RESEARCH ARTICLE

Comparison of physical fitness and mental stress in exercising and non-exercising medical students

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ABSTRACT

Background: Both physical fitness and mental fitness are essential to achieve success, especially in medical college students, where the academic pressure is high. Studies have shown that exercise helps to reduce mental stress as well as to maintain the fitness. Aims and Objectives: The present study was aimed to compare the level of physical fitness and level of mental stress in exercising and non-exercising medical students. Materials and Methods: A study was done on 60 medical students of age group of 18–20 years with 30 in the exercise group and 30 in the non-exercise group. Modified Harvard step test was used to assess physical fitness index and perceived stress scale questionnaire to assess mental stress. Descriptive analysis and independent t-test were used for statistical analysis. Results: The study demonstrated higher physical fitness ($P < 0.01$) and lower mental stress levels ($P < 0.01$) in the exercising group when compared to the non-exercising group. Conclusion: There was better physical fitness and lower mental stress levels among the exercising group when compared with the non-exercising group.

KEY WORDS: Physical Fitness Index; Mental Stress; Modified Harvard Step Test; Perceived Stress Scale; Exercising Individuals

INTRODUCTION

Healthy body along with healthy mind is important to lead a healthy life. The World Health Organization estimates have shown that physical inactivity indeed is the cause for almost one-fifth of ischemic heart disease and it also ascribes to 3.3% of all deaths worldwide. Mental health issues amid college students are raising in recent days. Increased spurt of depression, stress, and anxiety among the college students hinder with their capability to tackle with daily problems giving rise to poor quality of life and eventually influences academic performance.

Studies have also shown that there is a prevalence of high stress levels in health-care profession students, especially medical students. Significant amount of stress in the form of continuous evaluation and pressure to earn good grades in examination has been noted in medical students. Stress is described as disturbance of body’s homeostasis concerning to a real or perceived threat or challenge. The threatening or challenging situation is referred as stressor. The body responds to the stressor by releasing the hormones epinephrine, norepinephrine, and cortisol that are succeeded by cascade of physiological responses such as increase in heart rate, blood pressure, respiratory rate, and suppression of immune function. Although there is a general stress response pattern, how the individual responds to stress varies. Acute stress and chronic stress both have its effects on physical fitness and vice versa is also true. A person who is physically fit will be able to handle stress in a better manner. Exercise is a behavioral subset of physical activity. Exercise is defined as “Physical activity that is planned, structured, and repetitive.”

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repetitive which aims for the improvement or maintenance of physical fitness. Regular exercise helps to sustain physical fitness and also decreases mental stress. Physical fitness is defined as ability to carry out daily tasks with vigor and alertness without undue fatigue. Physical fitness index (PFI) is an important criterion to assess cardiorespiratory efficiency. Harvard step test was devised by Brouha et al. in 1943 to assess physical fitness of individual. It is a type of cardiac stress test for detecting and diagnosing cardiovascular disease. Harvard step test measures the physical fitness for muscular work and ability to recover after work by checking recovery heart rate of the individual. Quicker the heart rate comes back to normal better is the health of subject.

**Objective**

The objective of the study was as follows:
1. To assess the physical fitness among exercising and non-exercising students
2. To assess the mental stress among exercising and non-exercising students
3. To compare the level of physical fitness and level of mental stress in exercising and non-exercising medical students.

**MATERIALS AND METHODS**

This is a cross-sectional study performed on 60 medical students of age group of 18–20 years of both sexes. Ethical clearance was taken from the Institutional Ethical Committee, Bangalore Medical College and Research Institute (166/2021–22). Written informed consent was taken from all the students who were willing to participate in the study. Each subject was explained about the whole procedure and objective of the study. The study was conducted during January–March 2021.

**Inclusion Criteria**

The following criteria were included in the study:
- Healthy young male and female medical students
- Age between 18 and 20 years.

**Exclusion Criteria**

The following criteria were excluded from the study:
- Students with any musculoskeletal, neurological, cardiovascular, or respiratory disorders
- H/o alcohol intake and smoking.

**Methodology**

Participants were divided into two groups – exercising group and non-exercising group. Participants who were exercising regularly for at least 2 months were included in the exercising group and those who did not exercise were included in the non-exercising group. The exercising group was performing various types of exercises such as aerobic, strengthening, yoga, and ball exercise for >2 months, which is of moderate intensity, duration 45 min–1 h, 3–4 times a week.

**Anthropometry**

- Weight (in Kg) was measured using standard digital weighing scale with the participants wearing light clothes and without shoes
- Height was recorded using stadiometer with the participants standing erect
- Body mass index (BMI) was calculated using the formula BMI = (weight (in kg))/height (m²)
- Baseline heart rate was recorded in all participants
- Determination of PFI.

The study was performed in the physiology department laboratory. The subjects were asked to be lightly clothed. Subjects were asked to take rest for 5 min before start of exercise. Each subject was asked to perform modified Harvard step test (step up and step down at a constant pace) on a 16.25 inch stool at a rate of 30 steps/min (rate detected by metronome) and exercise was continued up to 5 min or stopped earlier if the subject gets exhausted. After the exercise, subject was made to sit quietly in a chair. Recovery pulse rate was counted at 1–1.5 min post-exercise.

The PFI score was calculated using the formula:

\[
PFI = \frac{\text{Duration of exercise in sec} \times 300}{5.5 \times \text{pulse count}} \times 100 \quad (1-1.5 \text{ min of recovery pulse})
\]

PFI scores were calculated and compared between both the groups.

**Rating fitness index**

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<th>Score</th>
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<td>Excellent</td>
<td>&gt;96</td>
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<tr>
<td>Good</td>
<td>83–96</td>
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<tr>
<td>Average</td>
<td>68–82</td>
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<tr>
<td>Low average</td>
<td>54–67</td>
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<tr>
<td>Poor</td>
<td>&lt;54</td>
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**Perceived stress scale (PSS)**

The PSS that was devised by Sheldon Cohen is most commonly used psychological scale for evaluating the perception of stress. It evaluates to what extent the individual considers the situations in their life as stressful. The 10 questions in the PSS questionnaire enquire about the thoughts and feelings of participants during the last month.

The stress questionnaire was given to both the group participants at the same time and the scores were calculated and compared between the two groups.
The total score was given out of 40. Score was interpreted as PSS score.

| 0–13 | Low mental stress |
| 14–26 | Moderate mental stress |
| 27–40 | High mental stress |

**Statistical Analysis**

Data presented as Mean ± Standard deviation. Independent *t*-test was used to compare between the exercise group and non-exercise group. *P* < 0.05 was considered statistically significant.

**RESULTS**

The observed findings of the present study are depicted in Tables 1, 2 and Figure 1.

**DISCUSSION**

This study was done to assess the level of physical fitness and level of mental stress in exercising and non-exercising medical students. The results of our study have shown that there is a statistically significant difference in PFI among both the groups. PFI is greater among the exercise group as compared to the non-exercise group [Table 2]. Our study also demonstrates that the perception of stress is less in the exercising group when compared to the non-exercise group [Table 2].

The results of our study are consistent with the previous study done by Sharma et al.[13] They have conducted their study on 220 college students and concluded that those who exercise regularly had better physical fitness levels and reduced mental stress levels than their non-exercising counterparts.[13] And also, inversely proportional significant correlation was found between physical fitness and mental stress which means increase in fitness index causes decrease in level of stress.[13] In another study done by Raj et al. on 300 undergraduate students in a medical college of South India, there was a statistically significant association between physical activity and psychological stress.[5] The study participants were divided into low, moderate, and high active groups based on International Physical Activity Questionnaire and it was observed that greater stress levels prevail in low physically active group whereas lesser stress in moderate and high active groups. They have found that students who were indulging in physical activity in college or elsewhere had low levels of stress than who were physically inactive.[5]

Regular exercise has shown to improve the O₂ consumption of the body, leading to increased physical fitness. As a result, body gets adjusted to heavy demand in exercising individuals.[14] Exercise releases endorphins and also lessens the level of stress hormone cortisol.[14] Benefits related to physical activity show dose-response relationship which means higher is the amount of physical activity, greater will be the health benefits.[15] Physical activity enhances cardiovascular and muscular fitness, cognitive and mental health, and bone health and subsequently improves quality of life.[13] There is an increased level of psychological stress amid student community specifically for medico students wherein the new atmosphere and academic pressure by itself acts as a stressor. Exercise and other physical activity enhance stress handling of body by modifying hormone responses such as endorphins.[15] Endorphins act as natural pain killer and it also improves sleep ability, which, in turn, reduces mental stress.[14] The previous studies demonstrated that regular aerobic exercise decreases the overall level of tension, lifts and stabilizes mood, enhances sleep, and also upgrades self-esteem.[16] Physical activity has shown to boost the synaptic transmission of monoamines including serotonin and dopamine which act as antidepressant influencing mood and behavior.[17] Earlier studies have also concluded that regular exercisers may be highly resistant to acute stress, which prevents them against poor health in future. And also, habitual physical activity leads to stress resilience in healthy individuals.[18] The World Health Organization
has recommended that 150–300 min of moderate-intensity aerobic exercise per week or 75–150 min of vigorous intensity per week is needed for the physiological adaptations to take place by which body handles stress and recovers from stress.[19]

Limitation
Our study was limited to small sample size of age group of 18–20 years. Larger sample size comprising different age groups would help to generalize the results.

CONCLUSION
Our study has found that there were better physical fitness and lower mental stress levels among the exercising group when compared with the non-exercising group. Although the ill effects of poor fitness may be absent at this age in students, it may cause obesity which is antecedent to diabetes, hypertension, and cardiovascular disease. The study emphasizes the concept of regular exercise for the well-being of the student population. It is high time medical students must perform exercise as a regular practice to maintain their cardiorespiratory fitness and also mental health.

REFERENCES