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Virginia Clinton

*University of North Dakota*, [virginia.clinton@und.edu](mailto:virginia.clinton@und.edu)

Stacy Meester

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A Comparison of Two In-Class Anxiety Reduction Exercises before a Final Exam

Virginia Clinton

University of North Dakota

Stacy Meester

Minnesota State University, Moorhead

Author Note

Address correspondence to Virginia Clinton, University of North Dakota, 231 Centennial St., Grand Forks, ND, 58202, [virginia.clinton@und.edu](mailto:virginia.clinton@und.edu), phone 1 (701) 777-5793, and fax 1 (701) 777-3454. We thank Alex Karie and Lisa Katrencik for their assistance with this study.

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### Abstract

The purpose of this quasi-experiment is to test two different methods for helping students reduce anxiety before an exam. Students in two introductory psychology courses (N = 111) engaged in either a focused-breathing or expressive-writing exercise before their final exam. Results indicated that, compared to previous exam performance, both focused breathing and expressive writing improved performance for students with high levels of trait test anxiety. However, there was no effect on final exam performance for either method for students with low levels of trait test anxiety. Both exercises appeared to reduce state anxiety for students, although the reduction was greater for students with high levels of trait test anxiety. These findings can be used to assist students who struggle with trait test anxiety.

*Keywords:* test anxiety, mindfulness, expressive writing, state anxiety

## **A Comparison of Two In-Class Anxiety Reduction Exercises before a Final Exam**

The issue of test anxiety is a common stressor for postsecondary students (Richardson, Abraham, & Bond, 2012; Stöber & Pekrun, 2004). Test anxiety has been shown to interfere with test performance (Rothman, 2004). Thus, methods that would enable students to reduce anxiety could, in turn, increase test performance. Enhancing mindfulness through focused-breathing exercises may reduce anxiety, which could lead to improvements in test performance (Arch & Craske, 2006; Napoli, Krech, & Holley, 2005; Paul, Elam, & Verhulst, 2007). In addition, expressive writing has been shown to enhance test performance, likely because of a reduction in anxiety (Ramirez & Beilock, 2011). Knowing which exercise is more effective in reducing anxiety would assist instructors in making choices for their classes and advising their students. The purpose of this study is to compare the effectiveness of two brief exercises (focused breathing and expressive writing) on final exam performance and test anxiety.

According to *attentional control theory*, test anxiety can reduce cognitive processing efficiency, which can lead to problems with performance (Eysenck, Derakshan, Santos, & Calvo, 2007). These issues with cognitive processing are assumed to be because of unpleasant moods and worrying related to anxiety (Stöber & Pekrun, 2004). Specifically, the nervous feelings evoked by anxiety can distract individuals from a test, thereby inhibiting performance (Keogh & French, 2001; Morris, Davis, & Hutchings, 1981).

One potential method to reduce anxiety associated with tests is through mindfulness-based interventions, such as focused-breathing exercises. Mindfulness is

characterized by full attention to the experiences of the present moment (Brown & Ryan, 2004). Practicing mindfulness techniques through meditation exercises, such as focused breathing, has been found to alleviate anxiety (Beauchemin, Hutchins, & Patterson, 2008; Evans et al., 2008) and enhance attentional control towards performance on cognitive tasks (Bonamo, Legerski, & Thomas, 2014; Chambers, Lo, & Allen, 2008; Jensen, Vangkilde, Frokjaer, & Hasselbalch, 2011; Napoli et al., 2005).

Another potential method to reduce anxiety associated with tests is through expressive writing, in which one expresses feelings about an upsetting event or issue in writing (Frattaroli, Thomas, & Lyubomirsky, 2011). Expressive writing was initially developed for therapeutic contexts and has been shown to decrease anxiety (Goldman, Dugas, Sexton, & Gervais, 2007; Gortner, Rude, & Pennebaker, 2006). Further research in educational contexts indicates that expressive writing can reduce anxiety related to academics (Wolitzky-Taylor & Telch, 2010).

Typically, studies examining the benefits of anxiety reduction exercises have compared a proposed intervention to a control with similar superficial characteristics (e.g., Ramsburg & Youmans, 2014; Ramirez & Beilock, 2011; Zeidan, Johnson, Gordon, & Goolkasian, 2010). However, two exercises with potential for reducing anxiety have not been compared in an authentic classroom testing environment. Class time is limited so instructors may appreciate research findings indicating what type of exercise is most effective.

In the current study, students in two introduction to psychology courses engaged in either focused breathing or expressive writing prior to taking a cumulative final exam,

which is often stressful and anxiety inducing (Burns, 2004; Giacobbi, Tuccitto, & Frye, 2007).

### **Method**

Participants were students in two introductory psychology courses ( $N = 111$ ; 60% female; 40% male;  $M_{\text{age}} = 19.69$ ,  $SD = 1.6$  years) who consented to be in the study, had taken each of the previous exams, and completed all the measures. Two weeks prior to the final exam, students completed the Cognitive Test Anxiety Scale as a measure of trait test anxiety online using Qualtrics (CTAS; Cassady & Johnson, 2002). Before the final exam, one course engaged in an expressive writing exercise and the other engaged in a focused breathing exercise lead by the instructor. The focused breathing exercise was used in Hafenbrack, Kinias, & Barsade (2014) and involved listening to a 15-minute recording by a professional meditation instructor. Hafenbrack et al. (2014) adapted the script from Arch and Craske's (2006) script, which was adapted from materials from Kabat-Zinn (1990). The writing exercise was adapted from Ramirez and Beilock (2011) and involved instructing the students to write openly about their feelings regarding the exam they were about to take. Before and after the exercise, participants reported how calm or nervous they felt on a 5-point Likert scale. The calm scores were reversed scored and added to the nervous scores to create a measure of state anxiety.

The final exam was cumulative and consisted of 40 multiple-choice questions on course content. Items were dichotomously scored and the sum total correct was the assessment score (40 possible). Previous exams were three unit exams and also 40 item multiple-choice exams. The course was structured so that there were four exams: three unit exams and a comprehensive final. The instructor dropped the lowest exam grade.

The final exam was optional to provide students an opportunity to improve their course grade. Forty-seven percent of the students in the courses chose to take the final.

### **Results and Discussion**

A one-way between subjects ANOVA with CTAS scores as the dependent variable and type of exercise as the independent variable indicated no a priori differences in trait test anxiety,  $F(1, 110) = 1.17, p = .28$ , Cohen's  $d = .20$ . Following Ramirez and Beilock (2011) and Park and colleagues (2014), a median split was conducted on test anxiety to examine the effects of the different exercises on performance for a high-stakes exam. Because there was no group without an anxiety-reduction activity, student scores on the final exam were compared to average performance on previous exams in the course. A repeated measures ANOVA was conducted with exam performance as within-subjects variables (average previous exam performance as the first level and final exam performance at the second level). Type of exercise and test anxiety group were between subjects variables. Results indicated an increase in exam scores from the previous exams to the final exam across conditions and test anxiety groups  $F(1, 107) = 4.19, p = .04$ , Cohen's  $d = .18$ . There was no main effect of type of exercise,  $F(1, 107) = 1.44, p = .23$ , Cohen's  $d = .29$ , nor was there an interaction between changes in exam scores and type of exercise  $F(1, 107) = 1.13, p = .29$ . However, there was an interaction between changes in exam scores and test anxiety groups,  $F(1, 107) = 5.91, p = .02$ .

Follow-up repeated-measures ANOVAs with exam performance as within-subjects variables for each of the test anxiety groups were conducted. For the low test anxiety group, there was no difference from the previous exams to the final exam,  $F(1, 52) = .05, p = .83$ , Cohen's  $d = .03$ . However, for the high test anxiety group,



performance improved from the previous exams to the final exam,  $F(1, 57) = 11.55$ ,  $p = .001$ , Cohen's  $d = .37$  (see Figure 1<sup>1</sup>). Given this pattern of results, it appears that, as with other studies (Brunyé et al., 2013; Ramirez & Beilock, 2011), the anxiety-reduction exercises may have been beneficial for high test anxiety students' exam performance, but not for low.

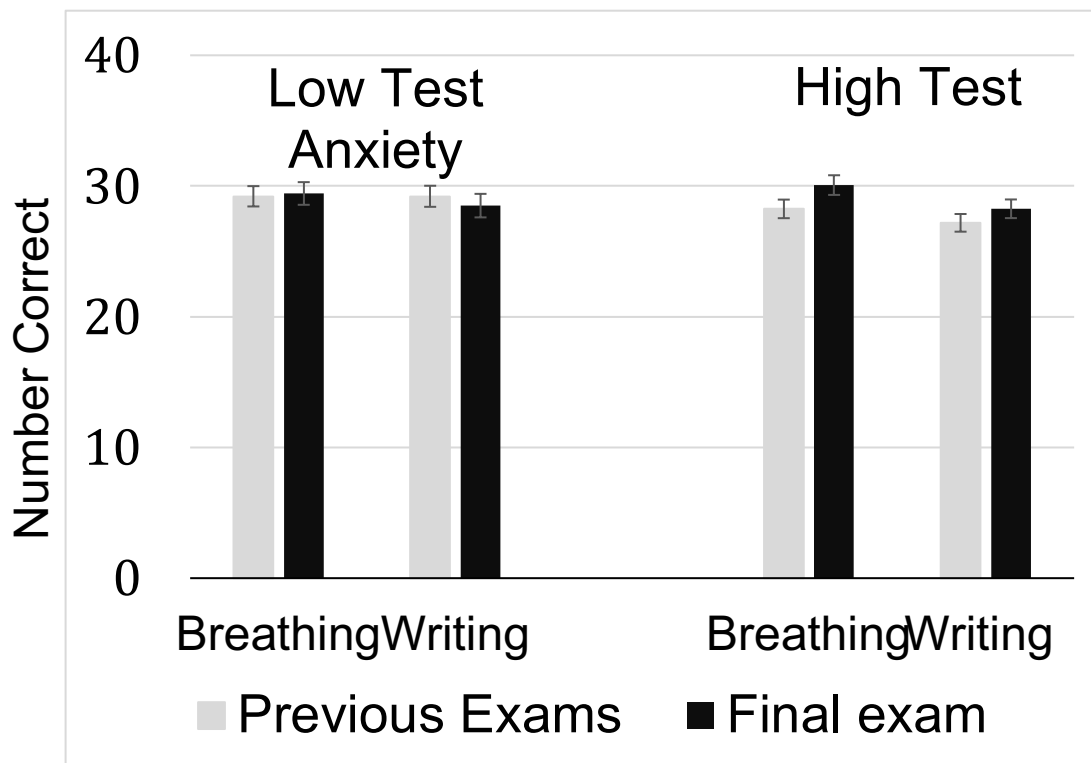


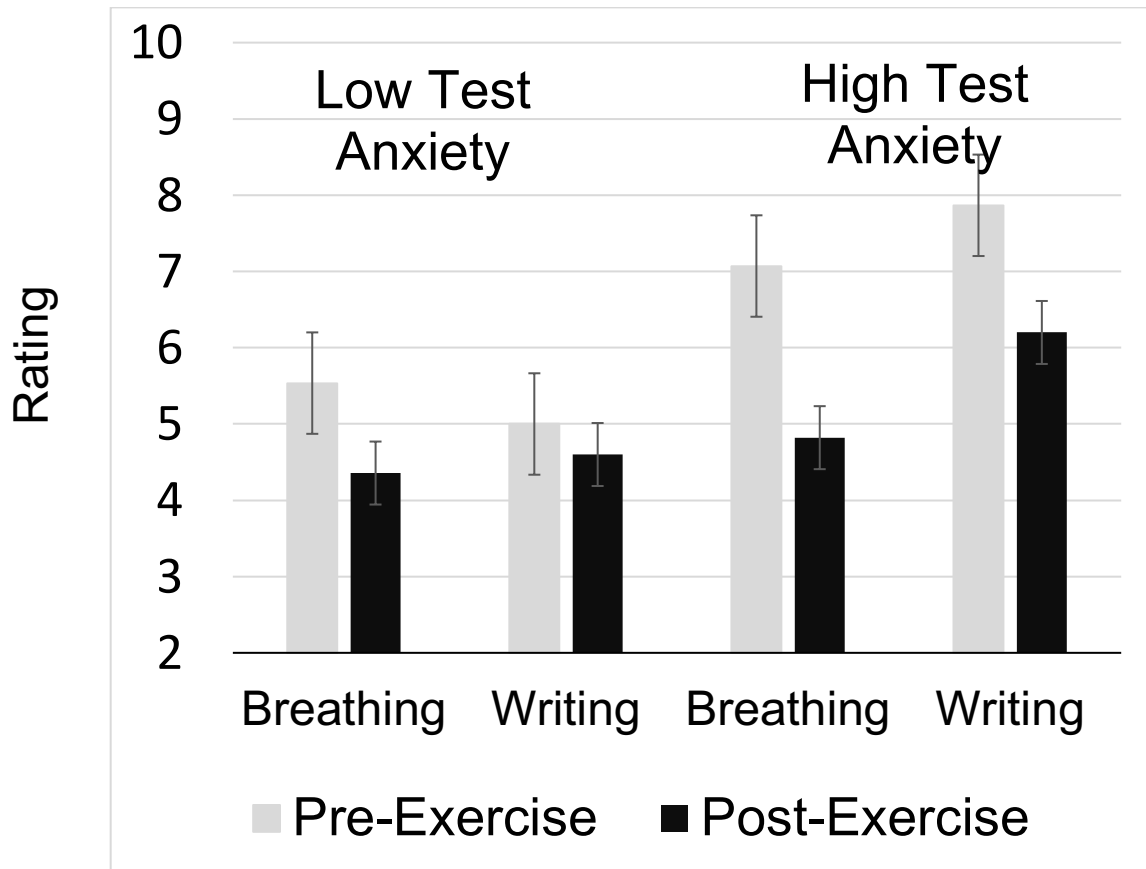
Figure 1. Previous exam and final exam performance by condition and level of trait test anxiety (Means and +/- 1 SE).

Repeated-measures ANOVAs were also conducted to assess the effects of the type of

<sup>1</sup> There is a concern that the average exam performance may have been influenced by outliers. To address this concern, analyses using the median exam score were conducted both with only students who had taken all three previous exams and for those who missed an exam. The results (significance and effect sizes) using medians were similar as those reported using means.

exercise on changes in state anxiety levels. Levels of state anxiety (pre- and post-exercise) were within-subjects variables and between subjects variables were type of exercise and level of trait test anxiety. Levels of state anxiety lowered across conditions from pre- to post- exercise,  $F(1, 107) = 57.52, p < .001$ , Cohen's  $d = .65$ . There was no effect of exercise type,  $F(1, 107) = 2.05, p = .16$ , Cohen's  $d = .43$ , nor was there a significant interaction between levels of state anxiety and type of exercise,  $F(1, 107) = 3.527, p = .06$  (as can be noted in Figure 2, this marginal finding is likely due to a trend in which with lower levels of pre-exercise state anxiety were more affected by the breathing exercise than the writing exercise). However, there was an interaction between test anxiety group and levels of state anxiety,  $F(1, 107) = 10.41, p = .002$ .

Follow-up repeated-measures ANOVAs with levels of anxiety (pre- and post-exercise) as within-subjects variables for each of the test anxiety groups were conducted. For the low test anxiety group, state anxiety levels decreased after the exercise,  $F(1, 52) = 13.94, p < .001$ , Cohen's  $d = .41$ . For the high test anxiety group, state anxiety levels also decreased after the exercise, but the effect size was larger than for the low test anxiety group,  $F(1, 57) = 46.33, p < .001$ , Cohen's  $d = .97$ . Means and standard errors of pre- and post-exercise state anxiety levels by condition for each test anxiety group are reported (see Figure 2). Taken together with the exam performance findings, perhaps there was only an association of an anxiety-reduction exercise on the final exam performance for students with high levels of trait test anxiety because their state anxiety levels decreased more than did students with low levels of trait test anxiety. Another possible reason why exam performance did not differ for students with low levels of trait anxiety is that low-trait anxious individuals tend to have their attention and subsequently their cognitive performance less affected by anxiety than high-trait anxious individuals (Berggren & Derakshan, 2013).



*Figure 2.* State anxiety ratings pre- and post-exercise by condition and level of trait test anxiety (Means and  $\pm 1$  SE).

Certain limitations with this study should be noted. Random assignment was not possible with this research design and, as such, causal claims cannot be made. In addition, this exam, unlike most exams, was optional, which may have affected results. Furthermore, there is an assumption state anxiety reduction explained noted improvement in exam performance that cannot be tested with the data from this study. A future study with a required, high stakes exam that has a control of no exercise or a sham exercise with random assignment to conditions would be ideal to address these limitations.

Overall the results indicate that expressive writing and focused breathing appear to be beneficial for exam performance for students who struggle with test anxiety. Instructors interested in helping their students address their test anxiety issues may wish to encourage them to try focused breathing, expressive writing, or both. Additionally, as time and resources permit, it may be helpful to have students engage in either a focused breathing or expressive writing exercise prior to a high-stakes exam.

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