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DISCOVERY
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The relation of physical activity on the academic performance among students in Taif University in Saudi Arabia: A cross-sectional study

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ABSTRACT

Background: Exercise is thought to be an important component that has a major effect on academic achievement. *Methods:* This is a cross-sectional study conducted with the students of Taif University. Demographic information was collected along with physical activity levels as self-reported with the Arabic short form of the International Physical Activity Questionnaire (IPAQ), and academic performance was assessed using the Academic Self-Efficacy Scale (ASE). *Results:* A total of 385 valid responses were gathered—of which 30.4% were female and 69.6% were male. Applied health sciences technology was the most frequent college, with 71 participants (18.4%), followed by the faculty of medicine, which had 69 participants (17.9%). The average age was 22.3 years, with a 0.4 standard deviation. According to our data, 75.58% of the individuals engaged in high physical activity, compared to 11.43% and 12.99% for moderate and low physical activity, respectively. Each of the following factors showed a statistically significant difference: Academic year, BMI, residing region, and college. Moreover, there is a slight statistically favorable correlation between ASE scores and physical activity categories, yet there is no significant correlation between ASE scores and college. There was a statistically significant positive correlation between gender and ASE scores, indicating that women generally had higher ASE values than men. *Conclusion:* This study shows a relationship between university students' physical activity levels and academic success. Future longitudinal studies might more precisely examine whether or not children's academic performance and cognitive function could actually be enhanced by more physical activity.

Keywords: Academic performance (AP); physical activity (PA); university student; Saudi Arabia.

1. INTRODUCTION

Physical exercise is a crucial factor that may significantly influence academic performance. Many cognitive skills, including execution, decision-making, perception, focus, and memory, have increased in previous research (Loprinzi et al., 2012; Donnelly et al., 2016; Gomes-da-Silva and Arida, 2015). These skills might gain from regular practice. Exercise and physical activity (PA) are stress-relieving behaviors as, according to the stress-buffering hypothesis Cohen and Wills, (1985), Gerber and Pühse, (2009), regular PA may reduce the negative effects of stress on health. Most Saudi kids and adults were insufficiently active to fulfill the suggested requirements for moderate to vigorous PA. Saudi ladies were far less active than males (Al-Hazzaa, 2018; Lee et al., 2012).

According to Dobbins et al., (2013,) PA interventions are effective in extending the amount of time spent engaging in physical activity from five to forty-five minutes per day, decreasing the amount of time spent watching television from five to sixty minutes per day, and raising the maximal oxygen uptake, or aerobic capacity, which represents an individual's level of physical fitness. Regardless of the type of exercise (aerobic, anaerobic, or strength), it always provides benefits. Other research affirms that an organized, detailed, and healthy exercise regime produces positive psychological effects for the individual, such as the prevention of stress, since it stimulates the feeling of competence and is established as a means to increase self-control and self-sufficiency, in addition to providing a time to avoid unpleasant thoughts, emotions, and behaviors (Monserrat-Hernández et al., 2023).

The World Health Organization (WHO) (2020) recommends 75–150 minutes of moderate–to–intense physical exercise per week for adults (18–64 years of age) (World Health Organization, 2019). PA sessions can go up to 300 and 150 minutes each week. Adults should also incorporate any major muscle group-involving muscle-strengthening activities into their weekly repertoire for two or more days. Previous researchers tried to find a positive correlation between vigorous physical activity and higher academic performance. The more time spent in physical activity or sports in or outside colleges, the better academic performance will be. Saudi women have shown an increasing interest in doing public physical activities and sports (Alsanea et al., 2021). Students at Imam University in Saudi Arabia showed a correlation between their physical activity levels and academic achievement.

In a different study, physical exercise had a direct impact on the educational achievement of female undergraduate students at King Khalid University's health colleges (Alhazmi et al., 2021). According to the report, colleges should establish counseling services and health clubs to encourage students to lead healthy lifestyles and engage in regular exercise, since this will help them succeed in their future activities. High educational achievement was shown to be positively correlated with PA practices at King Saud University. Additionally, there is a positive association between PA, obese students, and GPA achievement. Therefore, to emphasize the importance of PA to the Saudi population, physical activity education and public health programs must be developed (Al-Drees et al., 2016).

Low PA and high anxiety and depression levels have an effect on the academic performance of medical students pursuing their medical degrees in Saudi Arabia (Alnofaiey et al., 2023). On the other hand, physical activity did not affect academic performance among medical students at Majmaah University Arabia (Zain et al., 2021). The GPA of the participants, which appeared to be identical for both those who were physically active and those who were not, provided evidence of this. GPA was positively associated with PA levels among female medical students at King Abdulaziz University, but not among male students (Yaghmour et al., 2022). Society needs awareness and support to promote PA, and the students require encouragement and support to exercise. Increasing physical exercise has become a worldwide health priority due to its various health advantages (Vuori, 2018).

This is particularly relevant given that around one-third of the world's population does not obtain the recommended level of physical activity (González et al., 2017). Approximately one in three adults in Indonesia who are ten or older are not physically active (Sitohang and Ghani, 2021). Students in universities or colleges are among these age groups, as they are more likely to be sedentary and physically inactive (Small et al., 2013). A recent survey revealed that over 50% of persons between 18 and 24, including those with college degrees, did not achieve the WHO's recommendation for physical exercise (Choi et al., 2021). According to studies done over the previous 20 years, one in three college students said they become more physically inactive throughout their time in school (Huang et al., 2003; Kolodinsky et al., 2007).

The results could be related to several factors, including the quick advancement of technology Ráthonyi et al., (2021), a lack of drive Eichorn et al., (2018), and pressure from the classroom (Hakim et al., 2020). Because they are so focused on lectures and assignments, students frequently do not have time for sports or physical activity (Supriyanto et al., 2021). The problem worsens because, in contrast to schools where students can participate in sports for 120 minutes a week, many Indonesian organizations fail to provide their

students access to sports facilities or even sports knowledge. Furthermore, many people find the move from senior high school to a university highly stressful, and their beliefs about what will happen to them during this time can also be a source of stress.

It's interesting to consider that while this relationship is frequently researched in school-age children, more research is needed in populations of university students, especially since most university students fail to meet the PA standards (Irwin, 2004; Rouse and Biddle, 2010; Clemente et al., 2016). The study's importance might be summarized up as enhancing mental health by decreasing and preventing conditions such as anxiety and depression, as well as improving mood and other aspects of well-being. Additionally, it increased young people's awareness of time management and sports in general, which ultimately affected their educational achievement. Until today, there has been a lack of knowledge on the relationship between PA and academic performance in Taif University students. Therefore, the study aimed to assess the effect of physical activity on academic performance and to identify any gender or demographic differences among students at Taif University in Saudi Arabia.

2. METHODS

Study design and settings

This cross-sectional study determined the relationship between physical activity and academic performance among the students at Taif University in Saudi Arabia. The study obtained ethical approval with application no.45-116 from the Scientific Research Ethics Committee at Taif University, Saudi Arabia. The approval indicates an accurate review process to ensure that it meets the ethical standards for research involving human subjects. This work follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for reporting observational studies (Von-Elm, 2008).

Study participants

A total of 393 students in this study. The inclusion criteria were Taif University students enrolled in undergraduate programs, aged between 18 and 30 years, male and female participants, and confirming to participate in the study. Meanwhile, the exclusion criteria were students with pre-existing medical conditions or physical disabilities that limited their ability to engage in physical activity, students who were pregnant or had recently given birth, and students with a history of chronic absenteeism or academic misconduct.

Sample size estimation

Using calculator.net, the sample size was determined to be 381 participants to get a 5% margin of error and a 95% confidence interval. The population taken into consideration is the 42765 students at Taif University in Saudi Arabia, according to Taif University data.

Tools and data collection procedure

The primary outcome was to assess the relationship between physical activity and academic performance and to identify any gender or demographic differences among students at Taif University in Saudi Arabia. Google Forms were used to collect students' data. The questionnaire consisted of three sections, which the participants filled in:

Section 1 demographic data

It covered the demographic information: Sex, age, height (cm), weight (kg), body mass index (kg/m2), physical activity (hours per week), and estimated hours of sleep.

Section 2 The Arabic short form of the International Physical Activity Questionnaire (IPAQ)

This part comprised IPAQ's official Arabic short-version format, which contains nine items and is available at www.ipaq.ki.se. The IPAQ short version was utilized in this study includes seven items that provide information on time spent walking, in vigorous- and moderate-intensity physical activities, and in passive activity over the previous seven days. It evaluates the intensity of physical activity and sitting time in people's daily lives to estimate total physical activity in MET-min/week and sitting time (Al-Hazzaa, 2007; Lee et al., 2011). The score was in three categories: Low, moderate, and high physical activity. The IPAQ data was analyzed by using the following values: Walking equals 3.3 METs, Moderate PA equals 4.0 METs, and Vigorous PA equals 8.0 METs (Raihana et al., 2022).

The test-retest correlation (n = 71) for items of IPAQ ranged from r = 0.63 to r = 0.74 and was r = 0.79 for the total weekly PA in MET*min per week. The A-IPAQ showed a high internal consistency reliability with Cronbach's alpha ranging from 0.769–1.00 ($p < 0.001$) and intraclass correlation coefficient (ICC) ranging from 0.625–0.999 ($p < 0.001$), except for a moderate agreement with the moderate garden/yard activity (alpha = 0.682; ICC = 0.518; $p < 0.001$). The A-IPAQ had moderate-to-good test-retest reliability for most items (ICC ranging from 0.66. Therefore, it is a reliable and valid method for the Arabic population (Garashi et al., 2020).

Section 3 The Academic Self-Efficacy Scale (ASE)

The Academic Self-Efficacy Scale (ASE) is an eight-item fast assessment instrument designed to assess respondent self-efficacy of academic skills relevant to academic accomplishment, including time management, taking notes, taking tests, and general academic ability (Chemers et al., 2001). The Arabic version of the ASE is a nine-item scale scored along the same seven-point Likert scale as the original ASE. Each item has a score on the ASE along a seven-point Likert scale, where 1 = Very Untrue and 7 = Very True. Cronbach's alpha for the 9 items that measured the Arabic ASE across all students was very high ($\alpha = 0.925$). Thus, it's a valid and reliable tool (Al-Mohazie, 2018) (Figure 1-4).

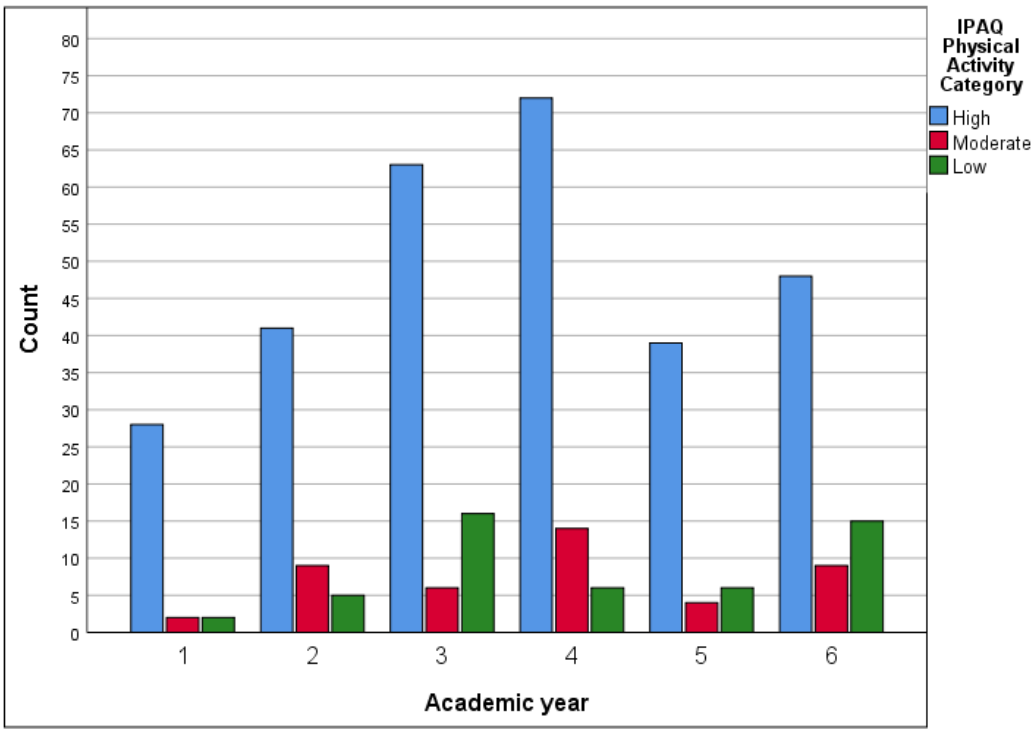

Figure 1 Bar chart of Frequencies of IPAQ and academic year.

Data Analysis

A statistical analysis was done by the Statistical Package for the Social Sciences (SPSS) version 25.0. The chi-square test ($\chi 2$) was used to examine the correlation between variables in qualitative data that was presented as numbers and percentages. The standard deviation (mean ± SD) and mean were used to express quantitative data. A p-value of less than 0.05 was considered statistically significant.

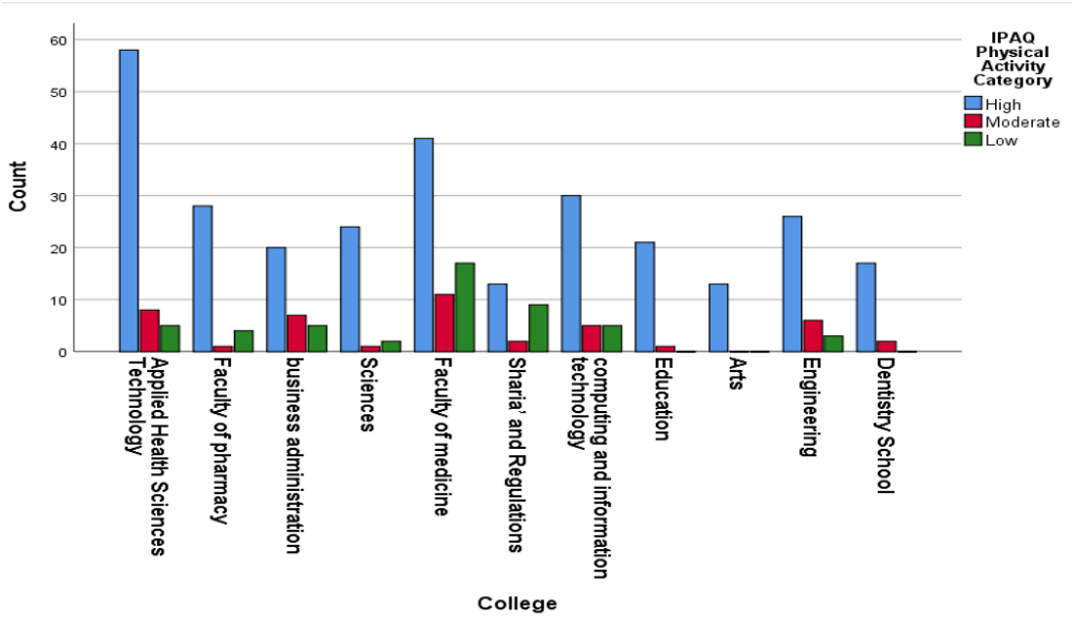

Figure 2 Bar chart of Frequencies of IPAQ and college.

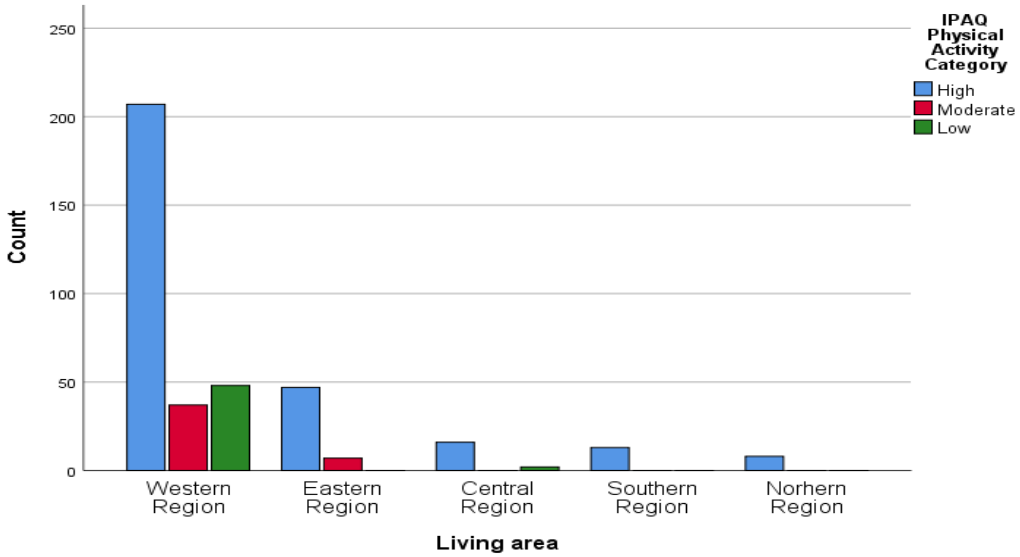

Figure 3 Bar chart of Frequencies of IPAQ and Living area.

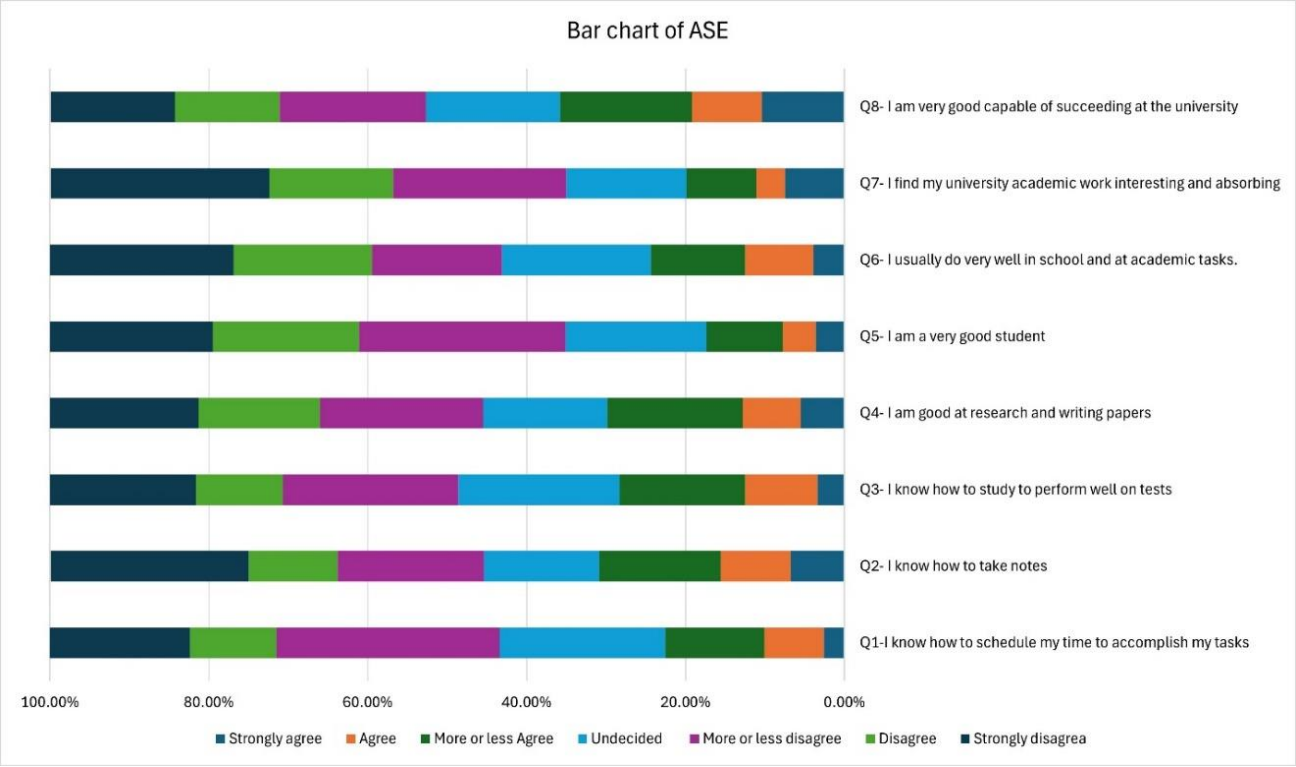

Figure 4 Reported answers consensus at 70%.

3. RESULTS

Participants

All the 393 participants, eight were not included in the survey because they did not meet the criteria needed to be included. We collected data from 385 participants. The college was Applied health sciences technology, with 71 (18.4%) followed by the faculty of medicine with a total number of 69 (17.9%) participants. The mean age was 22.3 years, with a standard deviation of 0.4. The most frequently observed gender was male (n=268 (69.6%). The BMI was 23.8 on average, with a 5.3 standard deviation. Almost 53.2% of the students were healthy with normal BMI, and 24.9% were smokers (n = 96). Socio-demographics and general characteristics of the students are shown in (Table 1).

Table 1 Demographics of the participants.

Overall (N=385)	
Age	
Mean (SD)	22.3 (0.4)
Gender	
Male	268 (69.6%)
Female	117 (30.4)
Weight in kg	
Mean (SD)	68 (17)
Height in cm	
Mean (SD)	168.5 (9.6)
BMI	
Mean (SD)	23.8 (5.3)
Underweight	38 (9.9%)

Healthy	205 (53.2%)
Overweight	107 (27.8)
Obese	35 (9.1%)
Academic year	
1st	33 (8.6%)
2nd	55 (14.3%)
3rd	84 (21.8%)
4th	92 (23.9%)
5th	49 (12.7%)
6th	72 (18.7%)
College	
Medicine	69 (17.9%)
Applied Health sciences	71 (18.4%)
Engineering	35 (9.1%)
Dentistry School	19 (4.9%)
Pharmacy	33 (8.6%)
Business Administration	32 (8.3%)
Sciences	27 (7%)
Sharia' and Regulations	24 (6.2%)
Computer and information technology	40 (10.4%)
Education	22 (5.7%)
Arts	13 (3.4)
Smoking	
Yes	96(24.9%)
No	289 (75.1%)
Living area	
Western Region	291 (75.6%)
Eastern Region	55 (14.3%)
Central Region	18 (4.7%)
Southern Region	13 (3.4%)
Northern Region	8 (2.1%)
Physical activity (hours per week)	
Mean (SD)	5.1 (4.4)
Hours of sleep per day	
Mean (SD)	7.3 (1.5)

Association of Physical Activity (IPAQ) with demographics

We categorized the participants who filled out the IPAQ questionnaire into three categories according to the level of their physical activities (High, moderate, and low). Then, we examined the relationships between gender, academic year, living region, college, BMI, and smoking status with PA categories by using the Pearson Chi-Square test and the Fischer Exact test of independent samples. There was a statistically significant difference in the variables of (living Region and college) (Table 2).

Table 2 Association between IPAQ and demographics

Demographics	IPAQ Physical Activity Category			χ2, p-value
	High	Moderate	Low	
Gender				
Male	205 (70.4%)	27 (61.4 %)	36 (72%)	2.85, 0.24±
Female	86 (29.6%)	17 (38.6%)	14 (28%)	
Academic year				
1st	29 (10%)	3 (6.8%)	1 (2%)	16.996, 0.07±
2nd	43 (14.8)	10 (22.7%)	2 (4%)	
3rd	60 (20.6%)	5 (11.4%)	19 (38%)	
4th	70 (24.1%)	16 (36.4%)	6 (12)	
5th	42 (14.4%)	2 (4.5%)	5 (10%)	
6th	47 (16.2%)	8 (18.2%)	17 (34%)	
Smoking				
Yes	67 (23%)	13 (29.5%)	16 (32%)	1.047, 0.59±
No	224 (77%)	31 (70.5%)	34 (68%)	
BMI				
Underweight	28 (9.6%)	7 (15.9%)	3 (6%)	8.146, 0.27±
Healthy	159 (54.6%)	18 (40.9%)	28 (56%)	
Overweight	81 (27.8%)	15 (34.1%)	11 (22%)	
Obese	23 (7.9%)	4 (9.1%)	8 (16%)	
Living Region				
Western Region	205 (70.4%)	38 (86.4%)	48 (96%)	21.296, 0.006±
Eastern Region	49 (16.8%)	6 (13.6%)	0 (0)	
Central Region	16 (5.5%)	0 (0%)	2 (4%)	
Southern Region	13 (4.5%)	0 (0%)	0 (0%)	
Northern Region	8 (2.7%)	0 (0%)	0 (0%)	
College				
Medicine	41 (14.1%)	11 (25%)	17 (34%)	48.61, <0.001±
Applied Health sciences	58 (19.9%)	8 (18.2%)	5 (10%)	
Engineering	26 98.9%)	6 (13.6%)	3 (6%)	
Dentistry School	17 (5.8%)	2 (4.5%)	0 (0)	
Pharmacy	28 (9.6%)	1 (2.3%)	4 (8%)	
Business administration	20 (6.9%)	7 (15.9%)	5 (10%)	
Sciences	24 (8.2%)	1 (2.3%)	2 94%)	
Sharia' and Regulations	13 (4.5%)	2 (4.5%)	9 (18%)	
Computer and information technology	30 (10.3%)	5 (11.4%)	5 (10%)	
Education	21 (7.2%)	1 (2.3%)	0 (0)	
Arts	13 (4.5%)	0 (0)	0 (0)	

± Pearson Chi-Square test, χ2 Chi-Square value

Association of Physical Activity (IPAQ) with academic self-efficacy scale

We used the Pearson Chi-Square test and the Fischer Exact test of independent samples to examine the association between PA and ASE. We found a statistically significant difference in the Q1,2,3,7. Most of the answers to all categories were in the form of Disagree and Strongly disagree. We found that students with high physical effort were the most likely to answer strongly disagree and disagree (Table 3).

Table 3 Association of Physical Activity (IPAQ) with Academic Self-efficacy scale

ASE scale	IPAQ Physical Activity Category			Total	χ2, p-value
	High	Moderate	low		
Q1-I know how to schedule my time to accomplish my tasks					
Strongly agree	7 (2.4%)	0 (0)	3 (6%)	10 (2.6%)	28.616, 0.004±
Agree	25 (8.6%)	0 (0)	4 (8%)	29 (7.5%)	
More or less agree	38 (13.1%)	3 (6.8%)	7 (14%)	48 (12.5%)	
Undecided	68 (23.4%)	6 (13.6%)	6 (12%)	80 (20.8%)	
More or less disagree	79 (27.1%)	15 (34.1%)	14 (28%)	108 (28.1%)	
Disagree	31 (10.7%)	10 (22.7%)	1 (2%)	42 (10.9%)	
Strongly disagree	43 (14.8%)	10 (22.7%)	15 (30%)	68 (17.7%)	
Q2- I know how to take notes					
Strongly agree	19 (6.5%)	0 (0)	7 (14%)	26 (6.8%)	41.009, <0.001±
Agree	32 (11%)	0 (0%)	2 (4%)	34 (8.8%)	
More or less Agree	51 (17.5%)	4 (9.1%)	4 (8%)	59 (15.3%)	
Undecided	45 (15.5%)	8 (18.2%)	3 (6%)	56 (14.5%)	
More or less disagree	54 (18.6%)	5 (11.4%)	12 (24%)	71 (18.4%)	
Disagree	28 (9.6%)	12 (27.3%)	3 (6%)	43 (11.2%)	
Strongly disagree	62 (21.3%)	15 (34.1%)	19 (38%)	96 (24.9%)	
Q3- I know how to study to perform well on tests					
Strongly agree	9 (3.1%)	1 (2.3%)	3 (6%)	13 (3.4%)	15.318, 0.224±
Agree	29 (10%)	4 (9.1%)	2 (4%)	35 (9.1%)	
More or less agree	52 (17.9%)	6 (13.6%)	3 (6%)	61 (15.8%)	
Undecided	61 (21%)	9 (20.5%)	8 (16%)	78 (20.3%)	
More or less disagree	63 (21.6%)	11 (25%)	11 (22%)	85 (22.1%)	
Disagree	31 (10.7%)	5 (11.4%)	6 (12%)	42 (10.9%)	
Strongly disagree	46 (15.8%)	8 (18.2%)	17 (34%)	71 (18.4%)	
Q4- I am good at research and writing papers					
Strongly agree	16 (5.5%)	0 (0)	5 (10%)	21 (5.5%)	20.615, 0.056±
Agree	22 (7.6%)	3 (6.8%)	3 (6%)	28 (7.3%)	
More or less agree	48 (16.5%)	7 (15.9%)	11 (22%)	66 (17.1%)	
Undecided	49 (16.8%)	6 (13.6%)	5 (10%)	60 (15.6%)	
More or less disagree	69 (23.7%)	5 (11.4%)	5 (10%)	79 (20.5%)	
Disagree	42 (14.4%)	9 (20.5%)	8 (16%)	59 (15.3%)	
Strongly disagree	45 (15.5%)	14 (31.8%)	13 (26%)	72 (18.7%)	
Q5- I am a perfect student					
Strongly agree	10 (3.4%)	2 (4.5%)	2 (4%)	14 (3.6%)	14.747, 0.256±
Agree	13 (4.5%)	0 (0)	3 (6%)	16 (4.2%)	
More or less agree	28 99.6%)	1 (2.3%)	8 (16%)	37 (9.6%)	

Undecided	54 (18.6%)	7 (15.9%)	7 (14%)	68 (17.7%)	
More or less disagree	79 (27.1%)	13 (29.5%)	8 (16%)	100 (26%)	
Disagree	55 (18.9%)	9 (20.5%)	7(14%)	71 (18.4%)	
Strongly disagree	52 (17.9%)	12 (27.3%)	15 (30%)	79 (20.5%)	
Q6- I usually do very well in school and in academic tasks.					
Strongly agree	8 (2.7%)	0 (0)	7 (14%)	15 (3.9%)	
Agree	26 (8.9%)	1 (2.3%)	6 (12%)	33 (8.6%)	
More or less agree	43 (14.8%)	2 (4.5%)	1 (2%)	46 (11.9%)	
Undecided	59 (20.3%)	8 (18.2%)	5 (10%)	72 (18.7%)	37.778, <0.001±
More or less disagree	48 (16.5%)	10 (22.7%)	5 (10%)	63 (16.4%)	
Disagree	49 (16.8%)	7 (15.9%)	11 (22%)	67 (17.4%)	
Strongly disagree	58 (19.9%)	16 (36.4%)	15(30%)	89 (23.1%)	
Q7- I find my university academic work exciting and absorbing					
Strongly agree	25 (8.6%)	0 (0)	4 (8%)	29 (7.5%)	
Agree	12 (4.1%)	2 (4.5%)	0 (0)	14 (3.6%)	
Mor or less agree	29 (10%)	1 (2.3%)	4 (8%)	34 (8.8%)	
Undecided	46 (15.8%)	6 (13.6%)	6 (12%)	58 (15.1%)	24.16, 0.019±
More or less disagree	69 (23.7%)	11 (25%)	4 (8%)	84 (21.8%)	
Disagree	39 (13.4%)	7 (15.9%)	14 (28%)	60 (15.6%)	
Strongly disagree	71 (24.4%)	17 (38.6%)	18 (36%)	106 (27.5%)	
Q8- I find my university academic work exciting and absorbing					
Strongly agree	24 (8.2%)	5 (11.4%)	11 (22%)	40 (10.4)	
Agree	22 (7.6%)	6 (13.6%)	6 (12%)	34 (8.8%)	
More or less agree	57 (19.6%)	5 (11.4%)	2 (4%)	64 (16.6%)	
Undecided	51 (17.5%)	10 (22.7%)	4 (8%)	65 (16.9%)	26.888, 0.008±
More or less disagree	54 (18.6%)	7 (15.9%)	10 (20%)	71 (18.4%)	
Disagree	43 (14.8%)	4 (9.1%)	4 (8%)	51 (13.2%)	
Strongly disagree	40 (13.7%)	7 (15.9%)	13 (26%)	60 (15.6%)	
Q9- I am very well capable of succeeding at the university					
Strongly agree	10 (3.4%)	1 (2.3%)	5 (10%)	16 (4.2%)	
Agree	27 (9.3%)	0 (0%)	2 (4%)	29 (7.5%)	
More or less agree	23 (7.9%)	2 (4.5%)	3 (6%)	28 (7.3%)	
Undecided	30 (10.3%)	2 (4.5%)	4 (8%)	36 (9.4%)	23.905, 0.021±
More or less disagree	48 (16.5%)	4 (9.1%)	3 (6%)	55 (14.3%)	
Disagree	46 (15.8%)	13 (29.5%)	8 (16%)	67 (17.4%)	
Strongly disagree	107 (36.8%)	22 (50%)	25 (50%)	154 (40%)	

± Pearson Chi-Square test, $\chi 2$ Chi-Square value

Multiple linear regression analysis

The multiple linear regression analysis examined the relationship between Assessment of Self-Efficacy (ASE) scores and three independent variables: Gender, College attendance, and Physical Activity Category. The results indicated that Gender (being female) had a statistically significant positive association with ASE scores (coefficient = 0.15, p = 0.003), suggesting that females, on average, had higher ASE scores compared to males. Physical Activity Category also shows a weak statistically positive association with ASE scores (coefficient = 0.10, p = 0.03), college attendance (coefficient = -0.12, p = 0.81) did not show significant associations with ASE scores.

The regression model accounted for approximately 3% of the variance in ASE scores, as indicated by the adjusted R-squared value of 0.03. While Gender had a significant impact on ASE scores, other factors that were not included may also contribute to self-efficacy levels among the study population (Table 4).

Table 4 Linear regression between ASE and gender, college, and PA categories.

Independent Variable	Coefficient	Standard Error	p-value	95% CI
Gender	0.15	1.28	0.003	1.3-6.5
College	-0.12	0.19	0.81	-0.4 – 0.3
Physical Activity Category	0.1	0.84	0.03	0.13-3.4

4. DISCUSSION

This study aimed to determine whether there were any gender or demographic differences among students at Taif University in Saudi Arabia, as well as the impact of physical activity (measured using the Arabic IPAQ) on academic performance (measured using the Academic Self-Efficacy Scale, or ASE). Our findings showed that the prevalence of high physical activity among the participants was 75.58%, while 11.43% and 12.99% for moderate and low physical activity, respectively. There was a statistically significant difference in the variables of (Academic year, BMI, living region, and college). Furthermore, physical activity categories show a weak statistically positive association with ASE scores; however, college did not show significant associations with ASE scores. Gender (being female) had a statistically significant positive association with ASE scores, suggesting that females, on average, had higher ASE scores than males.

A previous meta-analysis reported that current literature points to a positive influence of physical activity on academic performance in students, as more active students show better academic performance (Wunsch et al., 2021). While this link is frequently studied in students, there is little data for university student populations (Taras, 2005; Lipošek et al., 2018; El-Ansari and Stock, 2014; Lindner, 2002; Castelli et al., 2007). On the other hand, our results are inconsistent with a previous Saudi study among medical students at King Abdulaziz University (Yaghmour et al., 2022). Moreover, an earlier Indonesian study found a connection between academic success and a student's degree of physical exercise. This is in line with recent research on university students in Belgium Deliens et al., (2013), but it also contrasts a previous systematic review by Singh et al., (2012) that discovered a high positive correlation between physical exercise and academic success in children and adolescents.

Additional research on a survey Hillman et al., (2008) confirmed this finding, suggesting that regular physical activity is correlated to an increase in brain function connected to cognitive characteristics, which can positively impact academic achievement. Exercise and physical activity have a significant impact on brain health, which improves memory, learning, and academic performance, according to Gomez-Pinilla and Hillman (Gomez-Pinilla and Hillman, 2013). Furthermore, college students who engage in regular physical activity (PA) are more successful than their less physically active counterparts and have better moods, mental health, and personal contentment (Arslan and Akkas, 2014; Slavinski et al., 2021). The results of the current study show a correlation between university students' academic success and socio-demographic characteristics.

Similarly, a previous study in Indonesia discovered that male students typically have lower GPAs than their female counterparts. The last Saudi study reported that physically active females have better GPAs than physically active males. Similar results were seen in the last American study where gender and academic achievement were connected, with female students often achieving better GPAs than male students (Deliens et al., 2013; Richardson et al., 2012). The fact that women were more motivated, more inclined to collaborate with peers, pay attention in class, and more organized. On the other hand, men tend to be less motivated to study and have more significant issues with discipline in the classroom (Severiens and Ten-Dam, 2012). Certain studies claim that differences in ability measured by standardized performance tests also contribute to gender achievement gaps.

Further studies, however, disagreed with these conclusions by showing that female students outperformed male students in grades even in situations where they were equally capable (Workman and Heyder, 2020). The university year also shows a difference in GPA, with third-year students showing a higher GPA than their peers. Our study has some limitations. First, it is a cross-sectional study with

selection bias in only one institution. Moreover, this research did not address all the factors that may influence PA or AP, such as coping strategies and mental illnesses. Over the past five years, research on PA and academic achievement has made significant progress and more work remains. There haven't been many observational or longitudinal studies conducted in the last 10 years; most of the research on PA and GPA among college students is still cross-sectional.

It is crucial to emphasize that cross-sectional correlations do not allow for the drawing of causal conclusions, given the abundance of observational research (Howie and Pate, 2012). Thus, future cohort-based observational research has to be increased. Additionally, the evaluation of physical activity can be objectively assessed using devices like accelerometers to produce more reliable results.

5. CONCLUSION

This cross-sectional study demonstrates a link between academic achievement and physical exercise among university students. Future longitudinal studies could investigate with greater precision whether increased physical activity could improve the cognition and academic performance of students. Our findings showed that the prevalence of high physical activity among the participants was 75.58%. Furthermore, physical activity categories show a weak statistically positive association with ASE scores. There was a statistically significant difference in the variables of (Academic year, BMI, living region, and college).

List of abbreviations

PA - Physical Activity
AP - Academic performance
WHO - World Health Organization
IPAQ - International Physical Activity Questionnaire
MET - Metabolic equivalent
ASE - Academic Self- Efficacy Scale
SD - Standard deviations
p - probability value
BMI - Body mass index

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Ethics approval and consent to participate

The study was approved by the research ethics committee at Taif University, western Saudi Arabia, with letter number (HAO-02-T-105) on 04-01-2024. Written consent was obtained from all participants included in the study.

Author contribution

KMA and ISA conceived and designed the study, collected the data, applied eligibility criteria in the full-texts stage, analyzed and interrupted the results. This work was reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for reporting observational studies. Both authors contributed to drafting the manuscript of this work, and have read, and approved the final manuscript. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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