Effect of academic stress on physical activity level and cognitive functions in first year medical students: An observational study

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ABSTRACT

Background: Newly admitted medical students experience a different curriculum, which can be a stressor and may be the reason of stress during student life. Stress may affect physiological, psychological and cognitive functions of the students. Aims and Objective: Aim of the study was to assess the effect of academic stress on physical activity level and cognitive functions in first year medical students. Materials and Methods: This observational study was conducted on 30 healthy newly admitted medical students (18 -25 years). The data was collected thrice, baseline, after two months and after four months. Stress was assessed by using DASS and Cohen perceived stress scale (PSS). GPAQ was used to estimate the physical activity level. And cognitive functions were assessed by using subjective method (MMSE questionnaire) and objective method (P300). Results: No significant difference of mean values of age, height, weight, BMI, physical activity level, DASS score, PSS and P300 latency were observed over the time to which recording was taken. The mean score of PAL represents the high physical activity. But the score of DASS and PSS represent severe and moderate stress level respectively. The significant difference was seen in the mean values of MMSE score and P300 amplitude over the time to which recording taken. Conclusion: On the basis of the current study results, we conclude that students have stress during their academic period. This stress might be helpful in potentiating the cognitive functions with the optimum physical activity.

Key words: Academic stress; Physical activity level; Cognition; DASS; Medical students.
within the hippocampus, a region of brain that is central to learning and memory.\textsuperscript{11} Cognitive functions are a brain activity which includes: memory, attention, visual-spatial, and executive functions, while complex cognitive processes include: thinking (abstract, cause and effect, creative thinking, and planning) and language functions.\textsuperscript{12} These cognitive functions are necessary for daily routine activities and must for such a creative fine profession. Physical activity improves health.\textsuperscript{13,14} Intervention studies suggested that increased physical activity results in profound reductions in physical ailments.\textsuperscript{15,16} There is a similar picture for exercise on mental health outcomes. Those who exercise suffer from less depression, anxiety, fatigue, and cognitive impairments.\textsuperscript{17-22}

**MATERIAL AND METHODS**

The present observational study was conducted in the department of physiology of RUHS College of Medical Sciences, Jaipur. The data was collected from the 30 newly admitted 1st year medical students (voluntary participation) after getting consent and institutional ethical clearance (RUHS-CMS/Ethics Comm./2018/112).

Procedure and instrument used: The data was collected thrice, baseline, after two months and after four months by using following instruments and questionnaire.

a. DASS and Cohen Perceived Stress Scale: For assessment of academic stress.\textsuperscript{23,24}
b. GPAQ (global physical activity questionnaire): for assessment of physical activity level (PAL).\textsuperscript{25}
c. MMSE (mini mental state examination): for assessment of cognitive functions.\textsuperscript{26}
d. P300 (ERP): for assessment of cognitive functions, using NCV/EMG/EP Machine.

**RESULTS**

The mean values of data collected thrice were presented in the Table 1.

| Variables          | Mean±SD       | (F value) | P value |
|--------------------|---------------|-----------|---------|
|                    | Baseline      | After 2 months | After 4 months |
| Age (Years)        | 20.07±1.70    | 20.16±1.68 | 20.63±1.81 | 0.91482 | .404499 |
| Height(cm)         | 173.3±8.87    | 173.26±8.82 | 173.6±8.79 | 0.01196 | .98811 |
| Weight(Kg)         | 64.43±11.64   | 65.9±10.98 | 66.13±9.82 | 0.21664 | .805652 |
| BMI (kg/m\(^2\))   | 21.89±4.56    | 21.43±5.35 | 21.97±6.14 | 0.15347 | .857959 |
| PAL (GPAQ)         | 1531±899.32   | 1626.33±663.77 | 1629.2±577.72 | 0.17756 | .837615 |
| DASS Score         | 28.8±16.75    | 32.4±12.64 | 32.1±12.31 | 0.61306 | .544015 |
| PSS Score          | 15.2±4.1      | 16.23±4.47 | 17.26±5.08 | 1.35679 | .262878 |
| MMSE               | 24.57±2.86    | 24.96±2.09 | 26.6±1.45 | 7.11711 | .001*   |
| P300 latency (ms)  | 272.20±43.46  | 267.98±33.99 | 262.72±27.94 | 0.53123 | .589774 |
| P300 Amplitude (µV)| 2.61±1.87     | 4.45±1.42 | 4.73±1.08 | 17.67 | <.0001* |

Table 1: Mean values of study data

The present study was designed to observe the status of academic stress with physical activity level and cognitive functions. Stress can either potentiate or deteriorate the cognitive functions.\textsuperscript{11} Academic stress is the stress gained by a student during his/her academic life because of hectic schedule. Due to their busy academic schedule most of students unable to spare time for physical activities. Keinan et al. reported that degree of stress experienced by undergraduate students may differ from non student peers and from one school year to another and also argues that feeling of frustration, anxiety, and depression are common among the undergraduate students.\textsuperscript{27} Some students are often under stress because of interpersonal relationships, Lack of guidance, excessive academic work load and socialization pressure.\textsuperscript{28,29} Various studies explained that exercise or physical activity decreases the load of depression, anxiety, fatigue, and cognitive impairments among individuals.\textsuperscript{17-22} Pradhan G. et al. revealed that excessive stress affects cognitive functions and may negatively affect their performance in the examinations. The present study showed that DASS and PSS score of 1st year medical students had severe and moderate stress level respectively over a period, which was same as baseline. This means newly admitted medical students will be under stress due to new environment. But in the physical activity level (PAL) there was no significant change which remain same...
as baseline (highly active). Even in stressful environment the present study participants (medical students) were physically active.

Betterment in cognitive functions was also observed over the time period. From MMSE score the significant betterment of cognitive functions was observed. The mean P300 latency (ms) was decreased as over the time period but not significantly. But in the P300 amplitude (µV) there was significant rise indicating betterment in cognition. Long time Stress can affect cognition through sympathetic nervous system and brain-pituitary-adrenocortical axis. Himani et al.26 reported that the latency of P300 was found to be significantly delayed in cases of major depression as compared to that of control group but amplitude was depressed. Some stressors may be appraised as positive and may be deleterious to cognition.10,32 But the present study participants (medical students) have best cognitive functions and good physical activity level even in stressed conditions.

**CONCLUSION**

From the present study results we can conclude that students have stress during their academic period. And this stress might be helpful in potentiating the cognitive functions with the optimum physical activity.

**Limitations**

In the present study the study group was small and subjects participated were physically highly active. So the further research studies must be on different physical activity level and on large students group.

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