ORIGINAL ARTICLE

The Association Between Physical activity with Cognitive And Cardiovascular Deconditioning In Age Related Decline Of College Students

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Abstract

Objective: To determine the association between physical activity and cognition in age-related decline of college students and to find the correlation between physical activity with cardiovascular deconditioning.

Methods: The analytical cross-sectional study was conducted from January 1 to May 1, 2017, in different medical and engineering colleges of Rawalpindi and Islamabad in Pakistan.Data was collected through non-probability purposive sampling method. Demographic data was recorded and standardized assessment tools, including physical activity index and stroop colour word test for cognition, were used. Bivariate correlation analysis was used to determine association between different variables.

Result: Of the 702 subjects, 340(48.5%) were males and 362(51.7%) were females. The overall mean age was 21.84±1.73 years (range: 17-24 years), and mean body mass index was 22.12±3.6.Overall, 292 (41.8%) students were labelled as physically active and 410(58.8%) had sedentary lifestyle.Physical activity and cognition showed positive association (p=0.004) in students.Physically inactive participants showed cardiovascular and cognitive deconditioning with age (p = 0.68).

Conclusion: Physical activity was found to be a key tool of cardiovascular health and cognition.It ameliorated overall health and brought better academic performance of students engaged in sports-related activities.

Keywords: Studentscognition, Cardiovascular, Deconditioning, Physicalactivity. (JPMA 68: 1755; 2018)

Introduction

Physical activity (PA) in youth is a requisite part of healthy aging and preservation of cognitive and cardiovascular functions.Aging is a universal phenomenon and a complicated process that encounters many variables. Healthy aging involves taking part in regular physical activity i.e. both aerobic and strength exercises.[1]Regular PA is greatly associated with enhancements in brain function and cognition during childhood and also during the course of adulthood.[2]

Streamlined PA in you this known to foster positive outcomes in health, including increased bone mineral density (BMD), cardiorespiratory benefits, and improvement in cognitive, psychological and neurological parameters and decreased risk of degenerative diseases. This health-related components are recognised as an essential attributes to student's academic performances.[3]Physically active students perform well academically as it builds self-confidence and integrates social interaction and development.Sports-related activities strengthens soul and mind andbrings productivity in youth.It's greatly known that young individuals who are physically inactive more easily adopt other unhealthy behaviours (e.g. tobacco, alcohol and drug use) which results in poor academic performance.[4]Aerobic activity vigorously enhances performance on tasks that include executive cognitive function, like planning, scheduling, inhibition control, and working memory.[5]Executive cognitive processes are subjected to age-related declines and are also mediated by the frontal lobes of the brain.[6] In elders better aerobic health decreases loss of brain volume in areas that facilitate executive cognitive function. Likewise, students who have improved aerobic health and fitness show higher spatial memory performance and it also increase the hippocampal volume.[5]It has been assumed that decreased PA or deconditioning contributes significantly to the decline rather than inevitable aging and degenerative processes.[7]Evidence supported that atherosclerosis has a significant role as a common pathophysiological ground for the heart-brain connection in aging.[8] Decrease in cognition and cardiovascular disease(CVD) have a lot of vascular risk factors (VRFs) in adults,for example smoking, hypertension and diabetes mellitus. In addition, CVD can contribute to decrease in cognition by causing cerebral hypo-perfusion, hypoxia, emboli or infarcts.[9]

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The inactive lifestyle throughout our modern society has outdated the need for PA.(10) Lack of sleep and poor dietary habits also affect students' cognitive level and academic records.[11]The current study was planned to determine the associationbetween PA and cognitive and cardiovascular deconditioning in age-related decline of college students.

Subjects and Methods

This analytical cross-sectional study was conducted from January 1to May 1,2017, and comprised students from different medical and engineering colleges (post-secondary educational institutions) of Rawalpindi and Islamabad, Pakistan.Approval was obtained from the research ethics committee of Riphah College of Rehabilitation Sciences, Riphah International University, Islamabad.Sample size was calculated with the help of sample size calculator with80% type II error and 95% confidence interval (CI) and the expected correlation coefficient waskept at r=0.13. Non-probability sampling technique was employed. Students aged 17-24 years from first, second, third, fourth and fifth years participated were selected. Informed consent was obtained from all the subjects and they were asked to complete a survey to assess various health behaviours, such as PA and a stroop colour word test.The questionnaire also contained items used to obtain demographic information, including gender, age, ethnicity, body mass index (BMI), study hours, sleep time, leisure time, daily study hours, addiction and risk factors. For stroop colour word test the test-taker read colour,words or named ink colours from three pages as quickly as possible within a time limit;the time was noted through stopwatch. Student's verbal memory and psychomotor speed were assessed through time. The test yielded three scores based on the number of items completed on each of the three stimulus sheets. An Interference score was used in determining the individual's cognition level.[12]The other measure used was PA index. It measured intensity, duration and frequency.[13] Students were guided to pick their current exercise programme by selecting score for each category in PA index.

Data was analysed using SPSS 20. Demographic data was evaluated by descriptiveanalysis in which mean, standard deviation, frequency and percentages of different variables were calculated Bivariate analyses was conducted using the Spearman's correlation for ordinal variables and Pearson correlation for continuous variables.

Results

Table-1: Bivariate correlation analysis between cognition and years of study.

Variables	1st year	2nd year	3rd year	4th year	5th year	p value	r value
Normal cognition	0 (0%)	28(26.9%)	60 (57.1%)	2(0.1%)	16(15.4%)	0.0049	0.11
Impaired cognition	31(5.2%)	499(8.2%)	166(27.9)	91(15.1)	260(43.6)		

Of the 702 subjects, 340(48.5%) were males and 362(51.7%) were females. The overall mean age was 21.84±1.73 years (range: 17-24 years), and mean BMI was 22.12±3.6. There were 520(74.0%) students from medical colleges, 62(8.9%) engineering students and 120(17.1%) were studying social sciences. Those who

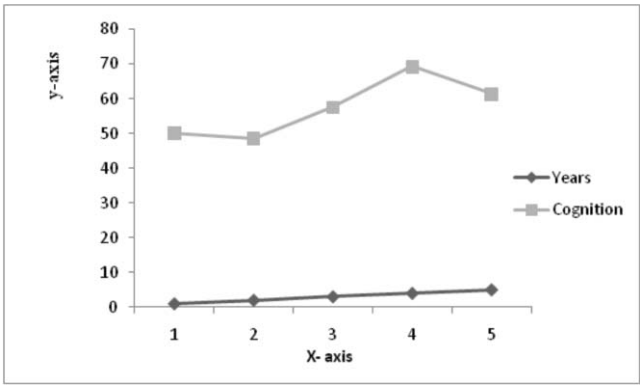

Figure: Cognitive decline with years of study in college students.

studied 2-4 hours were 536 (76.5%), 5-6 hours were 146 (20.7%) and <8 hours were 20(2.7%). Students with GPA >3.5 were 47(6.7%) and number of students with <2 GPA were 5(0.7%). Of the total, 392(55.8%) students slept 7-8 hours and 302(42.8%) slept<6 hours. Overall, 292(41.8%) students were labelled as physically active and 410(58.8%) had a sedentary lifestyle. Also, 316(45.1%) students spent<2 hours in leisure activities, 259(37.1%)spent 3-4 hours and 125(17.9%)spent 5-6 hours. There were 127(18.1%) smokers, 557(79.8%) non-smokers and 18 (2.6%) students were involved in other addictions.

Table-2: Bivariate correlation analysis between physical activity and years of study.

Variables	1st year	2nd year	3rd year	4th year	5th year	p value	r value
Very active lifestyle	0	0	6	1	4	0.018	0.089
Active and healthy	14	8	40	16	14		
Acceptable but could be better	4	6	22	10	2		
Not good enough	12	17	79	34	28		
Sedentary	19	28	173	105	58		

Bivariate correlational analysis showed positive association between cognition and PA index, with those doing regular PA having less cognitive decline with aging compared to those who were physically inactive ($p<0.005$) (Table-1). As more students were living a sedentary lifestyle, so with progression in years of study their academic achievement was falling due to cognitive decline ($p< 0.005$) (Table-2, Figure).

Discussion

Sedentary lifestyle leads to early health issues among young adults who are pursuing their education. This study shows that those students who do regular PA have less cognitive decline with progression in years of study compared to those who are physically inactive. Inactive lifestyle leads to cardiovascular deconditioning. The results indicated that students who were engaged in mild to moderate PA were cardiovascular fit and their academic performance was also better. The finding is in accordance with a study conducted to compare selected physiological variables between active and sedentary male college students. The maximum rate of oxygen consumption(VO2 max) levels were more in active college students.[14]Evidence suggests that students should be encouraged to get involved in sports and it should be a compulsory subject in learning institutes.[15] The current study showed that students who were active showed less cognitive and cardiovascular decline than those who were not involved in any PA. Christina E. Miyawaki, et.al conducted a survey which concluded that the prevalence of inactivity was high, especially among adults with subjective cognitive decline[16]. The findings of the current study showed that students who did regular PA performed well in academic due to their outstanding higher mental functions.Extensive evidence suggests that physical activity beneficially influences brain function and executive cognitive processes in particular. It suggests that PA in adulthood has a significant, lasting impact on cognition.[17] It also states that as humans were designed to move, movement improves cognitive performance and delays age-related cognitive declines through multiple neural mechanisms that support improved brain function.[18] This study also supports the evidence that PA among college students reduces cognitive decline.

Students in the current study performed very well on stroop test ($p= 0.004$). Another study indicated that adult hippocampal neurogenesis plays a key role in cognition. Physical exercise, a potent enhancer of adult hippocampal neurogenesis, has emerged as a potential therapy or an adjunctive therapeutic strategy for cognitive decline.[19]A study on association between PA and perceived stress in college students documented deleterious effects of stress and sedentary behaviour on health, showing implications for lifetime physical and mental health.[20]PA has often been recommended as a strategy for managing stress in youths with sedentary lifestyle[21].In adults the prevalence of sedentary lifestyle is often high. Physical inactivity is the fourth leading cause of mortality[22].

In terms of limitations, the current study made cognition and cardiovascular assessments subjectively and no biomarker was added.

Conclusion

Physical activity is an essential component of healthy aging and preservation of cardiovascular and cognitive functions in adolescence. Physically active students were better in verbal memory, had faster psychomotor speeds, and improved executive function in academia.

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