

Association of Internet Supported Physical Activity with Academic Performance of Medical Students

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Abstract

Physical activity is known to decrease stress and improve academic performance (cognitive skills, attitudes and academic scores) in students as it increases the blood flow to the brain thereby increasing oxygenation of the neuronal tissues. This is specially applied in the students of medical universities where higher stress levels are recorded.

Objective: To determine the role of internet supported physical activity in academic performance of medical students. The study design is Quasi Experimental Study conducted in a Medical University, Lahore for 6 months.

Methods: A total of 100 students (age 18 – 25) were enrolled. Data were collected through pre-tested questionnaires and analyzed by frequency tables, cross tabulations and paired sample t-tests through SPSS version 16.

Results: After the intervention was carried out, 91%

of the students had noticed significant increases in their physical energy levels and stress levels were reduced in 79% of the students. A total of 52% of students lost their weight after the intervention out of which 44% had also claimed a decrease in their stress levels. Academic Performance of students was determined by the following factors; Cognitive skills and attitudes, which further included attention span (an increase of 62% was seen), memory (improvement was seen in 62% of the students) and grasp on concepts (which was increased in 77%), Class room behaviors such as class attendance (increase was seen in 59% of the students) and Academic scores (improvement was not significant ($p = .612$) and increase was seen only in 43% of students of which 23 were female and 20 were male students). However, the physical activity and academic performance was statistically in significant ($p = 0.612$).

Conclusion: The physical activity and academic performance was not found to be significant. In addition, physical activity was found to decrease stress levels and this decrease in stress was positively related to weight loss in these students.

Key Words: Internet supported physical activity, academic performance, medical students.

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Date of Submission: 29-09-2016

Date of Acceptance for publication: 15-02-2017

Conflict of Interest: None

Funding Source: None

Contribution

All Authors have contributed in Study Design, Data Collection, Data Analysis, Data Interpretation, Manuscript Writing and Approval.

Introduction

Physical activity/exercise is defined as any movement by skeletal muscles that results in energy consumption.¹ It enhances the functioning of musculoskeletal and cardiovascular systems in addition to improving weight control, bone and muscle strength.² The World Health Organization (WHO) recommends 30 minutes of moderate intensity activity on 5 days of the week to

receive health benefits and reduce the risk of non-communicable diseases including cardiovascular disease, diabetes mellitus and cancer.³ Further, PA was recently found to improve cognitive and memory functions as it increases the blood flow to the brain thereby increasing oxygenation of the neuronal tissues. These results led us to consider that regular PA might improve the academic performance of students.² There are several categories of factors that fall under academic performance in the literature. The Centers for Disease Control and Prevention (CDC) divided academic performance into three categories: cognitive skills (attention, memory etc.) and attitudes, academic behaviors, and academic achievement (GPA, class test scores etc.).⁴ Numerous means are being utilized to enhance the awareness regarding physical activity in people in order to assess its influence on academic performance. Lately computer tailored interventions top the chart. Computer tailored interventions are web-based interventions which means that people can use internet to seek advice. These interventions are inexpensive, convenient and accessible at any time and location.⁵ By using Internet-based technology for the purpose of promoting physical activity, we can potentially reach greater number of people in addition to full time access to intervention materials and the capacity to instantaneously deliver intervention messages to participants without the technical difficulties of print or telephone-delivered interventions.⁶

Many studies were held to determine the relationship between physical activity and academic performance. However, main focus of these studies was on the school going children and adolescents. An analysis of the relevant data from the KYRBWS-V concluded that vigorous PA was positively correlated with academic performance in the case of boys, and moderate PA was positively correlated with academic performance in both boys and girls.² A study conducted in Iceland found a very weak positive correlation between self-reported PA and self-reported grades.⁷ Two similar studies conducted in USA found a positive relationship between PA and academic achievement.^{8,9} Another research conducted in California, USA concluded that there was a consistent, positive and significant association between fitness scores and academic scores.¹⁰ Dwyer et al. from Australia concluded that there was a positive association between cardiovascular fitness and academic achievement in children.¹¹ The results of a study in Illinois USA suggested that there was a greater allocation of attention and working memory in high fit children.¹² Limited number of

researches was conducted on medical students in this regard. Two cross sectional studies conducted in Saudi Arabia and UAE concluded that there was positive correlation between physical activity and academic performance of medical students.^{13,14} A number of researches also concluded the opposite of above mentioned results. A research conducted in Canada suggested that there was a weak negative relationship between PA and academic achievement.¹⁵ A research conducted in Tennessee USA found a significant negative correlation between PA and academic performance in girls but not in boys.¹⁶ A study conducted in Hong Kong, China concluded that PA was not associated with academic achievement in either boys or girls.¹⁷ A study done in Michigan concluded that academic achievement was not affected by one semester of increased physical education and physical activity.¹⁸

We intend to carry out a study on a group of medical students. The purpose of our study is to determine whether internet supported participation and maintenance of physical activity makes medical students erudite or not.

Methods

A quasi experimental study was carried out at King Edward Medical University, Lahore among the students of MBBS (aged 18-25). Non probability sampling was used to enroll these students into the study. Second generation computer intervention i.e. Email was used through which information regarding physical activity to be performed in a week as specified by World Health Organization (i.e. 150 minutes of moderate-intensity aerobic physical activity or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week) was delivered 5 times a week to the participant. Reminders to all the participants were sent once a week and regular feedback was taken for six months. Academic achievement, being a component of academic performance, was evaluated through a questionnaire which assessed the changes in percentages in the current evaluation procedures being used in university settings i.e. Class tests (pre intervention and post intervention test results). Changes in cognitive abilities such as memory and attention, general attitude and behavior were also assessed through this questionnaire. The data we acquired was then statistically analyzed by frequency tables, cross tabulations and paired sample t-tests using SPSS version 16 and the results compiled.

Results

A total of 100 students (age group 18 to 25) were enrolled in this study. 50% of them were males and 50% were females. According to the answers given by the students through the questionnaire, a number of conclusions were drawn. 98% of all the students were keen on maintaining their fitness and 99% of students were already aware of advantages of exercising regularly. 53% of the total number of students had incorporated sports into their daily life routines whereas the rest 47% had not. Motivation was found to be a significant driving force among medical students as 91% of them claimed that they would exercise regularly if motivated enough and 78% of the students found out that their physical activity levels had increased significantly as compared to the previous years. 57% did not find such activities limited by time constraints.

After the said intervention was carried out, 91% of the students had noticed significant increases in their physical energy levels. Stress levels were reduced in 79% of the students. A total of 52% of students lost their weight after the intervention out of which 44% had also claimed a decrease in their stress levels as stated previously. This showed a positive correlation between stress reduction and weight loss (see fig. below) (Fig 1).

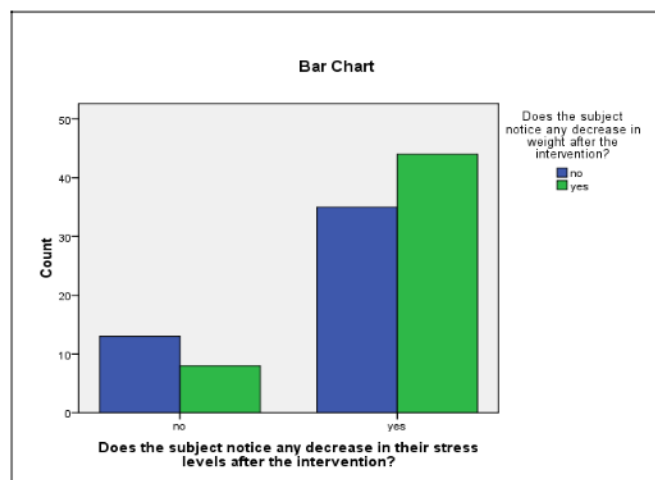


Fig. 1:

Academic Performance of students included:

- Cognitive skills and attitudes which further included attention span (an increase of 62% was seen), memory (improvement was seen in 62% of the students) and grasp on concepts (which was increased in 77%).

- Class room behaviors which included class attendance (increase was seen in 59% of the students).
- Academic scores/achievement (improvement was seen in 43% of students of which 23 were female and 20 were male students), p value is .612 (Fig 2).

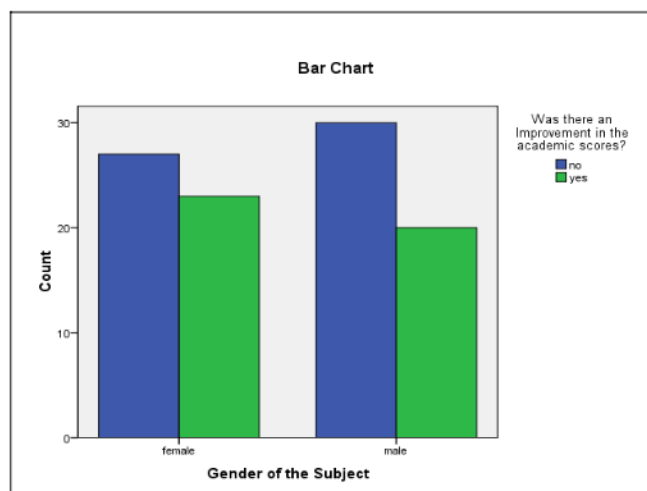


Fig. 2:

Table 1: Pre Intervention test Result, in Frequency and Percentages.

Class Test Percentages	Frequency	Percentage
0 – 20	1	1.0
21 – 40	15	15.0
41 – 50	13	13.0
51 – 60	17	17.0
61 – 70	20	20.0
71 – 80	23	23.0
81 – 90	9	9.0
91 – 100	2	2.0
Total	100	100

Discussion

Many studies were held to determine the relationship between physical activity and academic performance. However, main focus of these studies was on the school going children and adolescents as stated previously. To the best of our knowledge this is the first Pakistani experimental study that endeavored to look into the effects of internet supported physical activity

on academic performance of medical students. In our research 43% of students (aged 18 to 25) showed improvement in their academic scores with moderate intensity PA and 57% students did not ($p = .612$). Due to lack of relevant data on university age students in general and for medical students in specific, it was hard to compare our results with other student populations. Only two similar studies, that were cross sectional and non-experimental, specifically on medical students were conducted in Saudi Arabia and UAE and they showed a significant positive correlation between self reported PA levels and GPAs.^{13,14} Moreover, a meta-analysis conducted by US department of health concluded that there was 52% positive correlation and 46% neutral correlation between extracurricular PA and academic scores.⁴ On the contrary, our results

Table 2: Post Intervention Test Results.

Class Test Percentages	Frequency	Percentage
0 – 20	1	1.0
21 – 40	8	8.0
41 – 50	14	14.0
51 – 60	17	17.0
61 – 70	28	28.0
71 – 80	28	28.0
81 – 90	4	4.0
91 – 100	0	0.0
Total	100	100.0

Table 3: Results of Paired Sample t-tests Between Pre and Post Interventional Test Results are as Follows.

	Paired Differences					t	df	P-value
	Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Diff.				
				Lower	Upper			
Pre intervention academic performance of medical students - Post Intervention academic performance of medical students	-.080	1.574	.157	-.392	.232	-.508	99	0.612

were not in consistence with all the researches carried out in this context. Physical activity level was quite an independent entity according to a research carried out in Hong Kong, China.¹⁷ According to Coe et al. academic scores were not affected by one semester of increased physical education and activity¹⁸ as was also demonstrated by our research ($p = .612$). Dwyer et al. conducted a study in South Australia and found no significant differences in academic performance.¹⁹ Another study conducted by Tremblay et al. stated that there was a weak negative relationship between academic achievement and physical activity.¹⁵ Increase in academic scores, after the said intervention, was seen in 43% of students out of which 23% were females and 20% were males. These results were in consistence with a research conducted by California Department of Education which stated that even though there were minor differences in scores (females scored better than males), the overall relationship between phy-

sical fitness and academic achievement was homogenous across gender.¹⁰ Dwyer *et al.* and Pate *et al.* based their studies on school children and adolescents and could not find a considerable gender difference in their academic score improvement.^{10,20} A number of researches were also inconsistent with our research results. Eveland-Sayers *et al.* found the relationship between 1-mile run and language and mathematics scores to be inverse in female students (3rd – 5th grades) whereas male students did not show the same results.¹⁶ A research conducted on Korean adolescent students was of view that vigorous Physical activity was related positively with academic performance in case of boys whereas moderate levels of physical activity were positively related with academic performance in girls and boys both.² Cognitive skills and attributes include attention span, memory and a quick grasp on concepts. In our research, 62% of students reported to have seen a positive change in their

memory and attention span after the intervention which was in accordance with the meta-analysis of 134 studies done by Etnier et al. that showed positive effect of physical activity on cognitive functions. The studies included memory, perceptual skills, IQ and tests for other entities. A significantly positive result was seen for all entities including memory.²¹ Another meta-analysis of 15 researches conducted in China, Canada, USA, Europe and Singapore by Sofi et al. proved the relation between physical activity and protection against a decline in cognitive functions that included attention span, memory, and others. 38% participants who did high levels of physical activity had lesser decline and 35% of the individuals showed a positive relation between protection of cognition and physical activity.²² A meta-analysis of 16 researches by Sibley and Etnier showed positive correlation of physical activity and perceptual skills.²³ In our research, the percentage of participants who reported to have a better grasp of concepts after the intervention came out to be 77%. Although our research set out to see the effects of PA on academic performance, 79% students agreed that PA also reduced stress levels in them. In a research conducted by Canadian Medical Association, routine physical activity was found to be strongly associated with decreased stress, anxiety and depression, the overall psychological well-being of a person.²⁴ However, according to Physical Activity and Mental Health, a report released by the U.S department of Health and Human Services, mental health benefits associated with PA, such as overall well-being of a person, reduction in tension and confusion, perceived stress and anxiety, may or may not be seen in participants with no prior mental disorders.²⁵ Moreover, PA provides a wide range of health benefits, including weight loss, as documented by 52% of students who lost their weight by the end of our intervention. According to one study, PA may slightly reduce the weight of the participant but no significant weight loss can occur unless workout intensity is increased above the recommended levels.²⁶ WHO's work on this subject suggests that PA done regularly not only leads to decreased risk for Non-communicable diseases, like hypertension, diabetes, colon cancer, etc. but also is an essential determinant of energy expenditure, making PA a key factor for energy balance and weight control.²⁷ A research comparing the effect of Standard Behavior Therapy to higher PA on weight loss, postulated that PA is more effective in maintaining weight rather than weight loss.²⁸ Many studies suggest that changes in weight due to stress vary from person to

person depending on how they respond to stressful situations. Like in the intervention we conducted, 44% of the students who had claimed a decrease in stress levels were also the ones who had experienced weight loss after the intervention. The International journal of obesity conducted a research correlating work stress with weight change and concluded that stress has bidirectional effects on BMI and weight.²⁹

Conclusion

The physical activity and academic performance was found statistically insignificant among the medical students. In addition, physical activity was found to decrease stress levels and this decrease in stress was positively related to weight loss in these students.

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