# Relationship Between Anxiety and Standardized Patient Test Performance in the Medicine Clerkship

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**PURPOSE:** Anxiety is thought to affect test performance. Studies have shown that students with low levels of test anxiety achieve higher scores on multiple choice question (MCQ) examinations than those with high anxiety levels. Female students have been shown to have higher test anxiety levels than male students. Standardized patient (SP) examinations are being used in medical schools and for licensing purposes. As SP exams are relatively new, there are few studies measuring anxiety levels for the SP test. The purpose of this study was to measure and compare medicine clerkship student SP versus MCQ examination anxiety levels and to determine if level affected test performance.

**METHODS:** The Spielberger test attitude inventory was used to measure anxiety in 150 students rotating through the clerkship. Students completed questionnaires after the MCQ and SP examinations. Mean examination scores and anxiety levels were compared. Based on questionnaire scores, students were divided into 3 groups: low, moderate, and high anxiety. The MCQ and SP examination scores were analyzed to determine if male/female anxiety-level affected test performance.

**RESULTS:** There were no meaningful anxiety-level differences between the SP and MCQ examinations. An inverse relationship between anxiety level and test scores was not identified. Female students had higher anxiety levels but sex differences did not influence examination performance.

**DISCUSSION:** Medicine clerkship student test performance is not affected by anxiety level. Implications of the findings for incorporating stress management training in medical school curricula and suggestions for future research are discussed.

*KEY WORDS:* standardized patient evaluation; medicine clerkship; test anxiety.

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W*e live in a test-conscious, test-giving culture in which the lives of people are in part determined by their test performance.*[1] Medical students must pass standardized examinations to demonstrate competence in various subjects and for licensing purposes. Investigators have reported that the need to perform well on tests and preparing for and taking tests were the most stressful situations students experienced while in medical school.[2,3]

Test anxiety is a situation-specific form of anxiety in response to taking tests.[4] It is an unpleasant emotional state or condition with perceived feelings of tension, apprehension, nervousness, and worry. The physiological manifestations of any situation-specific anxiety generally include increased blood pressure, rapid heart rate with palpitations and tachycardia, sweating, dryness of the mouth, nausea, dizziness, hyperventilation, restlessness, tremors, and feelings of weakness.[5] In general, the more difficult an examination and the more important the consequences that are attendant upon successful performance, the more likely the test will be perceived as threatening by students and the greater the effects of situation specific anxiety.[4,6]

The anxiety some students experience during examinations depends on several factors. These can be either problems with retrieval of information during the test and "going blank" or problems with encoding, organizing, and storing course information due to poor study skills.[7] Doing poorly in multiple-choice question (MCQ) examinations, for example, is considered to be more of an encoding, organizing, and processing kind of deficit than a problem with retrieval. Students who do not process information effectively and have trouble assimilating new information do poorly, not only in evaluative exams, but also in take-home tests and nonevaluative pressure situations.[8,9] It is important, therefore, to identify the underlying problem and develop a plan for a student based on the specific anxiety-producing deficit.

Although there is conflicting evidence in the test anxiety literature, there is broad agreement that test anxiety is associated with lower academic performance and that a linear relationship exists between anxiety and examination performance.[8,10] Frierson and Hoban[11] reported that first-year medical students with low levels of anxiety during an MCQ examination achieved better scores than students with high levels of anxiety. There is little research, however, on anxiety levels of third-year clerkship students and test performance.

There is also general agreement that substantial sex differences in test anxiety exist with female students having higher test anxiety than male students. Are female students at a disadvantage in test taking situations? Is school more stressful for women than men? Some studies have analyzed the components of anxiety, such as the autonomic nervous system response (the emotionality component) and the excessive worrying about failure component, to further evaluate for sex differences that might affect performance.[10,12] The worry component is associated with poor study habits or retrieval problems and is thought to contribute more to performance decrements than emotionality. Studies have consistently found that although female students have higher test anxiety than male students from early elementary school through college, there are no meaningful sex differences in academic performance.[13,14] This is the case, regardless of whether the predominant anxiety component is emotionality or worry.[10]

A majority of students believe that MCQ examinations give rise to less anxiety than other types of examinations.[15] Standardized patient (SP) examinations are being used in medical schools, residency programs, and for licensing purposes. There is now an SP clinical skills (CS) licensure require-

ment called the United States Medical Licensing Examination (USMLE) Step 2 CS whereby students are videotaped interviewing, examining, and counseling trained actors pretending to be patients. The unique qualities of the standardized patient examination make it, understandably, a stressful experience. In less than 15 minutes, a student must interview and examine a patient and accurately formulate a differential diagnosis and plan. With each patient, the student must demonstrate excellent communication skills and composure. The examination was developed to provide more information about the bedside skills of future physicians. Medical students must pass this examination before graduation or starting a residency-training program. Some medical schools are beginning to add SP examinations into the curriculum, not only to test students, but also to help them gain confidence and experience before the USMLE Step 2 CS examination.

By the time our third-year students start the medicine clerkship, they have taken at least 25 medical school MCQ and as few as 5 SP examinations. We hypothesized that the lack of student experience in taking SP examinations might evoke greater anxiety for the SP test. Additionally, our SP examination is 40 minutes longer and precedes the MCQ exam by 1 week, additional factors that could contribute to higher anxiety levels. Although most medical students are experienced at taking MCQ examinations, the SP examinations are relatively new for some students. There are little data on clerkship student levels of anxiety during a SP examination.

The main purpose of this study was to investigate the relationship between test anxiety and performance on the 2 most common evaluative methods used in medical school clerkships and by the USMLE, namely the MCQ and SP examinations. Are high levels of test anxiety associated with lower test performance, as most people assume? Is worry or emotionality the main anxiety component seen in medical students? We also wanted to investigate gender differences in anxiety levels and compare subsequent test performance of male and female students. Are tests more stressful for female students and are female clerkship students at a disadvantage when taking tests? Finally, we were interested in seeing if medical students experienced higher levels of anxiety during an SP examination than the MCQ examination and if so, was performance on the SP examination negatively influenced by the higher anxiety levels.

## METHODS

Our institutional review board (IRB) approved the following research design. We studied consented third-year students scheduled to rotate through the 12-week medicine clerkship. The clerkship was given in 4 rotation sequences (July to September, October to December, January to March, and April to June) during the academic year. Two examinations were given at the end of the clerkship: the departmentally developed SP examination (reliability=0.63) and the MCQ-National Board of Medical Examiners (NBME) medicine subject examination (reliability=0.8). Both of the examinations have been used in the clerkship for over 10 years. The SP examination preceded the MCQ examination by 1 week. The SP examination score accounted for 20% and the MCQ examination for 30% of the final clerkship grade. Students were required to score at least a 70% on both exams as a requirement for passing the clerkship. It was our assumption that the students perceived the examinations to be quite important.

The MCQ examination consisted of 100 questions and lasted 2 hours and 10 minutes. The departmental SP examination was developed using the United States Licensing Examination (USMLE) Step 2CS (Clinical Skills) blueprint and resembles the new licensing examination requirement. The test lasted 3 hours and consisted of 6 simulated patient encounters (the USMLE has 11 to 12 cases) specifically designed to reflect a balance of acute, subacute, and chronic medical problems. Each student was expected to gather a pertinent history and perform a relevant physical examination based on the complaint of the patient (i.e., cough, weight loss, chest pain). Each patient encounter was 10 minutes long (USMLE has 15-minute encounters) and was graded by the SP based on a predefined performance checklist of 20 to 25 essential skills and behaviors needed to be adequately performed by the student. Standardized patients had been trained to perform reliable assessments in all components of the examination and students were videotaped as they interacted with SPs to assure quality control (interrater reliability >0.90). Similar to the USMLE, SP encounters were followed by postencounter stations where students were required to answer questions regarding the history, physical examination, differential diagnosis, and diagnostic plan of the previous SP encounter. Postencounters were graded by the clerkship director using predefined performance standards.

Student anxiety levels were measured by the Test Attitude Inventory (TAI), a definitive instrument for measuring anxiety in adults, which provides reliable ($\alpha$ coefficient of 0.9) assessment of acute anxiety. Since its introduction more than 30 years ago, the TAI has been translated and adapted in 48 languages and has been used to measure anxiety in more than 6,000 studies.[4]

In responding to the 20-item Likert-type TAI questionnaire, students self-reported the intensity of their feelings at a particular time (i.e., at the time of the examinations). Scores were obtained by summing up the scores for the 20 items that comprise the scale. The TAI consists of 2 subscales for measuring emotionality and worry which appear to be the major components of test anxiety.[15] Eight questionnaire items make up an emotionality subscale (the autonomic nervous system reactions evoked by the stress of being evaluated). Eight items make up a worry subscale (cognitive concerns about the consequences of failure that interfere with attention). Subscale scores range from 8 to 32 points. The remaining 4 TAI items are used to derive the total score. Given the scale of 1 to 4 for each of the 20 items, the range of possible scores for the questionnaire could vary from a minimum of 20 to a maximum of 80. Although norms are not available for medical students, the questionnaire is reported to have excellent psychometric properties in college and high school students.[4,16]

Anxiety levels were assessed after students took the 2 clerkship examinations. As no TAI norms exist for medical students, low, moderate, and high anxiety groups were formed for male and female students using sample-specific means and standard deviations based on the SP and MCQ questionnaire responses. Male and female students were classified as having low or high test anxiety if their scores ranged 1 standard deviation below or above the male or female sample mean. Male students were classified at the time of the SP exam as low test anxious if they scored between 20 and 32 ($n$=16; $M$=27.38 ± 3.22), moderately test anxious if their scores ranged from 33 to 58 ($n$=50; $M$=45.78 ± 7.35), and highly test

anxious if their scores ranged from 59 to 80 ($n$=14; M=65.36 ± 4.94). Male students were classified at the time of the MCQ exam as low test anxious if they scored between 20 and 31 ($n$=13; M=23.92 ± 4.19), moderately test anxious if their scores ranged from 31 to 56 ($n$=56; M=44.13 ± 6.59), and highly test anxious if their scores ranged from 57 to 80 ($n$=11; M=67.09 ± 7.29). Female students were classified at the time of the SP exam as low test anxious if they scored between 20 and 40 ($n$=10; M=33.60 ± 4.99), moderately test anxious if their scores ranged from 41 to 62 ($n$=47; M=51.38 ± 6.50), and highly test anxious if their scores ranged from 63 to 80 ($n$=13; M=68.23 ± 4.36). Female students were classified at the time of the MCQ exam as low test anxious if they scored between 20 and 37 ($n$=10; M=30.70 ± 5.93), moderately test anxious if their scores ranged from 38 to 59 ($n$=48; M=48.33 ± 4.86), and highly test anxious if their scores ranged from 60 to 80 ($n$=12; M=66.75 ± 7.19).

Student's $t$ tests were used to compare if overall and subscale anxiety levels differed for the SP versus MCQ examinations. The dependent variable, test anxiety level, was then analyzed by 1-way ANOVA for sex and clerkship rotation differences. Analysis of variance was used to determine if specific male or female anxiety levels (low, moderate, or high) or specific TAI subscale components (worry or emotionality) affected outcome measures, namely the MCQ and SP examination scores. $P$-values less than .05 were considered to be statistically significant. Data were processed using SPSS (Statistical Product and Service Solutions Inc., Chicago, IL) software.

## RESULTS

One hundred and fifty third-year medical clerkship students (88% of the class) agreed to participate in the study. Each clerkship rotation sequence included 35 to 40 students. The mean age of students was 25.58 (SD ± 2.39) years. 53.33% ($n$=80) were men and 46.67% ($n$=70) were women.

Student mean ($M$) test anxiety scores after the MCQ and SP examinations were 46.32 ± 12.77 and 48.53 ± 12.87, respectively. As measured by means of Student's $t$ test, anxiety levels associated with the SP examination were significantly greater than that of the MCQ examination ($t$=2.18, $P$=.03). Additionally, the levels of anxiety reported by students on the emotionality subscales were significantly higher than those reported for the worry subscales after both the SP (20.12 ± 5.5 vs 18.79 ± 5.4; $t$=4.39, $P$=.00) and MCQ (20.07 ± 5.7 vs 17.43 ± 5.2; $t$=10.60, $P$=.00) examinations.

Mean SP anxiety scores over the 4 clerkship rotations were 48.85 ± 13.18, 51.47 ± 12.43, 47.83 ± 13.24, and 46.20 ± 12.56, respectively. Mean MCQ anxiety scores for the 4 rotations were 47.67 ± 15.19, 43.03 ± 13.07, 44.71 ± 15.59, and 49.38 ± 3.08, respectively. Student anxiety scores did not differ significantly per clerkship rotation for either the SP ($F$=1.11, $df$=3/149, $P$=.35) or MCQ examinations ($F$=1.93, $df$=3/149, $P$=.13).

Women clerkship students showed a clear tendency to achieve higher overall TAI test anxiety ratings. Significant differences in overall test anxiety means between the sexes were confirmed for the MCQ examination (48.97 ± 11.51 vs 44.00 ± 13.42, $F$=5.84, $df$=1/149, $P$=.02) and the SP examination (51.97 ± 11.56 vs 45.53 ± 13.27, $F$=9.93, $df$=1/149, $P$=.00). Analysis of variance showed no significant differences

### Table 1. Medicine Clerkship MCQ and SP Mean Examination Scores Grouped by Student Test Anxiety Level*

| Classification of anxiety | Mean Anxiety Level ± SD | |
| --- | --- | --- |
| | **MCQ Mean Exam Scores** | **SP Mean Exam Scores** |
| Low anxious males | 78.54 ± 6.65 (M=23.92 ± 4.19) $n$=13 | 84.66 ± 5.83 (M=27.38 ± 3.22) $n$=16 |
| Low anxious females | 77.58 ± 7.71 (M=30.70 ± 5.93) $n$=10 | 82.53 ± 7.52 (M=33.60 ± 4.99) $n$=10 |
| Moderate anxious males | 78.86 ± 9.55 (M=44.13 ± 6.59) $n$=56 | 84.34 ± 7.33 (M=45.78 ± 7.35) $n$=50 |
| Moderate anxious females | 79.44 ± 8.26 (M=48.33 ± 4.86) $n$=48 | 86.43 ± 5.74 (M=51.38 ± 6.50) $n$=47 |
| High anxious males | 76.62 ± 6.95 (M=67.09 ± 7.29) $n$=11 | 86.31 ± 5.24 (M=65.36 ± 4.94) $n$=14 |
| High anxious females | 75.67 ± 6.34 (M=66.75 ± 7.19) $n$=12 | 85.67 ± 6.44 (M=68.23 ± 4.36) $n$=13 |
| ANOVA | $P$=.99 | $P$=.57 |

*The range of possible scores for the anxiety questionnaire could vary from a minimum of 20 to a maximum of 80.*
*MCQ, multiple choice question; SP, standardized patient.*

in test performance among the 3 anxiety level groups. This was the case whether male or female students had high, moderate or low levels of test anxiety (see Table 1).

Female students scored significantly higher than male students in both the worry subscale for the SP (19.83 ± 5.05 vs 17.88 ± 5.57; $P$=.03) and MCQ (18.38 ± 5.00 vs 16.60 ± 5.32; $P$=.04) exams and the emotionality subscale for the SP (21.87 ± 4.96 vs 18.80 ± 5.42; $P$=.00) and MCQ (21.22 ± 4.98 vs 19.03 ± 6.08; $P$=.02) exams. Worry anxiety levels did not affect performance in either the SP ($F$=0.92, $df$=1/149, $P$=.57) or MCQ tests ($F$=0.81, $df$=1/147, $P$=.71). Similar insignificance was found between the emotionality subscale and the SP ($F$=0.79, $df$=1/149, $P$=.75) and MCQ examinations ($F$=0.88, $df$=1/148, $P$=.61).

## DISCUSSION

This study provides evidence that examinations at the medical school clerkship level cause anxiety and that female clerkship students are more anxious about tests than male students. Even though research[15] shows that students believe MCQ exams give rise to less anxiety than other types of exams and we hypothesized that students would experience more anxiety for the SP exam, levels of anxiety were not very different between the 2 tests. Although the anxiety score differences between the MCQ and SP examinations reach statistical significance, it is unlikely that the 2-point variation represents any meaningful difference. This variation could be explained by the fact that the SP examination was longer and given first in the clerkship.

Does test anxiety affect test performance and are female clerkship students at a disadvantage in test taking situations? In our study, anxiety level did not account for a significant amount of the variance in student performance in either the SP or MCQ clerkship examinations. This was the case whether

male or female students had high, moderate or low levels of test anxiety. This is in agreement with Chapell et al.,[14] who showed that female graduate students had higher levels of test anxiety than male students but clinically insignificant performance differences. Even though it appears that our clerkship students are anxious about SP examinations, their level of anxiety did not seem to influence examination performance. This could be due to students having some previous experience in SP examinations, albeit limited, before the clerkship. The lesser weight of the SP examination towards the final grade could be an additional contributing factor. Identifying the factors that explain why some tests are more important and more anxiety producing to medical students than others might be helpful.

As it has been shown that the TAI worry subscale is more closely related to test performance than the emotionality subscale,[12] investigators have evaluated for subscale gender differences. Zeidner[10] reported greater sex-group differentiation in college students on the emotionality subscale than on the worry component with no meaningful effect on test performance. Our female clerkship students had significantly higher anxiety scores than male students in both the worry and emotionality subscales. Nonetheless, there were no gender subscale effects on test performance and the significant subscale sex differences (emotionality>worry) were small. It might be important, however, to determine levels of emotionality or worry that are debilitating. Developing a specific plan for the underlying deficit could benefit certain students.

There were several weaknesses in our study. The questionnaires were completed after the examinations as our IRB thought that having students fill these out beforehand might increase anxiety levels and affect test performance. More accurate levels of anxiety might have been measured if questionnaires had been completed before examinations. Previous studies have shown, however, that time of anxiety testing had no meaningful effect on TAI reliability[17] except for emotionality scores which may be lower following tests. A further limitation may be that of nonparticipation bias (12%); it would have been advantageous to interview a sample to see if they were high anxiety students or to look at their examination scores to see if they were similar to participants in the study.

Even though a certain amount of anxiety is facilitative and may benefit clerkship students, some medical schools are beginning to add SP examinations into the curriculum not only to test students but also to help them gain confidence and experience before the USMLE Step 2 CS examination. Practice examinations allow students to experience the stressful feelings the real examination would evoke and then apply anxiety control techniques.[18] Students with high emotionality subscale scores, like some of our clerkship students, may respond to systematic desensitization and other forms of behavioral treatment, such as, practice examinations. Students, however, with high worry subscale scores would need to improve study skills and receive help in encoding or retrieval of information. Even though emotionality was the predominant anxiety component of our clerkship students, it would still be appropriate to identify the specific underlying problem and develop the correct plan for a student with high levels of test anxiety. Practice examinations may not benefit all students.

Some may argue that at this point in their educational careers, most third year medical students, including the 16% of our clerkship students with high levels of anxiety, have probably mastered test taking. Given the lack of differences in test performance with low and high test anxiety, is it even necessary to help students by integrating stress-reducing programs into medical school curricula? Although there is evidence that student participation in stress reduction programs does improve test scores,[19] and students universally find stress management programs to be helpful,[20] behavioral treatment to control test anxiety and improve test scores is controversial. Studies have shown, however, that medical students who participate in such programs demonstrate increases in empathy and sensitivity towards patients as well as decreases in anxiety.[21,22] Additionally, as anxiety subscale components are associated with different deficits, improved understanding of test anxiety may help medical schools better understand the learning process. Evaluating test anxiety and stress-reducing interventions and determining if future patients benefit would be important. These would be areas for further research. If we want medical students to do their best, test anxiety research is warranted.

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