STUDENT CORNER-
RESEARCH ARTICLE

Engaged or distracted? Assessing medical students' attention dynamics during lectures

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Abstract

Objective: To evaluate the concentration dynamics and assess the attention span of first year medical students.

Method: The cross-sectional study was conducted at Sahiwal Medical College, Punjab, Pakistan, from October 8, 2023, to February 29, 2024, and comprised undergraduate first year medical students of either gender. The assessments were carried out during Physiology and Biochemistry classes that were taught by the respective heads of department. The concentration of students was checked at 5-minute intervals during the entire lecture. Data were collected using a questionnaire distributed among them after taking the informed consent. The responses were analysed using SPSS 20.

Results: Of the 107 students, 54(50.5%) were male and 53(49.5%) were female, 84(78.5%) were hostilities, and 87(81.3%) students had slept less than eight hours on the preceding night. A total of 408 questionnaires were distributed during five different lectures, and the response rate was 100%. The concentration levels rose till the first 10 minutes after which they constantly declined till the end of the lecture except for a transient rise in concentration right at the end. The attention span of students during the Physiology lectures was significantly associated with gender, while that of the Biochemistry was significantly associated with sleep duration.

Conclusion: Students' concentration was at its peak during the initial 10 minutes and then drifted away during the rest of the lecture.

Key Words: Lecture, Attention, Public sector, Undergraduate, Medical education, Vigilance, Cross-sectional study.

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Introduction

Student concentration during lectures has always been a topic of interest among educational professionals, with the traditional lecture practice sometimes dubbed as ineffective. According to a study, the class style is the most common area of reasons for students to miss a class, underscoring the need for better alternatives.[1] Still, conventional lecture methods are being relied upon, especially in underdeveloped and developing countries, where conventional teaching is more convenient and affordable, requiring less effort and manpower. Notably, recent studies show that the lecture can be an effective way to help students acquire new knowledge, and may have benefits over alternatives, like flipped or small group learning.[2] However, when it comes to the duration of the lecture, it is most often not based on real-time research. Many institutions have reduced lecture duration without any basis of sound research. In such a scenario, evidence-based lecture durations are of paramount importance to improve the efficiency of such lectures, when the alternatives are impractical. A study conducted into Emergency Remote Learning interestingly suggested difficulties, like longer duration and poor concentration during lectures, which ultimately call for a better understanding of attention dynamics.[3] Recently, student (dis)engagement has been studied through the machine learning approach, but this method has its own limitations.[4]

Several authors have proclaimed that the attention span during lectures is 10-15 minutes, after which it wanes.[5] Several observational studies have also produced evidence of waning attention span.[6,7] Lecture duration has also been assessed through facial analysis of instructors, and it has been concluded that the instructors should not allow the lecture duration to exceed 20 minutes.[8]

In 2010, a study using clickers was conducted in the United States, and the data suggested that students did not pay attention continuously for 10-20 minutes during a lecture. Instead their attention alternated between being engaged and non-engaged in ever-shortening cycles throughout a lecture segment.[9] A study in

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Birmingham suggested that concentration rose to a maximum at 10-15 minutes, and then fell steadily thereafter.[10] In a research using eye trackers, the participants exhibited on-task vigilance percentages starting with 67% at the start of the class, and it rose to an average of >90% on-task vigilance at the 7-9 minute mark.[11]

However, if we insist on dogmatically applying a 10-15 minute[12] or even a 60-minute limit on lectures, we are implying that we really do not care about evidence at all. Also, the studies quoted above were limited by a marked lack of data regarding association between concentration and other factors, like residence, breakfast, sleep and exercise. To the best of our knowledge, no research has been conducted to assess the concentration and attention span of undergraduate public-sector medical students in Punjab, Pakistan. The current study was planned to assess the concentration and attention span of undergraduate medical students and its association with other factors.

Materials and Methods

The cross-sectional study was conducted at Sahiwal Medical College, Punjab, Pakistan, from October 8, 2023, to February 29, 2024, and comprised undergraduate first year medical students of either gender. The focus was restricted to first year students, as they are considered to be more punctual and invested in the lectures. After approval from the institutional ethics review board, the sample size was calculated with confidence level 90%, using the the following formula[13] to calculate the sample size:

$$Sample\ size = \frac{Z_{1-\alpha/2}{}^2 SD^2}{d^2}$$

$Z_{(1-\alpha/2)}$ = standard normal variate 1.64,

SD = standard deviation of variable = 0.53[14], confidence interval (CI) = ±5%, and d = absolute error or precision = 0.05.

After taking written informed consent from the subjects, data were collected using a validated questionnaire.[10] The assessments were done during Physiology and Biochemistry classes that were taught by the respective head of department. The students were asked to record their concentration level on the questionnaire at the beginning of each lecture and at 5-minute intervals thereafter each time a soft buzzer sounded. The scale ranged 1-9, and indicated 1= no concentration at all, 2 = changing, 3 = below average level of concentration, 4 = changing, 5 = average level of concentration, 6 = changing, 7 = above average level of concentration, 8 = changing, and 9 = maximum level of concentration. Teachers and students were acclimatised to the sound of the buzzer before the actual lecture, and the sound did not cause unnecessary disruption.

Data were collected during morning lectures, keeping in mind the perspective that the attention is highest early in the morning. Additional information regarding sleep, exercise, residence and breakfast was also collected from the students using a self-designed questionnaire (Annexure).

Data were analysed using SPSS 20. Fisher's exact test was used to compare the data. P<0.05 was considered statistically significant.

Results

Of the 107 students, 54(50.5%) were male and 53(49.5%) were female, 84(78.5%) were hostelites, and 87(81.3%) students had slept less than eight hours on the preceding

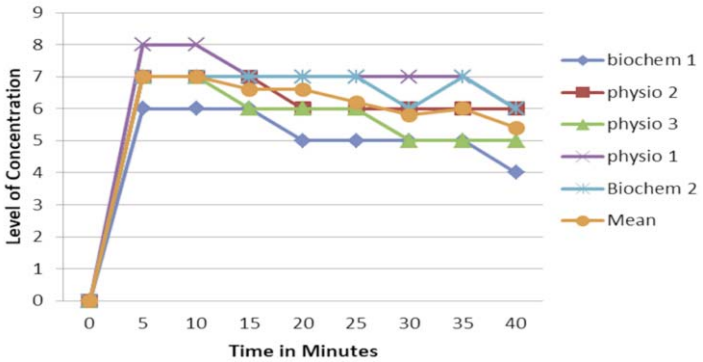

Figure: Variation in the mean level of student concentration with time.

Table-1: Physiology Lectures.

		Average Attention Span Time of each student during all the Lectures of Physiology					p-value
		Changing from below average to average	Average Level of Concentration	Changing from average to above average	Above Average level of Concentration	Changing from above average to maximum level	
Gender	Female	0 (0%)	1 (1.9%)	19 (35.8%)	23 (43.4%)	10 (18.9%)	0.0001
	Male	3 (7.7%)	10 (25.6%)	16 (41%)	6 (15.4%)	4 (10.3%)	

Table-2: Biochemistry lectures.

	Average Attention Span Time of each student during all the Lectures of Biochemistry							p-value
	Changing from below average to average		Average Concentration	Changing from Average to Above Average	Above average Concentration	Changing from Above average to Maximum	Maximum Concentration	
Duration of last night's sleep	<8 hours	4(10.3%)	11 (28.2%)	15(38.5%)	7 (17.9%)	1 (2.6%)	1 (2.6%)	0.001
	>8 hours	0 (0%)	0 (0%)	2 (25%)	1 (12.5%)	5 (62.5%)	0 (0%)	

night. A total of 408 questionnaires were distributed during five different lectures, and the response rate was 100%.

The concentration levels of the students rose till the first 10 minutes after which they constantly declined till the end of the lecture except for a transient rise in concentration right at the end (Figure).

The attention span of students during the Physiology lectures was significantly associated with gender, while that of the Biochemistry was significantly associated with sleep duration (Table 2).

Discussion

Studies assessing students' concentration and attention during lectures have generally been based on observing students' facial expressions or eye movements[11] as an indication of their attention. Surprisingly, there are a limited number of empirical studies evaluating students' concentration during lectures through self-evaluation. The current study encouraged self-assessment by measuring the concentration levels at 5-minute intervals during 40-minute lectures. The concentration levels of the students rose till the first 10 minutes after which they constantly declined till the end of the lecture except for a transient rise in concentration right at the end. The transient rise at the end may be attributed to a short discussion including active recall and a small quiz carried out by the lecturer, combined with the awareness that the lecture was almost over. Similarly, a hypothetical curve has been plotted of student receptivity over time, showing that it peaked in the first 5 minutes of the lecture, then declined after 10 minutes, and increased at about 45 minutes in a 50-minute class.[6] It has been suggested that the increase at the end was because of the awareness that the lecture was about to end. Furthermore, according to a study, a peak in attention is observed just before the end of the lesson.[15] Our research is consistent with the view that for most students, concentration lasts about 10 minutes.[5] It may be that too much information in a course leads to a loss of concentration.[16] It has also been discovered that attention distraction and learning disengagement are strongly associated with the fear of missing out among students.[17] This is an important insight about why students' focus decreases over time during lectures. Decrease in attention span over time may also be related to symptoms of inattention.[18] In contrast, a study observed 90 lectures with 12 different teachers, and reported, unlike the current study, that there was a period of low attention at the beginning of the lesson, followed by a decline in attention 10-15 minutes later which continued thereafter (similar to the current study).[7] This decrease in attention, the study stressed, could be explained by a variety of variables, including the subject's difficulty and the teacher. Another study reported that concentration peaked at 10-15 minutes, rather than 5-10 minutes, and then steadily decreased.[10] There was no increase at the end, unlike the transient increase observed in the current study. Surprisingly, a study using clickers found that the students did not have sustained attention, but rather went through stages of attention and inattention throughout the lecture.[9]

The current study showed that concentration levels varied by subject and teacher, including the teaching style, the teacher's personality, and the overall exam weightage of the topic being taught. This was in line with earlier studies.[7,10] It has been argued that the inconsistency of students' attention is due to differences between teachers.[12] A lecturer's abilities to care for the students' needs and status are crucial for fostering focus.[14] Displayed enthusiasm also plays a crucial role towards attracting attention.[19] Team lectures may prove more engaging and educational, resulting in increased attention span compared to the lectures taken by a single teacher.[20] Attention span may increase through implementation of robotics platforms.[21]

Interestingly, the current data showed that the attention span of students during the Physiology lectures was significantly associated with gender, while that of the Biochemistry was significant associated with sleep duration. According to a study conducted in Ghana, gender influences the academic performance of

students.[22] A study conducted during Physiology classes found that there were gender differences in preferences for the teaching aids used during the lectures, which may also indirectly affect concentration.[23] There is, however, a scarcity of research on the direct impact of students' gender on attention span. According to the current study, sleep duration had a significant association with concentration during Biochemistry class. Poor sleep quality is associated with deficiency in alertness and hence lower academic performance.[24] Contradictorily, a study found out that academic performance was not significantly impacted by poor sleep.[25] Contrary to the current study, Sahu et al. showed no association between attention span and sleep behaviour.[26] In a research at a university in Ontario, trait flow (i.e., deep, effortless concentration) was studied. The findings suggested that the tendency to experience flow in daily life extends to a classroom environment.[27] This gives a clue towards the difference in concentration and engagement levels.

Though the current findings are significant with respect to attention span and the association of gender and sleep with concentration, but the study has its limitations. For instance, Anatomy lectures were not included as permission was not given by the relevant department. Moreover, the sample size was rather limited, which may have affected the generalisability of the results. Undergraduate and postgraduate medical students, except for those in the first year, were not included in the study because of their erratic schedule. As per the findings, residence, breakfast and exercise had no significant effects on the attention span, but this may have been due to the small sample size. Furthermore, the study only covered the morning lectures, leaving out noon and afternoon lectures.

Conclusion

Students' concentration was at its peak during the initial 5-10 minutes before drifting away for the rest of the lecture.

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Annexure:

MEDICAL STUDENT CONCENTRATION DURING LECTURES

Roll No._____

Gender: ☐ Male ☐ Female

Residence:
☐ Day Scholar ☐ Hostilite

Did you have breakfast this morning?
☐ Yes ☐ No

How much sleep did you have last night?
☐ <8 hours ☐ >8 hours

Did you have any exercise this morning? ☐ Yes ☐ No

At each buzzer sound, please mark your concentration level at that moment to your best estimate.

Concentration level	No concentration at all	Changing	Below average level of concentration	Changing	Average level of concentration	Changing	Above average level of concentration	Changing	Maximum level of c concentration
Grade/Level	1	2	3	4	5	6	7	8	9
5 minutes									
10 minutes									
15 minutes									
20 minutes									
25 minutes									
30 minutes									
35 minutes									
40 minutes									

AUTHORS' CONTRIBUTIONS:
HS: Concept and design.
TN: Data acquisition, analysis and interpretation.
LI: Drafting and revision.
FM: Agreement to be accountable for all aspects of the work.
NA: Final approval.