Reviving the Test-Stressed Brain: A Technique to Reduce Test Anxiety and Improve Scores

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Abstract

In this informal, preliminary study to explore the use of an evidence-based expressive writing technique to reduce performance anxiety and improve test scores in medical students, results showed both reduction in the experience of anxiety and an increase in test scores in the majority of participants. Deutsch discusses how educational therapists can use this technique within the context of a mentoring relationship.

In November 2010, Learning and the Brain held a conference in Boston, called *No Brain Left Behind: Improving Teaching, Testing & Treatments*. The conference was aimed at ameliorating learning experiences in education. One of the featured presenters was psychology professor Sian Beilock, PhD, Director of the Human Performance Laboratory at the University of Chicago and leading author of the book *Choke: What the Secrets of the Brain Reveal About Getting it Right When You Have To* (Free Press, 2010) and "Writing About Testing Worries Boosts Exam Performance in the Classroom," (Ramirez & Beilock, 2011).

In March 2011, Dr. Beilock was again one of the featured speakers at the Association of Educational Therapists' Chicago Area Conference, where she presented her research on the psychological mechanisms driving learning and performance (Ramirez & Beilock, 2011) and various strategies for reducing performance anxiety (Beilock, 2010).

During both presentations, Dr. Beilock described the neuroscience behind performance on high-stakes exams and her information prompted this article's research studies, which attempted to integrate Beilock's brain research within an educational therapy context. While science does not always inform practice, one of the responsibilities of educational therapists is to examine and develop interventions that are research-based. These interventions further clarify what we do and legitimize our profession in the context of the learning relationship.

Dr. Beilock's research describes an expressive writing intervention designed to mitigate students' performance anxiety during high-stakes exams (Ramirez & Beilock, 2011). Students' worries about test-taking and test performance generate anxiety, which ultimately competes with working memory capacity and lowers exam performance. Therefore, Dr. Beilock attests, if anxiety is reduced, working memory capacity can remain robust and test performance is not adversely affected.

Discussion of the Neuroscience

Working memory, a cognitive skill whereby the brain retrieves past relevant information to apply to the current information being processed, is an executive function essential to performance on an exam. When students become anxious prior to, or during an exam, the anxiety elicits a physiological response that shuts down working memory capacity. This behavior has its evolutionary roots in the innate fight-flight-freeze response that ensured our ancestors' survival (Sapolsky, 1994). All animals, including humans, depend on a biological response to protect them when threatened. In animals, ancillary functions shut down and energy is directed toward survival. In humans, a similar response can be triggered by anxiety.

When students become anxious during test-taking, stress and anxiety is heightened in the limbic system. In an effort to conserve energy for the fight or flight response, the limbic system may shut down non-essential functions, such as working memory; therefore, an already stressful enterprise becomes more stressful because recall of information is compromised when it is needed most. Understanding this connection between test anxiety and working memory capacity informs the root of the academic problem called *performance anxiety* and provides a clear learning goal when collaborating with a student.

Using Research To Inform Academic Support

As educational therapists, we specialize in one-on-one academic support, a highly attuned process that is often characterized by our ability to empathize or "walk in someone's shoes." If empathy informs the way we engage with our students, then understanding the neurobiology of a learning challenge may enhance our ability to engage with them more effectively.

Dr. Beilock describes an expressive written language activity that offers a strategy for reducing performance anxiety, improving test scores. In addition, this technique offers promise that it may enrich the educational therapy relationship because it may add a rich, informative context in which the educational therapist listens and learns from the student's narrative.

In Dr. Beilock's writing strategy, students describe their experience of test anxiety for 10 minutes prior to test-taking. Initially, students may treat the strategy like journal writing. However, Ramirez and Beilock (2011) draw a distinction between journal writing and their expressive written language strategy. Journaling, or writing about one's feelings, is not entirely the goal. Instead, it is also important for students to recognize and express what they know or what they have done to effectively prepare for the test that will make the difference in mitigating performance anxiety.

It was noted that when introducing this strategy to a student, it may take three or more iterations of writing before providing relief from performance anxiety. Therefore, the educational therapist must be instructive about the difference between writing down one's thoughts and feelings on paper versus expressing the specifics involved in one's test preparation. This

should not be a laundry list of tasks, but rather a description of both feelings and mental processes. Without the latter, students do not seem to understand all that they have done that is positive and helpful in successfully taking a test. Take, for example, the following writing sample from a recent student.

"What matters is that I am here and I am really smart. I think it finally hit me in a deep and much needed way that the only part that really matters is that I'm smart and capable…I should have trusted that even if I didn't know the answer, I had a high enough level of familiarity with the material to trust that if I hadn't ever heard of some answer it was safe to say that it was the wrong answer!"

PROCEDURE

To experiment with Dr. Beilock's findings, her expressive written language activity was used with medical students and residents who had academic performance anxiety. The writing activity was utilized in two separate trials: individually and classroom-style. Trial 1 included three medical students and two residents who were failing their national exams as a result of performance anxiety. Trial 2 included a class of 95 students who attended a test preparation lecture.

In Trial 1, anxiety was assessed and diagnosed in the context of a multi-step intake process that included a complete academic, psychiatric, and family history. Students' narratives were used to further construct a portrait of their anxiety. The following is a vignette that includes a compilation of these students and details how educational therapy may be an effective context in which to address test anxiety, by implementing Dr. Beilock's strategy to ameliorate test performance.

Trial 1

Mary (name was changed) was a medical student referred for educational therapy due to low achieving scores on standardized tests. Mary had been studying to re-take a high-stakes board exam that she had previously failed. This exam became one of five exams that she failed. Weekly or bi-weekly meetings were arranged depending on her schedule. The educational therapy was characterized by supportive and organizational functions, such as reading, test preparation, time management strategies, and discussion about her feelings related to underachieving in medical school. Prior to implementing Dr. Beilock's strategy, Mary scored in the lowest percentile, needed to pass her re-take exam, and failed four other board exams. The educational therapy was empathic, but insufficient. It was not effectively addressing her severe test anxiety.

Initially, Mary spent considerable time writing a list of concerns associated with underperforming. This method did not change the outcomes on practice tests. Gradually, Mary learned to elaborate her writing and include a detailed explanation of her fears and worries associated with test-taking. She described feelings of insecurity and inadequacy as a test taker. Despite these beliefs,

Mary also wrote about her robust test preparation and depth of knowledge of the material. All writing took place 10 minutes before completing a block of 30-50 practice questions. Through her writing, Mary demonstrated an awareness of her effective test preparation and fund of knowledge. As Mary's writing evolved, her performance on practice questions improved. She passed each of the required board exams, ultimately increasing her rate of accuracy on each test by at least 10 percentage points.

As expected, for students without performance anxiety, practicing test questions improves test scores largely due to improvements in retention that occurs when students practice cued recall on multiple-choice questions prior to an exam. This phenomenon is referred to as the testing effect (Karpicke & Roediger, 2008). However, when a student has test anxiety, this trajectory is inconsistent and iterations of practice questions alone often prove ineffective. Using Dr. Beilock's expressive written language activity, students can overcome performance anxiety and benefit from the testing effect. In fact, students may improve their accuracy on an exam even more, if they practice for exams using free-recall (fill-in-the-blank questions) rather than cued recall (Beilock, 2010).

Trial 2

In preparing second-year medical students for the United States Medical Licensing Exam (USMLE) Step 1, I (the author) have designed the Advanced Learning Strategies™ curriculum, which provides students with reading support, organizational tools, and practice question analyses. It is a multi-step process that provides a framework for high-stakes test preparation based on several factors, including a preliminary, comprehensive diagnostic to assess fund of knowledge and test-taking skills, a learning challenges assessment, and the length of time available for test preparation.

The USMLE Step 1 board exam is a nationally administered exam, following the first two years of medical school. It is designed to evaluate knowledge of the basic sciences and organ systems. It also provides a gateway to clinical training, and is significant in determining a student's medical career in the United States. Higher scores on this exam allow the student greater flexibility in pursuing the most competitive medical careers at the most prestigious hospitals. Lower scores can significantly alter a medical student's career.

USMLE Step 1 questions are vignette-based and contain clinical information about patients that require students to understand and excavate information pertaining to the basic sciences and organ systems. At this point in medical school, vignette-based exam questions are somewhat novel. Prior to this time, most objective-based USMLE tests had one or two sentences in the question stem, followed by five multiple-choice answers. The vignette-based test question can include a 15-sentence paragraph with laboratory values that require strong working memory skills, deep fund of knowledge, and strong test-taking skills—all within a strict time limit.

During the introduction to the Advanced Learning Strategies™ class, students took a 20-question, vignette-based practice test in Microbiology and Biochemistry. In post-workshop evaluations, students reported that these practice tests were stressful because they were "unanticipated" and "challenging." At the conclusion of the class, students took a second 20-question, vignette-based test in Microbiology and Biochemistry. However, prior to this second test, they completed Dr. Beilock's writing strategy, detailing their fears associated with the practice questions. Prior to both practice tests, students were told that these tests were good predictors of performance on Step 1. Though not everyone in the workshop had performance anxiety, by a show of hands, nearly all of the students indicated feeling anxious prior to the first set of practice questions. While this was not a formalized study, and instead was meant to teach a series of test-taking strategies to students, informally, students indicated that the writing strategy decreased their experience of test anxiety.

It should be noted that during the past decade, these practice tests had been used in the same way during the class introductions, but without the written expressive language activity. Pre- and posttest scores did not always change during the class. However, frequently there had been a one-point increase in posttest scores. That increase could be associated with the testing effect (Karpicke & Roediger, 2008), where mathematically, a student's score will improve five percentage points per question on a 20-question test. Therefore, a one-point improvement is positive, but likely not sufficient for students failing their practice tests.

This year, following the addition of Beilock's writing activity, nearly all 95 students scored two points higher on the second (post) tests. There were five students who scored three points higher and 10 students who did not improve. Students were not interviewed at the end of class. Therefore, there is no anecdotal information about these improvements. However, these scores are quantitatively higher than in previous years. Additionally, since February 2011, a class of 125 students at another medical school was taught the Advanced Learning Strategies™ Step 1 workshop by the same instructor, which also included the expressive writing technique, and the results were comparable.

Discussion

When students score two points higher on a 20-question test, this amounts to a 10-percentage point increase. Ten percentage points correlates with Dr. Beilock's research (Beilock, 2011) and suggests that those students contending with performance anxiety can free up working memory capacity and improve overall test performance using this writing strategy.

When considering Dr. Beilock's approach within the supportive relationship of educational therapy, educational therapists, who meet with students one-on-one, address a variety of learning issues, such as performance anxiety. In Trial 1, ongoing, one-on-one meetings with the medical students and residents allowed for follow-up, and, perhaps, a better self-understanding

of their test anxieties, as well as a safe environment in which to explore them.

While Dr. Beilock's research does not address the relevance of a relationship-based approach in decreasing performance anxiety, greater academic achievement has been made in the context of one-on-one academic support relationships (Bloom, 1984). In fact, during weekly meetings, these medical students and residents' test scores continued to improve. All five of these students in Trial 1 initially self-identified with performance anxiety, and all five had either failed previous board exams or had scored well below the mean on National Board of Medical Examiners Subject Exams (NBME) and therefore, were at-risk according to their schools or residency programs. The implications for these outcomes support both activities: 1) addressing performance anxiety using brain research, and 2) addressing performance anxiety in the context of a supportive, one-on-one academic relationship.

Conclusion

Improving test scores of students with performance anxiety is critical for academic success. Taking exams when one is anxious can become an untenable experience. Dr. Beilock's expressive written language exercise (Ramirez & Beilock, 2011) is a verified way for educational therapists to help students mitigate their anxiety and improve test performance.

Completing the writing activity and sharing it in the context of a one-on-one learning alliance provides students with an opportunity to examine their feelings about test performance. The power of describing one's thoughts to an educational therapist can enhance a mentoring relationship (Ungerleider, 2010), and in that context, I believe that Ramirez and Beilock's (2011) writing strategy can become an effective means of offsetting performance anxiety. It has an evaluative and curative effect as the student and educational therapist work together. Within that relationship, the students' writings become part of the context in which to explore the emotions associated with learning (Field, Kay, Kaufman, Edward, Saltzman, & Charles, 1993), underscoring the significance of a relationship-based approach in one-on-one academic support.

References

Beilock, S. (2010). *Choke: What the secrets of the brain reveal about getting it right when you have to*. New York, NY: Free Press.

Bloom, B. S. (1984). The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. *Educational Researcher*, *13*(6), 4-16.

Karpicke, J. D., & Reodiger III, H. R. (2008). The critical importance of retrieval for learning. *Science*, *319*, 966-968.

Field, K., Kaufman, E., & Saltzman, C. (1993). *Emotions and learning reconsidered: International perspectives.* Lake Worth, FL: Gardner Press, Inc.

Ramirez, G., & Beilock, S. (2011). Writing about testing worries boosts exam performance in the classroom. *Science*, *331*, 211-213.

Sapolsky, R. M. (1994). *Why zebras don't get ulcers.* New York, NY: Henry Holt and Company.

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