



Sleeping Duration, Bedtime and BMI and Their Rapport on Academic Performance among Adolescents

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Authors' contributions

This work was carried out in collaboration among all authors. Authors WAR and WAD designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors SS, YSB and HYAM managed the analyses of the study. Authors AAS and RA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Proper development of cognitive skills during childhood is substantially connected with adequate sleeping. Sleeping is drastically undergoing pattern changes during the shifting from childhood to adolescence. The academic acquisition is a multifactorial process with devastating inputs. Academic achievement directly correlates with the behavioral attitudes of students. Shorter sleeping duration erodes the volume of brain gray matter in frontal and precuneus cortex regions. Moreover, the concomitant depletion of neurotransmitters is proportionally connected with inadequate sleeping.

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Aims: To evaluate the associations between bedtime initiations, sleeping sufficiency and objective academic performance in a large sample of second secondary students.

Methods: The study sample consisted of 900 adolescents; 450 boys and 450 girls in the second secondary class at Hail city in the Kingdom of Saudi Arabia. Participants filled a questionnaire about their socioeconomic factors as bedtime, sleeping duration, mental games practicing, and physical activity. Weight and height were measured to assess body mass index (kg/m^2). Data extracted from the questionnaire used to study the contribution of the concomitant factors on academic achievement.

Results: The mean weight was 73.57 ± 8.34 kg IQR (44-126) while the mean height was (170.38 ± 6.45) cm IQR (141-192). The mean BMI was 33.57 ± 14.79 (IQR 21.0–38.8). The overall prevalence of childhood obesity was 460 (49.6%; 95% CI: 55.3–66.8%) while the prevalence of overweight was 85 (9.04%; 95% CI: 7.3 –11.4%). The mean ministry academic score for the second secondary class was 70 ± 9.99 IQR (44- 99) while the school academic score was 88.07 ± 7.44 IQR (60-99). 51.6% of the students went to bed between 10-12 pm and only 17.6% slept between 8 and 10 hours.

Conclusion: We can summarize, the independent variables as bedtime, sleeping duration, and obesity ameliorate academic achievement in a counteractive way; high BMI above 35 and prolonged sleeping duration more than 10 hours significantly curb the total academic score, whereas, healthy bedtime of 8-10 pm concomitantly augment the academic achievement.

Keywords: Bedtime; sleeping duration; obesity; academic achievement; KSA.

1. INTRODUCTION

Pedagogy has acknowledged the personal disparities as a conceivable factor with implications associated with academic achievement [1]. Academic scientists have reported shreds of evidence about the impact of personal habits such as bedtime, sleeping duration, screen time, and physical activities on both cognitive performance and academic achievement [2-5]. Sleeping is described as a repetitive state of reduced brain activity and response to environmental cues [6]. Adequate sleeping is substantially required for the proper development of cognitive skills during childhood [7]. Sleeping pattern is drastically undergoing pattern changes during the shifting from childhood to adolescence [8]. These changes are accomplished with an exponential decrease in the sleeping phase without a concomitant increase in the sleeping duration [9]. Late bedtime along with insufficiency in sleeping duration have an erodent effect on academic achievement among school and university students [10].

Aberrantly, the majority of teenagers in secondary schools and medical schools as pharmacy and dental colleges reported in several studies an insufficiency in sleeping duration at night time along with sleepiness during both day time and classrooms [11-14]. Additionally, more than 40% of adolescents demonstrated a late bedtime as a pattern of evening circadian rhythm [15]. Several elements such as technology use,

academic pressure, parental loss of control, economic inputs, and social influences may negatively implicate bedtime in school students [16]. The fluctuation in circadian rhythm affects directly on the brain anatomy as the gray matter volume retracts in students exposed to fewer sleep durations [17]. The most important part of the brain in regulating sleep duration is the hypothalamus. Neurotransmitter gamma-aminobutyric acid (GABA) neurons inhibit the firing of cells involved in wakefulness. Several groups of neurons are inhibited by this action--including neurons containing histamine, norepinephrine, serotonin, hypocretin, and glutamate--and this inhibition promotes sleep [18].

The relationship between sleeping and the academic achievement has been reported by many scientists and researches but these studies were focusing on students in modern world countries where the majority of students have bedtime between 8 pm and 10 pm, whereas, in the Gulf region in general and specifically in Saudi Arabia students attend to have a nap in the day time. This lifestyle is a point of concern for public health scientists generally and school policymakers specifically; this concern is not only regarding the health status of children and adolescents but also some questions were raised about the impact of sleeping on academic achievement among Saudis' students [19,20]. We sought to explore the implications associated with disparities in the sleeping phase and poor academic achievement to provide some pertinent

recommendations specific to the Gulf region. In this study, we will explore the effect of demographical data and socioeconomic factors on the academic achievement of a group of secondary school students in Hail city, KSA.

2. METHODS

2.1 Study Sample

In this study 900 adolescents, 450 boys, and 450 girls from 4 public secondary schools voluntarily participated. The secondary grade students ages ranged between 17-19 years collected from 4 secondary schools from Hail city in the Kingdom of Saudi Arabia (KSA) in May 2017. The secondary schools involved in the study are Al-Sedeeq Secondary school (boys), Al-Farooq Secondary school (boys), First Secondary school (girls) and Fifth Secondary school (girls). The study questionnaires were distributed to the students who attended the study day. Subsequently, participants were kindly asked to finish the entire questionnaire and to ask the research team for help if they had a problem in understanding any question. The weight and height were measured and documented by the research team after finishing off the questioner filling.

2.2 Measures

2.2.1 Academic achievement

In this study, we have adopted the academic achievement as the main dependent variable. To estimate the level of academic achievement, students were asked to report their average School (SGPA) and Ministry Exam Grade (KGPA). The grades were documented according to the percentage grading system out of 100.

2.2.2 Bedtime

To explore the effect bedtime on the student's academic acquisition we asked the participants to choose bedtime among four choices 1) 8:00 PM to 10:00 PM 2) 10:00 PM to 12:00 PM 3) 12:00 PM to 3:00 AM and 4) Day time. The student was asked to write for the time and duration of day time sleeping if he chooses the Day time choice. Students' answers were handled as Independent variables.

2.2.3 Sleeping duration

To investigate deeper about the effect of sleeping duration on academic achievement we

asked the participants to define the sleeping duration and if it is continuous or distracted through choosing of four choices 1) 2-6 hours 2) 6-8 hours 3) 8-10 hours, and 4) more than 10 hours. Students' answers were handled as continuous variables.

2.2.4 Body mass index

To calculate the Body mass index (BMI), weight and height of respondents were measured by the research team. BMI was calculated from the data with the following formula: weight in kilograms/ (height in meters × height in meters). We have used the BMI classification published by The world health organization [21] to classify the respondents, < 18.5 underweight, 18.5-25 normal, 25-30 overweight, 30-35 obese, and >35 Severe obesities.

2.3 Physical Activity

Physical activity is compulsory in the national curriculum for the Saudi Arabia education system and is mainly given as one session for 45 minutes per week, students were asked to fill the self-report questions about the physical activity: 'Do you practice sport?' 'Type of sport do you practice?' 'How often do you participate in sport in a week?' 'How often do you participate in sport per day?'

2.4 Data Analyses

Statistical data were expressed as mean ± standard deviation (SD) for the continuous variables and the percentage for categorical variables. All samples were tested for normality using graphical and statistical (Kolmogorov-Smirnov test). T-test was used for continuous variables and chi-square for nominal variables. ANOVA and Pearson's *r* correlation was used to examine the bivariate correlation between the continuous variables in the study. We used a series of multinomial logistic regression analyses to examine the like hood of achieving high academic achievement after the adjustment of BMI, bedtime, and sleeping duration. P-values less than 0.05 were significant. The SPSS program version 25 was used in the analysis.

3. RESULTS

Table 1 shows the sociodemographic characteristics of the study population. Boys showed taller, heavier, and more sports fitness

than girls (all $p < 0.05$). The mean weight for the study population was 73.57 ± 8.34 kg IQR (45-125) while the mean height was (170.38 ± 6.45) cm QR (140-193). Girls showed an earlier bedtime with longer sleep duration and lower BMI (all $p < 0.05$). The average bedtime was 11:18 pm where 46.3% of the students went to bed between 10-12 pm (Table 2). On the other hand, the average sleeping duration was 7 hours and 50 minutes as 52.4% of students reported sleeping between 6 and 8 hours (Table 2). The mean BMI was 33.57 (IQR 22.0–39.8) where the boys had severely higher than girls ($p > 0.0001$). The overall prevalence of childhood obesity was 435(46.2%; 95% CI: 55.3–66.8%) while the prevalence of overweight was 140 (14.9%; 95% CI: 7.3 –11.4%). There was no significant difference in academic achievement among boys and girls. The mean academic score for the school exams of the second secondary class was 88.07 ± 7.44 IQR (60-100) (Table 1). Whereas, the Ministry Exam Grades were 71.63 ± 7.15 IQR (44- 99); the highest prevalence was in the category of 60-69, 457 students with an incidence of 48.93% (Table 2). 35.1% of boys and 26.6% of girls have their food at exact times for meals. 53.7% of students don't practice any sports activity. 49.4% of students prefer to play mental games (Table 2).

Table 4 shows the multivariate linear model and performing post hoc Duncan's analysis has revealed a positive significant impact of the bedtime of 8:00-10:00 pm and sleeping duration

of 6-8 hours on academic achievement. The bedtime has affected positively on the academic levels as the students went to bed between 8:00 pm and 10:00 pm had a better academic achievement than their colleagues ($p < 0.05$) (Table 4). On the contrary, going to bed between 10:00- 12:00 pm and sleeping duration of 8-10 hours has impacted negatively on the BMI levels which reflects healthier readings for the participants (not shown). On the other and, the bedtime analysis showed a positive correlation between late bedtime after 10 pm ($R = 0.126$, $p < 0.009$) and a higher incidence of obesity. While the type of sport (soccer and walking) ($r = 0.1$, $p < 0.001$) and duration ($r = 0.872$, $p < 0.002$) has affected positively on the BMI values.

Table 5 show Multinomial regression models on the associations of the SGPA. Regarding SGPA only objective bedtime had a significant impact on academic achievement after adjusting for sleep duration, sex, and BMI ($\beta = 1.889$; $p < 0.05$).

Data are presented as mean \pm standard deviation. Differences between sex were examined by t-test or chi-squared test. Values in bold font indicate significant results. SGPA: School grade point average, MGPA: Ministry grade point average. BMI: Body mass index. Values were natural log-transformed before analysis, but non-transformed values are presented in the table.

Table 1. Descriptive statistics of the 900 students at twelfth grade in public secondary schools in Hail

	All (900)	Girls (450)	Boys (450)	P
Age	17.19 \pm 0.38	17.65 \pm 0.54	17.66 \pm 0.54	0.671
SGPA	88.07 \pm 7.44	90.84 \pm 7.51	86.30 \pm 7.38	0.034
MGPA	71.63 \pm 7.15	70.54 \pm 9.58	69.77 \pm 10.35	0.076
Height	170.38 \pm 6.45	168.53 \pm 7.29	173.01 \pm 7.43	0.072
Weight	73.57 \pm 8.43	69.54 \pm 16.89	78.87 \pm 16.49	0.437
BMI	33.57 \pm 14.79	29.28 \pm 13.51	37.85 \pm 14.78	0.000
Sleeping hours	7.90 \pm 3.52	8.24 \pm 3.36	7.56 \pm 3.64	0.000
Bed time	11.18 \pm 1.4	10.43 \pm 1.53	11.51 \pm 1.12	0.000

Table 2. Sociodemographic characteristics of the 900 students at twelfth grade in public secondary schools in Hail

GPA	Girls		Boys		All	
	n	%	n	%	n	%
95-100	70	8.0%	105	11.7%	175	19.7%
94-90	115	13.3%	110	12.8%	225	26.1%
89-85	110	11.7%	100	10.6%	210	22.3%
84-80	95	10.1%	85	9.0%	170	19.1%
79-75	50	5.3%	40	4.3%	90	9.6%
74-70	15	1.6%	15	1.6%	30	3.2%
Total	450	50.0%	450	50.0%	900	100.0%

		Girls		Boys		All	
KGPA	95-100	15	1.6%	15	1.6%	30	3.2%
	94-90	10	1.1%	5	0.5%	15	1.6%
	89-85	5	0.5%	5	0.5%	10	1.1%
	84-80	70	7.4%	70	7.4%	140	14.9%
	79-75	60	6.4%	80	8.5%	140	14.9%
	74-70	75	8.0%	70	7.4%	145	15.4%
	69-65	100	11.7%	70	8.5%	170	20.2%
	64-60	115	13.3%	135	15.4%	250	28.7%
	Total	450	50.0%	450	50.0%	900	100.0%
BMI	< 18.5 under weight	95	10.1%	40	4.3%	135	14.4%
	18.5-25 normal	155	16.5%	75	8.0%	230	24.5%
	25-30 overweight	80	8.5%	60	6.4%	140	14.9%
	30-35 obese	80	8.5%	100	10.6%	180	19.1%
	> 35 Sever obesity	60	6.4%	195	20.7%	255	27.1%
		Total	450	50.0%	450	50.0%	900
Age	16	5	0.5%	5	0.5%	10	1.1%
	17	155	17.6%	150	17.0%	305	34.6%
	18	280	30.9%	285	31.4%	565	62.2%
	19	10	1.1%	10	1.1%	20	2.1%
		Total	450	50.0%	450	50.0%	900
Do you have your meals at an exact time	Yes	310	35.1%	230	26.6%	580	58.2%
	No	140	14.9%	220	23.4%	360	41.8%
	Total	450	50.0%	450	50.0%	900	100.0%
Do you make sport	Yes	205	25.0%	200	21.3%	405	45.1%
	No	235	25.0%	260	28.7%	495	55.9%
	Total	450	50.0%	450	50.0%	900	100.0%
What type of sport	None	120	12.8%	145	16.5%	275	29.3%
	Walking	130	14.9%	130	14.9%	280	29.8%
	Body building	20	2.1%	20	2.1%	40	4.3%
	Soccer	125	14.4%	100	10.6%	235	25.0%
	Other	55	5.9%	55	5.9%	110	11.7%
		Total	450	50.0%	450	50.0%	900
Number of sport practicing per week	None	70	7.4%	100	11.7%	170	17.1%
	1	145	15.4%	120	12.8%	265	27.2%
	2	100	10.6%	70	7.4%	170	19.1%
	3	60	6.4%	55	5.9%	115	11.2%
	4	95	10.1%	115	12.2%	210	23.3%
	Total	450	50.0%	450	50.0%	900	100.0%
Practicing mental games	Yes	260	27.7%	245	26.1%	490	54.4%
	No	210	22.3%	220	23.4%	410	45.6%
	Total	450	50.0%	450	50.0%	900	100.0%
Bed time	8-10 pm	105	11.2%	70	7.4%	175	18.6%
	10-12 pm	215	23.9%	200	22.3%	415	46.3%
	12-3 am	105	11.2%	125	15.4%	230	26.6%
	Day time	35	3.7%	45	4.8%	80	8.5%
	Total	450	50.0%	450	50.0%	900	100.0%
Sleeping duration	2-6 hrs.	55	5.9%	85	9.0%	140	14.9%
	6-8 hrs.	270	30.9%	200	23.4%	470	52.4%
	8-10 hrs.	95	10.1%	135	14.4%	230	24.5%
	>10 hrs.	30	3.2%	30	3.2%	60	6.4%
		Total	450	50.0%	450	50.0%	900

Table 3. Bivariate correlation between the dependent and the independent variables

Correlations		SGPA	KGPA	BMI	Practicing mental games	Bedtime	Sleeping hours	Sex
SGPA	Pearson Correlation	1						
	Sig. (2-tailed)							
KGPA	Pearson Correlation	.586**	1					
	Sig. (2-tailed)	0.001						
BMI	Pearson Correlation	-	-.065*	1				
	Sig. (2-tailed)	0.146	0.046					
Practicing mental games	Pearson Correlation	-.084**	-.174**	0.016	1			
	Sig. (2-tailed)	0.01	0.001	0.617				
Bedtime	Pearson Correlation	-.076*	-.146**	.203**	0.012	1		
	Sig. (2-tailed)	0.019	0.001	0.001	0.708			
Sleeping hours	Pearson Correlation	-.068*	-0.031	-	.086**	-.189**	1	
	Sig. (2-tailed)	0.036	0.337	0.877	0.009	0.001		
Sex	Pearson Correlation	0.031	-0.039	.290**	0.042	.118**	0.014	1
	Sig. (2-tailed)	0.346	0.233	0.001	0.201	0.001	0.674	
	N	900	900	900	900	900	900	900

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Table 4. Multivariate linear model analysis for academic achievement of the students, bedtime and sleeping duration

		SGPA Duncan ^{a,b,c}		
	N	Subset		
		1	2	3
Day time	80	81.87 ^a		
12-3 am	405		87.99 ^b	
10-12 pm	165		88.06 ^b	
8-10 pm	250			90.20 ^c
Sig.		1.000	0.926	1.000
Sleeping duration		1	2	3
> 10 hrs	50	82.50 ^a		
2-6 hrs	130		86.71 ^b	
8-10 hrs	220			88.54 ^c
6-8 hrs	500			88.88 ^c
Sig.		1.000	1.000	0.680 ^c

Means for groups in homogeneous subsets are displayed. Based on observed means

The error term is Mean Square (Error) = 44.840

a. Uses Harmonic Mean Sample Size = 132.810

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed

c. Alpha = .05

Table 5. The multinomial logistic regression analysis for the effect of covariates on academic achievement

SGPA ^a		Parameter estimates			
		Sig.	Exp(B)	95% Confidence Interval for Exp (B)	
				Lower bound	Upper bound
95-100	Intercept	0.828			
	Sex	0.279	1.596	0.684	3.724
	Sleeping hours	0.736	0.923	0.58	1.469
	Bed time	0.035	1.886	1.047	3.398
	BMI	0.677	0.938	0.692	1.271
94-90	Intercept	0.159			
	Sex	0.78	1.126	0.49	2.587
	Sleeping hours	0.452	0.839	0.531	1.325
	Bed time	0.036	1.861	1.04	3.328
	BMI	0.446	0.89	0.66	1.201
89-85	Intercept	0.233			
	Sex	0.473	0.735	0.316	1.707
	Sleeping hours	0.03	0.598	0.376	0.952
	Bed time	0.023	1.971	1.1	3.534
	BMI	0.06	1.339	0.988	1.815
84-80	Intercept	0.234			
	Sex	0.48	0.736	0.314	1.723
	Sleeping hours	0.042	0.616	0.385	0.983
	Bed time	0.042	1.841	1.022	3.315
	BMI	0.084	1.311	0.965	1.782
79-75	Intercept	0.014			
	Sex	0.504	0.733	0.294	1.824
	Sleeping hours	0.117	1.51	0.902	2.526
	Bed time	0.001	5.075	2.704	9.525
	BMI	0.672	0.93	0.666	1.299

The reference category is: 74-70
 Bold numbers indicate significance

4. DISCUSSION

This study was conducted to clarify the impact of the concomitant variables on the academic achievement of adolescents in Hail, Saudi Arabia. Namely, we explored the impact of gender, bedtime, sleeping duration, BMI, mental games, and physical activity on academic achievement. The confounding variables of bedtime, sleeping duration and playing of mental games were linear and positive in the predictive model while BMI showed a significant negative association with academic scores.

Our study has relied on the analysis of data for a population of 900 participants; 450 boys and 450 girls were enrolled in this study. The pertinent finding of our study could be the positive association of early bedtime at 8 pm and academic achievement whereas the late bedtime after 12 pm conferred a negative impact on academic acquisition. Moreover, the sleeping duration of 8 hours impacted positively on

academic achievement, whereas, the increase in sleeping duration more than 8 hours did not provide a better result; on the contrary, it affected negatively the academic performance. Roenneberg, Kuehnle et al. [15] reported that students are not able to shift their bedtime to earlier hours than summer late bedtime had less cognitive and academic achievements. Likewise, Asarnow, McGlinchey Harvey [22] emphasized the negative relation of late bedtime and academic performance and congenital outputs. The comparison between genders showed an earlier bedtime and a longer sleeping duration in girls that endowed a higher academic acquisition and lower body mass index. Performing the multinomial regression of the covariates of bedtime, sleeping duration, and the sex showed a significant finding for bedtime on academic achievement over the other covariates of sleeping duration, gender, and BMI. Adelantado et al. [5] reported a positive association between the quality of sleeping with academic performance (β ranging from 0.209 to 0.273; all p

<.001). Concomitantly, Alswat et al. [23] reported a positive correlation between sleeping quality and academic achievement in Saudi Arabia ($p < 0.005$). While Almoajel et al. [24] concluded a negative impact on disturbances in the sleeping pattern on academic achievement for college students in Riyadh. On the other hand, health care scientists reported plausible implications on the physiological function and anatomical structure in students exposed to sleeping distress [17,18].

In the current study, multinomial logistic regression analysis for the effect of variable factors on academic achievement has revealed a significant contribution of bedtime over the covariables of sleeping duration, sex, and BMI on academic achievement ($p < 0.001$), respectively. Firstly, bedtime accounted for a higher academic achievement proportion of 36.5% for the students going to bed between the hour 8:00 pm and 10 hours when compared with the student having a bedtime after 10:00 pm or sleep in the daytime. The prolonged sleeping more than 8 hours didn't confer higher achievement, on the contrary, it resulted in fewer marks; this could be attributed to less time consumed in studying and the sleepiness of students during the school time. Research proves the negative impact and correlation between long sleep duration more than 10 hours and academic achievement [4,25,26].

In the current study, the academic achievement of school students was affected by many factors; first of all, BMI has affected the students' score negatively ($r = -0.322$, $p < 0.005$) as the proportion of obese students in the category of low grades of 60-69 was 34% compared to 20% for the normal weight students. Several publications reported the negative correlation between BMI and academic achievement [2,27-29]. Direct links suggested the deleterious consequences of obesity on the general health reflected in an increase of school absence because of health issues, lack of self-confidence, and hyperactivity interfering with academic achievement [30-32]. The rational explanation behind these findings could be attributed to the lacking of confidence in the overweight and obese student's which subjects them to exploitation and criticism of other students leading to an increase in studying days' absence conferring lower academic achievement.

These results are consistent with Taras and Potts-Datema as they demonstrated poorer

levels of academic achievement among obese children and adolescents in both regions of the United States of America and Europe. They concluded that generally overweight students do not attend a school or perform as their healthy counterparts. Such findings are difficult to interpret, however, because school performance is confounded by school attendance and other factors, such as mental health, low self-esteem, or depression [33].

5. CONCLUSION

We can summarize, the independent variables as bedtime, sleeping duration, and obesity ameliorate academic achievement in a counteractive way; high BMI above 35 and prolonged sleeping duration more than 10 hours significantly curb the total academic score, whereas, healthy bedtime of 8-10 pm concomitantly augment the academic achievement.

6. RECOMMENDATIONS

We highly recommend the adolescents to have a sleeping duration not less than 7 hours with a bedtime, not after 10 pm. Additionally, in accordance with COVID 19 pandemic attack and the World Health Organization guidelines, we substantially recommend implementing the Social Distancing guidelines and personal hygiene in schools and universities to control the spreading of the disease.

LIMITATIONS

Firstly, we conducted a cross-sectional study for correlational analyses, this type of analysis does not provide definitive conceiving evidence for the elements influencing academic achievement but still, it is utilized and recommended in such tests [34]. However, our data in compliance with data reported by other research groups in the Gulf region or in the USA and Europe which endows a potent plausible outcome [34-36]. Secondly, we counted on self-reporting for data collection so it is predictable to have higher degrees than actual since the self-reporting of student grades confers a degree of non-accurate grading. However, we couldn't extract the marks by our self's due to confidentiality restrictions. However, the National Education Longitudinal Survey indicates that although students do generally overestimate their math grades by about one-third of a letter grade ($r = 0.72$) [37]. However, clinical researchers

adopt self-filled questioners to study the effect of socioeconomic factors on the clinical aspects as a part of perception sources [38]. This systemic error will not affect the results individually, on the contrary, they will obey the same laws of deviation without changing the study out findings.

CONSENT

The informed consent was approved by the parents or guardians before participating in the study after clarifying the nature and characteristics of the study and data was handled in privacy.

ETHICAL APPROVAL

The study protocol was designed under the ethical guidelines of the Declaration of Helsinki1961 and approved by the Ethics Committee of the University of Hail.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Holmes ME, Kvasnicka MA, Brocato DK, Webb HE. Metabolic health and academic achievement in youth at risk for high school dropout in rural Mississippi: The role of classroom management. *Prev Med Rep.* 2018;11:115-19.
2. Muntaner-Mas A, Palou P, Vidal-Conti J, Esteban-Cornejo I. A mediation analysis on the relationship of physical fitness components, obesity and academic performance in children. *J Pediatr.* 2018; 198:90-97 e4.
3. Toh ST, Phua CQ, Loh S. Holistic management of obstructive sleep apnea: Translating academic research to patient care. *Sleep Med Clin.* 2019;14:1-11.
4. Burns RD, Fu Y, Brusseau TA, Clements-Nolle K, Yang W. Relationships among physical activity, sleep duration, diet, and academic achievement in a sample of adolescents. *Prev Med Rep.* 2018;12:71-74.
5. Adelantado-Renau M, Beltran-Valls MR, Migueles JH, Artero EG, Legaz-Arrese A, Capdevila-Seder A, et al. Associations between objectively measured and self-reported sleep with academic and cognitive performance in adolescents: DADOS study. *J Sleep Res.* 2019:e12811.
6. Krueger JM, Frank MG, Wisor JP, Roy S. Sleep function: Toward elucidating an enigma. *Sleep Medicine Reviews.* 2016;28: 46-54.
7. Carskadon MA. Patterns of sleep and sleepiness in adolescents. *Pediatrician.* 1990;17:5-12.
8. Carskadon MA, Vieira C, Acebo C. Association between puberty and delayed phase preference. *Sleep.* 1993;16:258-62.
9. Mercer PW, Merritt SL, Cowell JM. Differences in reported sleep need among adolescents. *Journal of Adolescent Health.* 1998;23:259-63.
10. Beebe D, Rose D, Amin R. Effect of chronic sleep restriction on adolescents' learning and brain activity in a simulated classroom: A pilot study. in *Sleep*; 2008. AMER ACAD SLEEP MEDICINE ONE WESTBROOK CORPORATE CTR, STE 920, WESTCHESTER
11. Link S, Ancoli-Israel S. Sleep and the teenager. *Sleep Res.* 1995;24:184.
12. Newman DL, Moffitt TE, Caspi A, Magdol L, Silva PA, Stanton WR. Psychiatric disorder in a birth cohort of young adults: prevalence, comorbidity, clinical significance, and new case incidence from ages 11 to 21. *Journal of Consulting and Clinical Psychology.* 1996;64:552.
13. Zeek ML, Savoie MJ, Song M, Kennemur LM, Qian J, Jungnickel PW, et al. Sleep duration and academic performance among student pharmacists. *American Journal of Pharmaceutical Education.* 2015;79.
14. Elagra MI, Rayyan MR, Alnemer OA, Alshehri MS, Alsaffar NS, Al-Habib RS, et al. Sleep quality among dental students and its association with academic performance. *J Int Soc Prev Community Dent.* 2016;6: 296-301.
15. Roenneberg T, Kuehnele T, Pramstaller PP, Ricken J, Havel M, Guth A, et al. A marker for the end of adolescence. *Current biology.* 2004;14:R1038-R39.
16. Carskadon M, Mindell J, Drake C. Contemporary sleep patterns of adolescents in the USA: Results of the 2006 National Sleep Foundation Sleep in America Poll. in *Journal of Sleep Research.* 2006. Blackwell Publishing 9600 Garsington RD, Oxford OX4 2DQ, Oxon, England.

17. Aphas G, Ioannou Y, Giannaki CD. Physical fitness and obesity levels during an academic year followed by summer holidays: an issue of insufficient time for physical activity. *Int J Adolesc Med Health*. 2017;31.
18. Siegel JM. The neurotransmitters of sleep. *J Clin Psychiatry*. 2004;65:4-7.
19. Sui Z, Raman J, Han B, Burchell T, Coogan SCP, Brennan B, et al. Recent trends in intensive treatments of obesity: Is academic research matching public interest? *Surg Obes Relat Dis*; 2019.
20. Washington R. Negative association between obesity and academic performance-Physical fitness may help mediate the effects. *J Pediatr*. 2018;198:2-3.
21. Organization WH. Body mass index - BMI. 2012; Available:<http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi>.
22. Asarnow LD, McGlinchey E, Harvey AG. The effects of bedtime and sleep duration on academic and emotional outcomes in a nationally representative sample of adolescents. *J Adolesc Health*. 2014;54: 350-6.
23. Alswat KA, Al-shehri AD, Aljuaid TA, Alzaidi BA, Alasmari HD. The association between body mass index and academic performance. *Saudi Medical Journal*. 2017; 38:186.
24. Almoajel A, Al-Zahrani AN, AL-Qtaibi MS. Health behaviours affecting academic performance among university students in Riyadh, Saudi Arabia: KSU female students as an example. *Australasian Medical Journal (Online)*. 2017;10: 870-78.
25. Zeek ML, Savoie MJ, Song M, Kennemur LM, Qian J, Jungnickel PW, et al. Sleep Duration and Academic Performance Among Student Pharmacists. *Am J Pharm Educ*. 2015;79:63.
26. Guo L, Luo M, Wang W, Huang G, Zhang WH, Lu C. Association between weekday sleep duration and nonmedical use of prescription drug among adolescents: the role of academic performance. *Eur Child Adolesc Psychiatry*; 2019.
27. Rayyan wa, al-majali is, batarseh y, salem s, dayyih wa. The adversary effect of obesity on academic achievement among ADOLESCENTS. *Asian J Pharm Clin Res*. 2019;12:257-60.
28. Washington R. Negative association between obesity and academic performance — Physical fitness may help mediate the effects. *The Journal of Pediatrics*. 2018;198:2-3.
29. Judge S, Jahns L. Association of overweight with academic performance and social and behavioral problems: An update from the early childhood longitudinal study. *Journal of School Health*. 2007;77:672-78.
30. Santana CCA, Hill JO, Azevedo LB, Gunnarsdottir T, Prado WL. The association between obesity and academic performance in youth: A systematic review. *Obes Rev*. 2017;18:1191-99.
31. Rayyan WA. Obesity Influence on Lead levels in Blood and Scalp Hair among TeenageSmokers in Jordan. *Scholars Journal of Applied Medical Sciences*. 2016; 4:244-50.
32. Bustami m, Abudayyih w, Batarseh ys, almajali is, tamimi ln, rahhal a, et al. Effect of smoking and obesity on the serum levels of vitamin d3 in the central region of jordan. *International Journal of Biology, Pharmacy and Allied Sciences*. 2019; 8:17.
33. Taras H, Potts-Datema W. Obesity and student performance at school. *Journal of School Health*. 2005;75:291-95.
34. Taras H, Potts-Datema W. Sleep and student performance at school. *Journal of school health*. 2005;75:248-54.
35. Suraya F, Meo SA, Almubarak Z, Alqaseem YA. Effect of obesity on academic grades among Saudi female medical students at College of Medicine, King Saud University: Pilot study. *J Pak Med Assoc*. 2017;67: 1266-69.
36. Baxter SD, Guinn CH, Tebbs JM, Royer JA. There is no relationship between academic achievement and body mass index among fourth-grade, predominantly African-American children. *J Acad Nutr Diet*. 2013; 113:551-7.
37. Laura J. Burns RH, Steven J. Ingels, Judith Pollack, Daniel J. Pratt, Donald Rock, Jim Rogers, Leslie A. Scott, Peter Siegel and Ellen Stutts. Project officer: Jeffrey Owings. *Educational Longitudinal Study of 2002 Base Year Field Test Report*; 2003.

- Available:<https://nces.ed.gov/pubs2003/200303.pdf>
38. Alsaggaf MA, Wali SO, Merdad RA, Merdad LA. Sleep quantity, quality and insomnia symptoms of medical students during clinical years. Relationship with stress and academic performance. Saudi Med J. 2016; 37:173-82.

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