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Gender differences in test anxiety and their impact on higher education students' academic achievement

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Abstract

Test anxiety has detrimental effects on the academic performance of many university students. Moreover, female students usually report higher levels of test anxiety than do their male peers. The present study examined gender differences in test, trait, and math anxiety among university students, as well as differences in their academic achievement. Participants were 168 students from the University of Barcelona, all of whom completed measures of test anxiety, math anxiety, and trait anxiety. They were also asked about their expected level of anxiety when faced with four specific test situations: multiple-choice, open-question, oral presentation, and an exam involving calculations. At the end of the course in which they were enrolled, students were assessed through a multiple-choice and an open-question exam. Compared with their male counterparts, female students reported higher levels of test, math, and trait anxiety, as well as greater expected anxiety in three of the four test situations considered. However, females did not show lower academic achievement than male students in either the open-question or the multiple-choice exams. These results are discussed in terms of gender differences in socialization patterns and coping styles.

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1. Introduction

Any attempt to understand students' academic development needs to consider the issue of test anxiety, which can be defined as a situation-specific trait characterized by the predisposition to react with elevated anxiety in a context where performance is assessed (Hodapp, Glanzmann, & Laux, 1995). According to Zeidner, test anxiety "is the set of phenomenological, physiological, and behavioral responses that accompany concern about possible negative consequences of failure on an exam or similar evaluative situation" (Zeidner, 1998, p. 17). Students frequently report test anxiety and there is broad agreement in the empirical literature that it is associated with lower academic performance (Cassady & Johnson, 2002; Zeidner, 1998). The fact that this relationship has been observed even in large samples of undergraduate and graduate students (Kassim et al., 2008) highlights the serious problem that test anxiety constitutes for many college and university students.

Several explanations have been proposed to explain the relationship between test anxiety and academic achievement. Some authors suggest that test anxiety may consume cognitive resources (i.e., attention and working memory resources), thus preventing students from concentrating on the exam (Eysenck, 1992). More recent explanations (Linnenbrink, 2007) refer to the fact that anxiety may affect students' motivation and undermine their learning strategies (e.g., anxiety may reduce motivation to learn or impede the use of efficient learning strategies). Whatever the underlying cause, test anxiety may reduce students' academic achievement by interfering with their exam preparation, their performance while taking an exam, or both.

Some research on test anxiety has focused on gender differences, it being repeatedly found that female students experience higher levels of test anxiety than do males (Bandalos, Yates, & Thorndike-Christ, 1995). Less is known, however, about whether these differences between males' and females' reported levels of anxiety may impact on their academic achievement. Some years ago, the meta-analysis by Hembree (1988) revealed that the high level of test anxiety reported by females is not generally accompanied by lower performance scores. Since then, however, few studies have been conducted, especially as regards higher education students.

Given that test anxiety is a factor that may affect academic grades, and bearing in mind that female students usually report higher levels of test anxiety, this study had the following objectives: 1) To examine gender differences in trait, math, and test anxiety; 2) to study these differences in greater detail by analyzing male and female students' answers to each item of a test anxiety questionnaire, as well as their expected level of anxiety when faced with specific types of test situations (i.e., oral presentation, open-question exams, multiple-choice, or exams involving calculations); and 3) to explore gender differences in academic achievement by analyzing male and female students' grades in an open-question and a multiple-choice exam, as well as their number of hits, errors, and unanswered questions in the latter.

2. Methods

2.1. Participants

Participants were 168 psychology undergraduates from the University of Barcelona, all of whom were enrolled in a Research Designs course during the 2014-2015 academic year. The sample comprised 135 women (80.36%) with a mean age of 20.90 years ($SD = 2.43$, range = 19-30) and 33 men (19.64%) with a mean age of 21.20 years ($SD = 2.78$, range = 19-29).

2.2. Materials

Participants were administered the following scales and questionnaires:

- *Test Anxiety Questionnaire* (CAEX; Valero, 1999): This questionnaire (developed originally in Spain) measures test anxiety by describing 50 possible situations that might trigger test anxiety or physiological responses elicited by test-related situations. Respondents use a six-point Likert-type scale, ranging from 0 (Almost never) to 5 (Almost always), to indicate how often they experience each of the situations (frequency). For this study we selected 14 items from the full questionnaire, given that we were only interested in the cognitive aspects of test

anxiety, those related to worry and concern when preparing for or while sitting an exam (see Figure 1). Reliability was high for frequency of occurrence scores (Cronbach’s alpha = .94).

TEST ANXIETY QUESTIONNAIRE

Please answer the questionnaire by considering how often you experience each of the situations described below. Respond quickly, but make sure you think through the answers. It is very important to answer all the items.

	Almost never	Seldom	Sometimes	Often	Usually	Almost always
1. During a test I feel nervous if the teacher stands next to me, and then I can no longer answer the questions.						
2. I often cry after a test, thinking about how badly I’ve done, even if I don’t know my mark.						
3. While I’m sitting a test, I think about how badly I’m doing.						
4. I get nervous if I see that others have finished the test before I have.						
5. I think the teacher is constantly watching me.						
6. I usually bite my nails or chew my pen during a test.						
7. I’m constantly restless throughout a test (moving my feet, playing with my pen, looking around the room, at the clock, etc.).						
8. I think I’m going to fail the test, even if I’ve studied beforehand.						
9. Before taking the test, my thought is that I’ve forgotten everything and that I’m going to fail.						
10. If I sit at the front of the class I feel more nervous.						
11. If the test is time-limited I get more nervous and do worse.						
12. My feeling as I leave the test room is that I’ve done badly.						
13. I think beforehand that I’ll be nervous and that I’ll forget everything.						
14. It takes me a long time to answer most of the questions or to decide to hand in my test paper.						

Fig. 1. The 14 items selected from the CAEX (Valero, 1999).

- *Questions about the level of anxiety related to specific types of test situations:* These questions form part of the Test Anxiety Questionnaire (Valero, 1999). Respondents are asked to report the expected level of anxiety that 11 types of tests would elicit in them. For the present study we selected four types of tests (see Figure 2), with participants responding on a six-point Likert-type scale ranging from 0 (Not anxious) to 5 (Extremely anxious).

Please indicate how anxious you would feel when faced with each of the following types of test situations:

	Not anxious	Slightly anxious	Fairly anxious	Very anxious	Highly anxious	Extremely anxious
An oral presentation of a given topic in class.						
A written test with multiple-choice answers.						
A written test with open questions.						
A test involving math problems or calculations.						

Fig. 2. Expected level of anxiety when faced with specific types of test situations.

- *Abbreviated Math Anxiety Rating Scale (sMARS; Alexander & Martray, 1989)*: This instrument measures math anxiety by presenting 25 situations in which it may arise. The respondent must indicate the level of anxiety associated with each item using a five-point Likert-type scale anchored by 1 (no anxiety) and 5 (high anxiety). The sum of the item scores yields a total score for math anxiety, ranging between 25 and 125. The present study used the Spanish version of this scale (Núñez-Peña, Suárez-Pellicioni, Guilera, & Mercadé-Carranza, 2012), which has shown evidence of strong internal consistency (Cronbach’s alpha = .94) and high 7-week test-retest reliability (.72).
- *State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983)*. The STAI is a 40-item scale used to measure state (STAI-S) and trait (STAI-T) anxiety. Trait anxiety reflects a general and relatively stable tendency to respond with anxiety. Only the STAI-T subscale was used in this study. The STAI-T subscale includes 20 statements describing different emotions, and respondents must answer by considering how they feel “in general”. Items are answered on a four-point Likert-type scale, from 0 (almost never) to 3 (almost always). Good to excellent internal consistency (Cronbach’s alpha = .89-.96) and adequate 30-day test-retest reliability (r = .75-.86) have been reported with high-school students (Spielberger et al., 1983). The Spanish adaptation of this test was used in this study (Spielberger, Gorsuch, & Lushene, 2008).

2.3. Procedure

Data were collected from students on the Research Designs course as part of a voluntary activity. All the tests were administered in classroom settings by the researchers, who supervised completion and provided appropriate support when required. At the end of the course, students sat two exams: one involving open questions and another with a four-option multiple-choice format. Wrong answers in the multiple-choice test were penalized -0.25 to discourage random guessing.

3. Results

Gender differences were studied by applying independent t-tests to all measures collected (i.e., the anxiety measures, including each of the CAEX items and the test-situation questions, and the final exams). On the anxiety measures, female students were found to report higher levels of math anxiety ($t(160) = 3.2, p = .002$), trait anxiety ($t(160) = 2.5, p = .012$), and test anxiety ($t(160) = 2.4, p = .019$), as compared with their male peers. The same pattern of results was found when studying gender differences in expected levels of anxiety when faced with specific types of test situations. As shown in Table 1, female students reported a higher expected level of test anxiety than did their male counterparts for oral presentations ($t(160) = 2.5, p = .013$), open-question tests ($t(160) = 1.9, p = .048$), and exams involving calculations ($t(160) = 2.4, p = .017$). However, males and females did not differ when asked how much anxiety they would experience when sitting a multiple-choice exam.

Table 1. Means, standard deviations (in brackets), and t-tests for anxiety measures by gender.

Anxiety measures	Female students	Male students	t-test	p
Math anxiety	64.20 (16.16)	53.59 (16.12)	3.21	.002
Trait anxiety	23.17 (8.64)	18.55 (9.96)	2.53	.012
Test anxiety	23.12 (10.79)	18.03 (8.99)	2.36	.019
Oral presentations	3.06 (1.42)	2.34 (1.23)	2.51	.013
Multiple-choice test	1.80 (1.08)	1.69 (1.49)	0.37	.716
Open-question test	2.26 (1.13)	1.79 (1.15)	1.99	.048
Test involving calculations	2.53 (1.41)	1.83 (1.42)	2.42	.017

In order to study gender differences in test anxiety in more detail, we performed separate t-tests for each CAEX item. As shown in Table 2, male and female students differed in their answers to items 1, 9, and 11 ($t(160) = 2.8$, $p = .006$; $t(160) = 2.4$, $p = .016$; and $t(55.8) = 3.3$, $p = .002$, respectively), with females reporting a higher frequency of occurrence of the situations described in these items (see Figure 1 for CAEX items).

Table 2. Means, standard deviations (in brackets), and t-tests for items 1, 9, and 11 by gender.

CAEX items	Female students	Male students	t-test	p
Item 1	2.72 (1.51)	1.86 (1.46)	2.80	.006
Item 9	1.92 (1.42)	1.21 (1.26)	2.43	.016
Item 11	1.57 (1.36)	0.86 (0.95)	3.34	.002

Finally, we analyzed gender differences on the achievement measures. Although no group differences were found in either the open-question or multiple-choice exam grades, a more detailed look at the latter showed that female students tended to leave more questions unanswered than did male students ($t(156) = 1.9$, $p = .057$). As shown in Table 3, no gender differences were found in the number of hits or errors.

Table 3. Means, standard deviations, and t-tests for achievement measures by gender.

Achievement measures	Female students	Male students	t-test	p
Open-question exam	6.20 (1.90)	6.02 (1.95)	0.45	.654
Multiple-choice exam	7.16 (1.69)	7.36 (1.17)	0.59	.552
Hits (multiple-choice)	22.74 (4.15)	23.28 (3.00)	0.66	.509
Errors (multiple-choice)	4.36 (2.85)	4.86 (2.64)	0.86	.391
Unanswered questions (multiple-choice)	2.88 (2.67)	1.86 (2.08)	1.92	.057

4. Discussion

The aim of this study was to examine differences between female and male higher education students in their reported level of test, math, and trait anxiety, as well as their expected level of anxiety when faced with specific types of test situations. We also explored gender differences in students' grades in an open-question and a multiple-choice exam.

As for the measures of anxiety, female students reported higher levels of test, math, and trait anxiety than did their male counterparts. These results are consistent with some previous research on gender differences in test anxiety (e.g., Bandalos et al., 1995), math anxiety (e.g., Hembree, 1990), and trait anxiety (e.g., Zalta & Chambless,

2012), although it should be noted that such differences have not always been observed. A more detailed study of the results revealed that female students reported higher levels of test anxiety specifically for test situations involving open questions, oral presentations, and calculation or math problems. No gender differences in expected anxiety levels were found in relation to the multiple-choice test situation.

Two explanations have been proposed to account for gender differences in test anxiety. One attributes them to the different social roles assigned to men and women, the idea being that because females are under greater pressure to succeed academically than are males, they are more afraid of failing in a test situation. The other explanation suggests that men are more defensive than women when it comes to admitting anxiety, as doing so may be experienced as threatening their masculinity.

Regarding academic achievement, although female students reported higher levels of test anxiety than did males, no gender differences were observed in actual performance, that is, in final exam grades. Male students did not outperform their female peers in either the open-question or the multiple-choice exam. A closer look at students' multiple-choice answers revealed that female students did not differ from males in either the number of hits or errors, although they tended to leave more questions unanswered than did their male counterparts. Given that wrong answers in the multiple-choice exam were penalized (-0.25), a plausible interpretation of this finding is that female students were more cautious when answering the multiple-choice questions, whereas male students may have been more daring. However, as already noted, this gender difference did not affect the final exam grade.

In conclusion, this study showed that although reported levels of test anxiety were higher for female university students than for their male peers, this does not seem to affect their academic achievement, since their final grades were comparable with those of their male classmates. This result is consistent with the findings of previous research showing that greater test anxiety among females did not result in poorer academic performance (Hembree, 1988), and it suggests that female students may have developed effective strategies for coping with anxiety in test situations.

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