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BRIEF REPORT

Opening Up in the Classroom: Effects of Expressive Writing on Graduate School Entrance Exam Performance

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Our study sought to determine whether experimental disclosure could improve exam performance and psychological health in students taking a graduate school entrance exam. Students preparing for the GRE, MCAT, LSAT, or PCAT were randomly assigned to write expressively about their upcoming exam or to a neutral writing condition. Participants completed measures of depressive symptoms and test anxiety before and after writing, and exam scores were collected. The experimental disclosure group had significantly higher test scores and significantly lower pre-exam depressive symptoms than the neutral writing group. Although benefits for depressive symptoms were found in expressive writers regardless of exam type, the advantage of expressive writing for test performance was only observed in students taking the MCAT or LSAT.

Keywords: expressive writing, experimental disclosure, exam performance, test anxiety, anticipatory stress

When faced with stressful life events, expressing one's deepest thoughts and feelings in writing, also known as "expressive writing" or "experimental disclosure," may be a useful tool in protecting or improving one's health, well-being, and general functioning (Frattaroli, 2006). Previous studies have shown that expressive writing delivers numerous benefits, including reductions in distress (Barry & Singer, 2001), decreases in fatigue, tension, and upper respiratory symptoms (Lepore & Greenberg, 2002), and improvements in functional status (Hamilton-West & Quine, 2007). It is believed that experimental disclosure interventions help people free their minds of unwanted thoughts, make sense of upsetting events, better regulate their emotions, habituate to negative emotions, and improve their connections to their social world. All of these factors, in turn, are likely to produce benefits for health and well-being.

Previous studies of expressive writing have instructed participants to write about a wide range of stressors, with common topics including coping with illness (e.g., Leake, Friend, & Wadhwa, 1999), experiences of loss (e.g., Bower, Kemeny, Taylor, & Fahey,

2003), and adjusting to college life (e.g., Pennebaker, Colder, & Sharp, 1990). A stressor well known to many college students is the graduate school entrance exam, like the Graduate Record Exam (GRE), the Medical College Admissions Test (MCAT) or the Law School Admissions Test (LSAT). Important exams are sources of significant stress and strain in the lives of students, as periods leading up to exams have been characterized by increases in cortisol (Lewis, Nikolova, Chang, & Weekes, 2008) and elevations in state anxiety and perceived stress (Lewis, Weekes, & Wang, 2007). Students often spend considerable time and money preparing for these exams.

In a study by Lepore (1997), students planning to take a graduate school entrance exam who were assigned to write expressively about their upcoming exam showed significantly greater declines in depressive symptoms prior to their exam than those assigned to write about trivial topics. This study is one of the few experiments to examine the effects of writing about an *upcoming* stressor, and it suggests that writing allowed participants to cope more effectively with their anticipatory stress. However, it is unknown whether this experimental disclosure intervention affected students' performance on the exam itself, as test scores were not collected.

Can expressive writing improve performance on graduate school entrance exams? Several reasons lead us to suspect that it can. First, depressive symptoms tend to impair test performance (Catanzaro, 1996), and as described earlier, writing interventions reduce depressive symptoms (Lepore, 1997). Second, anxiety is often negatively related to test performance on high-stakes exams (e.g., Cassidy & Johnson, 2002), and some evidence suggests that

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expressive writing reduces anxiety (e.g., van Emmerik, Kamphuis, & Emmelkamp, 2008). Finally, expressive writing interventions have been found to significantly improve grade point average (Pennebaker & Francis, 1996), as well as some areas of cognitive functioning, such as working memory (Klein & Boals, 2001; Yogo & Fujihara, 2008) and Stroop color naming (Lepore, Fernandez-Berrocal, Ragan, & Ramos, 2004).

The goals of the present study were twofold: first, to test whether exam performance can be improved by expressive writing, thereby extending Lepore's (1997) results; and second, to determine whether test anxiety, in addition to depression, can be reduced shortly before a graduate school entrance exam. We hypothesized that expressive writing would improve performance on entrance exams, and that depression and anxiety would mediate the relationship between writing and test outcomes.

Method

Participants

One hundred four students (70% women, $M = 20.98$ years) scheduled to take the GRE-General ($n = 48$), MCAT ($n = 38$), LSAT ($n = 15$), GRE-Subject ($n = 2$), or Pharmacy College Admissions Test (PCAT; $n = 1$) participated in our experiment. To be included, participants had to: (a) be at least 18 years of age; (b) be planning to take one of the aforementioned graduate school entrance exams in the near future; (c) be available for a baseline interview 17–40 days before their exam and an in-person visit 3–15 days before their exam; and (d) previously have taken an undergraduate college entrance exam (SAT or ACT). Test-takers were recruited from university and preparatory course classrooms at University of California, Riverside (UCR) and nearby; 100 students or alumni of UCR and four students from neighboring colleges were enrolled during the recruitment period of November, 2003 to April, 2006. To minimize demand characteristics, no students were given an expectation that participation might improve their scores. Participants were simply told that we were “interested in the lives of students who are taking a graduate school entrance exam.”

Students enrolled in introductory psychology courses were given course credit ($n = 35$). In the initial months of recruitment, participants who were ineligible for course credit volunteered with no compensation ($n = 28$); once study funds became available, those ineligible for course credit were paid \$20 for their participation ($n = 41$). The ethnic breakdown of the participants was as follows: 33% Caucasian, 26% Asian or Pacific Islander, 15% Hispanic or Latino(a), 12% Black or African American, and 14% Other. Eighty-eight percent of the participants were taking the graduate school entrance exam for the first time.

Measures and Procedures

Telephone interviews. Eligible participants were verbally consented via telephone. Upon consenting, they provided demographic information and completed a phone interview approximately 27 days prior to their exam (Time 1). A second phone interview was conducted about 3 days before their exam (Time 2), followed by a final phone interview approximately 8 days after their exam (Time 3). All interviews assessed participants' symp-

oms of depression, intrusive thoughts, and cognitive test anxiety. Depressive symptoms were measured with the 7-item Severe Depression subscale of the General Health Questionnaire (Goldberg & Hillier, 1979), intrusive thoughts with a 10-item scale used by Lepore (1997), and cognitive test anxiety with a 27-item measure (Cassady & Johnson, 2002). These measures have been shown to have high internal reliability in samples of college students (Vallejo, Jordán, Díaz, Comeche, & Ortega, 2007, reported an α of .85 for the depression subscale of the GHQ; Lepore, 1997, reported an α of .92 for the intrusive thoughts scale; and Cassady & Johnson, 2002, reported an α of .91 for the cognitive test anxiety scale) and were also found to have high internal reliability in the present sample (average α 's across all three measurement points being .82, .89, and .93 for the GHQ, intrusive thoughts scale, and cognitive test anxiety scale, respectively). Prior to the exam, test anxiety questions were worded to measure how the participants typically react during exams; after the exam, questions were reworded to reflect their reactions to that particular exam.

Laboratory visit. Participants came to the laboratory for a writing visit approximately 9 days before their exam (between Time 1 and Time 2). They were provided a manila envelope containing writing instructions, escorted to a small, private room, and allowed 30 min to write. Treatment participants (the “expressive writing group”) were instructed to write about their deepest thoughts and feelings about their upcoming exam, and control participants (the “neutral writing group”) were instructed to write about the activities in which they had participated during the last 24 hrs. Writing instructions were identical to Lepore (1997), and assignment to groups was randomized within population types. Participants were also asked to sign a form releasing their cumulative GPA and SAT/ACT scores from UCR's registrar's office (if applicable).

Exam results. After the exam, participants were asked to report their test results via phone and then to bring in documentation, to rate their satisfaction with their scores (from -2 for *very dissatisfied* to $+2$ for *very satisfied*), and to indicate how the writing session affected them (if at all). Exam results were collected from January, 2004 to August, 2006.

Results

Baseline Characteristics

All three psychological variables (depressive symptoms, intrusive thoughts, and cognitive test anxiety) were significantly correlated (all $ps < .001$), with rs ranging from .40 to .48. At baseline, mean scores for all participants were 1.51 ($SD = 0.81$) on the Intrusive Thoughts Measure and 1.55 ($SD = 2.36$) on the GHQ Severe Depression Subscale, similar to scores reported in other nonclinical college samples (Lepore, 1997; Vallejo et al., 2007). However, the mean score on the Cognitive Test Anxiety scale ($M = 60.12$; $SD = 14.56$) was lower than scores reported in two other undergraduate samples (Cassady & Johnson, 2002; Cassady, 2004).

A further analysis of the baseline characteristics revealed that, prior to condition assignment, expressive writing participants had significantly higher intrusive thoughts ($M = 16.83$, $SD = 1.04$) than neutral writing participants ($M = 13.29$, $SD = 1.16$), $t(102) = 2.28$, $p = .025$; therefore, baseline levels of intrusive thoughts

were used as a covariate in all analyses involving comparisons of the writing groups. The two groups did not significantly differ on baseline SAT (or ACT-SAT equivalent) scores ($M_s = 1120.56$ and 1126.00 for the experimental and control groups, respectively, $p > .800$), with an approximate average percentile of 67th for both groups. All other baseline group differences (e.g., age, depressive symptoms) were also found to be nonsignificant (all $p_s > .150$).

Manipulation Check

Expressive writing and neutral writing essays were analyzed for total number of words used, positive emotion words (e.g., happy, love), negative emotion words (e.g., sad, hate), causation words (e.g., because, cause), insight words (e.g., understand, realize), and time-related words (e.g., hour, minute) using the Linguistic Inquiry Word Count (LIWC; Pennebaker, Francis, & Booth, 2001). Results indicated that the manipulation was successful. As expected, expressive writers (who were asked to express their deepest thoughts and feelings) wrote significantly more positive emotion words, negative emotion words, causation words, and insight words and wrote significantly fewer time-related words than neutral writers (who were asked to write about time management) (all $p_s < .001$). However, no significant group difference emerged for total words used ($p = .606$).

Test Performance Results

Analyses of covariance were performed on the percentile test scores and the satisfaction scores, controlling for Time 1 intrusive thoughts and for SAT/ACT scores. Given that no “pretest” scores were collected for these dependent variables and that SAT/ACT scores were highly related to both these variables ($r = .75$ for test performance and $r = .51$ for satisfaction), using SAT/ACT scores as a covariate serves to reduce the error variance due to preexisting differences in ability, intelligence, and related constructs that would otherwise be eliminated by a pretest. This procedure has routinely been used in the past by expressive writing researchers who have examined educational outcomes (e.g., the effect of

expressive writing on grade point average, Pennebaker & Francis, 1996) and other researchers who have examined the effects of cognitive/emotional interventions on test performance (e.g., stereotype threat, Steele & Aronson, 1995).

As hypothesized, participants who wrote about their deepest thoughts and feelings about their upcoming graduate school entrance exam scored significantly higher on the exam ($M = 50$ th percentile) than did those who wrote about neutral topics ($M = 41$ st percentile), $p = .024$, $r = .25$. The expressive writing group was also significantly more satisfied with their exam performance than the neutral writing group, $p = .031$, $r = .25$. The expressive writing group’s average ratings for satisfaction with exam scores were somewhat “neutral” (-0.31), whereas those of the neutral writing group were closest to “slightly dissatisfied” (-0.88) (see Table 1).

Psychological Health Outcomes

Analyses of covariance were performed on Time 2 and Time 3 depressive symptoms and test anxiety scores, controlling for Time 1 values of depressive symptoms and test anxiety, respectively, and for Time 1 levels of intrusive thoughts. Those who wrote about their thoughts and feelings showed significantly lower levels of depressive symptoms at Time 2 (adjusted $M = 1.13$, $SE = 2.05$) than did those who wrote about their past 24 hrs (adjusted $M = 2.15$, $SE = 0.32$), $p = .026$, $r = .22$; Lepore’s (1997) result for the same assessment was $p = .027$, $r = .21$. Significant group differences were not found either for Time 3 depressive symptoms or for test anxiety at either time point, although the means were in the expected direction for all analyses (r_s ranged from $.04$ to $.06$, all $p_s > .600$).

Mediators and Moderators of Test Performance

Mediators. Correlational analyses revealed that the change in depressive symptoms from Time 1 to Time 2 was not significantly related to test performance ($r = .04$, $p = .755$), indicating that depressive symptoms could not have been a mediating variable. In

Table 1
Test Performance and Satisfaction With Performance for Expressive Writing and Neutral Writing Participants, Controlling for SAT/ACT Scores and Baseline Intrusive Thoughts

Variable	Unadjusted Mean (SD)	Adjusted Mean (SE)	r-effect size	p-value
Overall Test Score (Percentile) ^a				
Expressive Writing (N = 45)	48.65 (30.45)	49.89 (2.65)	.25	.024
Neutral Writing (N = 39)	42.09 (21.47)	40.66 (2.86)		
Satisfaction with Test Scores				
Expressive Writing (N = 40)	-0.40 (1.41)	-0.31 (0.18)	.25	.031
Neutral Writing (N = 37)	-0.78 (1.25)	-0.88 (0.18)		

Note. Of the 104 participants, four expressive writing and six neutral writing participants cancelled/did not take their exam. In addition, three expressive writing and six neutral writing participants cancelled their score at the end of the testing period, and one treatment participant was lost to follow-up. Five expressive writing and two neutral writing participants who reported their test scores could not be reached for satisfaction data.

^a Seventy-five participants provided hard copies of their exam scores; the remaining nine participants provided only self-report data. No significant treatment/control differences were found in the failure to obtain hard copies ($p = .107$) or in test scores between participants who did and did not provide hard copies of their scores ($p = .116$). A very high, significant correlation ($r = .99$, $p = .001$) was found between the initial self-reported and the actual verified scores.

addition, test anxiety was not further explored as a potential mediator due to its lack of significant main effects.

Moderators. We examined *type of test* as an exploratory potential moderating variable because different types of graduate school entrance exams vary greatly in content and are likely to attract students with distinctly different backgrounds and characteristics. Analyses of covariance were performed on all outcome measures and the Treatment X Type of Test interaction term was examined. (Students taking the GRE-Subject or PCAT were excluded due to very small cell sizes.) Type of Test was a significant or marginally significant moderator for three outcome variables: (a) test score ($p = .054$); (b) satisfaction with test score ($p = .020$); and (c) cognitive test anxiety at Time 3 ($p = .033$). Of those who took the LSAT or MCAT, expressive writing participants showed significant benefits with regard to test performance ($p = .010$) and satisfaction with test scores ($p = .001$), relative to similar neutral writing participants. However, expressive writing participants taking the GRE did not significantly benefit in these outcomes ($p = .765$ for test scores; $p = .667$ for satisfaction; see top panel of Figure 1). In addition, expressive writing participants taking the GRE had marginally higher test anxiety at Time 3 compared to neutral writing participants taking the same exam ($p = .075$), whereas expressive writers who took the LSAT or MCAT had marginally lower test anxiety at Time 3 than their neutral writing counterparts ($p = .092$; see bottom panel of Figure 1). It should be noted that, although expressive writing appears to have had limited benefit for students taking the GRE, GRE test-takers did not significantly differ from the MCAT and LSAT test-takers in the degree to which they rated the writing session positively.

We also examined compensation type (unpaid volunteer, course credit, paid volunteer), prior exam experience (never vs. at least once), sex, and baseline test anxiety as moderators. Baseline test

anxiety was the only variable found to moderate the effect of the intervention, at least with respect to satisfaction with test score ($p = .010$; all other $ps > .15$), such that participants *low* in pretest test anxiety showed benefit from the intervention in terms of performance satisfaction (adjusted $M_s = 0.02$ and -1.24 for low anxious students in the expressive writing and the neutral writing groups, respectively, $p = .005$). In contrast, participants *high* in pretest test anxiety did not benefit from the intervention on this variable (adjusted M_s for satisfaction = -0.57 and -0.42 for high anxious students in the expressive writing and neutral writing groups, respectively, $p = .699$).

Word Use Correlates

To explore potential process variables, we examined the relationship between the outcome variables and word use by the expressive writing participants, using the categories described earlier (word count, positive emotion, negative emotion, causation, insight, time). Contrary to Lepore (1997), who reported no relationship between word use and depression outcomes, our analyses indicated that expressive writers who used more positive emotion words showed greater reductions in depressive symptoms 3 days before the exam ($r = -.35$, $p = .020$), and those who used more causation words showed greater reductions in depressive symptoms 1 week after the exam ($r = -.33$, $p = .040$). No significant relationships were found between word use and test performance, test satisfaction, or change in test anxiety.

Discussion

The results of this experiment demonstrated that writing about one's deepest thoughts and feelings about an upcoming high-stakes test significantly improves the performance of students taking a graduate school entrance exam. In addition, the study confirmed that expressive writing significantly reduces depressive symptoms shortly before the exam, with an effect size similar to that found by Lepore (1997). Although depression benefits were found in expressive writers regardless of exam type, the advantage of expressive writing for test performance was only observed in students taking the MCAT or LSAT. On average, neutral writers taking the MCAT or LSAT scored in the 46th and 23rd percentile, respectively, whereas expressive writers taking these exams scored in the 58th and 43th percentile; a difference of this magnitude is similar to raising one's MCAT score from 25 to 27 and one's LSAT score from 144 to 149. The effect size associated with these test score differences ($r = .24$) is not dissimilar to those found in some stereotype threat experiments, in which lab-based test performance is assessed after emotions/anxiety levels are manipulated (average r_s range from .05 to .37, depending on the subgroup/specific methodology; Nguyen & Ryan, 2008).

We hypothesized that the expressive writing intervention would also significantly reduce test anxiety before or during the exam, but this hypothesis was not supported. Several possible reasons could account for this null finding. First, our measure of test anxiety was originally designed to measure *trait* levels (witness its high test-retest reliability, $r = .81$), and thus may not have been sensitive to small changes in anxiety levels (Cassady & Johnson, 2002). Consequently, we could not test whether *state* test anxiety was affected by expressive writing (cf. Zohar, 1998). Second,

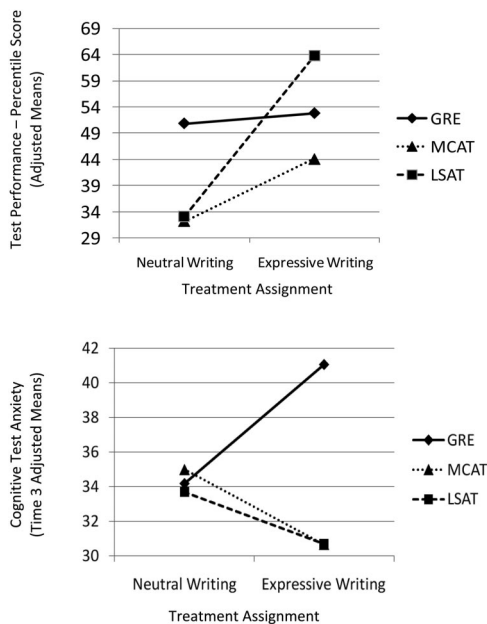


Figure 1. Treatment \times Type of Test for Test Performance (top) and Time 3 Cognitive Test Anxiety (bottom).

although we chose to focus on the cognitive (worry) component of test anxiety due to its stronger relationship with test performance (Cassady & Johnson, 2002), experimental disclosure may be more likely to influence the emotionality component. Indeed, expressive writing interventions tend to affect emotion-related aspects of psychological health more than cognition-related ones (Frattaroli & Dickerhoof, 2006). Finally, we may not have had enough power to detect a significant change in anxiety in our sample. A meta-analysis by Frattaroli (2006) reported that the mean effect size for anxiety outcomes in expressive writing is small ($r_s = .03$ to $.05$), but parallel to ours ($r = .04$ for Time 2 and $r = .06$ Time 3). Thus, a larger sample is required to reliably detect such small effects.

A surprising finding was that the relative benefit of expressive writing for test performance was limited only to those taking the MCAT and the LSAT. One possible explanation is that the study patterns of students taking the different exams vary in such a way as to cause this interaction. Specifically, there is evidence that many students taking the GRE do not begin studying for their exam until very close to the test date (Loken, Radlinski, Crespi, Millet, & Cushing, 2004). Although no published data are available on study habits of students taking the MCAT or LSAT, informal conversations with our study participants and a post hoc analysis of the participants' essays suggest that students taking these two exams may begin studying earlier and for more hours than their GRE counterparts. Indeed, among neutral writing participants, potential GRE-takers reported (in their essays) studying for approximately 1.25 hours over the previous 24 hours, whereas MCAT or LSAT-takers reported studying for approximately 3 hours. Likewise, GRE-takers in the expressive writing group reported having started studying approximately 2 months prior to their writing session, whereas MCAT or LSAT-takers reported having started approximately 5 months earlier. Given these potential differences in study habits, the expressive writing session may actually lead participants taking the GRE to realize that they have not prepared as well as they could have, causing some anxiety that may negate the otherwise positive effects of the intervention. Indeed, expressive writers taking the GRE reported marginally higher test anxiety during their exam compared to controls, while those taking the MCAT or LSAT who wrote expressively showed marginal decreases in their anxiety compared to controls. Finally, the type of test taken may be confounded with some personality variable that is known to moderate the effect of expressive writing; for example, medical and law students tend to be more extraverted than students from other majors (Lievens, Coetsier, De Fruyt, & De Maeseneer, 2002), and extraverts are relatively more likely to benefit from an expressive writing intervention (Sheese, Brown, & Graziano, 2004). As such, these findings may not generalize to test-takers of all personality types and/or study habits.

In addition to potential problems of generalizability, a further limitation of this study was the failure to identify any mediators of the effect of writing on test performance. We expected the reduction in depression found in our expressive writers to be a mechanism by which experimental disclosure improves test performance, but no significant relation was found between reduction of depression and test scores. If reduced depression is not the link between expressive writing and test performance, what is? We consider several possibilities. First, expressive writing has been shown to benefit working memory ability (Kellogg, Mertz, & Morgan, 2010; Klein & Boals, 2001; Yogo & Fujihara, 2008). Because working

memory has been positively associated with performance on standardized tests (Kiewra & Benton, 1988), the role of working memory may be an important link between expressive writing and test performance. Second, our intervention may have prompted students to change their studying behaviors. Specifically, expressive writers may have dedicated more time to studying or focused more intently during their allotted study time, as it has been suggested that expressive writing may clarify for participants the appropriate behaviors for goal attainment by improving their emotional regulation skills (King, 2002). The inclusion of measures of working memory or studying behaviors would be valuable in future research in this area.

Because the present study is the first to show that an expressive writing intervention can improve performance on high-stakes exams, much about this topic is still unknown. In addition to questions about mechanisms underlying improvements in test performance, we do not know whether this benefit is limited to traditional expressive writing instructions. King (2001) found that writing about one's best possible future self produced subjective well-being and physical health benefits similar or superior to traditional (usually negative) expressive writing (see also Lyubomirsky, Dickerhoof, Boehm, & Sheldon, 2008). Given that positive emotional expression was related to decreases in depression in our expressive writers, future studies might examine whether writing about one's "best possible exam self" can improve psychological health and/or performance among those taking high stakes exams. Also, although the control group included in our study is the most common type of control used in this area, it lacks a degree of ecological validity in that test takers do not typically spend their free time writing detailed, objective essays about their activities in the last 24 hours. We offer evidence that 30 min of expressive writing is better for test performance than 30 min of neutral writing about daily activities—but is it better than 30 min of *studying*? Although we suspect 30 minutes of studying could not produce effects comparable to those found here, only future research can answer that question.

In summary, the current research has presented evidence that a brief, easy, inexpensive expressive writing intervention can deliver meaningful performance benefits to students seeking graduate education. Although further work is needed to determine the mechanisms and boundary conditions of this effect, we recommend use of this procedure as a supplement (but not a replacement) to a regular program of study for students preparing for medical or law school admissions examinations.

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