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Physical Activity, Body Mass Index in Relation to Academic Performances among University Students University of Bahri - Khartoum, Sudan

Siham Mohamed Osman Gritly[1], Dr. Nada Ali Abelhameed Bahafizalla[2]

[1]Assistant Professor in the fields of Health and Nutrition, Khartoum Sudan

[2]MD Dermatologist, Khartoum Sudan

Abstract: ***Physical activities in relation to academic performances had not get much attention in Sudan. The aim was to conduct a quantitative correlational analysis of physical activity in relation to academic performance and to determine the relationship between body weight and academic performance as well as to identify if BMI would predict the academic performances among students at University of Bahri. Methodology Descriptive and analytical cross sectional design was used. The result showed that moderate physical activity were found among (38.7%). the GPA for the highest percentage was 2.40 – 3.49. BMI (18.50 – 24.99) were found among 69.3% with GPA around 2.40-3.49 (68.6%). There was no significant relation between the gender and GPA, p> 0. 05. Likewise there was no significant difference between males and females in GPA, sig> 0. 05. There was no significant relation between the BMI and GPA, p> 0. 05. Nevertheless there was a significant difference in GPA between students with different BMIs, sig < 0. 05. There was a significant relation between the physical activity and GPA, p< 0. 05. And a significant difference in GPA between students with different physical activities, sig < 0. 05. It means that physical activity effect on GPA.***

Keywords: Physical activity, body mass index, grade point average (GPA), academic performance

1. Background

Academic performance is influenced by factors like socioeconomic status, Minutes Spent on Facebook and the Link between Sleep Quantity and Academic Performance but few researches connected the benefit of exercises and physical activities and the academic performance among university students mainly in Sudan

The CDC states[(1)]"…physical activity can have an impact on cognitive skills and attitudes and academic behavior, all of which are important components of improved academic performance. These include enhanced concentration and attention as well as improved classroom behavior."

It is important to understand that physical activity positively affects the following: overweight and obesity, HDL cholesterol, Blood pressure, Insulin resistance, skeletal health, musculoskeletal injuries, Psychological well-being, Self-esteem, Anxiety and depression. Exercise directly impacts the behavior and development of the brain. "It is likely that the effects of physical activity on cognition would be particularly important in the highly plastic developing brains of youth," Healthier students are better learners**[(2)].** He summarized how exercise may affect executive functioning: Increased oxygen flow to the brain, increased brain neurotransmitters, "[Increased] brain-derived neurotrophins that support neuronal differentiation and survival in the developing brain." Neurotrophins assure the survival of neurons in areas responsible for learning, memory, and higher thinking

Physical activity directly benefits a person's physical and mental health. People who exercise regularly are less susceptible to a number of chronic health conditions**[(3)].**

Physical activity can be defined as "any bodily movement produced by skeletal muscle that results in energy expenditure" [(4)]Physical activity is closely related to, but distinct from, exercise and physical fitness. It can be categorized as occupational, leisure, sports, household, or other forms of activity.

Exercise is a subset of physical activity that is "planned, structured and repetitive bodily movement, done to improve or maintain one or more components of physicalfitness" [(4)]Health-related fitness broadens the traditional concept of fitness to include the functional capacity needed for everyday life and health. It includes the characteristics of functional capacity that are affected positively by physical activity or negatively by thelack of physical activity and are, at the same time, associated with health status[(4)].

2. Physical Fitness, Body Mass Index in Relation to Academic Performance

Grade Average Point (GPA) is often taken as the best predictor of a student's graduation and future educational attainment**[(5)]**. Two studies**[(6,7)]**connected physical fitness and body mass index with the academic performances, these researchers revealed that physically active students had low body mass index and these factors can positively related to academic performance. A study on the correlation between physical fitness levels, body mass index, and academic achievement found non-significant trends of a correlation between physical fitness and academic achievement, the researchers suggested that based on the results of their study, one may generally predict whether an individual will do well academically based on their physical fitness and body mass, and vice versa**[(8)]**.

Another study among undergraduate university students in Nigeria proposed that there was no significant association

between body mass and academic performance and they anticipated that no basis to judge a student generally by body mass profile rather conducive learning environment (science and technology) and genetic (typology and mental) endowments would continue to influence academic performance in Sports Courses[9]. A relationship between physical activity or Body Mass Index (BMI) and academic performance in college-age students found that students in the normal BMI category had significantly higher GPA scores than students in the overweight category. Juniors had significantly higher GPA scores than seniors. They concluded that normal weight individuals, had higher GPA scores than their overweight counterparts[10].

kimm, S.Y.S al. 2012 [7] found significant ($p < 0.001$) positive correlation with physical activity and academic performance. They suggested that only body fat percentage independently and significantly predicted academic performance in both the genders. The present data highlighted the importance of practicing sufficient physical activity in daily life not only to keep check against increased body fat levels and prevent obesity but also to increase Corticotropin-releasing factor (CRF). Additively, it indicated that higher levels of body fat and lower levels of Corticotropin-releasing factor (CRF) may possibly restrict performance in examination. They concluded that PA induced lowering of body fat and improvements in CRF may be expected to bring about some positive changes in academic performance.

3. Methodology

Descriptive and analytical cross sectional design was used to determine the correlation between physical activities, body mass index and academic performances and achievements among the students of University of Bahri Khartoum Sudan.

150 Participants of this study were randomly selected from university of Bahri college of public health ages ranging from 18- 25

The A-very weighing scale (Houghton Co Ltd, London) was used for the measurement of the body weight of each subject, while Houghton Stadiometer was also used to measure the height of each subject.

Body mass index values were adapted from WHO 1995[11], WHO 2000[12]WHO 2004[13]**.** BMI are age-independent and the same for both sexes. Calculations have been done using the following formula: BMI= Weight (kg)/Height (m2).Body mass calculator for computation and interpretation

While the students' academic performance as represented by CGPA Average 4.50 - 5.00 First class Honour (1);
3.50 - 4.49 Second class Honour –Upper (2)
2.40 - 3.49 Second class Honour-Lower (3);
1.50 - 2.39 Third Class (4)
1.00 - 1.49 Pass(5)

The cumulative grade point average (CGPA) for each student was collected from the University of Bahri result template. The template converts every examination score entered into CGPA, based on which final classifications of degree are based. The data collected were arranged in line with WHO (2004) body mass classification chart, Students' physical activity level were self-reported according to https://www.hsph.harvard.edu/ school ofpublic health. measures were categorizedas Low, Moderate and high activity. The data was analyzed with descriptive statistics, chi square, Pearson Product Moment Correlation coefficient and regression analysis at .05 alpha levels

4. Results

Results were presented in tables

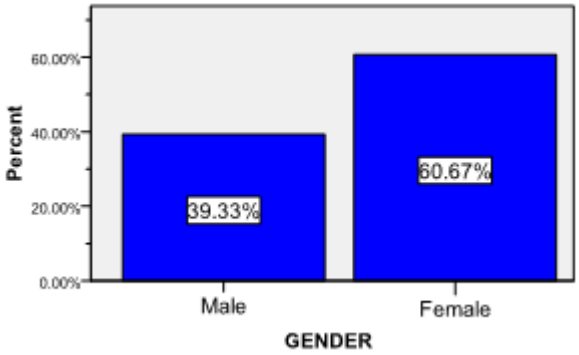

Figure 1: Distribution of study population according to gender (N=150).

From the figure above, the highest percentage of the study population were females (60. 7%).

Table 1: Distribution of height in cm. among the students (N=150)

		Frequency	*Percent*
Valid	131.00 - 140.00	2	1.3
	141.00 - 150.00	8	5.3
	151.00 - 160.00	47	31.3
	161.00 - 170.00	63	42
	171.00+	30	20
	Total	150	100

From the table above, the height for the highest percentage of the study population was between 161-170 cm.

Table 2: Distribution of weight in kg. among the students (N=150)

		Frequency	*Percent*
Valid	<= 40.00	2	1.3
	41.00 - 49.00	26	17.3
	50.00 - 58.00	41	27.3
	59.00 - 67.00	39	26
	68.00 - 76.00	34	22.7
	77.00+	8	5.3
	Total	150	100

From the table above, the weight for the highest percentage of the study population was between 50 – 58 kg .

Table 3: Distribution of BMI among the students according to the international classification WHO 2004 (N=150).

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	< 18.50	22	14.7	14.7	14.7
	18.50 - 24.99	104	69.3	69.3	84
	25.00 - 29.99	18	12	12	96
	30.00+	6	4	4	100
	Total	150	100	100	

From the table above, the BMI for the highest percentage of the study population was between 18.50 –24.99 (Normal range).

Table 4: Distribution of BMI among the students according to gender (N=150).

		BMI				
		< 18.50	18.50-24.99	25.00-29.99	30.00+	Total
Gender	Male	2	53	4	0	59
	Female	20	51	14	6	91
Total		22	104	18	6	150

From the table above, the BMI for the highest percentage of males (53%) and females (51%) was between 18.50 –24.99 (Normal range).

Table 5: Distribution of physical activity among the students (N=150).

		Frequency	Percent
Valid	Very Active	48	32
	Moderate Active	58	38.7
	Low Active	44	29.3
	Total	150	100

From the table above, the physical activity status for the highest percentage of the study population wasmoderate active (38.7%).

Table 6: Distribution of GPA among the students (N=150).

		Frequency	Percent
Valid	1.50 - 2.39	13	8.7
	2.40 - 3.49	128	85.3
	3.50 - 4.49	9	6
	Total	150	100

Table 6 showed that the GPA for the highest percentage (85.3%) of the studied population was between 2.40 – 3.49,(second class- honor lower).

Table 7: Distribution of BMI among the students according to GPA (N=150)

		BMI				
		<18.50	18.50-24.99	25.00-29.99	30.00+	Total
GPA	1.50 - 2.39	4	7	0	2	13
	2.40 - 3.49	18	88	18	4	128
	3.50 - 4.49	0	9	0	0	9
Total		22	104	18	6	150

From the table above, the highest number of the students (males or females) was in the normal range of BMI (18.50 – 24.99) and had 2.40-3.49 GPASecond class Honour-Lower (3).

Table 8: Distribution of GPA among the students according to gender (N=150).

		Gender		
		Male	Female	Total
GPA	1.50 - 2.39	5	8	13
	2.40 - 3.49	45	83	128
	3.50 - 4.49	9	0	9
Total		59	91	150

Table 8 described the highest number of the students according to gender in relation to grade point average 2.40-3.49. The highest number were (83 out of 150 female students) and (45 out of 150 male students)

Table 9: Distribution of GPA among the students according to physical activity (N=150).

		Activity			Total
		Very Active	Active	Low Active	
GPA	1.50 - 2.39	0	1	12	13
	2.40 - 3.49	39	57	32	128
	3.50 - 4.49	9	0	0	9
Total		48	58	44	150

From the table above, the highest percentage of the students with different physical activity (57%) had 2.40-3.49 GPA .

Table 10: Correlation between gender and GPA (N=150).

		Gender	GPA
Gender	Pearson Correlation	1	-.134-
	Sig. (2-tailed)		0.102
	N	150	150
GPA	Pearson Correlation	-.134-	1
	Sig. (2-tailed)	0.102	
	N	150	150

There was no significant relation between the gender and GPA, p> 0. 05. According to table 10

Table 11: Difference between gender in GPA (N=150)

Group Statistics					
	GENDER	N	Mean	Std. Deviation	Std. Error Mean
GPA	Male	59	2.9675	0.42598	0.05546
	Female	91	2.8578	0.37965	0.0398

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
GPA	Equal variances assumed	0	0.998	1.647	148	0.102	0.10966	0.0666	-.02195-	0.24126
	Equal variances not assumed			1.606	13.689	0.111	0.10966	0.06826	-.02557-	0.24488

ANOVA
GPA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.43	1	0.43	2.711	0.102
Within Groups	23.496	148	0.159		
Total	23.927	149			

There was no significant difference between males and females in GPA, sig> 0. 05. It means that gender don't effect on GPA.

Table 12: Correlation between BMI and GPA (N=150)

Correlations			
		BMI.Value	GPA
BMI.Value	Pearson Correlation	1	0.091
	Sig. (2-tailed)		0.267
	N	150	150
GPA	Pearson Correlation	0.091	1
	Sig. (2-tailed)	0.267	
	N	150	150

There was no significant relation between the BMI and GPA, p> 0. 05.

Table 13: Difference between BMI in GPA (N=150).

ANOVA
GPA

	Sum of Squares	*Df*	*Mean Square*	*F*	*Sig.*
Between Groups	20.408	66	0.309	7.294	0
Within Groups	3.519	83	0.042		
Total	23.927	149			

There was a significant difference in GPA between students with different BMIs, sig < 0. 05. It means that BMI effect on GPA, but not reach to relationship level.

Table 14: Correlation between physical activity and GPA (N=150).

Correlations			
		Activity	GPA
Activity	Pearson Correlation	1	-.567-**
	Sig. (2-tailed)		0
	N	150	150
GPA	Pearson Correlation	-.567-**	1
	Sig. (2-tailed)	0	
	N	150	150
**. Correlation is significant at the 0.01 level (2-tailed).			

There was a significant relation between the physical activity and GPA, p< 0. 05. It means that decrease in physical activity lead to decrease in GPA.

Table 15: Difference between physical activity in GPA (N=150).

ANOVA					
GPA					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	8.451	2	4.225	40.134	0
Within Groups	15.476	147	0.105		
Total	23.927	149			

There was a significant difference in GPA between students with different physical activities, sig < 0. 05. It means that physical activity effect on GPA.

5. Discussion

The aim of this study was to conduct a quantitative correlational analysis in order to determine if either physical fitness or body mass index could hypothetically correlate with academic performance at the university level.

The groups under investigation were chosen randomly from University of Bahri College of public health. Total number of 150 students participated in the study upon their consent. Female students were 61% while male students 39% all of them from different regions of Sudan. Nearly half of the sample heights were between 161-170 cm. This result may indicated that African people characterized by their tallness. Sudan is characterized by its unique features, including climatic factors and socio-cultural settings. Different ethnic groups from different parts in neighboring countries represented the unique feature of the Sudanese inhabitance. Weight of the sample was found to range from 50 – 58 kg. Although half of the sample mean height around 165 cm but weight might indicated low calories intake. This is due of low socio-economic status of the country.

According to the result of this study the body mass index were found to range between 18.50 –24.99 (Normal range) for both gender. For males (53%) and females (51%). Body mass index as indicator is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m2) [13].

In recent years, there was a growing debate on whether there are possible needs for developing different BMI cut-off points for different ethnic groups due to the increasing evidence that the associations between BMI, percentage of body fat, and body fat distribution differ across populations and therefore, the health risks increase below the cut-off point of 25 kg/m2

Out of 150 students 106 (70.7%) were reported physicallyvery active and moderate active (32.0% and 38.7% respectively). This result might indicated that University students in Sudan usually spends an appreciated effort and a lot of energy during their studying years as they crossing long distances walking. Besides some of them working as labors during years of studying to cover their expenses and other needs.

The highest percentage (85.3%) of grade point average (GPA) among the students (N=150) was between 2.40 – 3.49, (second class- honor lower).

Out of 150 students 83female had grade point average around 2.40 – 3.49, this represented about 55% of the total sample. The highest grade point average only found among 9 male students out of 150 (6% only).

A research [(14)]was conducted to explore patterns of physical activity in relationship to self-reported GPA of students. The result showed that More males (55.0%) than females (41.4%) reported meeting the physical activity guidelines. They suggested that no significant patterns of physical activity by GPA were observed in this analysis; They suggested that academic achievement did improve with physical activity up to a point, but that students with very low and very high physical activity levels had lower academic achievement scores than students with moderate physical activity habits. Grissom, J.B. 2005 [(15)]found that increased academic achievement with increased physical fitness tended to be more reliable for female students than male students

According to body mass index this study showed that the highest number of the students (males or females) was in the normal range of BMI (18.50 – 24.99) and had 2.40-3.49 GPA Second class Honor-Lower. According to gender the researchers found that about 55% were female students (83 out of 150 students). This research similarly found that there was no significant relation between the gender and GPA, p> 0. 05. Also, There was no linear relation between the gender and GPA, R2 < 0.5. as well as there was no significant difference between males and females in GPA, sig> 0. 05.This result might indicated that there was no differences between gender academic achievements.

There was no significant relation between the normal BMI and GPA, p> 0. 05 were found in this study. Similarly, there was no linear relation between the BMI and GPA, R2 < 0.5 were found in this study, although a study in Saudi Arabia found a significant association between the normal BMI and high-GPA achievers [(16)].

On the other hand there was a significant difference in GPA between students with different BMIs, sig < 0. 05. It means that BMI effect on GPA, but not reach to relationship level in our study.

The present study showed a significant relation between the physical activity and GPA, p< 0. 05. It means that decrease in physical activity lead to decrease in GPA.A study [(17)]found thata positive associations between PA habits and high academic achievement. In addition, positive association was found between PA, obese students and GPA achievement.On the other hand another study found that there was no significant correlation between GPA and level of physical activity. They suggested Negative findings for this study may be associated with the limited range of GPA scores for graduate students[(18)]

A research on School performance as a predictor of adulthood obesity indicated that female students' academic performance was affected by physical activity more than male high school students[(19)]

The relation between physical fitness and body mass with academic achievement is further strengthened by the firm relationship between physical fitness and body mass[(20)]

6. Conclusion

This study concluded that the highest percentage of the students (males or females) was in the normal range of BMI (18.50 – 24.99) and had 2.40-3.49 GPA.

There was no significant relation between the gender and GPA, p> 0. 05. Likewise there was no significant difference between males and females in GPA, sig> 0. 05. It means that gender don't effect on GPA. There was no significant relation between the BMI and GPA, p> 0. 05. Nevertheless there was a significant difference in GPA between students with different BMIs, sig < 0. 05. It means that BMI effect on GPA, but not reach to relationship level. There was a significant relation between the physical activity and GPA, p< 0. 05. It means that decrease in physical activity lead to decrease in GPA.

There was a significant difference in GPA between students with different physical activities, sig < 0. 05. It means that physical activity effect on GPA.

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