71$. Contrary to hypotheses, results indicated that the expressive writing intervention did not have an impact on participants’ state test anxiety.

**Hypothesis 2**

The second hypothesis predicted that participants in the expressive writing group would demonstrate superior performance on the target exam as compared to participants in the neutral writing group. A Repeated Measures ANOVA was used to assess exam performance (Baseline, Target) differences as a function of group (expressive or neutral). Mean exam scores went from 78.34 to 76.61 (see Table 4). Results indicated that there were no significant group by exam
condition interaction, $F(1,104) = 0.01, p = .99$. Additionally, there were no main effects for the group’s exam performance, baseline exam $F(1, 106) = .57, p = .45$ or target exam, $F(1, 106) = .58, p = .45$. Suggesting that the intervention did not improve exam performance.

**Exploratory Analyses**

In addition to the primary hypotheses of this study, I was interested in two exploratory research questions. The first addressed the extent to which state test anxiety (SRAS-1) and trait test anxiety (TAI-T) were related. A correlational analysis (see Table 5) across all of the participants revealed that state test anxiety level, as measured by the SRAS-1, was significantly correlated to trait test anxiety, as measured by the TAI-T ($r = .48, p < .01$). These results provided preliminary support for the validity of SRAS as a measure of test anxiety. Another secondary research question was whether there was a relationship between test anxiety and test performance. A correlation analysis showed a significant inverse relationship between trait test anxiety (TAI-T) and test performance (Baseline), $r = -.27, p < .01$. This demonstrated that as test anxiety increased, test scores tended to decrease. Additionally, there was a significant negative correlation between TAI-T and the target exam $r = -.20$, suggesting that higher trait test anxiety is related to lower exam performance, in accordance with previous findings.

Hierarchical multiple regression was used to predict Target exam performance after controlling for sex, trait anxiety, change in test anxiety, and Baseline exam performance. Results are detailed in Table 6. Sex, TAI-T and SRAS-D were entered in Step 1, explaining 4.7% of the variance reported in Target Exam performance. Next, Baseline Exam was entered in Step 2, and the total variance explained by the model as a whole was 36.8%. Finally, in Step 3, group was entered, and the total variance explained by the model as a whole was 36.8%, indicating that group did not account for any additional variance in the Target Exam. Overall, the model was
found to be statistically significant, $F (4, 103) = 14.53, p < .01$. The only significant predictor in the model was baseline exam, which accounted for 32.1% with a standardized beta weight of .60. None of the other predictors contributed a significant amount of variance. In other words, exam performance was not significantly influenced by sex, trait test anxiety (TAI-T) or change in test anxiety (SRAS-D).

**Discussion**

It was hypothesized that the students who received an expressive writing intervention would demonstrate a greater decrease in test anxiety and an increase in exam performance compared to the students in the neutral writing group. Contrary to the hypotheses, participants in the expressive writing group did not report a decrease in test anxiety or an improvement in exam performance. As expected, results from the exploratory analyses, revealed a moderate correlation between state (SRAS-1) and trait (TAI-T) test anxiety and a significant inverse correlation between TAI-T and exam performance. The results from this study will be discussed in the context of other studies using expressive writing to reduce test anxiety.

**Effects of Expressive Writing on Test Anxiety**

Previous research has indicated that higher test anxiety is associated with lowered exam performance, and researchers have suggested expressive writing as an intervention to decrease test anxiety, and improve exam performance. To the best of my knowledge, there have only been two prior studies (Blank-Spadoni, 2013; Frattaroli et al., 2011) that have examined the effects of expressive writing on test anxiety before and after the expressive writing intervention; unfortunately, other studies in this area have not assessed participants’ test anxiety.

Contrary to predictions that expressive writing would decrease test anxiety, two other studies in addition to the current study, did not find expressive writing to decrease test anxiety.
One such study by Fattaroli et al. (2011) found that expressive writing did not reduce test anxiety; however, they have admittedly provided several possible explanations accounting for their null findings. Frattaroli et al. suggested that their measures of test anxiety may not have been sensitive enough to detect slight changes in participants’ anxiety, since they were using a trait measure of test anxiety with a high test-retest reliability (very stable). Additionally, they assessed participants’ test anxiety via phone about eight days after the exam, when students were removed from the testing situation, and may not report heightened levels of test anxiety. By contrast, the current study assessed participants’ state test anxiety immediately before and after the expressive writing intervention and also did not find any decrease in test anxiety. Although the methodology of the current study and Frattaroli’s were largely different, both studies produced very similar findings.

Another study by Blank-Spadoni (2013) also did not find significant differences in state test anxiety across participants before and after an expressive writing intervention. Blank-Spadoni’s study was very similar in methodology to the current study; the main difference being the measure of state test anxiety scale. While the current study measured participants’ state test anxiety by creating a very brief, one item scale, Blank-Spadoni measured state test anxiety using a slightly longer, six item scale. Nonetheless, both studies found no change in test anxiety as a function of expressive writing.

All existing research examining the effect of an expressive writing intervention on reducing test anxiety, including the present results, have reported non-significant intervention effects. However, the limited number of studies precludes conclusion that expressive writing interventions have no impact on test anxiety. It is possible that the students in these studies may not have been highly anxious, and / or that the test anxiety measures were not acutely sensitive to
changes in anxiety. Two of these studies were classroom focused, measuring test anxiety immediately before and after the intervention preceding a unit exam. These exams perhaps did not evoke as much anxiety as a final exam or a high-stakes exam. Although participants in Frattaroli et al.’s study did take high-stakes exams, their test anxiety was not measured until eight days after the exam. If the participants’ anxiety were high, such as in a group of individuals with anxiety disorders, expressive writing may have been effective. Additionally, expressive writing may be the kind of intervention that is effective for some individuals but not everyone. Of course, the remaining conclusion is that expressive writing, especially writing about one’s worries, does not reduce test anxiety, at least not in this population.

Effects of Expressive Writing on Exam Performance

Previous studies examining the effectiveness of expressive writing on exam performance have demonstrated mixed results ranging from no effectiveness to astoundingly positive results. The current study is aligned with other research that did not find a significant improvement in exam performance. To date, there have been several empirical studies examining the effectiveness of expressive writing to improve exam performance, and a majority of them have been conducted by Beilock and colleagues (see Table 7). As can be seen in Table 7, results from these studies have varied greatly; however, all but one study has yielded small to no effects. The cohort of studies has included brief, expressive writing interventions across a variety of populations from high school through to graduate school, and across various content areas including, mathematics, biology, dental hygiene and multi-content high-stakes exams (e.g., graduate school entrance exams).

The current study hypothesized that students who participated in the expressive writing task prior to their examination, would demonstrate superior exam performance compared to
students who participated in the neutral writing task. Results from the current study did not provide support for this hypothesis, as students who participated in the expressive writing did not perform significantly better than students who participated in the neutral writing. Test scores from both groups were essentially identical for the baseline exam and on the target exam.

The study that provides the greatest contrast in findings from all other studies is the initial Ramirez and Beilock (2011) laboratory study, which reported results 5 to 10 times greater than the other studies. Their initial laboratory study demonstrated a very large effect \(d = 2.48\), followed by studies that generated modest effects. Interestingly, other independent researchers have not been able to replicate this strong effect. Their results were so strong that some critics said the findings seemed almost too good to be true. Clearly, the results of the current study are vastly different from those of Ramirez and Beilock (2011), despite the interventions being very similar as well as participants submitting similar writing content.

In both Ramirez and Beilock’s studies and the current study, the expressive writing group also wrote a significantly greater proportion of their sentences expressing negative thoughts and worries compared to the neutral writing group. When the proportion of worry-related sentences was taken into account in Ramirez and Beilock’s study, the writing group (expressive, neutral) by test (pre, post) interaction was significant; however, the current study did not find the interaction to be significant. Ramirez and Beilock demonstrated that a short, 10-minute expressive writing exercise was able to reduce the negative consequences (e.g., lowered exam performance) associated with test anxiety / testing situations. Similar to Ramirez and Beilock’s (2011) second study, Frattaroli et al. (2011) also found expressive writing to be slightly effective in improving examination performance. By contrast, the current study results were in line with
Lepore (1997) and Blank Spadoni (2013), who also found little to no effect of an expressive writing intervention.

An explanation of the differences in results between the current study and the Ramirez and Beilock’s studies may be found in the study designs. Although Ramirez and Beilock’s first studies were similar in design to the current study, several differences were evident. First, Ramirez and Beilock’s first two studies did not use actual classroom exams; rather, undergraduate students were brought into a laboratory, which was a contrived rather than an actual exam situation. Further, Ramirez and Beilock tried to replicate a high-stakes testing situation. Incentives were provided for superior performance to represent scholarships, and participants were video recorded and told that their peers and instructors would be watching, representing peer and teacher pressures. This testing environment was unique for test anxiety research, although other techniques have been used in previous studies to increase participants’ anxiety. This high-pressure plus incentive scenario does not exist in the real classroom situation, and is far different from my study or Blank-Spadoni’s study. Interestingly, once Ramirez and Beilock implemented their intervention in a classroom setting, the effects decreased greatly, suggesting that study design features may explain disparate findings across studies. When the Ramirez and Beilock contrived lab studies are removed from this research base, the remaining classroom-based expressive writing studies show little to no intervention effect. For example, when Ramirez and Beilock implemented the expressive writing intervention in high school classroom settings, they found small effects with students in the expressive writing group only slightly outperforming the neutral writing group, by 6%. In summary, no study found a reduction in test anxiety as a function of expressive writing, and only a couple of studies found
small positive effects on exam performance, while a couple of other studies found no positive
effects at all.

It should be pointed out that most of the studies by Beilock and colleagues focused on
math performance. For example, Park, Ramirez and Beilock (2014), employed an expressive
writing intervention prior to participants taking a math exam in which participants were
randomly assigned to either write for seven minutes or sit quietly for seven minutes prior to
taking an exam. They found that highly anxious participants, when asked to solve math
problems with high working-memory demands, performed significantly worse compared to
participants with low anxiety, but once participants were engaged in the expressive writing
intervention, their performance was no longer significantly different from low anxious
participants. The authors suggested that the expressive writing intervention was an effective way
to improve exam performance among participants with high anxiety. It is possible that by
focusing on the math performance of students with high anxiety scores these researchers found a
combination of factors that can be improved by expressive writing. The current study did not try
to induce anxiety, segregate students by anxiety, or assess math performance.

The focus on math by Park et al. (2014) and Ramirez and Beilock’s (2011) studies
warrants some discussion. One could argue that math problems require participants to hold steps
in their memory while computing each problem (i.e., high working memory demand). Because
expressive writing is thought to decrease cognitive worry and provide more resources that can be
devoted to working memory, it may play a more significant role in math exams. In the present
study, students were enrolled in psychology courses and their exams may simply have required
students to recall facts about what they learned in class, not necessarily requiring problem
solving and the working memory required by it. Thus the differences in the types of exams
between the studies could explain why expressive writing appears to be effective for mathematics, but may not be the case for multiple-choice recognition exams.

Results from the current study were similar to some previous studies that demonstrated small to no intervention effects (Blank-Spadoni, 2013; Frattaroli et al., 2011; Park et al., 2014), and quite dissimilar to the Ramirez and Beilock (2011) findings. This suggests the need for further research to determine if and when expressive writing can be utilized to improve exam performance. There appears to be a large discrepancy between these studies and the Ramirez and Beilock’s (2011) first study, despite all using very similar expressive writing interventions. It is still unclear under what conditions expressive writing may be effective in improving exam performance. However, it does appear that the effectiveness of the intervention may depend on the type of exam employed and the ecology of the examination. As noted above, Beilock and colleagues only used math or science exams, which may rely more on working memory whereas other exams may simply require recalling information. Also, Ramirez and Beilock obtained their strongest effects in contrived lab situations where they provided incentives and induced anxiety. Further, the Ramirez and Bielock findings have not been replicated, whereas several other studies show similar, weak or moderate effects of expressive writing. Taken together, the findings across studies do not provide compelling support for expressive writing interventions in classroom situations. Future research is necessary to better understand the potential benefits of expressive writing for which types of students, under which conditions, and for what types of exams.

**Exploratory Analyses**

While the main analyses sought to specifically examine the effects of an expressive writing intervention on test anxiety and academic performance, exploratory analyses were also
conducted to examine two additional relationships (see Table 5). The first was the extent to which state test anxiety (SRAS-1) and trait test anxiety (TAI-T) were related, and the second was the relationship between test anxiety and test performance. These analyses also served as internal and external validity checks to determine whether the measures were performing as expected.

Regarding the two test anxiety measures, one was a well-established measure (TAI-T) and the other was created for the purposes of this study (SRAS). Since the SRAS was created for the purposes of this study, and had never been used before, there was some concern with the validity and whether it would capture participants’ test anxiety. Consistent with expectations, the SRAS-1 and TAI-T, were found to be moderately correlated ($r = .48$). While both measures were assessing test anxiety, they were intended to measure different accounts of test anxiety. The SRAS was intended to measure individuals’ test anxiety at that particular moment, whereas the TAI-T was used to provide an estimate of test anxiety in general. Similar to the current study, Bank-Spadoni (2013) also found, using different measures, that state and trait test anxiety scores were moderately correlated ($r = .45$). Additionally, the current study found SRAS-1 and SRAS-2 to be moderately correlated ($r = .68$) suggesting that it is somewhat stable, yet likely sensitive to change. These findings provide preliminary support for the SRAS as potential tool for the measurement of situational test anxiety. However, this measure was a one-item attempt to capture test anxiety change after a brief intervention. It appears that the field would benefit from a standardized, reliable and valid measure of state test anxiety.

Another exploratory analysis examined the relationship between test anxiety and test performance. Similar to previous studies, the current study also found higher test anxiety to be associated with lower exam performance. As previously mentioned, Cassady and Johnson
(2002) used a regression analysis to identify effective predictors of exam performance. They found that cognitive test anxiety alone accounts for approximately 8% of the variance in student performance on actual course examination. The current study found that trait test anxiety (TAI-T) accounts for about 3.9% of the variance and state test anxiety (SRAS-1) accounts for 4.2% of the variance in test performance. In the current study, test anxiety accounted for even less variance in exam performance than did the Cassady and Johnson study, suggesting that test anxiety probably plays a minimal role in performance on classroom tests. It is likely that test anxiety has more effect on high stakes tests, and more research is needed on interventions that target high stakes test anxiety.

**Limitations**

As with all studies, there are several methodological aspects of this study that may limit one’s confidence in the findings. One such limitation is inherent to the sample of participants and the degree to which they experienced test anxiety. In the current study, the intervention was implemented prior to the participants taking an exam in one of their courses. These exams may not have evoked much anxiety, especially compared to high stakes exams. If test anxiety was rather minimal in these test situations, there may have been little chance for the intervention to be successful (i.e., produce any measureable change in test anxiety level or performance). Therefore the study’s results could have incorrectly suggested that the expressive writing intervention was not effective in reducing anxiety for students taking classroom exams. However, when comparing participants’ average TAI-T scores in this study (38 out of 80) to those of the normative sample (39.5 out of 80), the average scores are very similar to participants the current study, suggesting that participants in the current study reported average trait test anxiety levels (Spielberger et al., 1980).
A potential limitation in this study is the number of different classes used to draw a sufficient sample of participants. The classes did not significantly differ on variables such as age, sex, TAI and baseline score; however, the statistical comparisons across these classes could have produced null results because some of the class sizes were so small and the analyses were underpowered. Although the data were collapsed across classes, it is possible that differences existed between classes that were not detected. Since anxiety levels could have varied across classes, the effects could be obscured by collapsing the data, I wondered if students with the highest test anxiety scores differed from those with the lowest test anxiety scores. When I compared one-third of the students with the highest TAI scores to the lowest one-third, the pattern of results was still the same. Expressive writing did not have a differential effect on the exam scores for the higher test anxiety group.

Another limitation of the current study involved the students’ motivation to engage in the intervention. Participants may not have put forth much effort on the writing task or taken it seriously. While it appeared as though participants generally were writing for the majority of the intervention period, they were given extra credit regardless of the effort they put forth. Since effort in the study was not assessed, there is no way of accounting for participant’s level of engagement. However, to minimize this limitation, research assistants were walking around the classroom monitoring the students and, when needed, asking them to remove any items not pertaining to the study from their desks (e.g., cell phone, class notes). Overall, the expressive writing manipulation did seem to have some influence on writing, but it did not reduce test anxiety levels in this study.

Also, related to student motivation, since the intervention was implemented in classrooms, there was a limited amount of time (80 minutes) for students to complete both the
study requirements and their exams. Some students expressed concern about having enough
time to complete their exam since the study requirements took about 15-20 minutes to complete.
Further, students often get out of class early on test days since instructors allow them to leave
after completing their exam, suggesting that students may have been motivated to complete the
study quickly in hopes of leaving class earlier. To minimize this concern, instructors informed
students that their exams were designed to take less than an hour to complete and thus they
would have sufficient time to complete both the study and their exam during class time.
Nonetheless, the time pressures may have affected some students in ways not assessed by the
study.

Additionally, in the current study there were threats to external validity. For example, the
students in the current study were recruited from undergraduate psychology courses from one
large, private university in the Northeast and the majority of participants were female.
Therefore, the results of this study may not be representative of the general college population.
Moreover, previous studies have implemented similar expressive writing interventions with a
variety of students, including dental hygiene and biology majors as well as with high school
students. It is difficult to compare results across studies that vary so much and leave us
wondering if expressive writing is worth trying.

A further limitation of the current study involves factors that contribute to exam
performance. The current study design likely did not take into account all of the confounding
variables that could have contributed to participants’ exam performance. In particular, the
current study did not attempt to measure participants’ working memory, study skills, subject
knowledge or test taking skills, which most likely would have contributed to an individual’s
exam performance. Additionally, there were other factors that may also have played a role in the
participants’ performance such as their experience with the content of the class (e.g., if they were psychology majors). Of the small number of variables included in this study, only baseline exam score was a significant predictor of the target exam (32% variance). As noted in much of the literature on test performance, one of the best predictors of current (or future) performance is past test performance, especially on tests within the same class and semester. What is needed is research to identify variables that account for the rest of the variance (68% in this study) in test performance. It is not likely that test anxiety is a variable of great significance for taking tests in college psychology classes.

While there were threats to both the internal and external validity of the study, some steps were taken to minimize these threats. Additionally, the current study ran smoothly and the researchers did not encounter any major obstacles. Further, the attrition was low, as only four individuals decided not to participate in the second half of the study. It appeared that the internal validity of the study was adequate and the results likely reflect a treatment that was ineffective.

**Directions for Future Research**

The findings and limitations of the current study can be used to inform directions for future research in the treatment of test anxiety. Although some studies have demonstrated the effectiveness of brief, expressive writing interventions, classroom-based intervention studies have produced mixed results. The variety of research methodologies and findings suggest a need for more systematic research on expressive writing as a pre-exam intervention, particularly for students with high levels of test anxiety. There are many unanswered questions before we embrace or give up on expressive writing as an evidence-based treatment. More consistent positive findings are needed before recommending that teachers use expressive writing with their test anxious students.
Previous studies have suggested that expressive writing may work best to decrease test anxiety for individuals who experience high levels of test anxiety. Ramirez and Beilock (2011) demonstrated particularly strong effects in their study when they placed participants in an anxiety provoking situation (high-pressure condition). In the current study it is likely that participants were not experiencing heightened levels of anxiety prior to the intervention, which may be why there were no effects from the intervention. Therefore, future studies might consider an expressive writing intervention that is targeted towards students with high levels of test anxiety. Future studies may want to explore the effects of expressive writing among students with anxiety disorders, since those with high anxiety have been shown in prior studies to benefit more from the expressive writing.

Another direction for future research is to explore writing about other topics prior to the exams. Previous studies have examined the effectiveness of an intervention that had participants thinking about their ‘best possible self’ and they have found a significant increase in levels of optimism (Meevissen, Peters & Alberts, 2011). It seems as though if individuals are asked to take part in an activity that generates cognitive and emotional response incompatible with anxiety, they may experience a decrease in their test anxiety. It is possible, as noted in this study, that writing about one’s worries may not reduce test anxiety concerns. Perhaps, expressive writing tasks that replace anxious thoughts with positive ones may reduce anxiety and pave the road to better test performance.

In addition to the aforementioned areas, future studies should examine the acceptability of the writing intervention by both the students and the instructors. As noted earlier, real classroom exam situations have time constraints and students might not want to use test time for an intervention such as expressive writing. It may be beneficial to obtain information from
students regarding their experience participating in the intervention. In addition to student acceptability, measures of instructors’ acceptability of the intervention in their classrooms may help inform the development of interventions and what interventions are able to be implemented in the classroom. Even if an intervention is shown to be effective, in order for it to be successfully implemented into classrooms, it is important to determine whether instructions would be accepting of the intervention in their classrooms. Further, future studies need to be mindful of the amount time taken away from the exam itself.

**Conclusion**

There have been hundreds of studies in the area of test anxiety, but only a handful have focused on interventions that could be applied in a classroom setting, specifically examining the effects of expressive writing on anxiety and test performance. The results of one such study (Ramirez & Beilock, 2011) were remarkable in reporting an effect size of 2.48. It turned out that these results may have been too good to be true, as subsequent findings have not come close to achieving such positive effects. The current study follows the trend of more recent studies in that it found expressive writing to be rather ineffective in improving exam scores. It appears that expressive writing interventions prior to actual classroom tests do not reduce students’ level of test anxiety and tend not to improve exam performance. It does not appear that expressive writing is a technique that should be applied universally. Moreover, expressive writing may be useful for individuals with high levels of test anxiety, and / or for whom the test outcome has high stakes. However, further research is necessary even to make this claim. Research is also needed to determine whether specific treatment elements, such as reducing worry and freeing cognitive resources, may improve working memory, which in turn may improve performance on exams that have high working memory demands. Currently, it is unclear whether expressive
writing can play a role in reducing test anxiety for some people in some exam circumstances, such that less worry leads to better cognitive and exam performance. It appears that we have a long way to go before endorsing expressive writing as an effective treatment for specific populations under certain conditions.
Table 1

Participant Flow Chart

Total students enrolled in all 6 classes ($n = 144$)

Total Participants ($n = 114$)

Excluded ($n = 4$)
• Due to insufficient data

Randomized ($n = 110$)

Allocated to and received Expressive Writing ($n = 53$)
Class 1: ($n = 9$)
Class 2: ($n = 24$)
Class 3: ($n = 9$)
Class 4: ($n = 4$)
Class 5: ($n = 4$)
Class 6: ($n = 3$)

Allocated to and received Neutral Writing ($n = 57$)
Class 1: ($n = 12$)
Class 2: ($n = 24$)
Class 3: ($n = 8$)
Class 4: ($n = 5$)
Class 5: ($n = 4$)
Class 6: ($n = 4$)
Table 2

*Means for Number of Sentences Written, Anxiety-related Sentences and Non-anxiety Related Sentences*

<table>
<thead>
<tr>
<th></th>
<th>Expressive Writing</th>
<th>Neutral Writing</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sentences</td>
<td>11.26 (4.63)</td>
<td>14.70 (4.64)</td>
<td>-4.76</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Anxiety-related Sentences</td>
<td>3.85 (2.34)</td>
<td>0.33 (0.95)</td>
<td>12.54</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Non-Anxiety-related Sentences</td>
<td>7.42 (4.88)</td>
<td>14.37 (4.78)</td>
<td>-4.76</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Percent of Anxiety-related sentences</td>
<td>38.38 (22.30)</td>
<td>2.29 (7.98)</td>
<td>11.23</td>
<td>&lt; .01</td>
</tr>
</tbody>
</table>

*Note. N = 104. Standard deviations are in the parentheses.*
Table 3

Means and Standard Deviations of Demographic Information

<table>
<thead>
<tr>
<th></th>
<th>Total Sample</th>
<th>Expressive Writing</th>
<th>Neutral Writing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td>Age</td>
<td>20.86 (1.52)</td>
<td>110</td>
<td>21.09 (1.71)</td>
</tr>
<tr>
<td>GPA</td>
<td>3.32 (.43)</td>
<td>109</td>
<td>3.31 (.42)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>χ²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>.53</td>
<td>.47</td>
</tr>
<tr>
<td>Male</td>
<td>32</td>
<td>17</td>
</tr>
<tr>
<td>Female</td>
<td>78</td>
<td>36</td>
</tr>
</tbody>
</table>

Note. N=110. Standard deviations are in the parentheses.
Table 4

*Test Anxiety and Exam Scores*

<table>
<thead>
<tr>
<th>Total Sample</th>
<th>Expressive Writing</th>
<th>Neutral Writing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$n$</td>
</tr>
<tr>
<td>SRAS-1</td>
<td>5.47 (2.22)</td>
<td>104</td>
</tr>
<tr>
<td>SRAS-2</td>
<td>5.16 (2.32)</td>
<td>106</td>
</tr>
<tr>
<td>SRAS-D</td>
<td>2.31 (.19)</td>
<td>104</td>
</tr>
<tr>
<td>TAI-T</td>
<td>39.46 (12.2)</td>
<td>109</td>
</tr>
<tr>
<td>Baseline</td>
<td>79.28 (12.1)</td>
<td>106</td>
</tr>
<tr>
<td>Target</td>
<td>77.53 (11.8)</td>
<td>106</td>
</tr>
</tbody>
</table>

*Note.* N=110. Standard deviations are in the parentheses. SRAS-D was log-transformed.
Table 5

**Correlation Matrix**

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prompt</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Age</td>
<td>-.15</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sex</td>
<td>.07</td>
<td>-.28**</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Year</td>
<td>-.06</td>
<td>.54**</td>
<td>-.32**</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. GPA</td>
<td>.03</td>
<td>-.21*</td>
<td>.10</td>
<td>-.21*</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. TAI-T</td>
<td>-.04</td>
<td>-.09</td>
<td>.32**</td>
<td>-.21*</td>
<td>-.32**</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Baseline</td>
<td>.07</td>
<td>-.22*</td>
<td>.05</td>
<td>-.12</td>
<td>.58**</td>
<td>-.27**</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Target</td>
<td>.07</td>
<td>-.21*</td>
<td>-.02</td>
<td>.01</td>
<td>.45**</td>
<td>-.20*</td>
<td>.62**</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. SRAS-1</td>
<td>.02</td>
<td>-.05</td>
<td>.33**</td>
<td>.23*</td>
<td>-.12</td>
<td>.48**</td>
<td>-.23*</td>
<td>-.20*</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. SRAS-2</td>
<td>-.03</td>
<td>-.01</td>
<td>.29**</td>
<td>.19*</td>
<td>-.05</td>
<td>.47**</td>
<td>-.18</td>
<td>-.21*</td>
<td>.68</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>11. SRAS-D</td>
<td>.10</td>
<td>-.06</td>
<td>.06</td>
<td>-.03</td>
<td>-.09</td>
<td>.01</td>
<td>-.07</td>
<td>-.01</td>
<td>.37**</td>
<td>-.41**</td>
<td>--</td>
</tr>
</tbody>
</table>

*Notes. N = 110. Prompt refers to the group (e.g., Expressive or Neutral writing). Baseline refers to Exam1 and Target refers to the target exam (either Exam 2 or Exam 3). Year refers to how many years they have been in undergrad. TAI-T score is calculated based on participants response to questions on a self-report, Likert-type scale with 1=Almost Never and 4 = Almost Always. Exam scores (Exam 1 and target Exam are based on percent correct on each exam. SRAS is a self-report scale 1 = Not at all anxious 10 = Extremely anxious). SRAS-D is the difference between pre-and post-intervention. SRAS-D was log-transformed. * p < .05. ** p < .01.
Table 6

Hierarchical Multiple Regression Analyses Predicting Target Exam Performance

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>ΔR²</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td>.09</td>
</tr>
<tr>
<td>TAI-T</td>
<td></td>
<td>.10*</td>
</tr>
<tr>
<td>SRAS-D</td>
<td></td>
<td>.02</td>
</tr>
<tr>
<td>Step 2</td>
<td>.37</td>
<td></td>
</tr>
<tr>
<td>Baseline Exam</td>
<td></td>
<td>.08</td>
</tr>
<tr>
<td>Step 3</td>
<td>.37</td>
<td></td>
</tr>
<tr>
<td>Prompt</td>
<td></td>
<td>.02</td>
</tr>
</tbody>
</table>

Note. * p < .05.
### Table 7
Studies Examining the Effectiveness of Expressive Writing to Improve Exam Performance

<table>
<thead>
<tr>
<th>Source</th>
<th>Size (n)</th>
<th>Demographics</th>
<th>Method</th>
<th>Duration</th>
<th>Main Findings</th>
<th>Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lepore (1997)</td>
<td>74</td>
<td>Undergraduate &amp; graduate students</td>
<td>Phone interviews &amp; Lab visit</td>
<td>25 min</td>
<td>Depression scale: significant group differences, F(1,112) = 5.01, p &lt; .05 Intrusive thoughts scale, they did not find a significant interaction F(1,72) = .01.</td>
<td>.52</td>
</tr>
<tr>
<td>Frattaroli, Thomas &amp; Lyumbomirsky (2011)</td>
<td>104</td>
<td>Undergraduate students</td>
<td>Phone interviews &amp; Lab visit</td>
<td>30 min</td>
<td>Expressive writing group scored significantly higher on the exam (M = 50th percentile) compared to neutral writing group (M = 41st percentile), p = .024, r = .25.</td>
<td>.52</td>
</tr>
<tr>
<td>Ramirez &amp; Beilock (2011) Study 1</td>
<td>20</td>
<td>Undergraduate students</td>
<td>Lab visit</td>
<td>10 min</td>
<td>Pretest math performance did not differ between groups t(18) = 1.14, p = 0.27 Posttest math performance, EW performed significantly better than the control group t(18) = 5.55, p &lt; .01.</td>
<td>2.48</td>
</tr>
<tr>
<td>Ramirez &amp; Beilock (2011) Study 2</td>
<td>47</td>
<td>Undergraduate students</td>
<td>Low- and high-pressure scenarios</td>
<td>10 min</td>
<td>Pretest math performance did not differ as a function of groups F.2,44 = .74, p = .48; however this was not true for the posttest F(2,44) = 5.50, p &lt; .01. Posttest math performance, EW: significantly increased by 4%, r(15) = 2.09, p = .05. NW &amp; control: significant 7% drop in performance.</td>
<td>.22</td>
</tr>
<tr>
<td>Ramirez &amp; Beilock (2011) Study 3</td>
<td>51</td>
<td>High School students &amp; 3 biology classes</td>
<td>In-class</td>
<td>10 min</td>
<td>For the NW group, higher anxiety was related to lower test performance, r(26) = -.45, p &lt; .02. For the EW group, higher anxiety was not related to lower test performance, r(25) = -.07, p = .73.</td>
<td>.38</td>
</tr>
<tr>
<td>Ramirez &amp; Beilock (2011) Study 4</td>
<td>55</td>
<td>High School students &amp; 9th grade</td>
<td>In-class</td>
<td>10 min</td>
<td>NW group higher anxiety, lower test performance r(30) = -.48, p &lt; .01. For the EW group, higher anxiety was not related to lower test performance, r(25) = -.19, p = .36.</td>
<td>.33</td>
</tr>
<tr>
<td>Blank-Spadoni (2013)</td>
<td>158</td>
<td>Dental hygiene students &amp; undergraduate students</td>
<td>In class</td>
<td>10 min</td>
<td>No significant interaction between groups on exam performance, F(1,117) = .01, p = .96 No significant differences between pre-and post-state test anxiety across groups r (58) = -.49, p = .96.</td>
<td>.09</td>
</tr>
<tr>
<td>Park, Ramirez &amp; Beilock (2014)</td>
<td>80</td>
<td>College students</td>
<td>Phone &amp; Lab visit</td>
<td>7 min</td>
<td>Participants in the control group who had high test anxiety committed more errors (M = 21) on high-demand problems than participants with low test anxiety (M = 13), F(1,37) = 3.15, p = .08 Participants in the EW group did not differ in errors committed based on level of test anxiety F(1,37) = .97, p &gt; .3.</td>
<td>.49</td>
</tr>
<tr>
<td>The Current Study</td>
<td>110</td>
<td>College students</td>
<td>In class</td>
<td>10 min</td>
<td>There was no significant group by exam condition interaction, F(1,104) = .01, p = .99 differences between groups on exam performance There was no significant group difference by test anxiety interaction F (1, 102) = .80, p=.37.</td>
<td>.15</td>
</tr>
</tbody>
</table>

Notes. EW = expressive writing. NW = neutral writing. TA = test anxiety
Appendix A

Study Design

Steps:

1. Obtain access to six undergraduate classes

2. Each class will take baseline exam in their respective classrooms

3. Researchers go into each classroom to explain the study and obtain informed consent
   a) Contingent on consent, students will be administered the TAI
   b) Fill out the demographic questionnaire

4. Researchers go into each classroom on the day of the target exam and have students:
   a) Fill out Self-Report Anxiety Scale (time 1)
   b) Respond to a writing prompt (either expressive writing or neutral)
   c) Fill out Self-Report Anxiety Scale (time 2)
   d) Take their classroom exam
Appendix B

Demographic Questionnaire

1. Age: _____ years

2. Gender:   M   F

3. Year in school:
   - [ ] 1st Year of College (Freshman)
   - [ ] 2nd Year of College (Sophomore)
   - [ ] 3rd Year of College (Junior)
   - [ ] 4th Year of College (Senior)
   - [ ] 5th Year of College or more

4. Grade Point Average: _______(out of 4.0)

5. Ethnicity: (check all that apply)
   - [ ] African American
   - [ ] Asian
   - [ ] Caucasian
   - [ ] Hispanic
   - [ ] Native American
   - [ ] Other

6. English is my first language:       Y   N

7. I am fluent in English        Y   N
8. Have you been professionally diagnosed with: (check all that apply)

- ADHD/ADD
- Anxiety
- Depression
- Learning Disability
- Other: __________
Appendix C

Test Anxiety Inventory (TAI) (Spielberger, Gonzalez, Taylor, Anton, Algaze, Ross & Westbert, 1980)

Test Attitude Inventory

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I feel confident and relaxed when taking tests</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>While taking examinations I have an uneasy, upset feeling</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Thinking about my grade in a course interferes with my work on tests</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>I freeze up on important examinations</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>During exams I find myself thinking about whether I’ll ever get through school</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>The harder I work at a test, the more confused I get</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Thoughts of doing poorly interfere with my concentration on tests</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>8</td>
<td>I feel very jittery when taking an important test</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Even when I’m well prepared for a test, I feel very nervous about it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>I start feeling very uneasy just before getting a test paper back</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>During tests I feel very tense</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>I wish examinations did not bother me much</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>During important tests I am so tense that my stomach gets upset</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>I seem to defeat myself while working on important tests</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>I feel very panicky when I take an important test</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>I worry a great deal before taking an important examination</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>During tests I find myself thinking about the consequences of failing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>I feel my heart beating very fast during important tests</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>19</td>
<td>After an examination is over I try hard to stop worrying about it, but I can’t</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>During examinations I get so nervous that I forget facts I really know</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Appendix D

Self-Report Anxiety Scale (SRAS):

“Please circle how you would rate your current level of anxiety regarding this test on a scale from 1-10 (1= not at all and 10= extremely anxious).”

1 (Not at all)
2
3
4
5
6
7
8
9
10 (Extremely)
Appendix E

Writing Prompts: (Lepore, 1997; Niles et al., 2013; Ramirez & Beilock, 2011)

**Expressive:** “I would like you to spend the next ten minutes writing about your feelings about taking this upcoming test. In your writing, please really explore your feelings and or worries regarding this upcoming test. Remember, all responses are confidential. Please make sure to write for the entire ten minutes.”

**Neutral:** “I would like you to spend the next ten minutes writing about how you used your time all day yesterday (i.e., from the time you woke up until you went to bed). In your writing, please be as objective as possible. Remember, all responses are confidential. Please make sure to write for the entire ten minutes.”
Appendix F

**Procedural Script:**

**Phase 1**
- State to students:
  
  “Hello, my name is Stephanie Spielberger and I am a graduate student in the School Psychology Program at Syracuse University and I am inviting you to participate in a research study. I am interested in investigating the relationship between writing and test performance. Involvement in the study is completely voluntary, so you may choose to participate or not. I will be handing out a document outlining the study in more detail. Please, feel free to ask any questions about the study, if you have any.”

  “If you decide to participate in this study, you will be asked to participate in two days of activities that will take place during your regular class time. Today, you will be asked to fill out two short self-report questionnaires. On [Insert Date of target exam:________], you will be asked to: (1) respond to a multiple choice question, (2) respond to a writing prompt for 10 minutes, and (3) respond to another multiple choice question. Your responses will be kept confidential. This means that your name will not appear anywhere and your specific answers will not be linked to your name in any way. Also, please be aware that your instructor will not see any of your responses to any of the measures. Should you decide not to participate, please contact your professor for other extra credit opportunities that are available to you as an alternative.”

- After all informed consent forms have been filled out, collect all forms.
- For only those students who have consented to participate in the study, hand out the TAI
- Collect all TAI questions and make sure that students have provided an answer for each question
- Once all TAI questions have been collected, hand out the demographics questionnaire
- Collect all demographic questionnaires and make sure that students fill out each part of the demographic survey

**Phase 2**

- State to students:
  
  “Hello, as most of you already know, I am Stephanie Spielberger. I am a graduate student in the Psychology Department and here to follow-up with the study that many of you started last time I was here in your classroom. For those of you who have decided to participate, you will be receiving a packet. Please do not open it until I tell you to do so.”
□ Hand out Packets
□ Make sure that students are not turning the page yet
□ State to students:
   “Okay, if everyone can now turn to page one and respond to the first question. Once you are done, please turn the page to the blank page.”
□ Make sure that everyone has completed the first question and has turned to the blank page.
□ State to students:
   “For the next 10 minutes I would like for you to respond to the prompt on the top of the next page. Please write for the entire time. If you have any questions, please raise your hand and we will come over to answer your question.”
□ Set up stopwatch
   “Okay, please turn the page and begin”
□ Start stopwatch for 10 minutes
□ State to students once the 10 minutes are up:
   “Okay, time is up, please close your packets and we will come around to collect them. Thank you for your participation.”
□ Collect all packets
□ Make sure all material is taken out of the classroom.
References


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