



Impact of test anxiety on psychomotor functions and satisfaction with life of medical undergraduates during second professional curriculum

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ABSTRACT

Background: Studies done in various countries have shown test anxiety to be associated with stress. An extensive internet search showed limited studies on stress in undergraduate medical students in India. Hence this study was undertaken to assess the level of test anxiety and its impact on psychomotor functions and satisfaction with life of second professional level of medical undergraduates during relaxed and stressed state. **Methods:** This longitudinal study was conducted on 101 participants in the 2nd and 3rd year of professional course. The participants were subjected to Hamilton Rating Scale for Anxiety, Zung's Self Rating Anxiety Scale, Satisfaction with life Score and Psychomotor tests (Digit Substitution, Digit Cancellation) during relaxed and stressed state. **Results:** 101 participants were enrolled in the study had a comparable scores in Hamilton Rating Scale for Anxiety, Zung's Self Rating Anxiety Scale, Satisfaction with life Score, during relaxed and stressed state, but there was a statistically significant ($p < 0.05$) decrease in both Digit Substitution and Digit Cancellation test during stressed state. **Conclusion:** Findings in our study indicate that performance on psychomotor tests during examination decreased significantly and had comparable anxiety and satisfaction levels during the relaxed and stressed state.

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Introduction

Medical curriculum is intensive and challenging; medical students face increased stress, health-related and emotional problems to perform these increased responsibilities (1). Anxiety serves as an adaptive response to stress and is considered pathological when it is inappropriate to a given stimulus, by virtue of either its intensity or

duration. Work in animal models has demonstrated strong correlation between exposure to various forms of physical or emotional stress and individual differences in anxiety (2). Prevalence of anxiety during medical training ranged from 41.1% to 56.7% in a study done at School of Medical Sciences, Malaysia (3) and 13.7% in another study done at University of Auckland (4).

Test anxiety is described as “a set of phenomenological, physiological, and behavioural responses that accompany concern about possible negative consequences or failure on an exam or similar evaluative situation”. Test-anxious behaviour is typically evoked when a person believes that her or his intellectual, motivational, social capabilities and capacities are taxed or exceeded by demands stemming from the test situation (5). It is a feeling of distress felt by students across the globe and can be a devastating problem for many college and university students; as it may impair their performance and well being in the long run. Most students experience some level of anxiety during the examination. However, when anxiety affects the examination performance, it represents a problem. Medical students generally present with moderate levels of test anxiety but a considerable number have intense symptoms of test anxiety and require help (6). It is an emotional reaction mostly experienced by students during long anticipatory periods before the examinations and as observed by Morrison, medical students have marked undue stress during pre-examination and examination period (7). Evidence suggests that, principal stressors are related to medical training or academic factors rather than personal problems or any other stress inducing factor (8, 9, 10, 11). Oral examinations have been documented to cause greater cortisol release and feelings of anxiety than written examinations (12, 13). The data on test anxiety in Indian set up is lacking hence, the present study was undertaken to assess the level of test anxiety and its impact on psychomotor functions and satisfaction with life of second professional level of medical undergraduates during relaxed and stressed state.

Method

This longitudinal follow up study was conducted in second professional level of medical undergraduates after approval from the Institutional Ethics Committee. A total of 101 medical undergraduates were enrolled in the study after obtaining written informed consent. Students with current diagnosis of any disease state which could affect the outcome of the study

and those unwilling to give written consent were excluded.

Procedure

The participants were informed about the purpose of the study and the general instructions were explained. The participants filled questionnaires which included – Hamilton rating scale of anxiety (14), Zung’s self rating anxiety scale (15) and Satisfaction with life scale (16). The participants also performed Digit Symbol Substitution (17) and Digit Cancellation test (18). The participants filled these questionnaires and performed the tests in the relaxed state (after they were back from summer break, with no examinations in preceding 3 weeks and coming 2 weeks) and stressed state (one week before the university examination of Baba Farid University of Health Sciences, Faridkot, India of 2nd professional curriculum). Hamilton rating scale of anxiety is a 14 item observer rating scale which includes items like depressed mood, autonomic symptoms, behavior at interview and cardiovascular symptoms. Each item is defined by a series of symptoms and measures both psychic and somatic anxiety and is scored on a scale of 0 (not present) to 4 (severe), with a total score range of 0-56 (14). Students were divided in groups of two, and each participant performed the test on his/her partner. The procedure was repeated again with the other participant performing the test on his/her partner to obtain data of all participants.

Zung’s self rating anxiety scale is a 20 item self report questionnaire. Each student indicates how much each statement applies to him or her. Each question is scored on a scale of 1 (a little of the time) to 4 (most of the time), with a total score range of 20-80. Overall assessment is done by a total score (15). All the participants filled the questionnaire individually.

Satisfaction with life scale is a short 5 item scale for overall self assessment of life satisfaction. Each question is scored on a scale of 1 (strongly disagree) to 7 (strongly agree), with total score range of 5-35 (16). This questionnaire was also filled by the participants themselves.

A questionnaire regarding personal data, which included history of alcohol intake, smoking, hours of sleep (as per last one week), family history of hypertension, apart from age and gender was also filled by the participants and confidentiality was insured.

Psychomotor tests were included to evaluate the effect of test anxiety as participants with test anxiety tend to get distracted during a test, experience difficulty with comprehending relatively simple instructions, and have trouble organizing or recalling relevant information (17, 18).

Digit Symbol Substitution test forms a part of the Wechsler Adult Intelligence Test. It is applied to evaluate cognitive function, attention and psychomotor speed. A code table is given, displaying the correspondence between pairs of digits (from 1 to 9) and symbols. Each participant had to fill in corresponding symbol in place of digit in the space provided on a sheet of randomly placed digits in rows and columns within 2 minutes (17). The number of correctly represented symbols was recorded at relaxed as well as stressed state.

Digit Cancellation test- participants were presented with a sheet containing randomized digits in rows and columns and were asked to cancel the targeted letter given to them as many times it appears on the sheet in 2 minutes (18). The number of correctly represented symbols was recorded at relaxed as well as stressed state.

All the participants received prior training to fill all the questionnaires and perform both Digit Symbol Substitution and Digit Cancellation test.

Statistical Analysis

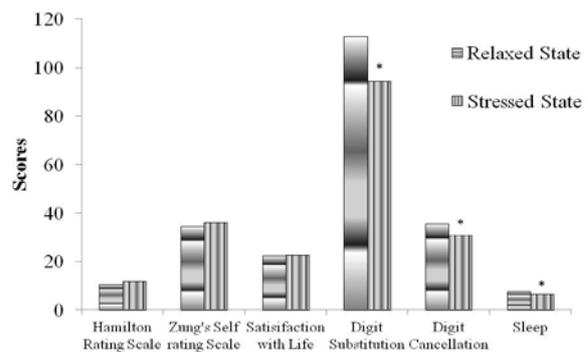
All the data assembled were presented as mean \pm standard deviation (Mean \pm SD). The results were analysed with the help of appropriate parametric (two-tailed students t-test) and non parametric (Kruskal-Wallis test, Mann-Whitney test, Chi-Square test) tests. A $p < 0.05$ was considered as statistically significant.

Result

The demographic profile of participants at relaxed state is presented in Table 1. A total of 101 participants were enrolled in the study. Of the 101 participants enrolled in the study, 37 were males and 64 were females with a mean age of 20.19 ± 0.87 years.

Table 1: Demographic profile at relaxed state

Characteristic	n=101
Sex (Male:Female)	37:64
Age (Years) (Mean \pm SD)	20.19 ± 0.87
Hamilton Rating Scale of Anxiety (Mean \pm SD)	10.68 ± 5.68
Zung's Self Rating Anxiety Scale (Mean \pm SD)	34.45 ± 7.07
Satisfaction With Life Scores (Mean \pm SD)	22.45 ± 6.26
Sleep (Hours) (Mean \pm SD)	7.59 ± 1.12



* $p < 0.05$ as compared to relaxed state

Figure 1: Comparison between relaxed and stressed state

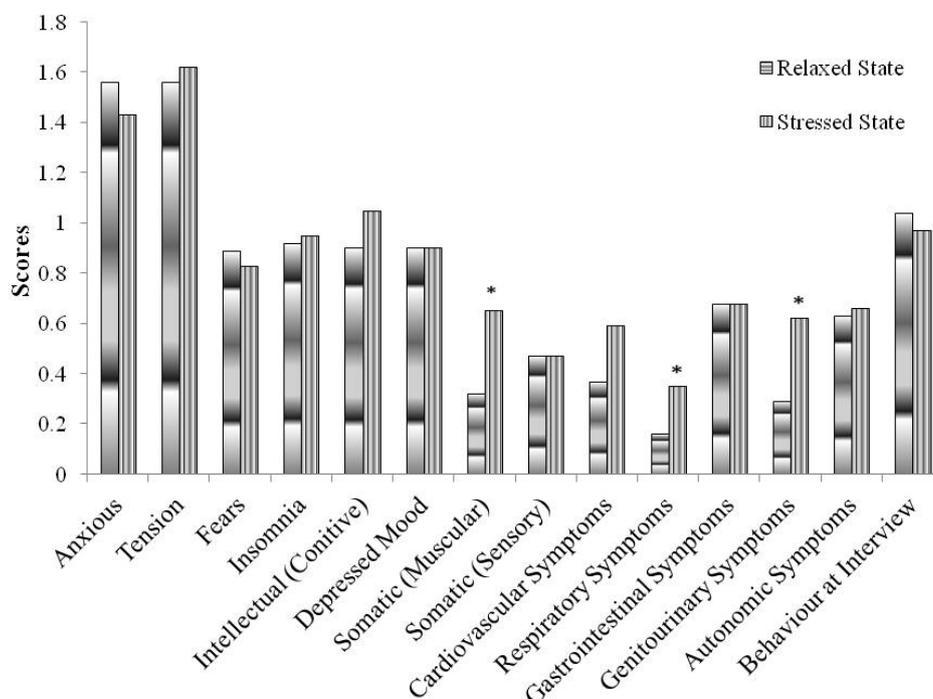
The anxiety levels and satisfaction with life determined during the relaxed state and stressed state are presented in Figure 1. The Hamilton rating scale for anxiety showed higher scores during the stressed state (11.84 ± 7.66 vs. 10.68 ± 5.68) during the relaxed state although it was not statistically significant ($p > 0.05$). A significantly higher ($p < 0.05$) number of participants had severe anxiety (8 vs.1) during stressed state as compared to relaxed state. Out of these 8 severely anxious participants, 6 were females. The Zung's Self rating scale for anxiety similarly showed a slight increase in scores in stressed state (36.04 ± 9.37 vs. 34.45 ± 7.07) but

this was not statistically significant. A comparison of the scores of the satisfaction with life scale showed that participants were slightly satisfied with their lives and there was no statistically significant variation in the total scores during the two states. The total score during relaxed state was 22.45 ± 6.26 and 22.97 ± 6.17 during stressed state. One participant was reported to be extremely dissatisfied during relaxed state as compared to 3 during the stressed state. 11 participants were extremely satisfied by their lives during the relaxed state while 9 were extremely satisfied even in the stressed state.

On analysis of the Digit Symbol Substitution test, a statistically significant decrease in the performance was noted during the stressed state. The average score decreased from 112.9 ± 26.04 during the relaxed state to 94.42 ± 36.77 during the stressed state. Similarly the performance on the Digit Cancellation test also showed a statistically significant decrease. The average score of the participants dropped from 35.46 ± 1.97 in the relaxed state to 30.85 ± 2.78 in the stressed state. There was a statistically

significant decrease in the average hours of sleep, from 7.59 ± 1.12 (Relaxed state) to 6.43 ± 1.23 (Stressed state). Higher number of participants had reported of sleep 5 hours (22 vs. 3) during stressed state and it was statistically significant.

Analysis of the different items of the Hamilton scale (Figure 2) revealed a statistically significant increase in the somatic symptoms (muscular) from 0.32 ± 0.65 to 0.65 ± 0.87 ; respiratory symptoms from 0.16 ± 0.39 to 0.35 ± 0.64 and genitourinary symptoms from 0.29 ± 0.62 to 0.62 ± 0.84 during the stressed state. The scores of somatic symptoms (sensory) and gastrointestinal symptoms were similar during relaxed and stressed state. For all the other items in Hamilton anxiety rating scale the scores were higher during stressed state but were not statistically significant. 14 students reported to be consuming alcohol occasionally but none of them consumed it on the day of exam or a week prior to it and no student gave history of smoking cigarettes to decrease the stress of medical education.



*p<0.05 as compared to relaxed state

Figure 2: Comparison of Hamilton rating scale for anxiety

Discussion

Test anxiety is an unpleasant feeling or emotional state that has both physiological and behavioural components and that is experienced in formal testing or other evaluative situations (19). It is characterised with somatic, cognitive and behavioural symptoms of anxiety in situations of preparing and performing tests and exams.

In a study on students of McGill University, it was found that medical students were not untowardly stressed; in fact they had a better relaxation potential (20). Our study showed similar results that medical students in the 2nd year of MBBS did not have higher test anxiety levels. Test anxiety being a type of performance anxiety, regular tests and tutorials being conducted in our college could also have been the possible reasons for decreased test anxiety in our study. Students are regularly counselled and trained to give examinations in a way, such that they do not consider it as a burden and stressful experience. Rather, take examinations as a part of their learning process and consider examinations to be useful. Studies indicate that by second year students get adjusted to the demanding environment of medical education and also find ways to cope up with the stress (21). As indicated by a study at Dow University, Karachi, students in their fourth and final years had higher levels of stress due to case presentations and dealing with death and suffering as compared to those in 2nd and 3rd years (22). A study in Thailand also showed stress in 61.4% medical students, mostly in the third year (23).

Study from Services Institute of Medical Sciences, Pakistan found that female medical students reported significantly higher test anxiety levels as compared to male medical students (24). Our study also had similar findings with 6 females out of the 8 reported to be having severe anxiety. It is suggested that the reason for this gender difference in anxiety may be due to the different social roles assigned to men and women and increased emotional vulnerability of females to this difference in their roles.

As inferred by a study done at Auckland on 778 students from medical, science, nursing, architecture fields, medical students are more satisfied with life compared to other students (4). Results from our study also indicate that medical students are satisfied with their lives.

As proven by Chavez EL et al in their study on 56 test anxious subjects, test anxiety did not significantly affect performance on finger tapping, trail making, digit span and digit symbol tests (25). But the results of our study indicated a statistically significant decrease in performance on both Digit Symbol Substitution and Digit Cancellation tests.

There are certain limitations in our study: Firstly, a larger sample size would have given a better picture of the prevalence and effect of test anxiety. Second, we did not measure the blood pressure and heart rate of the patients during relaxed and stressed state so the effect of test anxiety on autonomic functions was not determined. Thirdly, specific counselling for psychomotor tests could have been done. Fourth, the study was done only for the subject of Pharmacology and no other subject; the results might have varied for other medical subjects.

Conclusion

To conclude, the findings in our study indicate that the performance on psychomotor tests during the examination was decreased significantly, and there was a comparable anxiety and satisfaction levels during relaxed and stressed state.

Reference

1. Dahlin M, Joneborg N, Runeson B. Stress and depression among medical students: A cross-sectional study. *Med Educ* 2005; 39: 594-604.
2. Gross C, Hen R. The developmental origins of anxiety. *Nature Reviews. Neuroscience* 2004; 5: 545-52.
3. Yusoff MSB, Abdul Rahim AF, Baba AA, Ismail SB, Mat Pa MN, Esa AR. The impact of medical education on psychological health of students: A cohort study. *Psychol*

- Health Med 2012; Nov 12. [Epub ahead of print] DOI:10.1080/13548506.2012.740162
4. Samaranayake CB, Fernando AT. Satisfaction with life and depression among medical students in Auckland, New Zealand. *N Z Med J* 2011; 124: 12-7.
 5. Zeidner M. Defining the Test Anxiety Domain. In *Test Anxiety: The State of the Art*. New York: Springer 1998; pp118.
 6. Latas M, Pantic M, Obradovic D. Analysis of test anxiety in medical students. *Med Pregl* 2010; 63: 863-6.
 7. Morrison J, Moffat K. More on Medical Student stress. *Med Educ* 2001; 35: 617-8.
 8. Supe AN. Study of stress in medical students at Seth GS Medical College. *J Post Grad Med* 1998; 44: 1-6.
 9. Vaidya PM, Mulgaonkar KP. Prevalence of depression anxiety and stress in undergraduate medical students and its correlation with their academic performance. *Indian J Occup Ther* 2007; 39: 7-10.
 10. Coburn D, Jovaisas AV. Percieved sources of stress among 1st year medical students. *Med Educ* 1975; 50: 589-95.
 11. Moffat K, Ross S, Morrison JM. Ist year medical student stress and coping in a problem based learning medical curriculum. *Med Educ* 2004; 38: 482-91.
 12. McEwen BS. Protective and damaging effects of stress mediators. *N Engl J Med* 1998; 338: 171-9.
 13. Lacey K, Zaharia MD, Griffiths J, Ravindran AV, Merali Z, Anisman H. A prospective study of neuroendocrine and immune alterations associated with the stress of an oral academic examination among graduate students. *Psychoneuroendocrinology* 2000; 25: 339-56.
 14. Hamilton M. Diagnosis and rating of anxiety. *Brit J Psychiatry* 1969; Sp 3: 76-9.
 15. Zung WWK. A rating instrument for anxiety disorders. *Psychosomatics* 1971; 12: 371-9.
 16. Diener E, Emmons RA, Larsen RJ, Griffin S. The Satisfaction with Life Scale. *Journal of Personality Assessment* 1985; 49: 71-5.
 17. Lezak MD, Howieson DB, Loring DW. *Neuropsychological assessment*. New York: Oxford University Press 2004; pp. 368-370. ISBN 9780195111217.
 18. Medhi B, Prakash A. Central Nervous System. In *Practical Manual of Experimental and Clinical Pharmacology*. New Delhi, Jaypee Brothers Medical Publisher (P) Ltd, 2010; pp291-302.
 19. Dusek JB. The development of test anxiety in children. In Irwin, B.S (Ed.), *Test Anxiety: theory, research and applications*. Hillsdale, NJ: Lawrance Erlbaum Associates, Inc 1980; p.88.
 20. Helmers KF, Danoff D, Steinert Y, Leyton M, Young SN. Stress and depressed mood in medical students, law students, and graduate students at McGill University. *Academic Medicine* 1997; 72: 708-14.
 21. Inam SNB. Anxiety and depression among students of a medical college in Saudi Arabia. *Int J Health Sci (qassim)* 2007; 1: 295-300.
 22. Afzal H, Afzal S, Siddique SA, Naqvi SA. Measures used by medical students to reduce test anxiety. *J Pak Med Assoc* 2012; 62: 982-6.
 23. Saipanish, R. Stress among medical students in a Thai medical school. *Medical Teacher* 2004; 25: 502-6.
 24. 24. Farooqi YN, Ghani R, Spielberger CD. Gender differences in test anxiety and Academic performance of Medical Students. *International Journal of Psychology and Behavioural Sciences* 2012, 2(2): 38-43.
 25. 25. Chavez EL, Trautt GM, Brandon A, Steyaert J. Effects of test anxiety and sex of subject on neuropsychological test performance: Finger Tapping, Trail Making, Digit Span and Digit Symbol tests. *Percept Mot Skills*. 1983; 56(3): 923-9.