

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.

INTRODUCTION

The newly admitted medical students experience a new environment after getting admission in medical college. To form the well experienced health care professionals (doctors) a medical college has very tight academic schedule. Some of them are: extensive curricula, numerous academic requirements and various types of examinations.^{1,2} One of the most eminent stressors in students' lives is academic stress.³ The effectiveness of academic stress as a psychosocial stress is well established regarding repercussions on physiological and psychological health.⁴ Furthermore, in academic stress

periods, different effects on psychological parameters can be detected, such as increased anxiety, poor sleep quality, a negative effect on well-being, increased negative affectivity and increases in the prevalence of depressive symptoms.⁵⁻¹⁰ From these findings, it can be assumed that times of high academic stress have a negative impact on health-related physiological and psychological outcomes. Short period of stress can potentiate memory formation. In contrast, more ever prolonged stress can have deleterious effect upon broad aspects of cognition. Some evidence suggest that some of these effect can probably be attributed to the reversible changes in the morphology of neurons

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within the hippocampus, a region of brain that is central to learning and memory.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.¹² These cognitive functions are necessary for daily routine activities and must for such a creative fine profession. Physical activity improves health.^{13,14} Intervention studies suggested that increased physical activity results in profound reductions in physical ailments.^{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.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.

- DASS and Cohen Perceived Stress Scale: For assessment of academic stress.^{23,24}
- GPAQ (global physical activity questionnaire):for assessment of physical activity level (PAL).²⁵
- MMSE (mini mental state examination): for assessment of cognitive functions.²⁶
- 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.

There was no significant difference of mean values of age, height, weight, BMI, physical activity level, DASS score, PSS and P300 latency 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 (Table 2).

The significant difference was seen in the mean values of MMSE score and P300 amplitude over the time to which recording taken (Table 1).

DISCUSSION

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.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.²⁷ Some students are often under stress because of interpersonal relationships, Lack of guidance, excessive academic work load and socialization pressure.^{28,29} Various studies explained that exercise or physical activity decreases the load of depression, anxiety, fatigue, and cognitive impairments among individuals.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

Table 1: Mean values of study data

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	.404409
Height(cm)	173.33±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	< .00001*

Significant (p< 0.05), SD – Standard deviation

Table 2: Status of PAL and Stress over a time period

	Baseline	After 2 months	After 4 months
PAL	Highly active	Highly active	Highly active
DASS	Severe	Severe	Severe
PSS	Moderate	Moderate	Moderate

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.³⁰ 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.^{31,32} 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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