Open Access

ORIGINAL ARTICLE

Physical Activity and Academic-Achievement of Medical Students: An Analytic Cross-sectional Study in Karachi

Naila Baig[1], Mirza Altamish Muhammad Baig[2], Khubaib Muhammad Shamim Meah[3],

Department of Medical Education, Directorate of Educational Development, Ziauddin University, Karachi, Pakistan[1]
Department of Ophthalmology and Visual Sciences, Aga Khan University Hospital, Karachi, Pakistan[2]
Department of Forensic Medicine, Ziauddin Medical College, Ziauddin University, Karachi, Pakistan[3]

ABSTRACT

Background: Physical inactivity is prevalent among medical students, with inconsistent academic scores. Physical activity enhances cognition and performance and improves academic achievement.
Objective: To determine how medical students' physical activity and associated factors influence academic achievement.
Methods: Using convenience sampling, this analytic cross-sectional study involved Dow International Medical College MBBS students of 1st year and 2nd year, to fill the International-Physical-Activity-Questionnaire-S7S. This estimated day-to-day physical activity/week, metabolic equivalent task (MET)-minutes/week, as physical-activity-scores. Annual examination percentage scores were used as academic achievement scores. Statistical significance was determined at $p<0.05$.
Results: The response rate was 229/307 (74.6%). Median physical activity scores and academic achievement scores were 1188.00 MET-minutes/week and 59.28%. Males were more physically active (p=0.001) despite the female predominance of 54.15%, and 2nd-year students (n=113), had significantly higher academic achievement scores (p=0.001). Ethnicity, physical limitation, and smoking status had insignificant effects on academic achievement. There was no statistically-significant difference in physical-activity-scores and academic-achievement-scores as per different age-groups (p=0.933, ηp^2=0.003 and, p=0.276, ηp^2=0.011), and BMI-groups (p=0.218, ηp^2=0.021 and (p=0.044, ηp^2=0.039). There was a tendency for between-the-group variance (p=0.04) in the "normal-weight" and "obese" BMI groups.
Physical-activity-scores and academic-achievement-scores showed no correlation (rs=0.035, p=0.597), and were independent of sitting hours/day (rs=0.043, p=0.558 and rs=0.039, p=0.603), sleep-hours/day (rs=0.077, p=0.223 and rs=0.001, p=0.984), and study hours/day (rs=0.040, p=0.556 and rs=0.091, p=0.181). Physical activity categories and academic achievement groups appeared independent of each other with no effect. (p=0.363, φc=0.097).
Conclusion: Physical activity has no effect on academic achievement of undergraduate medical students. Male student were physically more active but there was no association of gender with academic achievement.

Key Words: Physical Activity, Academic Achievement, Academic Scores, Medical Students
Doi: 10.53685/jshmdc.v5i1.206

……
……..
……..

How to cite this article: Baig N, Baig MAM, Meah KMS. Physical activity and academic-achievement of medical students: an analytic cross-sectional study in karachi. J Shalamar Med Dent Coll. 2024;5(1): 24-33. doi: 10.53685/jshmdc.v5i1.206

Corresponding Author:
Naila Baig
Senior Lecturer
Department of Medical Education, Directorate of Educational Development, Ziauddin University, Karachi
Email address: nailabaig66@gmail.com
Received: 08.11.2023, Ist Revision: 19.04.2024
2nd Revision: 11.06.2024, Accepted 25.06.2024

INTRODUCTION

A consistent variation in the academic scores of medical students is widely observed.[1] This might signify that the doctors may not be able to maximally address societal needs in the future. Various factors and specific behaviors hone academic achievement (AA) and performance. Physical activity (PA) enhances cognition and performance and improves AA.[2]

Physical inactivity is prevalent among students pursuing professional education,[3,4] including medical students, (n=12/45, 26%).[5] Due to academic burden, medical students are compelled to adopt a sedentary lifestyle.[6,7,9,10] This hampers their cognitive abilities and performance skills,[8] resulting in ever-increasing burnout,[11] and jeopardizing patient care in the future. A sedentary lifestyle and the health hazards associated with it pose a persistent threat to public health, accounting for more than five million premature deaths per year, globally.[12] However, we are not clear whether improved PA habits can particularly improve their examination scores. Moreover, aligning with cognitive theory and self-regulation Theory[13,14] if tomorrow's medical practitioners adopt a physically active lifestyle today, they would be more effective and confident counselors for their patients for adopting a healthy lifestyle, leading to longevity and a much reduced risk of diseases associated with sedentary lifestyles.[15] This can indeed be a major step towards health promotion and prevention of non-communicable life-threatening diseases.

It becomes imperative to study personal, academic, environmental, and social factors affecting medical students' examination scores, evidence of their deep learning.[13] Differences in self-regulation processes among academically high and low achievers is poised by educational and psychological theories. Medical students can optimize their AA through modification of their coping strategies.[14]

Exercise is often used synonymously with PA. It involves structured, planned, repetitive activity. According to World Health Organization (WHO) Guidelines 2018 and 2020, "Any bodily movement produced by skeletal muscles that requires energy expenditure, including activities while working, playing, carrying out household chores, traveling, engaging in recreational pursuits" is taken as PA.[12] For adults, aged 18-64 years, 150-300 minutes of moderate activity/week or 75-150 minutes of vigorous activity/week, or an equivalent combination, and large muscle group strengthening for ≥ 2 days/week, is taken as PA.[12] PA, a behavior related to both physical and mental health, is defined to have four dimensions: type, frequency, duration, and intensity.[3]

There is contrasting evidence on the correlation between different physical fitness and academic parameters of medical students. A relationship between the level of PA and AA among medical students and between normal Body Mass Index (BMI) and high AA is reported [4,6]. Research in Poland concluded that, compared to other health professions, medical students had the lowest PA level of 26%.[5] A correlation study in the USA concluded that an increase in the use of recreational activities increased academic scores and improved anxiety state and mood in medical students who otherwise had a fairly sedentary lifestyle. [7]

A South Indian study reported that physically active medical students were average (55%) or above average (28%), whereas, physically inactive were average (68%) or below average (21%).[10]

A Lahore-based research randomly recruited students from four different medical colleges in the city.[16] This cross-sectional study reported that 80.7% of students had no on-campus sports participation, with median television watching and computer work time of 120 min/ day (range 30-420 min/day). No statistically significant difference was found among PA status in obese and non-obese.[16] Another study in Lahore has reported significant differences (p=0.006) in healthy, fairly healthy, and unhealthy lifestyles among first to fifth-year medical students.[17]

A Sargodha-based research on undergraduates of different programs, including medical students, found that only 11.5% of students were involved in exercises daily, with the prevalence of physical inactivity being 52.2%.[18] A study conducted in Rawalpindi reported a statistically significant negative correlation between PA and the academic performance of medical students from all academic years of the medical program.[19]

Aiming to identify factors playing a role in reducing AA, this study was carried out to determine how medical students' physical activity and associated factors influence academic achievement. Patterns and trends of PA and AA in medical students were examined. The effect of differences in their age, gender, academic year, BMI, ethnicity, physical limitation, smoking status, sleep hours per day, and study hours per day on their PA scores and AA scores were determined.

METHODS

Ethical approval was taken from the Institutional Review Board, Dow International Medical College (DIMC), Dow University of Health Sciences (DUHS), Ojha Campus, Karachi, Pakistan (IRB 1661/DUHS/Approval/2020, issued on 07.09.2020).

It was an analytic cross-sectional study. The extended from November 2020 to February 2021. The estimated sample size, for a correlation coefficient (r)=0.208 for PA and AA, was 179, with alpha (two-tailed) 0.05 and beta 0.20.4.

All 307 medical students of both genders of 1st and 2nd professional years, at DIMC, DUHS, Ojha Campus, Karachi were enrolled. A simple convenient sampling technique was used.

Institutional permission was taken to access the students and the site. Participants were informed verbally and in writing, about the anonymity of responses, the use of their exam scores in this study, the right to withdraw from the study at any stage, and completely voluntary participation. Written informed consent was taken from all enrolled participants of the study.

A structured form was used for recording demographics and other parameters. The International Physical Activity Questionnaire, [20] Short Form, Last 7 Day Recall, Self-administered (IPAQ-S7S), English version, internationally validated (concurrent validity, median rho=0.671 for university students[8] and tested for reliability (test-retest, r=0.7-0.8),[5] was used to collect data on PA. This self-reporting format of the questionnaire inquired about PA in the last seven days, an indicator of one's usual/general PA status. The institutional record was used for AA scores.

PA Scores were determined in terms of Metabolic Equivalent of Task minutes/week (MET minutes/week) and AA Scores, in terms of percentages. Those not providing responses, providing incomplete responses, or filling out the questionnaires incorrectly were excluded from the study.

To collect demographics, and the PA status of participants over the one week before the exam (the result of which impact of PA was studied, as required by IPAQ), we approached them on day 1 of their scheduled theory annual exam after they had completed their written exam on that day. We explained the study questions and addressed their queries. The average response time was 5-10 minutes. For those who completed the questionnaire, we obtained their exam scores from the institute record.

The IPAQ-S7S asks about time spent in an active or sedentary state in the last seven days. This includes PA, a minimum of ten minutes, in four main domains: at home (house or yard work), workplace commuting, leisure time activities as sport/exercise, (or staying inactive). It also asks the type, duration, and frequency of each PA, hence, categorizing PA into vigorous, moderate, and walking (sitting is taken as a separate entity).

This questionnaire asks a total of seven questions. Two questions for PA category one, VIGOROUS

(lifting heavy weights, digging, bicycling fast, carrying out aerobics); two questions for category two, MODERATE (lifting light weights, bicycling at a regular pace, or playing doubles tennis); two questions about WALKING (at workplace/institute, home, reaching some faraway place on foot, leisure time walking, or walking as part of sport or exercise); and one question about SITTING on weekdays (sitting on a working/study desk, visiting others where one mostly sits, sitting while reading for fun, sitting/lying while watching videos/movies).

Self-reported activities guide the calculation of total PA status for each participant given as a single quantifiable score in terms of total MET-minutes/week. Accordingly, each participant is categorized as high, moderate, or low on PA.[3,5,20] Each PA level is presented as a MET, where MET=1 is the energy expenditure at resting state while consuming 3.5 ml of oxygen/min/Kg body weight, with MET used for vigorous PA is 8.0, for moderate PA is 4.0 and for walking is 3.3.[20]

To get the MET minutes/week for each participant's every type of PA reported, the specific MET value allocated to each type of PA (8.0, 4.0, or 3.3) is multiplied by "time spent in that activity as minutes/day" and "number of days a participant did that specific activity per last week". The MET minutes/week calculated for each type of PA is then added to give the PA score, the total MET minutes/week, for a participant. The reported number of sitting hours/week is mentioned separately.

According to study variables, participants were categorized as: Academic year: 1 and 2, Gender: females and males, Age: <20 years, 20-22 years and > 22 years, BMI: under-weight (<18.5 kg/m2), normal-weight (18.5-22.9 kg/m2), over-weight (23.0-24.9 kg/m2) and obese (≥25.0 kg/m2), Ethnicity: Pakistani and those not Pakistani or dual nationality status, Smoking status: never-smoked or ever-smoked (smoked in week before exam), Physical limitation: yes or no, PA status as: high PA if ≥ 3 days of vigorous PA/week, with MET minutes/week at least= 1500 or 7 days of any combination of walking, moderate PA or vigorous PA with MET minutes/week at least=3000, moderate PA if ≥ 3 days of vigorous PA/week for ≥ 20 minutes/day or ≥ 5 days of moderate PA/week and/or walking ≥30 min/day or any combination with MET-minutes/week at least=600, and low PA if not meeting criteria for moderate or high PA, and high, moderate and low achievers on getting following marks respectively: >74.50%, 60-74.50 % and < 60 %.

Statistical Analysis

Microsoft Excel for data compilation, and SPSS (version 21) for statistical analysis were used. We carried out data cleaning, adjustment for outliers, moderation for a minimum duration of a PA, and truncation of PA scores as per directions in the IPAQ-Scoring-Protocol. Frequencies and percentages were calculated for categorical variables. Median and IQR were calculated to determine the central tendency of data. The Mann-Whitney U test and the Kruskal-Wallis test were applied for the comparison of two and more than two groups respectively. The chi-squared test was applied and the Cramer's V effect was also calculated. Spearman's correlation test was applied to determine if there was any correlation between the studied parameters. The level of significance used was ($p<0.05$).

RESULTS

Responses on 229/307 questionnaires were analyzed (response rate was 74.6 %). Descriptive statistics of categorical variables are given in Table 1. The PA status of high /moderate/low achievers is given in Table 2. Median sitting hours, reported by 114/229 (49.78%) participants, were 8.0/day.

Table 1: Descriptive statistics of participants' demographics

Variables		n (%)	Physical Activity Categories n (%)			PA Scores	Achievement-Groups n (%)			Academic Scores
			High PA	Mod PA	Low PA	Median (IQR)	HA	MA	LA	Median (IQR)
Gender (n=229)	Female	124 (54.15)	16 (12.90)	48 (38.71)	60 (48.39)	774.75 (2338.88)	09 (7.26)	52 (41.94)	63 (50.81)	59.79 (16.07)
	Male	105 (45.85)	38 (36.19)	37 (35.24)	30 (28.57)	2079.00 (4455.00)	07 (6.67)	45 (42.86)	53 (50.48)	60.07 (15.19)
Academic Year (n=229)	First year	116 (50.66)	28 (24.14)	47 (40.52)	41 (35.34)	1314.00 (3159.00)	04 (3.45)	40 (34.48)	72 (62.69)	56.86 (14.28)
	Second year	113 (49.34)	26 (23.01)	38 (33.63)	49 (43.36)	960.00 (2853.00)	12 (10.62)	57 (50.44)	44 (38.94)	63.00 (14.54)
Ethnicity (n=224)	Only Pakistani	215 (95.70)	50 (23.26)	82 (38.14)	83 (38.60)	1188.00 (3150.00)	15 (6.98)	90 (41.86)	110 (51.16)	59.79 (14.92)
	Dual/other	09 (4.30)	02 (22.22)	02 (22.22)	05 (55.56)	240.00 (2757.00)	00 (0.00)	05 (55.56)	04 (44.44)	61.57 (17.67)
Smoking status-I (n=226)	Ever-smoked	41 (18.14)	15 (36.59)	15 (36.59)	11 (26.83)	1746.00 (4171.75)	01 (2.44)	19 (46.34)	21 (51.22)	60.40 (18.53)
	Never-smoked	185 (81.86)	39 (21.08)	67 (36.22)	79 (42.70)	990.00 (29.73)	15 (8.11)	78 (42.16)	92 (49.73)	60.07 (14.72)
Smoking status-II (n=35)	Within last week	19 (54.29)	04 (21.05)	09 (47.37)	06 (31.58)	1512.00 (4884.00)	00 (0.00)	09 (47.37)	10 (52.63)	56.67 (29.09)
	Before last week	16 (45.71)	01 (06.25)	08 (50.00)	07 (43.75)	2772.00 (3385.13)	02 (12.50)	04 (25.00)	10 (62.50)	60.30 (15.40)
Physical limitation (n=226)	Yes	09 (3.98)	04 (44.44)	01 (11.11)	04 (44.44)	2400.00 (4278.00)	00 (0.00)	04 (44.44)	05 (55.56)	55.36 (26.74)
	No	217 (96.02)	50 (23.04)	81 (37.33)	86 (39.63)	1188.00 (3134.25)	16 (7.37)	93 (42.86)	108 (49.77)	60.13 (14.72)
Age (n=224)	< 20 years	71 (31.70)	15 (21.13)	28 (39.44)	28 (39.44)	990.00 (2994.00)	05 (7.04)	26 (36.62)	40 (56.34)	58.93 (16.07)
	20-22 years	141 (62.95)	34 (24.11)	52 (36.88)	55 (39.01)	1314.00 (3113.25)	08 (5.67)	68 (48.23)	65 (46.10)	61.57 (15.12)
	> 22 years	12 (5.36)	04 (33.33)	04 (33.33)	04 (33.33)	1912.50 (3909.93)	02 (16.67)	02 (16.67)	08 (66.67)	56.77 (30.59)
BMI (n=209)	Under-weight	24 (11.48)	02 (8.33)	8 (33.33)	14 (58.33)	775.50 (2048.63)	03 (12.50)	10 (41.67)	11 (45.83)	61.34 (17.76)
	Normal-weight	93 (44.50)	24 (25.81)	35 (37.63)	34 (36.56)	1188.00 (3241.50)	08 (8.60)	43 (46.24)	42 (45.16)	61.36 (12.60)
	Over-weight	33 (15.79)	10 (30.30)	12 (36.36)	11 (33.33)	2346.00 (4105.75)	03 (9.10)	14 (42.42)	16 (48.48)	60.07 (17.92)
	Obese	59 (28.23)	15 (25.42)	25 (42.37)	19 (32.20)	1151.00 (3162.00)	02 (3.39)	21 (35.59)	36 (61.02)	56.50 (19.24)

PA=physical activity, IQR=inter-quartile range, BMI=body mass index, HA=high-achievers, MA=moderate-achievers, LA=low-achievers

Table 2: Physical activity status of high, moderate, and low achievers

PA Categories	AA-Groups		
	High-Achievers	**Moderate-Achievers**	**Low-Achievers**
High - PA	05/16 (31%)	26/97 (26.8%)	23/116 (19.8%)
Moderate - PA	07/16 (44%)	30/97 (31%)	48/116 (41.4)
Low - PA	04/16 (25%)	41/97 (42.3%)	45/116 (38.8%)

PA=Physical activity, AA=Academic-Achievement

Table 3: Descriptive statistics of physical activity scores, academic achievement scores, age, BMI, sleep, and study hours

Variables	Descriptive Statistics		
	n (%)	Median	IQR
PA-Score*	229 (100)	1188.00	3163.50
Academic-Score**	229 (100)	59.28	14.86
Age***	229 (100)	20.00	02.00
BMI (Kg/m^2)	209 (91.27)	22.69	06.01
Sleep-hours/day	223 (97.40)	07.00	02.00
Study-hours/day	217 (94.76)	06.00	04.00

PA= physical activity, BMI=body mass index, IQR=inter-quartile range, n=number of responses; *as MET (Metabolic Equivalent Task)-min/week, **as percentages, ***in years

Table 4: Difference in physical activity scores and academic scores, as per difference in academic year, gender, ethnicity, physical limitation, and smoking status

Variables	Physical activity scores			Academic Achievement scores		
	U	P	η_p^2	U	p	η_p^2
Academic Year	6094	0.360	0.004	4886.50	0.001	0.048
Gender	4700.50	0.001	0.057	6077.00	0.386	0.003
Ethnicity	812.00	0.410	0.004	956.60	0.863	0.000
Physical limitation	855.00	0.542	0.002	1063.00	0.839	0.000
Smoking status-I	3060.50	0.051	0.017	3698.50	0.490	0.002
Smoking status-II	132.00	0.507	0.225	116.50	0.240	0.041

U=Mann-Whitney statistic, p value, η_p^2=partial eta-squared (effect size)

Table 5: Association and effect of academic year, gender, age, BMI, ethnicity, physical limitation, and smoking status categories on physical activity and academic achievement groups

Variables	Physical-Activity Categories				Academic-achievement Groups			
	X^2	*df*	*p*	φ_c	X^2	*df*	*p*	φ_c
Academic Year	1.699	2	0.428	0.086	13.701	2	0.001	0.245
First year								
Second year								
Gender	18.940	2	0.000	0.288	0.041	2	0.980	0.013
Male								
Female								
Age	0.922	4	0.921	0.045	7.170	4	0.127	0.127
< 20 years								
20-22 years								
> 20 years								
BMI	6.970	2	0.323	0.129	5.260	6	0.511	0.112
Under-weight								
Normal-weight								
Over-weight								
Obese								
Ethnicity	1.219	2	0.544	0.074	1.087	2	0.581	0.700
Only Pakistani								
Dual/other								
Physical limitation	3.344	2	0.188	0.122	0.727	2	0.695	0.057
Yes								
No								
Smoking status-I	5.501	2	0.064	0.156	1.675	2	0.433	0.086
Ever-smoked								
Never-smoked								
Smoking status-II	2.389	2	0.303	0.278	1.117	2	0.572	0.190
Within last week								
Before last week								

***X^2*=Chi-squared statistic, *df*=degree of freedom, φ_c=Cramer's *V effect*, BMI=body mass index, *p* value 0.05 is statistically significant**

Among high-achievers and low, the most prevalent PA category was moderate PA, and among moderate-achievers, participants were mostly low on PA. Shapiro-Wilk-Test indicated a non-normal distribution for all variables, the descriptive statistics for which are given in Table 3, indicating median academic achievement scores being just under 60%. Mann-Whitney-U test values for academic year, gender, ethnicity, physical limitation, smoking-status-I (ever smoked or never smoked), and smoking-status-II (smoked last time within the week preceding the current exam or before that week) related differences in the study participants' PA-scores and AA-scores are summarized in Table 4. Males were more physically active, with their median PA scores higher by 1304 (p=0.001) Table 4, with a moderate effect size.

The gender-wise difference in participants' AA scores was negligible and statistically insignificant (p>0.05). The current study participants had statistically significantly different AA scores as per different academic years, (p=0.001), though with a small effect size (Cramer's V effect=0.245) (Table 4), as explained by median AA scores being higher by only 6.0 % marks for year-2 students. Age and BMI-related differences in PA scores and AA scores were analyzed through the Kruskal-Wallis test. There was no significant difference in age-related PA scores (p= 0.933, $\eta p^2 = 0.003$) and AA scores (p=0.276, ηp^2=0.011). PA scores according to BMI groups were also not significantly different (p=0.218, $\eta p^2 = 0.021$). Post-hoc ANOVA with Schefe-test showed significant differences within the groups (p=0.041), "normal-weight" and "obese", has resulted in between-the-group variance.

No linear correlation was proven statistically significant between sleep-hours/day and PA-scores and AA-scores (rs=0.077, p=0.223 and rs=0.001, p=0.984, respectively). Similar were the results for study hours/day and PA-scores and AA-scores (rs=0.040, p=0.556 and rs=0.091, p=0.181, respectively).

Cross-tabulation and Chi-squared-test were conducted for association among categories of academic year, gender, age, BMI, ethnicity, smoking status, and physical limitation with high/moderate /low physically-active students and high/moderate/low-achievers in examinations. The values of these tests are summarized in Table 5.

DISCUSSION

The PA questionnaire used in this study is internationally validated, for university students,[8] and tested for reliability (test-retest, r=0.7-0.8).[5]

There was twice the number of females in the low PA group, whereas, more than twice as many males in the high PA group. PA level being higher in males is consistent with previous studies.[15,24,25] The absence of statistically significant difference in PA scores of year 1 and 2 students (p=0.360) agreed with a previous study.[2] On the contrary, an increase in PA with progress through academic years has also been reported,[7] and the proportion of sedentary students is reported higher in year 2 (31%).[22] The study participants' PA scores and AA scores were independent of each other, supporting a previous study where the absence of a statistically significant relationship (p=0.92) was reported between PA and GPA.[22] This was contrary to most studies evaluating PA and AA of medical undergraduates.[2,6,7,9,22,25]

A sedentary lifestyle, indicated by hours spent sitting on working days, demonstrated the absence of correlation with PA and AA in the current study, negating the possibility that students were inactive because of spending more hours focusing on course books. Data has indicated the study of diverse parameters (PA/physical fitness/active lifestyle) AA of medical students. A positive correlation has been reported mostly.[6,7,25] However, in a recent study conducted at Rawalpindi-Pakistan, involving

medical students of all five undergraduate academic years, a statistically significant inverse correlation was reported between PA and academic performance.[19] Similarly research in Lucknow-India reported a statistically significant correlation between physical fitness scores and academic examination scores of male medical students (p=0.035).[25]

The findings of the current study happened to be quite different. This might be because of cultural differences reflecting in PA habits of a study population, but the criteria used to define PA could be different in different studies. For instance, on-campus recreational activity was gauged against PA in a study but outside-campus sport, exercise, or house-related PA was not taken into account.[7] In another, the type, frequency, and duration of various types of PA were considered but the relation to MET-minutes/week was not required according to the methodology adopted.[6] The largest factor involved seems to be the COVID-19 pandemic which might have led to drastic changes in PA status during the prevailing lockdown. Another important factor could be that the AA scores used in this study included 20% weightage of the continuous-assessment. This was very similar to a study that used the professional/module exam and reported a negative correlation.[18] Prolonged study hours may enhance academic performance, but it might affect otherwise by promoting physical inactivity.[23] The Global Health Observatory data repository 2022 shows the prevalence of insufficient PA in Pakistan among 18-year-olds and above, to be 45.7 %(31.6-60.0).[24]

Likewise, quite inconsistent findings on the PA status of medical students have been reported in the literature from time to time. A recent study reported 78% of medical students are physically active (44% categorized as highly active and 34% as moderately active).[22] In the current study, approximately 61% of the participants were categorized (as per IPAQ criteria) as being high or moderate on PA.

This did not concur with the findings of other studies, as 71.7 % of medical students were reported sedentary,[18] with only 33.33% were physically active among medical students.[9] Similarly, a study involving students of different professions reported sedentary lifestyles of medical students, with median total MET-minutes/week being extremely low, 87.7 (0-445).[3] Others have reported much higher counts (76%) on being physically active[15] as self-gauged by the participants.

A comparison of exam scores in a previous study showed that physically active students were average (55%) or above average (28%), whereas, physically inactive were average (68%) or below average (21%).[10] In the current study, findings were quite different, with mostly moderate-achievers and low-achievers in all three PA categories.

CONCLUSION

Most medical students of years 1 and 2 were moderate or low physically active. Moderately physically active students were high/low achievers, and those who were low physically active were moderate achievers. Males were more physically active and second-year students had higher AA scores. Physical activity scores are not related to academic scores. This might be just a single facet of the bigger picture that is yet to be explored.

Limitations of the study

This was a single-institute study. Self-reported data on PA could have added bias to the results. Convenience-sampling technique could have left out some essential data. Due to the non-normal distribution of the data, non-parametric statistical tests were applied. Annual exam scores, including 20% weightage of the modular exams, were used. PA in the week just before the exam, reflected as it is mostly not done a week before the exam.

The data collection was conducted during the years of the COVID-19 Pandemic, it can be additionally assumed that the PA practices might have remained similar throughout the year, be it before a modular or annual examination.

Study Strengths

Study power was improved by objectively collecting AA scores from the institute record. Convenience sampling helped target the population of interest. Ethical measures were communicated (orally and in writing) and were followed appropriately.

Recommendations

Extended studies are required on the relationship between PA and AA, comparing results with a larger number of medical students, of academic years 1-5, or even reaching out to under and postgraduate students of various health professions. More research on this topic could be a gateway to producing competent doctors and improving PA in national and global youth, supporting the WHO call for a 15% reduction in physical inactivity by 2030.

Acknowledgments

The authors acknowledge the professional guidance and mentoring by Dr. Mirza Nadeemullah Baig during the planning and conduction phase of this study. We appreciate the keen interest and support by Professor Syed Imran Mehmood who supervised this study. We are also grateful to Maria Muhammad Shamim Meah for her vigilant effort on data collection for this research.

REFERENCES

1. Abdulghani HM, Al-Drees AA, Khalil MS, Ahmad F, Ponnamperuma GG, Amin Z. What factors determine academic achievement in high achieving undergraduate medical students? A qualitative study. Med Teach. 2014; 36 Suppl 1: S43-S48. doi: 10.3109/0142159X.2014.886011.
2. Agarwal S, Bhalla P, Kaur S, Babbar R. Effect of body mass index on physical self concept, cognition & academic performance of first year medical students. Indian J Med Res. 2013; 138(4): 515-522.
3. Sudha B, Samuel AJ, Narkeesh K. Feasibility online survey to estimate physical activity level among the students studying professional courses: a cross-sectional online survey. J. Exerc. Rehabil. 2018; 14: 58-63. doi:10.12965/jer.1835130.565.
4. Elmagd MA, Mossa AH, Sami MM, El-Marsafawy TS, Jadaan OA, Mudawi MSE. The impact of physical activity on the academic performance among medical and health sciences students: a cross sectional study from RAKMHSU - Ras Alkhaimah-UAE. Int. J. Sports Health Phys. Educ. 2015; 2: 92-95.
5. Dąbrowska-Galas M, Plinta R, DąBrowska J, Skrzypulec-Plinta V. Physical Activity in Students of the Medical University of Silesia in Poland. Phys Ther. 2013; 93: 384-392.doi: 10.2522/ptj.20120065.
6. Al-Drees A, Abdulghani H, Irshad M, Baqays AA, Al-Zhrani AA, Alshammari SA, et al. Physical activity and academic achievement among the medical students: A cross-sectional study. Med Teach. 2016; 38: S66–S72. doi:10.3109/0142159x.2016.1142516.
7. Slade AN, Kies SM. The relationship between academic performance and recreation use among first-year medical students. Med Educ Online. 2015; 20: 25105. doi:10.3402/meo.v20.25105.
8. Keeley TJH, Fox KR. The impact of physical activity and fitness on academic achievement and cognitive performance in children. Int Rev Sport Exerc Psychol. 2009; 2: 198-214. doi:10.1080/ 17509840903233822.
9. de Greeff JW, Bosker RJ, Oosterlaan J, Visscher C, Hartman E. Effects of physical activity on executive functions, attention and academic performance in preadolescent children: a meta-analysis. J Sci Med Sport. 2018; 21(5): 501-507. doi: 10.1016/j.jsams.2017.09.595.
10. Wassenaar TM, Wheatley CM, Beale N, Nichols T, Salvan P, Meaney A, Atherton K, et al. The effect of a one-year vigorous physical activity intervention on fitness, cognitive performance and mental health in young adolescents: the Fit to Study cluster randomised controlled trial. Int J Behav Nutr Phys Act. 2021;18(1):47.doi: 10.1186/s12966-021-01113-y.
11. Babenko O, Mosewich A, Abraham J, Lai H. Contributions of psychological needs, self-compassion, leisure-time exercise, and achievement goals to academic engagement and exhaustion in Canadian medical students. J Educ Eval Health Prof. 2018; 15: 2. doi:10.3352/ jeehp.2018.15.2.

12. WHO guidelines on physical activity and sedentary behavior. World Health Organization; 2020.
13. Bandura A. Social cognitive theory in cultural context. Appl Psychol. 2002; 51: 269-290. doi:10.1111/1464-0597.00092.
14. Sandars J, Cleary TJ. Self-regulation theory: Applications to medical education: AMEE Guide No. 58. Med Teach. 2011; 33: 875-886. doi:10.3109/0142159x.2011.595434.
15. Al-Asousi M, El-Sabban F. Physical activity among preclinical medical students at the university of Malaya, Malaysia. J Nutr Health Food Sci. 2016; 4: 1-8. doi:10.15226/jnhfs.2016.00159.
16. Khan ZN, Assir MZK, Shafiq M, Chaudhary A-E-G, Jabeen A. High prevalence of preobesity and obesity among medical students of Lahore and its relation with dietary habits and physical activity. Indian J Endocrinol Metab. 2016; 20: 206. doi:10.4103/2230-8210.176357.
17. Nasir U, Butt AF, Choudry S. A study to evaluate the lifestyle of medical students in lahore, Pakistan. Curēus. 2019. doi:10.7759/cureus.4328.
18. Afzal F, Rasul A, Basharat A, Zahra SA, Khan RA, Shahbaz M, et al. Prevalence of physical inactivity in students of sargodha medical college. J Nov Physiother. 2018; 08. doi:10.4172/2165-7025.1000390.
19. Maqbool S, Safian HA, Mubeen H, Arsh L, Khan MS, Sundus O. Impact of physical activity and stress on academic performance of MBBS students of Rawalpindi Medical University. Eur J Med Health Sci. 2020; 2. doi:10.24018/ejmed.2020.2.5.467.
20. Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ)-short and long forms. Version 2.0. April 2004. https://www.physiopedia.com/images/c/c7/Quidelines_for_interpreting_the_IPAQ.pdf, Accessed on January 2022.
21. Wattanapisit A, Vijitpongjinda S, Saengow U, Amaek W, Thanamee S, Petchuay P. Results from the medical school physical activity report card (MSPARC) for a thai medical school: a mixed methods study. BMC Med Educ. 2018; 18. doi:10.1186/s12909-018-1408-7.
22. Alhaqbani AS, AlMaini RY, Alshalhoub MZ, Mcrabi AH, Marenga AS, Omair AA. Appraising the degree of physical activities among male students at a Saudi medical school. J Taibah Univ Med Sci. 2020; 15: 417–421. doi:10.1016/j.jtumed. 2020.06.004.
23. World Health Organization. Global Action Plan on Physical Activity 2018-2030. World Health Organization;2018. https://www.who.int/publications/i/item/9789241514187
24. World Health Organization Global Health Observatory Data Repository 2022.
25. Ojha P, Pandey N, Singh S. Physical fitness score and academic performance in medical students. Natl J Physiol Pharm Pharmacol. 2018; 8: 1031-1

AUTHOR'S CONTRIBUTIONS:

NB: Designed the work, conception of study, data acquisition, data interpretation, Final approval of the version be published

MAMB: Drafted the work, analyzed the data, reviewed it critically for important intellectual content, provide approval of the final version to be published

KMSM: Designed and drafted the work, the work, interpreted the data, Critical final review of manuscript, approval of the final version to be published

All Authors agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

CONFLICT OF INTEREST:

All authors declared no conflict of interest.

GRANT SUPPORT AND FINANCIAL DISCLOSURE:

No specific grant was taken for this research from any funding agency in the public, commercial or not-for-profit sectors.

DATA SHARING STATEMENT:

The data are available from the corresponding author upon reasonable request.