MEMORY AND CONCENTRATION SKILLS AMONG HORUS UNIVERSITY MEDICAL STUDENTS AND ITS ASSOCIATED FACTORS

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Abstract

Introduction: This study investigates the association between memory and concentration skills with sociodemographic characteristics, study hours, and sleep hours among undergraduate medical students at Horus University.

Objectives: To assess the relationship between memory and concentration skills and factors such as age, sex, governorate, residence, faculty, study hours, and sleep hours.

Methods: An epidemiological, observational, descriptive, cross-sectional study was conducted with 817 undergraduate medical students. Data were collected via an online questionnaire and analyzed using SPSS version 27. Memory and concentration skills were assessed using a modified Study Skills Inventory (SSI). Statistical analyses included the Mann-Whitney test, chi-square test, and Spearman correlation.

Results: The study found that 72.2% of students had adequate memory skills, and 70.3% had adequate concentration skills. Students studying less than 3 hours per day or sleeping less than 6 hours per day were more likely to have inadequate skills. A significant positive correlation was found between memory and concentration skills ($r = 0.615$, $p < 0.001$).

Conclusion: Adequate study hours (3 to 6 hours or more per day) and sufficient sleep (6 to 8 hours per day) are crucial for maintaining memory and concentration skills among medical students. These findings highlight the importance of promoting effective study habits and sleep hygiene to enhance cognitive performance.

Keywords: Memory, Concentration, Medical students, Study hours, Sleep hours, Sociodemographic factors.

Introduction

Getting a university degree requires a great deal of time and effort from students. Some undergraduates may assume that their college journey would be easy given that they are knowledgeable in a certain subject in high school. However, to be a successful student, one would also need to acquire the individual study skills that require continual education and training. Study skills include managing time, taking notes, reading books, listening to lectures, partaking in discussions, and taking tests. Study skills not only help students to take tests successfully and earn best possible grades, but they can also yield scientific and technical developments in all life fields (Vo, Huynh and Nguyen, 2022).

Objectives

The purpose of this study is to assess the association of memory skills and concentration skills with socio-demographical characteristics, study hours, and sleep hours among undergraduate medical students at Horus university.

Subjects and Methods

An epidemiological, observational, descriptive, cross-sectional, study was conducted at Horus university, New Damietta, Egypt during academic year 2023/2024. A convenient sample of 817 undergraduate students at different medical colleges participated in the study by filling online questionnaire included consent of participation, sociodemographic characteristics, study hours, sleep hours, and 19 questions related to memory skills (9 questions) and concentration skills (10 questions) modified from the Study Skills Inventory (SSI). Data had been collected in google excel form and analyzed using Statistical Package of Social Science (SPSS) version 27. The scores of memory and concentration skills summarized as median (Min. to Max.) based on Kolmogorov-Smirnov normality test. If the student yielded score of memory skills less than 30 or concentration skills less than 35, student memory and concentration skills were considered “not adequate”. Analysis of these skills with their associated factors was done using the Mann-Whitney test for quantitative variables, and chi-square test for qualitative variables. Moreover, Spearmen correlation was done between total score concentration skills and total score memory skills. The level of significance considered at 5%.

Ethical Considerations

This study was conducted in accordance with the ethical standards set forth by the Horus University Ethical Committee. Approval of the research was obtained on December 17, 2024, with reference number (M-2024-004). All participants provided informed consent prior to their involvement in the study. The confidentiality and anonymity of the participants were strictly maintained throughout the research process. Data was collected and analyzed in a manner that ensured the privacy of the participants.

Statistical analysis

This study employed an epidemiological, observational, descriptive, cross-sectional design to assess the association between memory and concentration skills and various factors among undergraduate medical students at Horus University. A convenient sample of 817 students from different medical colleges participated by completing an online questionnaire. The questionnaire included sociodemographic characteristics, study hours, sleep hours, and questions related to memory and concentration skills, modified from the Study Skills Inventory (SSI).

Data were collected using Google Excel forms and analyzed with the Statistical Package for Social Science (SPSS) version 27. Memory and concentration skills were summarized as median (Min. to Max.) based on the Kolmogorov-Smirnov normality test. Students with memory skills scores less than 30 or concentration skills scores less than 35 were considered to have "not adequate" skills.

The Mann-Whitney test was used to analyze quantitative variables, while the chi-square test was employed for qualitative variables. Additionally, Spearman correlation was conducted to examine the relationship between total memory skills scores and total concentration skills scores. Logistic regression analysis was performed to identify predictors of adequate memory and concentration skills. The level of significance was set at 5%. These statistical methods provided a comprehensive understanding of the factors influencing cognitive skills among the student population.

Results

Concerning memory skills, about 72.2% students had adequate score and 27.8% students had non adequate score and regarding concentration skills 70.3% students had adequate score and 29.7% students had non adequate score. In addition, the percentage of students with non-adequate memory or concentration skills was significantly more than those with adequate skills, by studying less than 3 hours per day. Also, students who had non-adequate concentration slept less than 6 hours per day than those who had adequate skills with a statistically significant difference. Moreover, Students' concentration skill scores were positively and significantly correlated with their memory skill scores ($r = 0.615$, $p < 0.001$).

Table (1) presents the sociodemographic characteristics of 817 undergraduate medical students at Horus University. The data includes age, sex, governorate, residence, faculty, study hours, and sleep hours. The mean age is 21.73 years with a standard deviation of 1.499. The majority of students are female (67.9%) and from Lower Egypt (97.3%). Most students reside in urban areas (64.4%) and are enrolled in the Physical Therapy faculty (47.2%). The table also shows that 54.8% of student's study between 3 to 6 hours per day, and 61.3% sleep between 6 to 8 hours per day. These characteristics provide a comprehensive overview of the student population, which is essential for understanding the context of the study (Table 1).

Table (2) summarizes the scores of memory and concentration skills among the students. The median score for memory skills is 35 (range 9 to 45), and for concentration skills, it is 40 (range 10 to 50). The table categorizes students into those with adequate and not adequate skills. About 72.2% of students have adequate memory skills, while 27.8% do not. Similarly, 70.3% have adequate concentration skills, and 29.7% do not. These statistics highlight the distribution of cognitive skills within the student population, indicating that a significant proportion of students struggle with memory and concentration (Table 2).

Table (3) examines the association between memory and concentration skills and various factors such as age, sex, governorate, residence, faculty, study hours, and sleep hours. The p-values indicate the statistical significance of these associations. Notably, study hours and sleep hours show significant associations with both memory and concentration skills. Students who study less than 3 hours per day or sleep less than 6 hours per day are more likely to have inadequate skills. This table underscores the importance of study and sleep habits in cognitive performance, providing evidence for targeted interventions to improve these skills (Table 3).

Table 1. Sociodemographic characteristics of undergraduate medical students.

Sociodemographic characteristics		**Undergraduate medical students (n=817)**	
Age Mean ± SD		21.73 ± 1.499	
		N	%
sex	Male	262	32.1
	Female	555	67.9
Governorate	Lower Egypt	795	97.3
	Upper Egypt	22	2.7
Residence	Urban	526	64.4
	Rural	291	35.6
Faculty	Medicine	238	29.1
	Dentistry	42	5.1
	Pharmacy	151	18.5
	Physical Therapy	386	47.2
Level	Level 1	19	2.3
	Level 2	131	16.0
	Level 3	99	12.1
	Level 4	41	5.0
	Level 5	521	63.8
	Level 6	6	0.7
Hours of study	Less than 3 hours	164	20.1
	From 3 to 6 hours	448	54.8
	More than 6 hours	205	25.1
Sleep hours	Less than 6 hours	154	18.8
	From 6 to 8 hours	501	61.3
	More than 8 hours	162	19.8

Table 2. Score of memory and concentration skills among undergraduate medical students.

	Undergraduate medical students (n= 817)	
	Score of memory skills	**Score of concentration skills**
Median (Min. to Max.)	35 (9 to 45)	40 (10 to 50)
	N (%)	N (%)
Not adequate	227 (27.8)	243 (29.7)
Adequate	590 (72.2)	574 (70.3)

Table (4) presents the results of logistic regression analysis to identify predictors of adequate memory skills. The odds ratios (OR) and 95% confidence intervals (CI) indicate the strength and precision of these predictors. Study hours are significant predictors, with students studying 3 to 6 hours per day having 1.8 times higher odds, and those studying more than 6 hours per day having 2.5 times higher odds of having adequate memory skills. Other factors such as age, sex, governorate, residence, and faculty do not show significant associations. This analysis highlights the critical role of study habits in memory performance (Table 4).

Similar to the previous table, Table (5) shows logistic regression results for predictors of adequate concentration skills. Study hours and sleep hours are significant predictors. Students studying 3 to 6 hours per day have 2.5 times higher odds, and those studying more than 6 hours per day have 2.53 times higher odds of having adequate concentration skills. Additionally, students sleeping 6 to 8 hours per day have 1.55 times higher odds of adequate concentration skills. This table reinforces the importance of both study and sleep habits in maintaining concentration skills (Table 5).

Figure (1) visually represents the positive correlation between memory skills and concentration skills among undergraduate medical students. Each point on the scatter plot corresponds to an individual student's scores in these two cognitive domains. The diagram shows a clear upward trend, indicating that students with higher memory skills tend to also have higher concentration skills. The correlation coefficient ($r = 0.615$, $p < 0.001$) further quantifies this relationship, demonstrating a statistically significant and strong positive correlation. This suggests that improvements in one cognitive skill are likely to be associated with enhancements in the other, highlighting the interconnected nature of memory and concentration in academic performance (Figure 1).

Discussion

Memory and concentration are fundamental cognitive skills that play a critical role in academic success, particularly in demanding fields such as medicine. Medical students are required to process, retain, and recall vast amounts of complex information, making these skills essential for their academic and future clinical performance. However, the development and maintenance of memory and concentration skills are influenced by various factors, including study habits, sleep patterns, and sociodemographic characteristics. Understanding these factors is crucial for designing effective interventions to support students in achieving their academic goals (Richardson et al., 2012; Alomoush et al., 2024).

The importance of study skills, including memory and concentration, has been widely recognized in literature. According to Vo, Huynh, and Nguyen (2022), study skills such as time management, note-taking, and active engagement in learning are essential for academic success. These skills not only help students perform well in exams but also contribute to long-term scientific and technical advancements. However, many students enter university with the misconception that their high school knowledge alone will suffice, leading to challenges in adapting to the rigorous demands of higher education (Vo et al., 2022).

Sleep is another critical factor that influences cognitive performance. Research has consistently shown that sleep deprivation negatively impacts attention, memory, and executive functions (Curcio, Ferrara, & De Gennaro, 2006). Medical students, in particular, often face sleep deprivation due to heavy academic workloads and clinical responsibilities, which can impair their ability to concentrate and retain information (Trockel, Barnes, & Egget, 2000). Despite the growing body of evidence on the importance of sleep, many students

Table 3. Association of memory and concentration skills with sociodemographic characteristics, study hours, and sleep hours among undergraduate medical students.

Sociodemographic characteristics		Adequate memory skills (n=590)	Not adequate memory skills (n=227)	*p*-value	Adequate concentration skills (n=574)	Not adequate concentration skills (n=243)	*p*-value
Age Median (Min. to Max.)		22 (18 to25)	22 (7 to 25)	0.345	22 (18 to 25)	22 (7 to 25)	0.147
		N (%)					
sex	Male	185 (31.4)	77 (33.9)	0.482	190 (33.1)	72 (29.6)	0.331
	Female	405 (68.6)	150 (66.1)		384 (66.9)	171 (70.4)	
Governorate	Upper Egypt	15 (2.5)	7 (3.1)	0.669	13 (2.3)	9 (3.7)	0.245
	Lower Egypt	575 (97.5)	220 (96.9)		561 (97.7)	234 (96.3)	
Residence	Rural	211 (35.8)	80 (35.2)	0.889	207 (36.1)	84 (34.6)	0.683
	Urban	379 (64.2)	147 (64.8)		367 (63.9)	159 (65.4)	
Faculty	Dentistry	28 (4.7)	14 (6.2)	0.727	29 (5.1)	13 (5.3)	0.786
	pharmacy	111 (18.8)	40 (17.6)		109 (19.0)	42 (17.3)	
	Physical Therapy	275 (46.6)	111 (48.9)		265 (46.2)	121 (49.8)	
	Medicine	176 (29.8)	62 (27.3)		171 (29.8)	67 (27.6)	
Hours of study	Less than 3 hours	97 (16.4)	67 (29.5)	<0.001	88 (15.3)	76 (31.3)	<0.001
	From 3 to 6 hours	330 (55.9)	118 (52.0)		334 (58.2)	114 (46.9)	
	More than 6 hours	163 (27.6)	42 (18.5)		152 (26.5)	53 (21.8)	
Sleep hours	Less than 6 hours	108 (18.3)	46 (20.3)	0.324	99 (17.2)	55 (22.6)	0.001
	From 6 to 8 hours	371 (62.9)	130 (57.3)		375 (65.3)	126 (51.9)	
	More than 8 hours	111 (18.8)	51 (22.5)		100 (17.4)	62 (25.5)	

Table 4. Logistic regression of predictors of adequate memory skills among undergraduate medical students.

Risk factors		β	*p*-value	OR	95 % CI	
					lower	upper
Age		-0.073	0.266	0.930	0.818	1.057
Sex	Male			r		
	Female	0.044	0.806	1.045	0.736	1.484
Governorate	Upper Egypt			r		
	Lower Egypt	0.116	0.811	1.123	0.432	2.919
Residence	Rural			r		
	Urban	-0.042	0.804	0.959	0.690	1.334
Faculty	Dentistry			r		
	pharmacy	0.393	0.313	1.481	0.691	3.173
	Physical Therapy	0.253	0.480	1.288	0.638	2.598
	Medicine	0.181	0.632	1.199	0.571	2.515
Hours of study	Less than 3 hours			r		
	From 3 to 6 hours	0.586	0.003	1.796	1.218	2.648
	More than 6 hours	0.920	<0.001	2.509	1.565	4.023
Sleep hours	Less than 6 hours			r		
	From 6 to 8 hours	0.160	0.444	1.174	0.779	1.770
	More than 8 hours	-0.039	0.876	0.962	0.589	1.571
Constant	1.553					
Model χ^2	20.599, *p*=0.038					
% predicted	72.0					

Z#: Mann Whitney test, 2: Chi-square test

continue to sacrifice sleep for study, potentially undermining their academic performance.

Sociodemographic factors, such as age, gender, and socioeconomic status, have also been explored to academic performance. While some studies suggest that these factors may influence cognitive abilities and academic outcomes (Richardson, Abraham, & Bond, 2012), others have found no significant associations (Credé, Roch, & Kieszczynka, 2010; Hawamdeh et al., 2023). This discrepancy highlights the need for further research to clarify the role of sociodemographic factors in shaping memory and concentration skills, particularly in the context of medical education.

Given the critical role of memory and concentration in medical education, our study aimed to assess the association of these skills with sociodemographic characteristics, study hours, and sleep hours among undergraduate medical students at Horus University. By identifying the factors that influence memory and concentration, our study seeks to provide valuable insights for educators and policymakers to develop targeted interventions that support students in achieving their academic potential.

The results of our study provided a comprehensive understanding of the factors influencing memory and concentration skills among undergraduate medical students at Horus University. Our findings revealed that while a majority of students possess adequate memory (72.2%) and concentration skills (70.3%), a significant proportion-27.8% for memory and 29.7% for concentration-struggle with these essential cognitive abilities.

Our results were particularly relevant in the context of medical education, where memory and concentration are critical for mastering complex subjects and performing well in both academic and clinical settings.

Study Hours: A Key Determinant of Memory and Concentration Skills

One of the most striking findings of our study was the strong association between the number of hours' students dedicate to studying and their

Table 5. Logistic regression of predictors of adequate concentration skills among undergraduate medical students.

Risk factors		β	*p*-value	OR	95 % CI	
					lower	upper
Age		-0.076	0.234	0.927	0.817	1.051
Sex	Male			r		
	Female	-0.276	0.129	0.759	0.531	1.084
Governorate	Upper			r		
	Lower	0.529	0.259	1.697	0.678	4.247
Residence	Rural			r		
	Urban	-0.108	0.518	0.897	0.646	1.246
Faculty	Dentistry			r		
	pharmacy	0.347	0.384	1.414	0.648	3.087
	Physical Therapy	0.129	0.726	1.137	0.553	2.339
	Medicine	-0.011	0.978	0.989	0.463	2.111
Hours of study	Less than 3 hours			r		
	From 3 to 6 hours	0.915	<0.001	2.496	1.692	3.682
	More than 6 hours	0.929	<0.001	2.532	1.607	3.989
Sleep hours	Less than 6 hours			r		
	From 6 to 8 hours	0.438	0.031	1.550	1.040	2.311
	More than 8 hours	-0.051	0.831	0.950	0.592	1.524
Constant	1.180					
Model χ^2	39.983, $p < 0.001$					
% predicted	71.3					

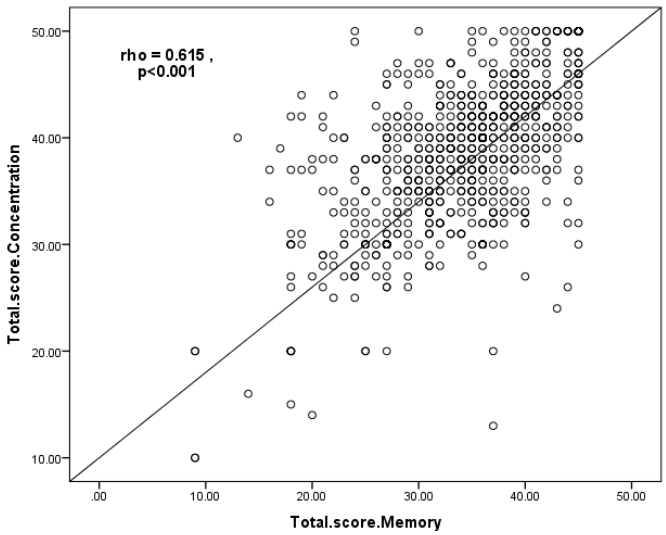

Figure 1. scatter diagram illustrated correlation between total score memory skills and total score concentration skills among undergraduate medical students.

memory and concentration skills. Students who studied 3 to 6 hours per day or more than 6 hours per day were significantly more likely to have adequate memory and concentration skills compared to those who studied less than 3 hours per day.

- Memory Skills: Among students who studied less than 3 hours per day, only 16.4% had adequate memory skills, while 29.5% had non-adequate skills. In contrast, students who studied 3 to 6 hours per day or more than 6 hours per day had much higher rates of adequate memory skills (55.9% and 27.6%, respectively). This suggests that consistent and prolonged study time is crucial for retaining and recalling information, which is essential for medical students who must memorize vast amounts of material.

- Concentration Skills: Similarly, for concentration skills, students who studied less than 3 hours per day had significantly lower rates of adequate concentration (15.3%) compared to those who studied 3 to 6 hours (58.2%) or more than 6 hours (26.5%). This indicates that the ability to focus and maintain attention during study sessions is closely tied to the amount of time students spend studying.

The logistic regression analysis further supports these findings, showing that students who studied 3 to 6 hours per day had 1.8 times higher odds of having adequate memory skills, and those who studied more than 6 hours per day had 2.5 times higher odds. For concentration skills, the odds were even higher, with students studying 3 to 6 hours per day having 2.5 times higher odds and those studying more than 6 hours per day having 2.53 times higher odds of adequate concentration. These results underscore the importance of dedicating sufficient time to studying for developing and maintaining cognitive skills.

Sleep Hours: A Critical Factor for Concentration

Another significant finding of our study was the relationship between sleep duration and concentration skills. Students who slept 6 to 8 hours per day were more likely to have adequate concentration skills compared to those who slept less than 6 hours.

- Concentration Skills: Among students who slept less than 6 hours per day, only 17.2% had adequate concentration skills, while 22.6% had non-adequate skills. In contrast, students who slept 6 to 8 hours per day had much higher rates of adequate concentration (65.3%). This suggested that insufficient sleep negatively impacted the ability to focus and maintain attention, which was critical for medical students who often face long hours of studying and clinical work.

A study conducted by Nonis and Hudson (2010) supports our findings by showing a positive correlation between the amount of time students spend studying and their academic performance. They concluded that students who dedicate more hours to studying tend to achieve higher grades. This aligns with our observation that students who study between 3 to 6 hours or more each day demonstrate better memory and concentration skills.

When discussing study hours and the concept of diminishing returns, it's crucial to address a contrasting study. Credé, Roch, and Kieszczynka (2010) conducted a comprehensive meta-analysis examining the link between study time and academic performance. They established that while there is a positive correlation between study time and grades, the effect size remains relatively small. Moreover, they emphasized that excessive study time can lead to diminishing returns. In contrast, our research indicates that students who dedicate more than six hours per day to studying have significantly higher odds of achieving adequate memory and concentration skills.

The logistic regression analysis further confirmed this relationship, showing that students who slept 6 to 8 hours per day had 1.55 times higher odds of having adequate concentration skills compared to those who slept less than 6 hours. Our finding aligns with a large body of research that highlighted the importance of sleep for cognitive functions, including attention, memory consolidation, and problem-solving (Walker, 2017). Sleep deprivation, on the other hand, has been shown to impair these functions, leading to decreased academic performance and increased risk of errors in clinical settings.

Memory and Concentration: A Strong Positive Correlation

Our study also found a strong positive correlation between memory and concentration skills ($r = 0.615$, $p < 0.001$). This means that students who performed well in memory-related tasks were also likely to perform well in tasks requiring concentration, and vice versa.

- **Interconnected Cognitive Skills:** This correlation suggests that memory and concentration are not isolated cognitive functions but are closely intertwined. For example, a student who can effectively concentrate during a lecture is more likely to retain and recall the information later. Similarly, a student with strong memory skills may find it easier to focus on tasks because they can quickly access relevant information without getting distracted.

In our investigation into the relationship between memory and concentration, we were encouraged to find alignment with the research conducted by Gathercole, Alloway, Willis, and Adams (2006). Their study reveals a robust connection between working memory and attention in children, highlighting the interdependence of these cognitive functions. This valuable insight reinforces our findings, which indicate a strong positive correlation between memory and concentration skills among medical students. Such connections could pave the way for targeted educational strategies to enhance cognitive performance.

Our findings have important implications for educational interventions. Improving one skill (e.g., memory) may have a positive spill over effect on the other (e.g., concentration). For instance, teaching students' memory-enhancing techniques, such as spaced repetition or mnemonic devices, could also improve their ability to concentrate during study sessions.

Sociodemographic Factors: No Significant Associations

Interestingly, sociodemographic factors such as age, sex, governorate, residence, and faculty did not show significant associations with memory or concentration skills in the logistic regression analysis. This suggested that these factors, while potentially influential in other aspects of student life, do not play a significant role in determining memory or concentration skills among the studied population.

- **Age:** The median age of the students was 21.73 years, and there was no significant difference in memory or concentration skills across different age groups. This indicates that cognitive skills related to memory and concentration are relatively stable among undergraduate medical students, regardless of their age.

- **Sex:** our study included a higher proportion of female students (67.9%) compared to male students (32.1%), but there were no significant differences in memory or concentration skills between the two groups. This suggests that gender does not play a significant role in determining these cognitive skills among medical students.

- Governorate and Residence: The majority of students were from Lower Egypt (97.3%) and lived in urban areas (64.4%). However, these factors did not significantly influence memory or concentration skills. This may be due to the relatively homogeneous nature of the sample, as most students came from similar geographic and socioeconomic backgrounds.

- **Faculty:** Students enrolled in various faculties, including Medicine (29.1%), Dentistry (5.1%), Pharmacy (18.5%), and Physical Therapy (47.2%). However, there were no significant differences in memory or concentration skills across these faculties. This suggested that the cognitive demands of different medical disciplines didn't significantly impact these skills.

In our study on gender differences in cognitive skills, we found that male and female students exhibited similar levels of memory and concentration skills. This finding presents an intriguing contrast to the research conducted by Halpern et al. (2007), which identified notable gender differences in cognitive abilities, particularly showing that females often excel in verbal memory tasks. This discrepancy opens up an opportunity for further exploration into the factors that may contribute to these differences and how they manifest in various contexts. Understanding these dynamics can enhance our approaches to education and cognitive development for all students.

Implications for Educational Practices

The findings of our study have several important implications for educational practices and student support services at Horus University:

1. **Promoting Consistent Study Habits:** Given the strong association between study hours and memory/concentration skills, universities should encourage students to develop consistent and effective study habits. Workshops or seminars on time management, study techniques, and goal setting could be beneficial. Additionally, providing students with access to study resources, such as libraries and online materials, could help them maximize their study time.

2. **Emphasizing the Importance of Sleep:** our study highlights the critical role of sleep-in maintaining concentration skills. Universities should raise awareness about the importance of adequate sleep and the risks of sleep deprivation. This could be done through health campaigns, sleep hygiene workshops, or by providing resources such as sleep clinics or counselling services.

3. Building on our research, Curcio, Ferrara, and De Gennaro (2006) performed a comprehensive review of the literature concerning sleep and cognitive performance. They found that inadequate sleep can have detrimental effects on attention, memory, and executive functions. These insights align with our findings, which suggest that students who achieve 6 to 8 hours of sleep each night exhibit improved concentration skills compared to their peers who sleep less than 6 hours. This reinforces the importance of adequate sleep for enhancing cognitive performance among students.

4. In our study on sleep and academic performance, we confidently established that students who slept between 6 to 8 hours each day demonstrated superior concentration skills compared to those who slept less than 6 hours. This stands in stark contrast to the findings of Trockel, Barnes, and Egget (2000), who suggested that while sleep quality is associated with academic performance, the total number of hours slept does not significantly impact GPA. Our results highlight the importance of adequate sleep for enhanced focus and academic success.

5. **Holistic Approaches to Cognitive Skills:** The strong correlation between memory and concentration skills suggests that interventions aimed at improving one skill may positively impact the other. For example, teaching students' memory-enhancing techniques, such as spaced repetition or mnemonic devices, could also improve their ability to concentrate during study sessions. Similarly, mindfulness or meditation practices could help students improve both concentration and memory.

6. **Addressing the Needs of Struggling Students:** The fact that nearly 30% of students struggle with memory or concentration skills highlights the need for targeted support for these students. Universities could offer additional resources, such as tutoring, study groups, or cognitive skills training programs, to help these students improve their academic performance.

Limitations

While our study provides valuable insights, it is important to acknowledge its limitations:

1. **Cross-Sectional Design:** The study's cross-sectional design limits the ability to establish causal relationships between the studied factors and memory/concentration skills. For example, while the study found a strong association between study hours and memory skills, it cannot definitively conclude that increased study time causes improved memory.

2. **Self-Reported Data:** The reliance on self-reported data for study and sleep hours may introduce bias, as students may overestimate or underestimate their study and sleep durations. Future studies could use objective measures, such as sleep trackers or study logs, to obtain more accurate data.

3. **Homogeneous Sample:** The sample was relatively homogeneous, with most students coming from Lower Egypt and urban areas. This limits the generalizability of the findings to other populations, such as students from Upper Egypt or rural areas.

Conclusion

In conclusion, our study highlights the importance of study hours and sleep duration in determining memory and concentration skills among undergraduate medical students. Students who dedicated sufficient time to studying and maintained adequate sleep were more likely to possess the cognitive skills necessary for academic success. Our findings underscored the need for educational interventions that promote healthy study habits and sleep hygiene among medical students. By addressing these factors, universities can better support their students in achieving their academic goals and preparing for their future careers in medicine.

While our findings are supported by several studies that highlight the importance of study hours and sleep in cognitive performance, some studies present contradictory evidence, particularly regarding the diminishing returns of excessive study time and the lack of a significant relationship between sleep quantity and academic performance. These discrepancies may be due to differences in study populations, methodologies, or the specific cognitive skills being measured. Future research should aim to address these inconsistencies by using longitudinal designs, objective measures of study and sleep habits, and more diverse samples.

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