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**CONTEMPLATIVE PRACTICES AND POST-SECONDARY WELL-BEING:
POTENTIAL METHODS FOR REDUCING TEST ANXIETY**

A Masters Thesis

Presented to

The Graduate College of
Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree
Master of Science, Psychology

By

Shannon Symmonds Hayden

July 2017

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**CONTEMPLATIVE PRACTICES AND POST-SECONDARY WELL-BEING:
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Psychology

Missouri State University, July 2017

Master of Science

Shannon Symmonds Hayden

ABSTRACT

Students encounter numerous sources of stress in college from school work to examinations. A proposed method for reducing test related anxiety is contemplative practice (namely, mindfulness meditation and expressive writing). These interventions were used immediately prior to an exam to determine effectiveness on students' mood and test grade. Although the study produced few statistically significant results, a promising trend in utilizing these interventions for increasing exam grades, increasing positive mood, and decreasing negative mood was uncovered. Each intervention appears to have dissimilar effects on different types of students (i.e., varying degrees of dispositional mindfulness and cognitive test anxiety; for example, students high in trait mindfulness had beneficial changes after practicing the meditation, but students low in trait mindfulness responded more to the exam expressive writing intervention). However, limitations of the study (such as a small sample size) require future investigations before determining the exact effects of these practices.

KEYWORDS: mindfulness meditation, expressive writing, test anxiety, mindfulness, resilience

This abstract is approved as to form and content.

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INTRODUCTION

Anxiety is a common problem in western cultures, and rates are not decreasing. Meta-analyses conducted by Twenge (2000) show a birth cohort effect on anxiety meaning that generational factors account for about 20% of variance in changes of anxiety over time. In fact, the author states that self-reports of anxiety *increase* about one standard deviation over 30-40 years. While anxiety manifests from various sources, upon entering academic settings (specifically higher education), students are flooded with various stressors. Challenging course schedules, major lifestyle adjustments, financial concerns, and elevated expectations are examples of anxiety provoking sources. Stressors, both within and outside of the classroom, significantly impact student performance and well-being. A total of 36% of college students report that their grades had “a lot of impact” on the stress they experienced in their daily lives, and 35% reported that it had “some impact”. Additionally, 37% of the participants stated their school work had “a lot of impact” on their daily stress levels, and 37% reported their school work had “some impact” (mtvU-Associated Press/Edison Media, 2008). In fact, the statistics increased in a subsequent study conducted a year later (mtvU AP, 2009; mtvU-Associated Press/Edison Media, 2009). Using a more comprehensive scope of how anxiety affects university students, 47% of a university student sample from Canada reported levels of stress that significantly affected their lives, and 29% stated they had elevated levels of psychological distress (McMaster Health Forum, 2013). These findings reveal a significant problem for both students and university administrators.

In addition to being stressed, many students do not have effective ways to manage these feelings. Over half of surveyed students (63%) reported instances where they could not get school work done due to overwhelming stress (mtvU-Associated Press/Edison Media, 2008). In a report released by the American College Health Association (2013) 30.7% of students reported that stress negatively affected in their academic performance. Thus, it is imperative for researchers to pursue methods to address students' high stress levels.

One proposed technique that education professionals might incorporate into pedagogy is contemplative practice (Barbezat & Bush, 2014). However, concerning research, we must systematically identify which practices, within the contemplative realm, are sincerely advantageous for students and then uncover the exact benefits. Considering that contemplative practices were revealed as beneficial for general anxiety in college students (discovered by various investigations detailed later), the next step is to narrow the scope of attention. Thus, one focused use of these practices in higher education involves reduction of test anxiety. Namely, two practices, mindfulness meditation and expressive free write, are identified as interventions for test anxiety (Clinton & Meester, 2015; Ramirez & Beilock, 2011). The present study empirically explores the use of these practices in hopes of identifying avenues for educators to minimize course related stress and help students maintain psychological health.

LITERATURE REVIEW

Test Anxiety and Current Interventions

Test anxiety is a common ailment among students. Zeidner (1998) defines this occurrence as “the set of phenomenological, physiological, and behavioral responses that accompany concern about a possible negative consequences or failure on an exam or similar evaluative situation”. It manifests both physically (i.e., trembling, sweating, restlessness, and voice tremor) and cognitively (i.e., difficulty concentrating, fear, apprehension, and tension; Gibson, 2014, Zeidner, 1998, Zuriff, 1997). Previous research found that these symptoms led to issues within the academic setting. For example, undergraduate and graduate students with high test anxiety have lower GPAs (Chapell et al., 2005), and anxiety interferes with information retention along with exam performance (Naveh-Benjamin et al., 1997; Rothman, 2004).

Methods to treat test anxiety are typically dispersed in five categories: behavioral, cognitive, cognitive-behavioral, study skills, and test-taking skills (Cizek & Burg, 2006; Von Der Embse, Barterian, & Segool, 2013). In particular, successful interventions for children, adolescents, and young adults include systematic desensitization (Egbochuku & Obodo, 2005), relaxation techniques (i.e., guided progressive muscle relaxation, and diaphragmatic breathing; Larson, El Ramahi, Conn, Estes, & Ghibellini, 2010), combined cognitive-behavioral and relaxation techniques (Gregor, 2005; Weems et al., 2009), and biofeedback techniques (Bradley, McCraty, Atkinson, Tomasino, Daugherty, Arguelles, 2010; Yahav & Cohen, 2008). Though numerous studies evaluate interventions to

decrease varying degrees of test anxiety, limited research explores the use of contemplative practices such as mindfulness meditation and expressive free writing.

Mindfulness Meditation

Mindfulness is one contemplative practice professors can incorporate into classrooms, and research in this area is prospering on college campuses. Brown and Ryan (2003, 2004) state that mindfulness is an open or receptive attention to and awareness of ongoing events and experiences. The nature of being mindful leads to a nonjudgmental acceptance of one's own moment to moment experience(s) and therefore combats psychological distress (i.e., worry, fear, rumination, anxiety, etc.) caused by maladaptive cognitive processes. Barbezat and Bush (2014) detail that introducing mindfulness in the educational setting fosters learning by preparing students to "disengage in habitual patterns of reactivity and come closer to clear comprehension of any situation" (pg. 96). Mindfulness is also beneficial for academics as it strengthens the capacity to retain and make sense of new information. Interestingly, a large span of research, specifically in post-secondary education, provide evidence which support these experiential claims (Oman, Shapiro, Thoresen, Plante, & Flinders, 2008; Shapiro, Schwartz, & Bonner, 1998).

Overall, within the educational environment, studies identify benefits of mindful interventions for university students, but they usually examine general well-being as opposed to more specific research endeavors (i.e., test anxiety). In one project, two eight-week interventions, Mindfulness Based Stress Reduction (MBSR) and Easwaran's Eight-Point Program (EPP), reduced undergraduates' perceived stress levels (Oman et al.,

2008). Additionally, a five-week mindfulness meditation training reduced rates of general anxiety for students diagnosed with learning disabilities (Beauchemin, Hutchins, & Patterson, 2008).

While the above studies analyzed mindfulness interventions, minimal attention targets psychological discomfort prior to an exam. The former research results are extremely promising for promoting overall wellness on college campuses, but fewer studies examine the use of mindful interventions in decreasing anxiety prior to exams or quizzes; however, the focused studies indeed reveal encouraging results. One of the more specific investigations was a pilot study conducted by Hayden, Young-Jones, and Yadon (2016) which shows that students who experienced a brief mindfulness meditation intervention, immediately prior to an exam, felt more alert, capable, and energized, as well as less mentally exhausted and anxious after the intervention. Since this pilot evaluation did not include a control group, analysis of exam performance was not feasible.

The present study will expand this design and consider the moderating effects of dispositional mindfulness on intervention effectiveness. Dispositional (or trait) mindfulness is an inclination toward present moment awareness (Brown & Ryan, 2003; 2004), and Shapiro et al. (2011) found that baseline trait mindfulness was a significant moderator of the Mindfulness Based Stress Reduction (MBSR) intervention effects. Participants who received the intervention and had higher levels of trait mindfulness showed greater increases in mindfulness along with subjective well-being. They also exhibited larger decreases in perceived stress.

Expressive Free Writing

Writing is another opportunity for minimizing test anxiety; this activity is encompassed within the contemplative umbrella. Barbezat and Bush (2014) assert that some educators use a task known as freewriting to promote students' inner inquiry. This method allows the individual to discover truths (s)he did not know existed and, ultimately, can "free the writer". Furthermore, Ramirez and Beilock (2011) discovered that ninth grade students who participated in an expressive writing task (in which they were instructed to openly write about their thoughts and feelings concerning the upcoming exam) immediately before a high stakes exam out performed conditions in which students sat quietly, wrote about an unrelated emotional event, or thought about a topic that would not be covered on the exam.

Ramirez and Beilock (2011) also found that higher trait test anxiety correlated with lower exam scores in the control condition but not the expressive writing group; moreover, the correlations between test anxiety and exam scores were significantly different amongst the expressive writing and control groups. This shows that the intervention moderated the relationship between trait test anxiety and exam performance. Expressive writing interventions alleviate some degree of anxiety towards the test, allowing highly anxious students to perform better on the exam; in a subsequent study, the researchers found no effect of the intervention for low anxiety students.

Overall, Ramirez and Beilock's (2011) examination promote the notion that expressive freewriting, specifically about exams, can decrease test anxiety and therefore improve exam grades. However, numerous possibilities exist for future investigations such as 1) using a college aged population, 2) employing a self-reported mood measure,

and 3) comparing expressive writing to other contemplative practices (i.e., mindfulness meditation). My intention is to address each of these questions within the present study.

Comparing Mindfulness Meditation and Expressive Writing

Considering that there may be an interaction effect, the combination of mindfulness and expressive writing interventions might be ideal to reduce test anxiety. Mindfulness meditation promotes positive feelings and reduces negative mood immediately prior to exams, but expressive writing seems to be more efficient in improving exam scores. This dichotomous relationship appeared upon inspection of two different research studies. One investigation compared the effects of both interventions for diminishing feelings of anxiety immediately prior to a pop-quiz (Clinton & Meester, 2015). They found that the mindfulness practice minimized feelings of nervousness for the average college student in comparison to the expressive writing group (who wrote about the upcoming exam). Remarkably, the expressive writing group performed better on the assessment when paralleled to the mindfulness practitioners. These findings are consistent with Ramirez and Beilock's (2011) results that expressive writing improved grade outcomes, but it is compelling why interacting effects of the interventions are present. Further research should explore this phenomenon. Finally, while said examination produced enlightening results, effects on exam grade (as opposed to quiz score) should be analyzed as well; I will utilize an exam in my design. To understand this interaction, the present research will also include a control group and inspect the intervention effects using actual exams.

Does Resilience Play a Role?

Currently, resilience is a buzz word among educators at all levels. Psychological resilience is described as a personality characteristic which moderates the negative effects of stress and promotes adaptation (Wagnild & Young, 1993). Resilience is especially important for at-risk and minority students in primary and secondary school (Connell, Spencer, & Aber, 1994; Masten, Fiat, Labella, & Strack, 2015), but another study supports the relationship between resilience and academic success for overall primary/secondary student populations (Deb & Arora, 2012). Since this connection exists, it is curious to note the specific degree resilience plays for post-secondary school success and well-being.

The concept of resilience is a promising area of examination for the colligate environment. While limited research connects resilience to well-being for this population, it has a connection to academic achievement. Beauvais, Stewart, DeNisco, and Beauvais (2013) found that resilience and academic success were significantly (but weakly) correlated with resilience for an undergraduate nursing population, but these two measures were significantly and strongly correlated for graduate nursing students. These are encouraging findings, but the question remains if there is an association between resilience and academic success for a different, more encompassing population of post-secondary students. My study seeks to explore this question. I will also examine if resilience has a relationship with dispositional mindfulness and cognitive test anxiety.

The Present Investigation

The present study built on prior research. It included the analysis of both mindfulness and expressive free write interventions along with a control condition. The control group completed a writing project similar to the methodology detailed by Ramirez and Beilock (2011) in which students expressively wrote about an unrelated event (for this project, they discussed their summer plans). Furthermore, my project examined intervention effects by using a course exam, where stakes are higher, since this type of assessment has larger impacts on overall grades. In addition, students answered three scales two weeks prior to their exam. This survey measured cognitive test anxiety, trait mindfulness, and resilience.

In line with Ramirez and Beilock's (2011) study, I expected students expressively writing about the exam to receive higher grades than students in the control group. Also, I predicted that students in the mindfulness meditation group would perform better on the exam than the control group. Though, per Clinton and Meester (2015), students in the exam expressive writing group performed better on the quiz (compared to the mindfulness meditation group). For my investigation, I anticipated similar results. Conversely, Clinton and Meester found that students in the mindfulness meditation group felt calmer and less anxious after the intervention when compared to the expressive writing group, and I projected the same direction of mood change for my study. However, I believed both experimental groups will have a larger shift in mood compared to the control group.

To examine if trait test anxiety plays a role in intervention success, I analyzed the moderating relationship between self-reported cognitive test anxiety, intervention group,

and exam grade, but I also looked at the connection between cognitive test anxiety, intervention group, and mood change. For this investigation, I predicted similar results to Ramirez and Beilock (2011). I foresaw less relationship between exam grade and anxiety for both interventions (mindfulness meditation and exam expressive writing) than for the control condition. Furthermore, I forecasted a larger shift in mood for the two interventions than for the control group.

As mentioned previously, Shapiro et al. (2011) found that dispositional mindfulness levels moderate individuals' response to a mindfulness program. In my study, I explored whether participants who have higher levels of trait mindfulness show greater effects from the interventions by using another moderation analysis. I anticipated that participants higher in baseline trait mindfulness will respond more to both interventions (exam expressive writing and mindfulness meditation) when compared to the control group such that a significant relationship will occur between change in mood for the intervention groups but not for the control group. Also, I predicted that individuals in the intervention groups, with higher levels of baseline mindfulness, will have better exam scores compared to those in the control group, and I anticipated a difference between intervention groups as well. I believed individuals greater in baseline mindfulness will have more response to the mindfulness intervention compared to the expressive writing intervention. Also, an analysis of baseline mindfulness determined whether it is a significant predictor of trait test anxiety (I expected a negative relationship) and overall GPA (I predicted a positive relationship).

Finally, this study included a measure of resilience. I projected that individuals who are high in resilience will have lower levels of trait test anxiety and higher overall

GPA [as found by Beauvais (2013)]. In addition, I predicted that individuals high in resilience will also have increased trait mindful awareness.

Research Questions

1. Does a short, guided mindfulness practice decrease negative feelings (i.e., nervousness) and increase positive feelings (i.e., calmness) prior to an exam when compared to an expressive free write and control writing activity?
2. Does this aforementioned practice improve information retention and performance on the test (as measured by their exam scores) in comparison to the expressive writing and control writing activity?
3. Is there a relationship between trait test anxiety, intervention group, and exam score? I predicted both interventions (mindfulness and expressive writing) will diminish negative feelings for highly anxious individuals. Therefore, there should be a reduced relationship between trait test anxiety and exam score for the intervention groups but not for the control group.
4. Is there a relationship between trait test anxiety, intervention group, and mood change? I predicted both interventions (mindfulness and expressive writing) will diminish negative feelings for highly anxious individuals. Therefore, there should be an increased relationship between trait test anxiety and exam score for the intervention groups but not for the control group.
5. Do baseline levels of mindfulness predict responsiveness (measured by change in mood) to the intervention? For example, do individuals, in the intervention groups, with higher levels of mindfulness have larger differences between pre- and post-mood measurements compared to the control group?
6. Do baseline levels of mindfulness predict responsiveness (measured by exam grade) to the intervention? For example, do individuals, in the intervention groups, with higher levels of mindfulness have higher grades compared to the control group?
7. Does the dispositional measure of mindfulness and resilience predict overall GPA?
8. Do the dispositional measures of mindfulness and resilience predict self-reported levels of test anxiety?

METHODS

Participants

Students ($N = 81$) from a midsized Midwestern university were asked to participate in the study. They were recruited from numerous psychology courses (PSY 411, PSY 302, PSY 200, and PSY 527/627). The mean age was 24.31 and 64% of the sample reported their selves as female ($n = 52$). A majority of students stated they were white ($n = 66$, 81%) and not Hispanic ($n = 70$, 86%). In addition, most participants were undergraduates ($n = 62$, 77%), and spoke English as their first language ($n = 73$, 90%). Many participants were not first generation ($n = 53$, 64%) or international students ($n = 73$, 90%), and most grew up in either rural ($n = 36$, 44%) or suburban ($n = 34$, 42%) areas.

Materials

The 14-Item Resilience Scale (RS-14; Wagnild, 2014; Wagnild & Young, 1993) measures an individual's resilience which is believed to be a positive personality characteristic that enhances adaptation to negative life events. The scale ranges from 1 (Strongly Disagree) to 7 (Strongly Agree). The 14-item short form is highly correlated with the full, 25-item version, and it demonstrated high internal consistency ranging from $\alpha = .91-.94$ for United States populations.

The Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) quantifies the presence or absence of attention to and awareness of events occurring in the moment. It is a single factor scale composed of 15 Likert-type questions, and the

scale ranges from 1 (Almost Always) to 6 (Almost Never). Higher scores reflect higher levels of mindfulness. Internal consistency for a student sample was $\alpha = .82$ and $\alpha = .87$ for a general adult sample.

The Cognitive Test Anxiety Scale (CTA; Cassady & Johnson, 2002) is a single factor scale which focuses solely on the cognitive aspect of test anxiety. It consists of 27 questions with response options of: A (not at all typical of me), B (only somewhat typical of me), C (quite typical of me), or D (very typical of me). High scores correspond to higher levels of test anxiety. Also, this scale has very high internal consistency ($\alpha = .91$).

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is composed of two mood scales: Positive Affect and Negative Affect. It is comprised of 20 items which are rated on a scale of 1 (very slightly or not at all) to 5 (extremely). The scale demonstrates good internal consistency with $\alpha = 0.86-0.90$ for the Positive Affect subscale and $\alpha = 0.84-0.87$ for the Negative Affect subscale.

Exam scores, for each participant, were obtained from the professors. To standardize across classes, the percentage earned was used for the analysis.

The demographics form asks a series of questions relating to individuals' demographics (i.e., age, gender, student classification, etc.).

Procedure

IRB approval was obtained (#16-0335 approved on 3/16/2016). Then, instructors recruited students from their specified courses, and I distributed an anonymous link approximately two weeks prior to the scheduled exam. The link directed voluntary participants to a survey through Qualtrics which they completed outside of class. At this

time, they signed the consent form and completed three scales: Mindful Attention Awareness Scale (MAAS), 14-Item Resilience Scale (RS-14), and Cognitive Test Anxiety Scale (CTA) which were randomized to control for order effects. Additionally, they responded to a series of demographics questions that were presented last to minimize stereotype threat.

Then, these students attended an “exam preparation activity” immediately prior to one of their exams (they arrived 40 minutes before their scheduled exam to allow ample time to complete the scales/activity and arrive to their test on time). Prior to their arrival, participants were randomly assigned to complete either a guided mindfulness recording, an expressive free write task, or a control writing activity. They were emailed directions to the appropriate room the day before their scheduled exam. After arrival to their allocated groups, participants completed the Positive and Negative Affect Schedule (PANAS; time measurement one: “pre-intervention”). Then, they completed the assigned activity (guided mindfulness meditation, expressive free write task, or control writing task) for 10 minutes. Research assistants conducting the experiment followed a protocol and gave specific directions to each group. Participants completed the PANAS once more (time measurement two: “post-intervention”) after they finished their activity. Then, they went to their classroom and took their test. Upon completion of their exam, I emailed students debriefing information, and instructors provided participants’ exam scores. Finally, professors awarded extra credit in their course for completion of the study (however, alternative options for extra credit were provided to students who did not wish to participate), and I entered the participating students into a raffle for one of three Amazon gift card.

RESULTS

Data Screening and Demographics

The sample ($N = 81$) was screened for accuracy, and none of the values were out of range. Then, I examined missing data and found that 23 individuals were missing over 5% of their data. These participants were individuals who did not complete any aspect of the study (pre-survey and exam day), only completed the pre-survey (and not the exam day), or only completed the exam day (and did not respond to any thing on the pre-survey). Since they were missing a majority of crucial data, all 23 were excluded from further analyses. There were four missing data points remaining, and Multivariate Imputation by Chained Equations (MICE) function in R was used to replace these data points. No multivariate outliers were identified using Mahalanobis distance. Finally, the assumptions for multicollinearity, normality, linearity, homogeneity, and homoscedasticity were met.

The final sample consisted of 58 participants with an average age of 24.41. Most participants were undergraduates ($n = 42, 83\%$), female ($n = 38, 66\%$), white ($n = 50, 86\%$), and not Hispanic ($n = 53, 91\%$). The majority were not first generation students ($n = 40, 69\%$), and their hometown was rural ($n = 28, 48\%$) or suburban ($n = 25, 43\%$). Many students stated that they were not international students ($n = 53, 91\%$), and English was their first language ($n = 54, 93\%$).

On a scale from one to seven, participants were somewhat familiar with mindfulness meditation ($M = 3.41, SD = 1.92$), and most did not have any type of weekly meditation practice. Also on a scale from one to seven, the participants were somewhat

familiar with expressive writing as well ($M = 3.97, SD = 2.00$), but the majority of students did not have a weekly expressive writing routine. Students reported using the following as techniques to reduce school related stress: exercise ($n = 42$), socializing ($n = 44$), meditation ($n = 10$), alcohol ($n = 21$), cigarettes ($n = 1$), eating ($n = 25$), reading ($n = 18$), watching TV/movies ($n = 44$), shopping ($n = 14$), cooking ($n = 18$), and other methods ($n = 15$).

ANOVAs (Research Questions 1 and 2)

For research question one, a Multilevel Model Analysis (MLM) was utilized to determine the effect of intervention (i.e., expressive writing about summer plans, expressive writing about the exam, or a mindfulness meditation) on change in positive and negative feelings measured by the PANAS. Class was designated as a random intercept factor in the model. However, there was no significant fit change in the models when accounting for differences in class versus a non-random intercept model ($p = .999$). Therefore, I did not pursue a MLM analysis. Instead, two factorial ANOVAs were employed.

The first analysis was a 3 (intervention type) x 2 (positive mood rating time measurement) mixed ANOVA. The main effect of intervention type was not significant, $F(2, 55) = .88, p = .42, \eta^2 = .03$, meaning there were no differences in positive mood ratings between practicing mindfulness ($M = 27.38, SD = 8.03$), expressively writing about the exam ($M = 25.40, SD = 7.48$), or expressively writing about summer plans ($M = 28.36, SD = 7.14$). The main effect of positive mood rating was not significant either, $F(1, 55) = .25, p = .62, \eta^2 < .01$, which demonstrated that there were not significant

differences in positive mood ratings between time 1 ($M = 27.24, SD = 7.41$) and time 2 ($M = 26.76, SD = 7.86$). Yet, the interaction between intervention type and positive mood rating was significant, $F(2, 55) = 5.14, p = .01, \eta^2 = .03$. Dependent t -tests were used for the post hoc analysis of the interaction between intervention group and positive mood rating time measurement with a Bonferroni correction. There was no significant difference between pre- and post- ratings for the group who expressively wrote about summer ($p = .24, d = -.40$). For the group who expressively wrote about the exam, there also was not a difference in ratings ($p = .68, d = .13$). Finally, the mindfulness meditation group did not exhibit any significant differences as well ($p = .25, d = .37$). See Table 1 for means, standard deviations, and group sizes, and refer to Figure 1 for a plot of the relationship.

The second analysis was a 3 (intervention type) x 2 (negative mood rating time measurement) mixed ANOVA. The main effect of intervention type was not significant, $F(2, 55) = .20, p = .82, \eta^2 = .01$, meaning there were no differences in negative mood ratings between practicing mindfulness ($M = 17.20, SD = 6.55$), expressively writing about the exam ($M = 18.05, SD = 5.57$), or expressively writing about summer plans ($M = 18.17, SD = 5.56$). Though, the main effect of negative mood rating was significant, $F(1, 55) = 7.45, p = .01, \eta^2 = .03$, which means that there were significant differences in negative mood ratings between time 1 ($M = 18.74, SD = 5.50$) and time 2 ($M = 16.84, SD = 6.15$). The interaction between intervention type and positive mood rating was also significant, $F(2, 55) = 4.15, p = .02, \eta^2 = .03$. Dependent t -tests were utilized for the post hoc analysis of the interaction between intervention group and negative mood rating time measurement with a Bonferroni correction. There was no significant difference between

pre- and post- ratings for the group who expressively wrote about summer ($p = .21$, $d = .42$). For the group who expressively wrote about the exam, there was also not a difference in ratings ($p = .70$, $d = -.13$). The mindfulness meditation group was approaching significance ($p = .05$, $d = .65$). See Table 1 for means, standard deviations, and group sizes, and refer to Figure 2 for a plot of the relationship.

In regard to research question two, a Multilevel Model Analysis was also performed to determine the effect of intervention on exam grade. Once again, class was set as a nested factor in the model. There was no significant fit change in models when accounting for differences in Class versus a non-random intercept model ($p = .81$). Therefore, I did not pursue a MLM analysis. Instead, a one-way between subjects ANOVA was employed. The one way between subjects ANOVA was not significant, $F(2, 55) = .59$, $p = .56$, $\eta^2 = .02$; consequently, no further analyses were completed. See Table 2 for means, standard deviations, and group sizes, and refer to Figure 3 for a plot of the relationship.

Moderations (Research Questions 3, 4, 5, and 6)

For research question three, a moderation analysis was used to determine if trait test anxiety predicted exam score as moderated by intervention group with GPA as a covariate. The overall model was significant, $F(6, 51) = 4.218$, $p = .002$, $R^2 = .33$. GPA was a significant covariate, $b = 18.55$, $t(51) = 3.54$, $p < .001$. However, trait test anxiety was not a significant predictor, $b = .07$, $t(51) = .34$, $p = .73$. Furthermore, expressively writing about the exam (as compared to expressively writing about summer) was not a significant predictor, $b = -2.32$, $t(51) = -.12$, $p = .90$, and mindfulness meditation (as

compared to summer expressive writing) was also not a significant predictor, $b = 21.46$, $t(51) = 1.21$, $p = .23$. Finally, the interaction between expressive writing groups and trait test anxiety was not significant, $b = 0.06$, $t(51) = .22$, $p = .82$, and the interaction between mindfulness meditation/summer expressive writing and trait test anxiety was also non-significant, $b = -.32$, $t(51) = -1.28$, $p = .21$. See Figure 4 for plot of the interaction.

To analyze research question four, trait test anxiety was examined as a predictor of both positive and negative mood change after the intervention (and intervention type was analyzed as the moderator). This research question was analyzed by employing two different moderation analyses.

Trait test anxiety was examined as a predictor of positive mood change after the intervention. The overall model was significant, $F(5, 52) = 2.92$, $p = .02$, $R^2 = .22$. Trait test anxiety was not a significant predictor, $b = -0.15$, $t(52) = -1.68$, $p = .10$. Also, expressive writing group (summer versus exam) was not a significant predictor, $b = -3.48$, $t(52) = -.41$, $p = .69$, and mindfulness meditation (compared to summer expressive writing) was not significant as well, $b = -9.50$, $t(52) = -1.18$, $p = .24$. While the interaction between expressive writing groups and trait test anxiety was not significant, $b = .10$, $t(52) = .78$, $p = .44$, the interaction between meditation/summer expressive writing and trait test anxiety is approaching significance, $b = .22$, $t(52) = 1.94$, $p = .06$. See Figure 5 for a plot of the interaction between trait test anxiety, intervention group, and positive mood difference score.

For the intervention group that expressively wrote about summer, there was a non-significant change in positive mood difference scores (as predicted by trait test anxiety), $b = -.15$, $t(16) = -1.63$, $p = .12$. The exam expressive writing intervention group

also had a non-significant change in positive mood as predicted by trait test anxiety, $b = -.05$, $t(18) = -.44$, $p = .66$. Finally, the mindfulness meditation group was also non-significant for trait test anxiety predicting positive mood difference score, $b = .07$, $t(18) = 1.15$, $p = .27$.

Trait test anxiety was examined as a predictor of negative mood change before and after the intervention. Intervention type was analyzed as the moderator. The overall model was significant, $F(5, 52) = 3.04$, $p = .02$, $R^2 = .22$. Trait test anxiety was not a significant predictor, $b = -0.19$, $t(52) = 1.13$, $p = .27$. Also, expressive writing group (summer versus exam) was not a significant predictor, $b = -1.08$, $t(52) = -.14$, $p = .89$, and mindfulness meditation (compared to summer expressive writing) was not significant as well, $b = -1.89$, $t(52) = -.25$, $p = .80$. The interaction between expressive writing groups and trait test anxiety was not significant, $b = -.02$, $t(52) = -.17$, $p = .87$, and the interaction between meditation/summer expressive writing and trait test anxiety was not significant either, $b = .05$, $t(52) = .49$, $p = .62$. Refer to Figure 6 for a plot of the interaction.

Regarding research question five, Mindful Attention Awareness was used to predict both positive and negative mood change with intervention type as the moderator. This research question was analyzed by employing two different moderation analyses.

Baseline MAAS level was examined as a predictor of positive mood change and intervention type was analyzed as the moderator. The overall model was significant, $F(5, 52) = 2.53$, $p = .05$, $R^2 = .20$. Baseline mindful attention awareness level was not a significant predictor, $b = -.65$, $t(52) = -.46$, $p = .65$. Also, expressive writing group (summer versus exam) was not a significant predictor, $b = -7.38$, $t(52) = -.80$, $p = .43$, and mindfulness meditation (compared to summer expressive writing) was not significant as

well, $b = 10.15$, $t(52) = 1.09$, $p = .28$. The interaction between expressive writing groups and trait test anxiety was not significant, $b = 3.06$, $t(52) = 1.24$, $p = .22$, and the interaction between meditation/summer expressive writing and trait test anxiety was not significant either, $b = -1.19$, $t(52) = -.48$, $p = .63$. See Figure 7 for a plot of the moderation interaction.

Baseline mindful attention awareness level was examined as a predictor of negative mood change after the intervention and intervention type was analyzed as the moderator. The overall model was significant, $F(5, 52) = 3.51$, $p = .008$, $R^2 = .25$. Baseline mindful attention awareness level was not a significant predictor, $b = -1.79$, $t(52) = 1.39$, $p = .17$. Also, expressive writing group (summer versus exam) was not a significant predictor, $b = 3.06$, $t(52) = .37$, $p = .71$, and mindfulness meditation (compared to summer expressive writing) was not significant as well, $b = 6.48$, $t(52) = .78$, $p = .44$. The interaction between expressive writing groups and trait test anxiety was not significant, $b = -1.66$, $t(52) = -.75$, $p = .46$, and the interaction between meditation/summer expressive writing and trait test anxiety was not significant either, $b = -1.29$, $t(52) = -.58$, $p = .57$. Refer to Figure 8 for a plot of the moderation.

For research question six, baseline mindful attention awareness level was examined as a predictor of exam score with intervention type as the moderator, and I controlled for university GPA. The overall model was significant, $F(6, 51) = 3.88$, $p = .003$, $R^2 = .31$. GPA was a significant predictor of exam score, $b = 20.00$, $t(51) = 4.20$, $p < .001$. However, baseline mindful attention awareness was not a significant predictor, $b = .22$, $t(51) = .07$, $p = .94$. Also, expressive writing group (summer versus exam) was not a significant predictor, $b = 11.08$, $t(51) = .55$, $p = .58$, and mindfulness meditation

(compared to summer expressive writing) was not significant as well, $b = -16.17$, $t(51) = -.79$, $p = .43$. The interaction between expressive writing groups and trait test anxiety was not significant, $b = -2.78$, $t(51) = -.52$, $p = .61$, and the interaction between meditation/summer expressive writing and trait test anxiety is approaching significance was not significant either, $b = 4.24$, $t(51) = .76$, $p = .44$. Refer to Figure 9 for a plot of the interaction.

Multiple Regressions (Research Questions 7 and 8)

To examine research question seven, a multiple regression was used to determine if baseline mindful attention awareness and resilience scores predict university GPA. The overall regression model was not significant, $F(2, 55) = .41$, $p = .67$, $R^2 = .01$. Additionally, mindfulness was not a significant predictor, $b = .05$, $t(55) = .72$, $p = .47$, and resilience did not predict GPA either, $b = -.003$, $t(55) = -.75$, $p = .46$. See Figure 10 for a plot of the regression.

To determine the effect of research question eight, a multiple regression was used to determine if baseline mindful attention awareness and resilience scores predict trait cognitive test anxiety. The overall regression model was significant, $F(2, 55) = 3.69$, $p = .03$, $R^2 = .12$. Mindful attention awareness was not a significant predictor in the model, $b = -3.01$, $t(55) = -1.06$, $p = .30$, but resilience scores did predict self-reported test anxiety, $b = -.40$, $t(55) = -2.03$, $p = .05$. Refer to Figure 11 for a plot of the relationship.

DISCUSSION

Stress and anxiety have a harmful impact on students' academic performance and psychological well-being (American College Health Association, 2013; McMaster Health Forum, 2013; mtvU-Associated Press/Edison Media, 2008; mtvU AP, 2009; mtvU-Associated Press/Edison Media, 2009). With a more focused analysis, test anxiety impacts students' GPAs and ability to retain information (Chapell et al., 2005; Naveh-Benjamin et al., 1997; Rothman, 2004). Mindfulness meditation and expressive writing are effective tools for students to navigate through test anxiety while also improving their exam scores (Clinton & Meester, 2015; Hayden, Young-Jones, & Yadon, 2016; Ramirez & Beilock, 2011). The present study sought to expand on past research by comparing the effects of mindfulness meditation, expressive writing about the exam, and expressive writing about summer plans on mood change and test grade. Furthermore, this study investigated students' response to the intervention based on their trait mindfulness and cognitive test anxiety scores. Finally, I also looked at the relationship between dispositional mindfulness, resilience, GPA, and cognitive test anxiety. Although the present study produced few statistically significant results, the data trends are detailed below. Each intervention appears to have dissimilar effects for different types of students (i.e., high levels of cognitive test anxiety, low levels of trait mindfulness, etc.). These results are a good foundation for designing future research.

Summary of Findings

The results indicate that a significant interaction exists between intervention and time measurements for positive mood scores. Upon further analysis, students' perception of positive mood did not significantly change between pre- and post-intervention. However, in review of the means, small changes (albeit, non-significant) were evident in reports of positive mood. In fact, my control group, who expressively wrote about their summer plans, was the only group who reported more positive feelings after the intervention. The mindfulness meditation and exam expressive writing groups actually reported less positive feelings after their intervention. While this seems strange, this peculiar interaction may be due to the mood adjectives used on the PANAS. For example, "excited", "strong", "active" and "enthusiastic" are a few characteristics not necessarily known to be cultivated in a mindfulness meditation.

Overall, participants reported less negative feelings after the interventions. While a significant interaction between group and mood time measurement exists, post hoc analysis revealed no significant differences for negative feelings by group. Though, evaluation of the means shows an interesting trend. My control group, who expressively wrote about their summer plans, and the mindfulness meditation group both reported less negative feelings. Though, the group who expressively wrote about the exam, in turn, had more negative feelings. These results are consistent with Clinton and Meester (2015) who found that the mindfulness intervention had more effect on negative feelings (i.e., nervousness) than expressively writing about the exam.

None of the interventions had a significant effect on exam grades. Yet, on review of the means, the group who expressively wrote about the exam had the highest exam

score ($M = 87.43\%$). The summer expressive writing group performed the next best ($M = 84.50\%$), and the mindfulness meditation intervention group had the lowest mean exam score ($M = 82.62\%$). Interestingly, these mean trends match both Clinton and Meester (2015) as well as Ramirez and Beilock (2011). Clinton and Meester found that students who participated in the expressive writing intervention, as opposed to the mindfulness treatment, received high scores on their quiz. Additionally, Ramirez and Beilock explained that expressively writing about the exam had the best consequence on examination grades. It is important to note that the means from the present study should be taken lightly as the analysis was non-significant. Though, I believe these trends are promising at identifying the potential benefits of each intervention on exam performance, and I am hopeful that additional data will improve the power of the research while leading to more definitive results.

Although GPA was a significant covariate in predicting test score (which was expected since exam scores directly affect students' university GPA), trait test anxiety did not predict exam score, and intervention did not interact with trait test anxiety. Unfortunately, this contrasts Ramirez and Beilock's (2011) findings, but according to the moderation plot, students high in cognitive test anxiety, who participated in the expressive writing interventions, outperformed students with low trait anxiety. Interestingly, the mindfulness meditation intervention has the opposite effect. Students high in trait test anxiety performed worse than those with low trait test anxiety. It may be that writing about the exam, for students with high level of test anxiety, is a cathartic experience which allows students to write down their emotions and then put them away just before the exam. Mindfulness meditation is a difficult practice to grasp when one is

in a state of anxiety, and this may be why students high in trait test anxiety (especially those who have very little experience with meditation) did not respond as well to the intervention.

Intervention type and cognitive test anxiety did not interact to predict a relationship with positive mood change. However, the interaction comparing mindfulness meditation and expressive writing about summer was approaching significance. Upon reviewing the plot, the control group, expressively writing about summer plans, worked the best overall at increasing positive emotions (but especially for the high trait test anxiety group). The trend for the other two interventions show these treatments (expressive writing about the exam and mindfulness meditation) decreased the amount of positive emotions for students with all levels of trait test anxiety. In fact, the mindfulness meditation group is the least effective treatments for high trait test anxiety students (as far as increasing amount of positive emotions), but this may be due to PANAS adjective issue mentioned in the previous analysis. Once again, these results were not found to be significant, and future research should further investigate the relationship.

While the moderation analysis examining the relationship between test anxiety and intervention on change in negative emotions was significant, none of the main effects or interactions showed statistical significance. However, the trend plot shows that mindfulness meditation was the most effective at decreasing negative emotions; this is particularly true for students high in trait test anxiety. In contrast, expressively writing about exam had ineffective, if not detrimental, effects on the students. The high anxiety students had very little change in their negative emotions, and students with low anxiety

actually had more negative emotions after the intervention. I speculate this may be because the high anxiety students are already feeling such intense emotions that they were aware these processes; on the contrary, for the students with low anxiety, the intervention may have revealed subtle emotions the participants might not have been focusing on until engaging in the writing practice.

Despite a significant overall moderation interaction between mindfulness scores and change in positive mood, none of the main effects of interactions were significant. On the contrary, the analysis plot, once again, reveals interesting trends. A relationship between exam expressive writing and mindfulness intervention is apparent. While the exam expressive writing intervention was more effective for students' low in mindfulness, the meditation was more effective for promoting positive feelings in students with high levels of trait mindfulness. This fits with Shapiro et al. (2011) who found that participants high in trait mindfulness responded more positively to mindful interventions than those with low initial levels. Expressively writing about summer plans was the best intervention for students with all levels of mindfulness (as students with all ranges of initial mindfulness levels outscored the other two interventions). This may be that students "see the light at the end of the tunnel" when writing about their summer plans as it gives them perspective that this is only one small piece of the college (and/or life) experience.

Concerning the relationship between dispositional mindfulness and negative mood change by intervention, a significant overall moderation was apparent, but the main effects and interactions were not. Nevertheless, the trend plot, once again, shows intriguing relationships for future investigations. Expressive writing about the exam was

the least effective intervention for participants high in mindfulness. In fact, it increased the quantity of negative emotions for highly mindful individuals. Furthermore, as expected, mindfulness was the best intervention for individuals with more mindful dispositions. This trend is the same for individuals on the lower end of the trait mindfulness spectrum. The exam expressive writing intervention had the smallest decrease in negative emotions (albeit, these individuals felt less negative emotions after writing about the exam unlike highly mindful students) while the mindfulness meditation produced the largest, helpful change in negative emotions.

The overall model of dispositional mindfulness predicting response to the interventions was significant, and GPA (as expected due to the abovementioned reason) was a significant covariate to exam grade fluctuations. Unfortunately, the analysis did not reveal any of the interactions to be significant. Yet, the plot shows an interaction between the interventions (although, this is statistically insignificant and should be interpreted with caution). Interestingly, the mindfulness intervention was the best for participants high in trait mindfulness. In contrast, this intervention was the worst for students with low levels of dispositional mindfulness. Expressively writing about the exam was the best intervention for this population. Additionally, expressive writing about the exam was the worst intervention for individuals with a more mindful disposition. My control group, expressively writing about summer plans, fell between these two.

Neither mindfulness nor resilience levels predicted GPA. This may be due to the fact that many influences on GPA variance exist. The combination of my small sample size and modest estimated effect size might not have provided enough power to detect the

relationship. In contrast, although trait mindfulness does not predict test anxiety, resilience levels do. This finding fits previous resilience research (Beauvais, Stewart, DeNisco, & Beauvais, 2013; Deb & Arora, 2012; Wagnild & Young, 1993), but it also adds to the breadth of research by directly analyzing its relationship to test anxiety and expanding the sample population.

Limitations

The adjectives used on the PANAS were one limitation of this study. Though this scale is extremely useful for mood studies, successive investigations would benefit from including more mood adjectives and analyzing them separately. Specifically, words for positive affect that are typically cultivated during a meditation (i.e., peaceful, calm, rejuvenated, etc.) should be included.

Besides identifying adjectives specific to contemplative practices, another area of focus should be expressively writing about summer plans (or another upcoming “break” for students). This group emerged as a potential intervention as opposed to a control; it has interesting implications as Ramierz and Beilock (2011) state that not just any type of writing will benefit exam performance. The benefits emerge when students expressively write about the “upcoming high-pressure situation”. They express that this exact intervention is what prompts a decrease in anxiety and, therefore, an increase in exam scores. I developed my control group activity based on this notion. This *seemingly* unrelated emotional event, in retrospect, did in fact turn out to be related to their current situation. Considering that this project was conducted toward the end of the spring semester, most students in the summer expressive writing group discussed how excited

they were for their summer activities. An interesting research pursuit for future studies could be to deeply examine this expressive writing topic. For example, does this topic have the same effect if conducted in the fall semester or does the event need to be closer? Though these students were not writing specifically about their exam, or even an upcoming anxiety inducing event, they might benefit both emotionally and intellectually.

One final limitation of this study was a small sample size which resulted in very low levels of power. However, review of the trends provide direction for subsequent studies which should seek to increase their population sample for more reliable results. This study was an extension of Ramierz and Beilock's (2011) study, which acknowledged that students have varying characteristics (i.e., levels of trait test anxiety and mindfulness) which require different methods of response.

Conclusion

Overall, despite many statistically non-significant results (due to various limitations), each intervention *may* have separate benefits for different types of students, and this study could be beneficial foundation for future research. This investigation provides building blocks for understanding the effectiveness of contemplative practices in reducing exam related stress. Succeeding studies should focus on improving the following: employ a more comprehensive method for measuring mood (specifically, analyze mindfulness related positive emotions), target different topics of expressive writing as interventions, and increase the sample size to attain more reliable results. While scientific investigation of these interventions is still necessary, they are accessible and can immediately be used by educators to improve students' experience in the

classroom (as prior research has already provided evidence of major, wide ranging benefits). Not only could these practices reduce student stress/anxiety levels, but they may lead to the betterment of society. After all, as Nelson Mandela stated, “Education is the most powerful weapon which you can use to change the world” (Schworm, 2013).

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Table 1. Means \pm standard deviations and sample sizes for the positive (top) and negative (bottom) mood factorial ANOVA.

		Pre-Intervention	Post-Intervention
Positive Mood	Expressive: Summer ($n = 18$)	26.95 \pm 5.74	29.78 \pm 8.24
	Expressive: Exam ($n = 20$)	25.90 \pm 8.03	24.90 \pm 7.06
	Mindfulness ($n = 20$)	28.85 \pm 8.13	25.90 \pm 7.85
Negative Mood	Expressive: Summer ($n = 18$)	19.33 \pm 5.99	17.00 \pm 4.98
	Expressive: Exam ($n = 20$)	17.70 \pm 4.80	18.40 \pm 6.36
	Mindfulness ($n = 20$)	19.25 \pm 5.83	15.15 \pm 6.73

Table 2. Means \pm standard deviations and sample sizes for intervention and exam score relationship.

	Expressive: Summer ($n = 18$)	84.50 \pm 11.19
Exam Score	Expressive: Exam ($n = 20$)	87.43 \pm 13.20
	Mindfulness ($n = 20$)	82.62 \pm 17.02

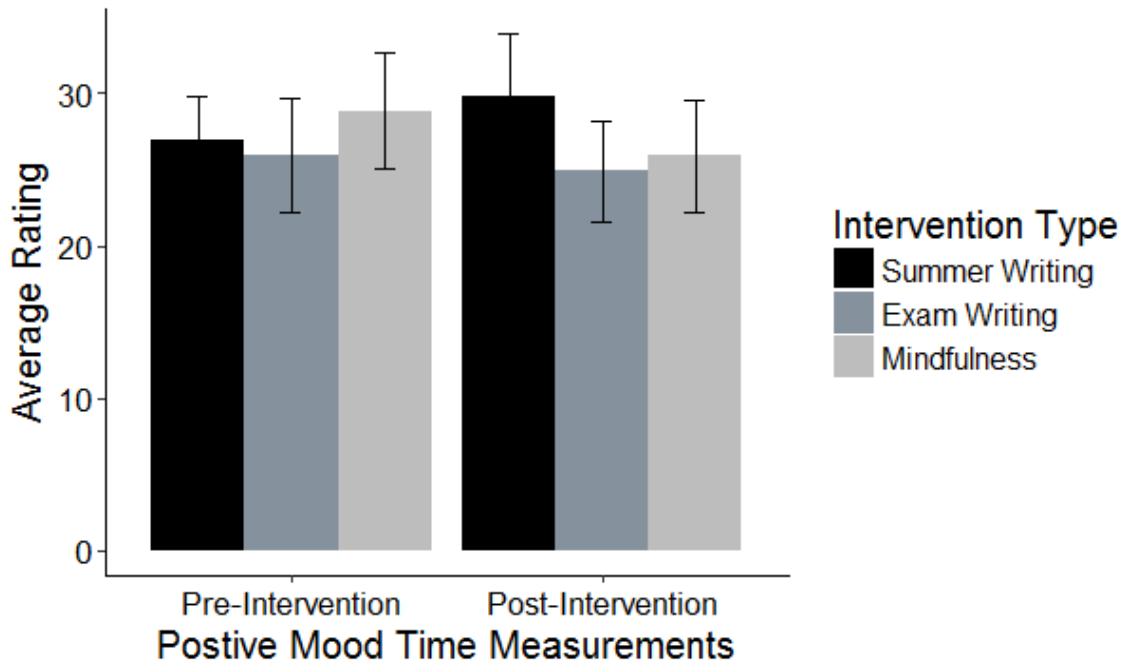


Figure 1. The interaction between positive mood time measurements and intervention type on positive mood rating.

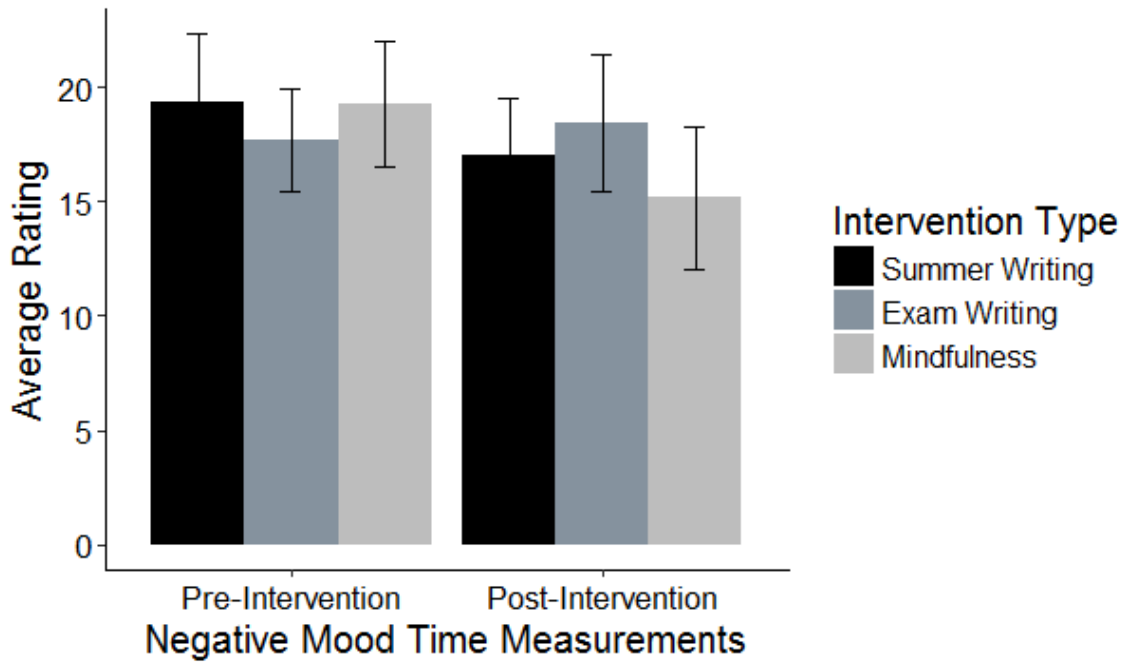


Figure 2. The interaction between negative mood time measurements and intervention type on negative mood rating.

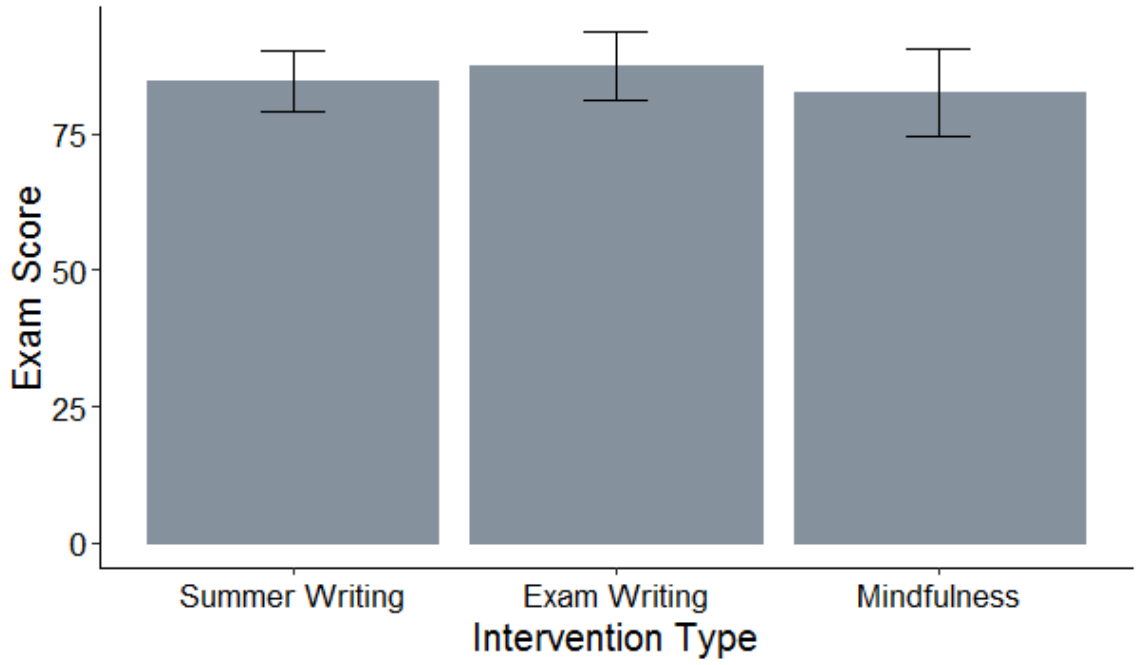


Figure 3. Intervention type and exam grade.

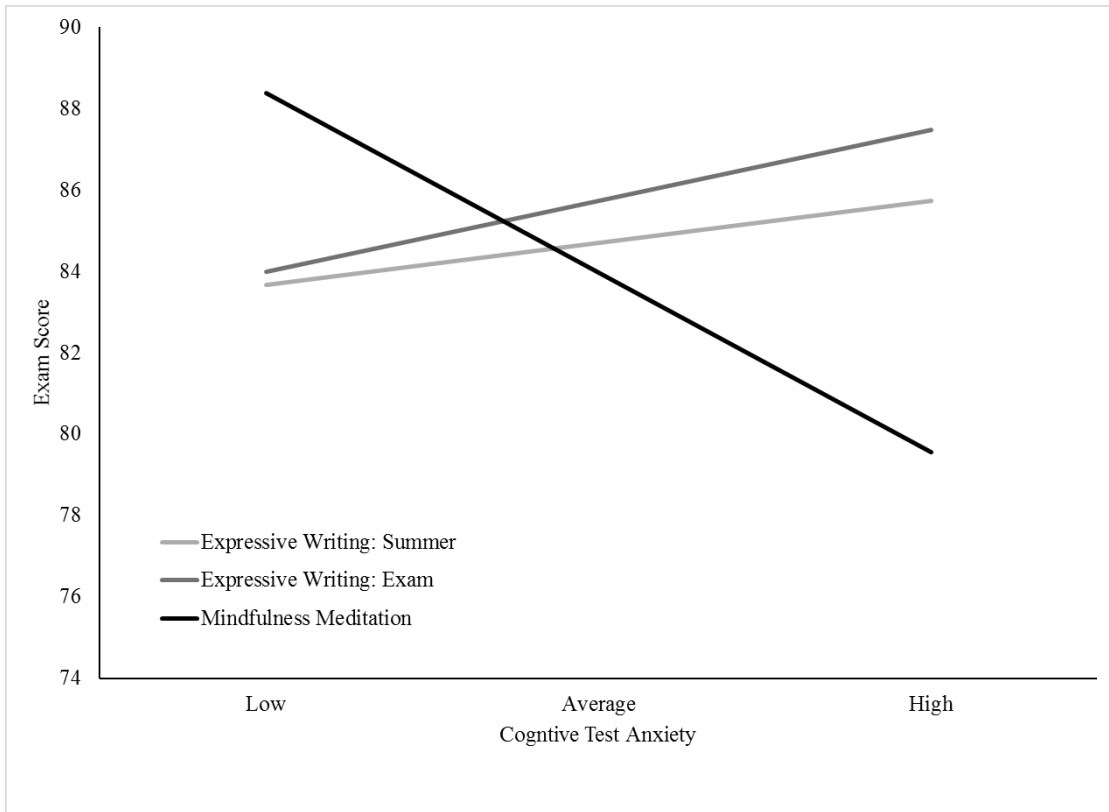


Figure 4. Changes in exam scores as predicted by CTA scores with intervention type as the moderator. GPA was entered as a covariate.

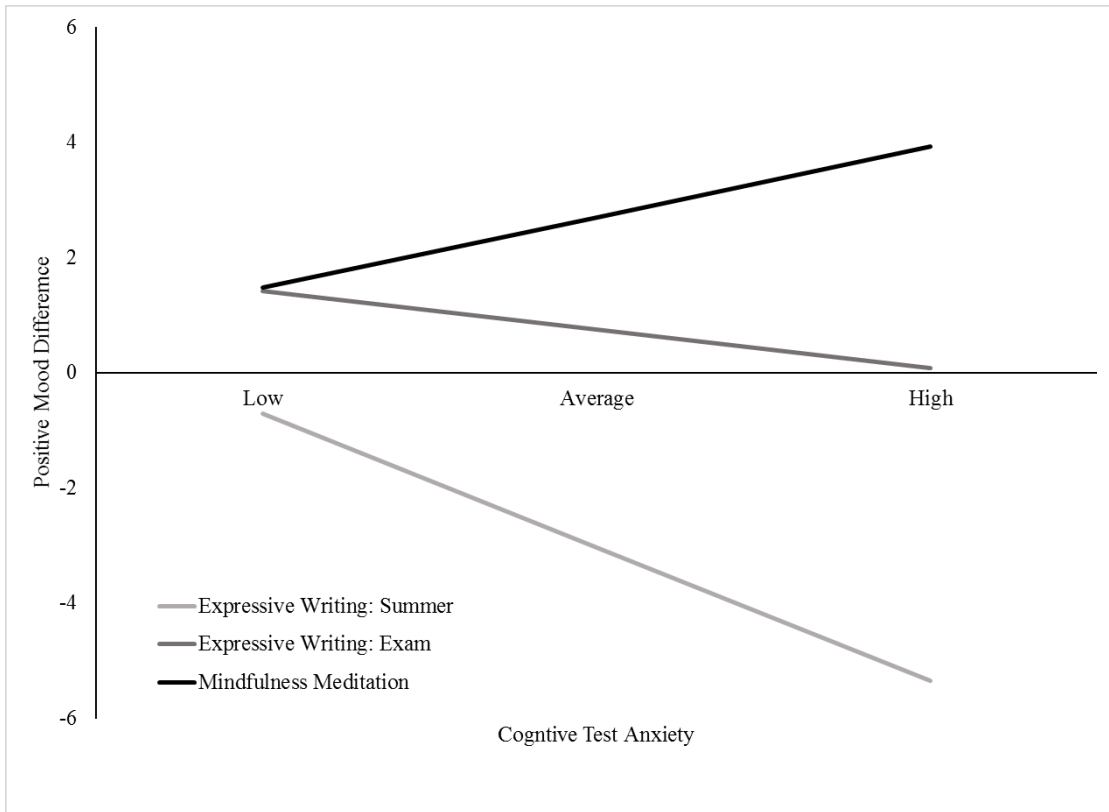


Figure 5. Changes in positive mood difference scores (PANAS time 2 – PANAS time 1) predicted by CTA and moderated by intervention type. A positive mood difference score reflects less positive feelings after the intervention, and a negative mood difference score depicts more positive feelings after the intervention.

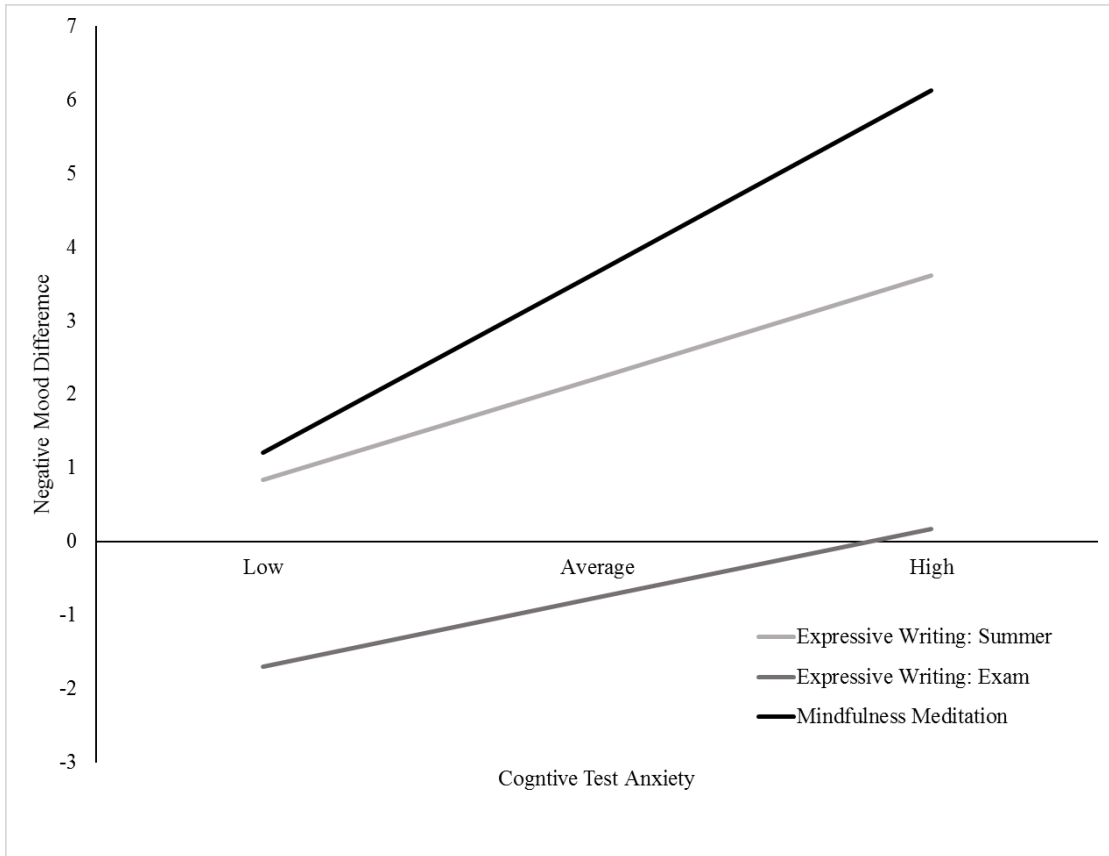


Figure 6. Changes in negative mood difference scores (PANAS time 2 – PANAS time 1) predicted by CTA and moderated by intervention type. A positive mood difference score reflects less negative feelings after the intervention, and a negative mood difference score depicts more negative feelings after the intervention.

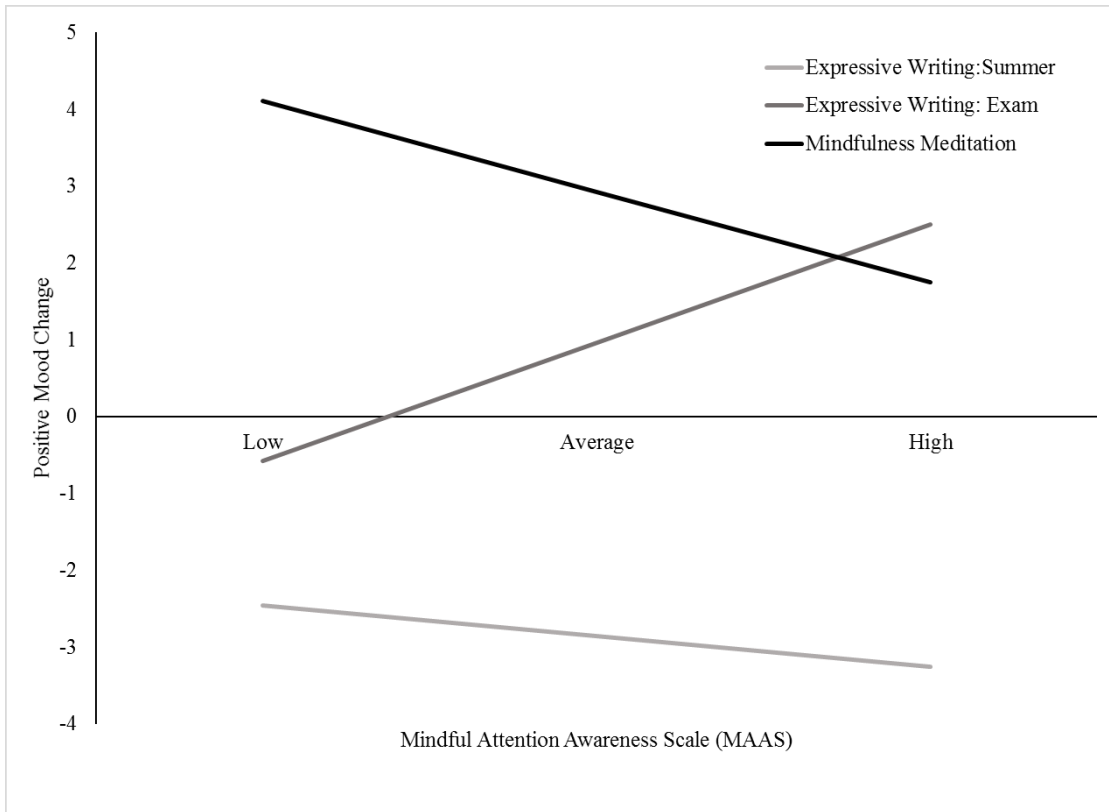


Figure 7. Changes in positive mood difference scores (PANAS time 2 – PANAS time 1) predicted by MAAS as moderated by intervention type. A positive mood difference score reflects less positive feelings after the intervention, and a negative mood difference score depicts more positive feelings after the intervention.

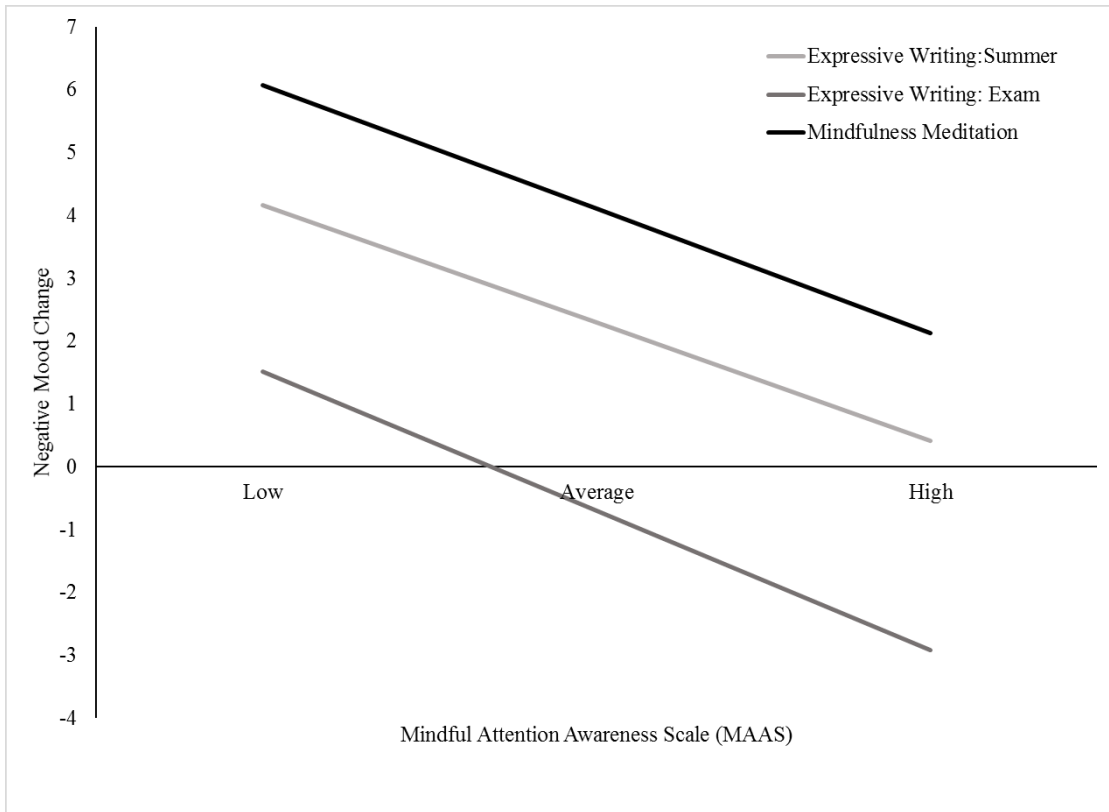


Figure 8. Changes in negative mood difference scores (PANAS time 2 – PANAS time 1) predicted by MAAS and moderated by intervention type. A positive mood difference score reflects less negative feelings after the intervention, and a negative mood difference score depicts more negative feelings after the intervention.

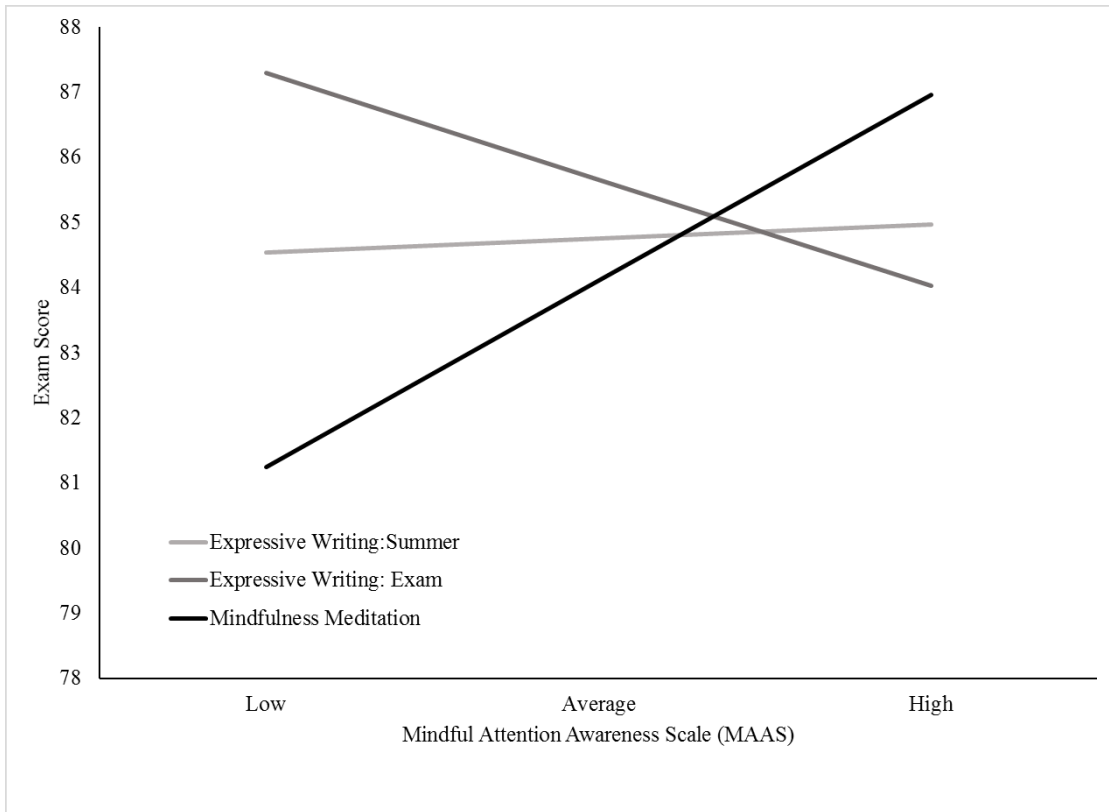


Figure 9. Changes in exam scores as predicted by MAAS with intervention type as the moderator. GPA was entered as a covariate.

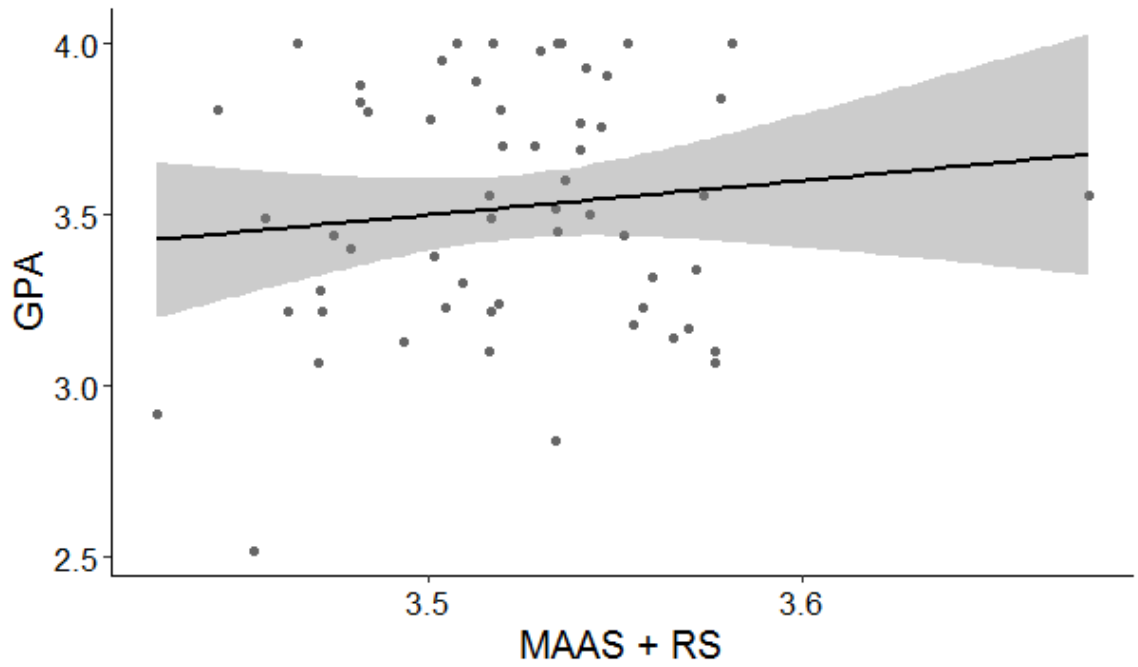


Figure 10. Relationship of MAAS and RS predicting GPA.

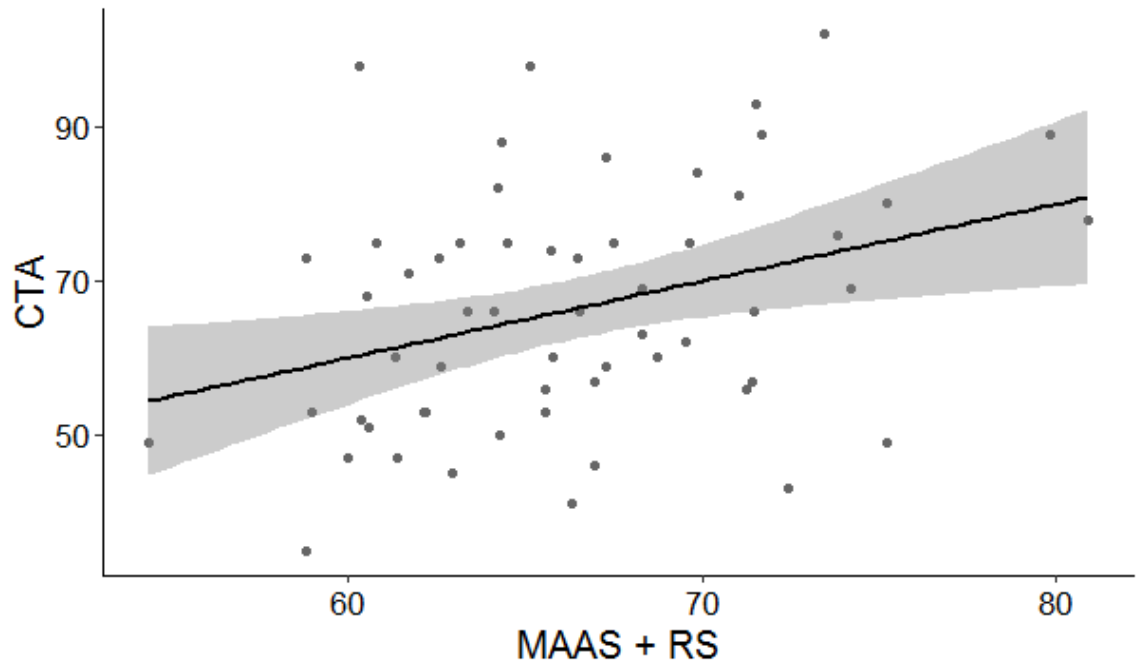


Figure 11. Relationship of MAAS and RS predicting CTA.