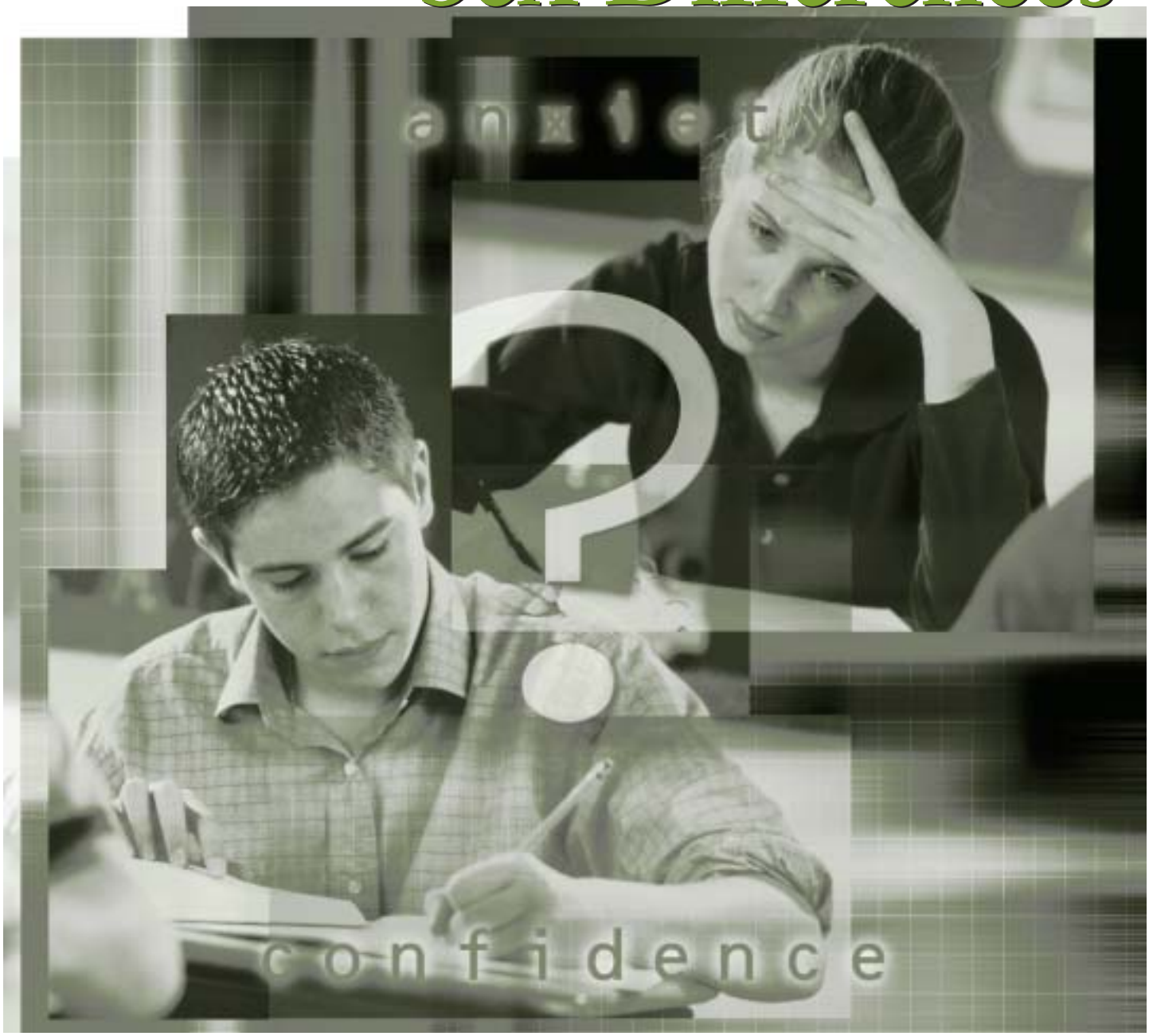
Can Anxiety Explain Sex Differences



Ellen Rydell Altermatt is an Assistant Professor in the Department of Psychology at Hanover College (IN). Her research interests include achievement motivation, peer relationships, coping strategies, and gender differences.

Minha Esther Kim is a graduate student at the College of Education at Michigan State University. Her research interests include stereotype threat and women's experiences in mathematics and science-related fields.

in College Entrance Exam Scores?

by Ellen Rydell Altermatt and Minha Esther Kim

Society knows well that males outperform females on mathematics portions of college entrance examinations. In 2003, for example, males scored an average of 537 points on the mathematics section of the Scholastic Aptitude Test (SAT), whereas females scored an average of 503 points. Less well known is the fact that males also show a slight advantage on the verbal portion of the SAT. In 2003, males scored an average of 512 points, whereas females scored an average of 503 points. These gaps appear to be closing, but are still a significant source of concern for students, parents and educators alike.

Why are there sex differences?

Researchers offer a variety of explanations for sex differences in standardized test scores. Some suggest that the sex differences are the result of biological factors. For example, males may perform better than females on mathematics tests because they are exposed to hormones in the womb that lead to enhanced functioning in the parts of the brain that contribute to spatial reasoning abilities. Spatial reasoning is, in turn, important in solving many mathematical problems. Others suggest sex differences are largely the result of environmental factors. For example, males may perform better than females on mathematics tests because they are more likely to engage in activities (for example, video-game-playing and model-building) that contribute to problem-solving skills. Males may also perform better than females on both mathematics tests and some tests of verbal abilities because they are taught to believe in their academic abilities and, thus, approach these tests with a greater sense of confidence.

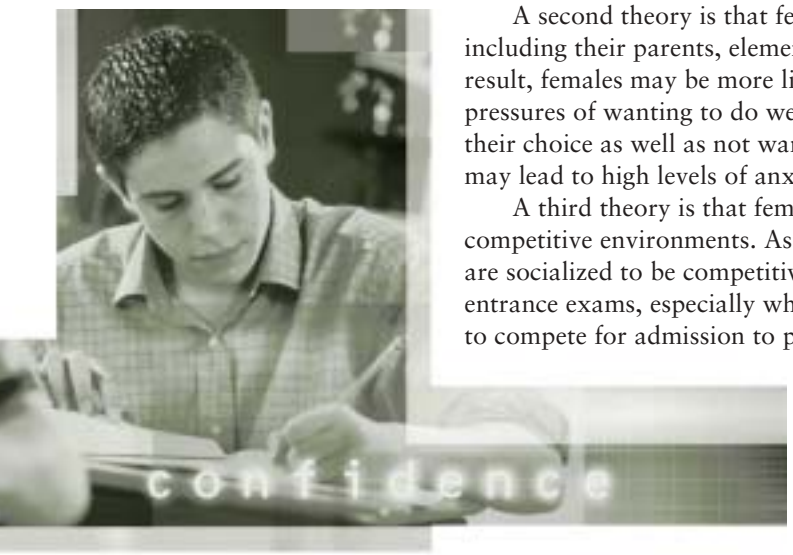
Anxiety as an explanation

The evidence that anxiety may also play a role in explaining sex differences in college entrance exam scores is growing. As early as elementary school, girls report that they are more worried than boys about their school performance. In research with fourth, fifth and sixth grade students, for example, my colleagues and I found that girls were more likely than boys to agree with statements such as "I worry about whether I am really smart" and "I worry about doing well on tests in school" (Pomerantz, Altermatt and Saxon, 2002). Similar sex differences in anxiety have been found among high school, college and adult populations (Feingold, 1994).

One might argue that females' greater levels of worry could be beneficial if it leads them to take important tests like the SAT more seriously and to study diligently for them; however, our results do not support this idea. Girls who worried frequently did not perform better in school than girls who worried infrequently. Worrying was, however, related to a number of negative outcomes for girls, including low levels of academic confidence and high levels of uncertainty about how to be successful. Low confidence and high uncertainty are likely to interfere with females' ability to perform at their best in testing situations. In particular, females may be focusing so much attention on their negative thoughts about the test and their fears that they may not succeed, that little energy is left for focusing on the test itself. Indeed, many studies show that students with high levels of test anxiety perform more poorly on cognitive tasks than students with low levels of test anxiety, even when levels of ability are similar (Eccles, Wigfield and Schiefele, 1998).

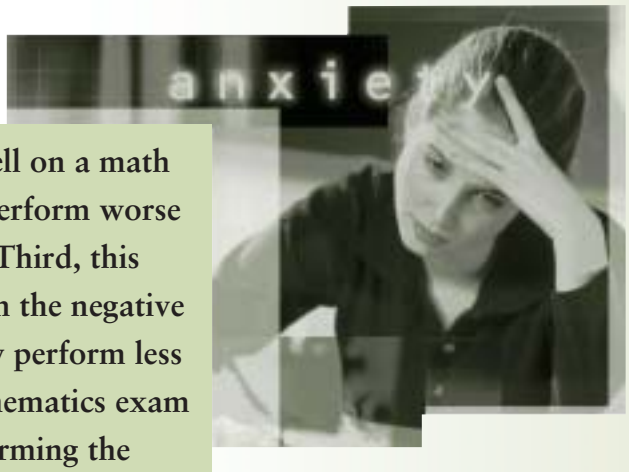
Why do females worry more than males?

One theory is that females are more likely than males to feel that poor performance is the result of uncontrollable factors, such as low ability. This belief may lead females to worry because they are concerned that a low score on a single test (especially one as important as a college entrance exam) indicates that they lack the skills necessary to succeed in college and have little chance of improving these skills. Males, in contrast, are more likely to see an isolated poor performance as the result of controllable causes, such as not studying diligently enough or staying up too late the evening before. This approach may lead to lower levels of worry among males taking college entrance exams, because they can blame a potentially low score on a variety of factors unrelated to their actual math or verbal skills.



A second theory is that females are more concerned than males with pleasing others, including their parents, elementary and secondary school teachers, and school counselors. As a result, females may be more likely than males to approach college entrance exams with the dual pressures of wanting to do well in order to increase their chances of admission to the college of their choice as well as not wanting to disappoint significant others. Combined, these pressures may lead to high levels of anxiety among females that inhibit test performance.

A third theory is that females may be more likely than males to experience anxiety in competitive environments. As a group, females are socialized to be cooperative, whereas males are socialized to be competitive. This socialization may disadvantage females in taking college entrance exams, especially when students view the primary purpose of these exams as a chance to compete for admission to prestigious colleges and for access to limited scholarship funds.



"Females may feel pressure to do well on a math test when reminded that they often perform worse than males on mathematics tests. Third, this pressure often leads people to confirm the negative stereotype. For example, females may perform less well than expected on a difficult mathematics exam because their worries about confirming the stereotype hamper their performance."

Claude Steele and his colleagues propose a fourth theory. This "Stereotype Threat Theory" is especially helpful in explaining why females perform worse than males on the mathematics portion of college entrance exams. Three basic premises guide Steele's theory. First, people are aware of society's negative stereotypes of them. For example, female students understand that society views them as less skilled in mathematics than male students. Second, people feel pressure not to confirm the stereotype, especially when they are placed in situations where the negative stereotype is salient. For example, females may feel pressure to do well on a math test when reminded that they often perform worse than males on mathematics tests. Third, this pressure often leads people to confirm the negative stereotype. For example, females may perform less well than expected on a difficult mathematics exam because their worries about confirming the stereotype hamper their performance.

Research confirms the merit of Stereotype Threat Theory. In one study, Spencer, Steele and Quinn (1999) asked high-achieving male and female college students to take a portion of the advanced Graduate Record Examination (GRE) in mathematics. The participants were divided into two conditions. For half of the students, the negative stereotype was salient. That is, students were told that males tend to outperform females on the test. For the other half of students, the negative stereotype was minimized. That is, students were told that males and females tend to perform similarly on the test. Consistent with Steele's theory, when the negative stereotype was made salient, females performed worse than males. However, when the negative stereotype was minimized, females and males performed similarly. This research suggests that female students are aware of the negative stereotype and, when it is salient, their performance suffers.

The reasons why stereotype threat leads to declines in women's performance are still under investigation. Research by Steele and his colleagues suggests that heightened levels of anxiety—perhaps in combination with other factors such as heightened arousal and sadness—may play some role (Spencer et al., 1995).

The activation of negative stereotypes can be extremely subtle and still have negative consequences for student performance. In one study, Inzlicht and Ben-Zeev (2000) found that females performed worse on a mathematics test when they took the test in a room in which males outnumbered them than in a room where only females were present. Even asking students to report demographic characteristics such as gender or race may activate negative stereotypes and, in turn, lead to performance declines. In a study with African American students, for example, Steele and Aronson (1995) found that students who were asked to report their race before taking a portion of the GRE performed worse than students who were not asked to report their race.

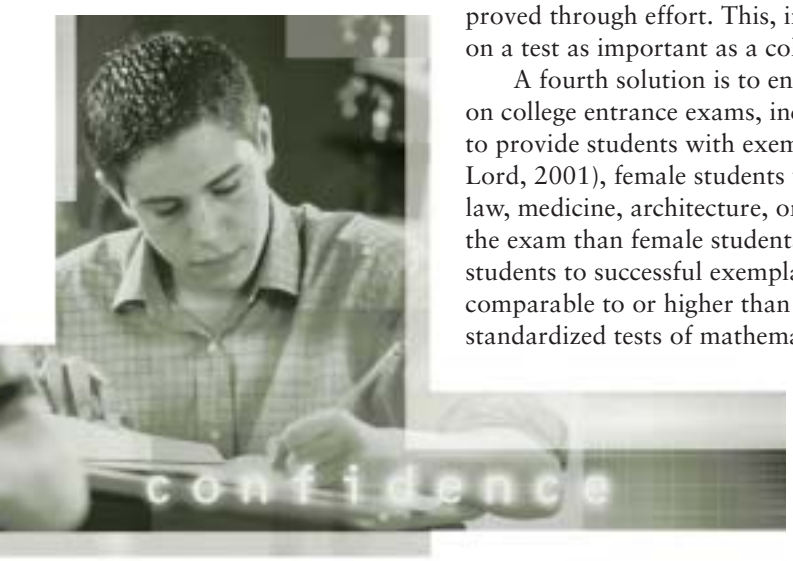
Suggestions for Alleviating Anxiety

If, indeed, anxiety plays a role in explaining sex differences in college entrance exam scores, the question becomes, "what practices alleviate female students' test anxiety and, in turn, reduce their disadvantage on standardized achievement tests?"

One solution comes directly from Steele's work. In particular, efforts should be made to reduce the degree to which negative stereotypes are activated in exam settings. Minimizing these stereotypes should make females feel less threatened by the possibility of doing poorly and their performance should, in turn, improve. Reducing the activation of negative stereotypes may be as simple as asking students to report demographic characteristics (including gender) *after* they have completed college entrance exams rather than before they have begun. Notably, this approach is likely to benefit not only female students, but also African American students—a group whose test scores are also thought to suffer as a result of Stereotype Threat.

A second—albeit more complicated—solution is to reduce the pressure to perform well on college entrance exams. If females are, indeed, more likely than males to feel that they will be disappointing parents, teachers, school counselors, and college admission personnel if they perform poorly on the test, they may approach these tests with levels of anxiety that inhibit their performance. These tests continue to play a major role in college admission decisions. However, students' anxiety may be reduced when they are aware that other criteria, including high school grade point average, participation in extra-curricular activities, and personal essays, guide these decisions. Students should also be told that approximately 400 colleges and universities, including a handful of prestigious colleges (for example, Mount Holyoke College in Massachusetts and Franklin and Marshall College in Pennsylvania), make the SAT or ACT optional for some or all applicants. Students who know they can attend highly-ranked colleges and universities, even if they score less well than they would like on a college admission test, are likely to feel lower levels of debilitating anxiety.

A third solution is to encourage female students to recognize that poor performance is not always diagnostic of a lack of ability. This message can be communicated very early on through the feedback parents, teachers and school counselors give. By providing feedback that focuses on a lack of effort (You need to spend more time studying your vocabulary.) rather than ability (You're vocabulary isn't very good.), students come to learn that academic skills can be improved through effort. This, in turn, reduces their fears that a single instance of failure (even on a test as important as a college entrance exam) is indicative of unchanging abilities.



A fourth solution is to enlighten female students that they are quite capable of succeeding on college entrance exams, including the mathematics portions. One way to convey this fact is to provide students with exemplars of successful women. In one study (McIntyre, Paulson and Lord, 2001), female students who read biographical essays about women who had succeeded in law, medicine, architecture, or invention before taking a mathematics exam performed better on the exam than female students who did not read these essays. In addition to introducing female students to successful exemplars, females should be aware that girls and women receive grades comparable to or higher than boys and men in mathematics classes and that the gender gap on standardized tests of mathematics performance is decreasing.

"Females' heightened worry levels may discourage them from pursuing admission to top-level programs in top-level schools and, after admission, may lead females to avoid courses and majors they are clearly capable of handling. The end result is that females may fail to pursue satisfying and lucrative careers, especially in mathematics and the sciences."

Conclusion

Males and females show a clear difference in the levels of anxiety they experience. Females' greater anxiety appears to place them at a disadvantage. However, the implications of females' heightened anxiety reach beyond their scores on a single exam. Females' heightened worry levels may discourage them from pursuing admission to top-level programs in top-level schools and, after admission, may lead females to avoid courses and majors they are clearly capable of handling. The end result is that females may fail to pursue satisfying and lucrative careers, especially in mathematics and the sciences. Fortunately, parents, teachers and college admission counselors can implement a number of policies to alleviate females' worry and prepare them for the inevitable challenges they will face in college and in the workplace.

References

Eccles, J. S., Wigfield, A., and Schiefele, U. (1998). Motivation to Succeed. In W. Damon (Series Ed.) and N. Eisenberg (Ed.), *Handbook of child psychology: Vol 3. Social, emotional, and personality development* (5th ed., pp. 1017-1095). New York: Wiley.

Feingold, A. (1994). Gender differences in personality: A meta-analysis. *Psychological Bulletin, 16,* 429-456.

Inzlicht, M., and Ben-Zeev, T. (2000). A threatening intellectual environment: Why females are susceptible to experiencing problem-solving deficits in the presence of males. *Psychological Science, 11,* 365-371.

McIntyre, R. B., Paulson, M., and Lord, C. G. (2001). Alleviating women's mathematics stereotype threat through salience of group achievements. *Journal of Experimental Social Psychology, 39,* 83-90.

Pomerantz, E. M., Altermatt, E. R., and Saxon, J. L. (2002). Making the grade but feeling distressed: Gender differences in academic performance and internal distress. *Journal of Educational Psychology, 94,* 396-404.

Spencer, S. J., Steele, C. M., and Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology, 35,* 4-28.

Steele, C. M. and Aronson, J. (1995). Stereotype threat and the intellectual test performance of African-Americans. *Journal of Personality and Social Psychology 69*, 797-811.