Original Research Article

Stress levels and "immediate examination performance" of medical students

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Abstract

Introduction: The effects of stress are known to be multi faceted. Equally unpredictable are the results of examinations. Evaluation of performance of a person in examination depends on many factors. In present study, we attempted to find stress levels and their effect on examination performance of first year medical students.

Material and methods: We asked the first year medical students to rate their perceived level of stress in percentage score from 0–100; 100 being the highest, along with other relevant data. We correlated this stress level and other factors with their marks in immediate examination, which was conducted in $\pm$ 10 days of recording stress score.

Results: It was found that stress levels higher than 40, suggestive of distress; lead to decrease in examination performance, as evidenced by decrease in marks in all types of examinations: viz. theory viva voce (oral), written theory examination and practical examination.

Conclusion: We studied effect of stress on examination performance. We found that higher stress led to poor performance in examinations. (negative correlation) We found high levels of stress in 52% of participants, that affected their exam performance. Since they were not aware of relaxation techniques, we introduced the same to them.

Key words

Stress, Stress levels, Marks, Examination performance.

Introduction

We studied happiness index and stress audit in medical students, during last 8 years. It was only 2 years before that we got curious about relation between stress levels and examination performance of medical students. Since studies on cited topic are sparse, we decided to take up initial study on a small population.

Hans Selye, a pioneering Austrian-Canadian endocrinologist of Hungarian origin, described stress as a result of wear and tear of the body. He further classified stress into eustress and distress [1]. Eustress refers to the physiological stress that motivates a person to work hard and get optimum results, for the efforts put in [2]. Spielberg described stress state as a persons' response to the stress and stress trait as a persons' habit to get stressed. Stress affects the mind, body, and behavior in many ways; affecting one's efficiency and performance. The specific signs and symptoms of stress vary widely from person to person [3].

Stress is known to evoke 3 F reactions (fright, fight and flight), raising the adrenalines and helping one win an emergency life threatening situation [4]. In chronic stress, where fight or flight is not possible: sympathetic-adrenocortical system is activated. This causes release of stress hormones, including corticosteroids [5].

We need some stress in our lives to keep us moving. The absence of stress by making one idle, can affect performance, health and well being; whereas the existence of too much stress, leads to many diseases: organic, psychological and behavioural [6].

Chronic stress results into increased sympathetic activity. Stress raises cortisol levels. Cortisol makes glucose and free fatty acids available for energy purposes. Cortisol suppresses immune reaction and facilitates actions of catecholamines [7].

Measuring galvanic skin resistance and evoked potentials are known methods to find level of sympathetic activity in a person. However these need sophisticated instruments, laboratory set up and technical skills.

Measuring cardio respiratory effects caused by raised levels of catecholamines, is one of the clinical method to get idea about existing stress. This needs medical personnel and spare time of both, subject and physician.

The most cost effective and therefore the most commonly used methods to decide stress levels are self report questionnaires. Many of these have been designed to measure stressful states and traits such as anger, anxiety, depression, and Type A coronary behavior [8].

It seems one can precisely judge ones' own stress level. Medical students being aware of their body and mind can be more trusted in this matter. Self assessment / perception of stress levels can be of great use in research studies.

Effect of stress levels on the performance of a person is well studied. The Stress Response Curve, as devised by Nixon, P. (1979), shows that as the level of stress increases, the performance level also increases; to the point of eustress, or healthy tension. Near the point of fatigue, an identified area called the comfort zone is seen. This indicates the range of stress levels that we can absolutely manage. Comfort zone stress facilitates reasonably good and sustainable performance levels [9].

Studies in college are altogether different from that in school. One of the biggest challenges for young people at university is to adjust to the lower degree of predictability [10]. Stellar

success at A–levels of higher secondary examinations requires both being smart and working hard. But dealing with the variety of not yet familiar exam styles and atmosphere at medical university is an additional challenge. San Diego's widely circulated students' independent news letter states that final exams create unnecessary stress, to the students and parents [11].

No matter how much we hate (or love) exams, they're part and parcel of the education system [12]. The joyous and cheerful class of school boys, gets stunned and worried, as soon as a notice for examination dates are announced. The light hearted teachers also get busy preparing question papers for the exams with utmost sincerity.

The questions asked by examiners, depend on their fancy and liking for a particular topic. The questions asked may be straight forward or bizarre. Some clever students give correct answers to the point. However sometimes, in a bid to score marks, the students bluff and give funny answers [13, 14]. The answers in viva voce serve as a source of entertainment for examiners and frustration for the internal teachers. When asked the questions, a few students frown deeply and stare upwards in memosphere [15].

Such is the anxiety of exam, that some examinees develop tics. (Sudden repetitive movement that is difficult to control) Motor or vocal tics and gestures like eye blinking, lip biting, hissings, bharat–natyam hand mudra are often seen [16].

Home sickness, young age, unknown colleagues, new environment, international language, other than mother tongue, and technical terminology; make study of first year of medicine highly stressful. Written tests, practical examinations and oral viva voce examinations prove tough to the students. Performance and results of examinations apart from being unpredictable, at times are highly surprising and shocking.

Performance in Examination depends on many factors. In a study of commerce students it was found that examination performance of a student was governed by teaching in the class, his own study and his ability to write in the examination hall [13]. According to Britney Cleme, University of Minnesota, Rochester; yoga meditation practice, increases exam marks from 52 to 60%.

We took up study of self perceived stress levels, and immediate examination results of fifty I M.B.B.S. students. The immediate examination defines examination conducted in $\pm$ 10 days of noting down the stress levels of participants.

The marks considered were of oral theory viva voce (20 marks), written theory paper (50 marks) and practical examination. (50 marks) The practical examination included hematology and human clinical practical, requiring cognitive, musculoskeletal and creative skills. At most places in this study, marks are denoted in percentage.

Material and methods

50 students of I M.B.B.S. participated in the present study. We asked the participants to note down their stress levels, as per their own perception, in the range 0–100. Their performance in immediate examination consisting of written tests, practical examinations and theory viva voce (oral), which was conducted in $\pm$ 10 days; was correlated with different factors including their stress levels already noted. The participants were divided into having scores of 0–20 (low stress = no stress), 21–40 (lower average = minimum stress), 41–60 (higher average = borderline high

stress), 61–80 (high stress = definite stress) and 81–100 (very high stress = distress, person in dire need of remedial help). We further studied exam performance of each group.

Results

It is seen that girls had higher level of stress (approximately by 10%). However girls scored better in nearly all immediate examinations by 6–10%. Girls had higher score even in written theory exams (**Table - 1**). Perhaps girls were able to tolerate a little higher stress better than boys.

Though body mass index denotes obesity, we found that persons with higher BMI (26– 30) had better performance in all immediate examinations (**Table - 2**). As per Indian mythology, blessed are the people; who are well fed and a little obese. They being happy go lucky people, are likely to have better performance. Average BMI of the participants was 21.1.

We further found that body mass index had positive correlation with examination performance. BMI had higher positive correlation with score in practical exams. Stress had negative coefficient correlation with performance in all immediate examinations. (**Table - 3**) This signifies that higher stress mars the performance of the students. Higher stress had more impact on theory examinations. Stress seems to affect memorizing, recollecting and writing skills.

With average stress score being 47.2, we divided participants into various group of stress scores of 20 each. The participants were divided into having scores of 0–20 (low stress = no stress), 21–40 (lower average = minimum stress), 41–60 (higher average = borderline high stress), 61–80 (high stress = definite stress) and 81–100 (very high stress = dis stress, person in dire need of remedial help). Stress group 0–20 and 21–40, had 24% participants each, with average stress

score of 15.1 and 31.3 respectively. Stress group 41–60, 61–80 and 81–100, had 20%, 22%, and 10%, participants with average stress score 52.5, 73.5 and 94.0 respectively.

Persons with stress levels 01–20 had highest performance in the exam. As the levels of stress increased (more than 40), there was definite decrease in the exam performance (**Table - 4**).

While dividing participants into groups of stress levels 01–40 and 41–100, we found that average stress of groups 01–40, 41–100 and all participants were 23.2, 69.4 and 47.2 respectively. Persons with stress levels 01–40 had significantly higher scores (by 06 to 16%), in different examinations (**Table - 5**). This validates The Yerkes-Dodson Law. This law was first described in 1908 by psychologists Robert Yerkes and John Dillingham Dodson. The law suggests that there is a relationship between arousal and performance. Increased arousal can help improve performance, but only up to a certain point. Beyond that point when arousal becomes excessive, performance diminishes [17].

Though none were taking psychotropic drugs, 40% of participants had sleep disturbances. Drinking tea or coffee (more than 600 ml/day) was seen in these persons, that was believed to raise alertness and also perhaps caused sleep disturbances.

Discussion

Research has found that different tasks require different levels of arousal for optimal performance. Difficult or intellectually demanding tasks may require a lower level of arousal to facilitate concentration. Our study with stress levels less than 40, facilitating better performance, validates this Yerkes Dodson Law [18].

Medical students are overloaded with a tremendous amount of information, which they are not able to memorize and recollect during examinations. Many medical students struggle with their own capacity to meet the demands of medical curriculum and examination stress [19].

Lack of preparation, memorizing text books, studying all night before exams, not revising and reviewing (all indicating lack of strategic studying and time management) were reported by more than half of medical students in other studies as factors contributing to their anxiety during exams [20].

In present study it was seen that girls had higher level of stress (approximately by 10%). However girls scored better in nearly all examinations by 6–10%.

Around 52 % of all students here had stress higher than 40 and they needed training in de stress measures. These students were offered counseling. They were advised about relaxation techniques, laughter therapy, creative arts, pranayam, dhyan and yog.

Since the present study was on only 50 participants, we shall like to study the same on larger population to validate the results found in this study.

Conclusion

Performance in examination depends on many known and unknown factors. As per a funny pun, 14 'P's viz. professor, pupil, past behavior, prejudice, preferences, preparation, persistence, presentation, patience, personality, peace of mind, perfection, pictures and presents: affect the performance of students in the examination.

We studied effect of stress on examination performance. We found that higher stress led to poor performance in examinations. (negative correlation) We found high levels of stress in 52% of participants, that affected their exam performance. Since they were not aware of relaxation techniques, we introduced the same to them.

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Table - 1: Gender, average stress levels and immediate exam marks.

Immediate exam	Average stress	Theory viva oral %	Written theory %	Practical exam %
Female	49.8	58.4	49.6	59.7
Male	44.6	55.2	48.6	58.4
Average	47.2	56.8	49.1	59.0

Table - 2: BMI levels and immediate exam (%) marks.

BMI	No of Pax	Theory viva oral %	Written theory %	Practical exam %
BMI 16– 20	26 pax	55.2	48.0	57.6
BMI 21– 25	18 pax	58.6	48.2	59.8
BMI 26– 30	06 pax	58.3	56.7	63.0
Average all	50 pax	56.8	49.1	59.0

Table - 3: Coefficient correlation of BMI and stress with immediate exam marks.

Immediate exam marks	Factor average value	Theory viva 20	Theory 50	Practical 50
BMI coefficient correlation	21.1	0.15209	0.15662	0.21680
Stress coefficient correlation	47.2	-0.24513	-0.30913	-0.18179

Table - 4: Stress levels (st) and immediate exam marks.

Immediate exam	Average St levels	Theory viva oral %	Written theory %	Practical exam %	All immediate exam average %
st 01 – 20	15.1	58.8	55.2	60.2	58.0
st 21 – 40	31.3	60.4	51.2	61.3	57.6
st 41 – 60	52.5	55	48.2	58	53.7
st 61 – 80	73.5	55.0	44.0	57.5	52.2
st 81 –100	94	51	42.8	56.4	50.1
Average all	47.2	56.8	49.1	59.0	55.0

Table - 5: Stress levels (st) and immediate exam marks.

st levels	No. of pax	Average st levels	Theory viva oral %	Written theory %	Practical exam %	Immediate exam aver % (all)
st 01 – 40	24 pax	23.2	59.6	53.2	60.8	57.8
st 41 –100	26 pax	69.4	54.2	45.4	57.5	52.4
Average all	50 pax	47.2	56.8	49.1	59.0	55.0