Research Article

Exploring the Influence of Learning Strategies on Academic Performance among Medical Students in Lahore

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Abstract:

Background: To excel in medical school, students utilize a range of learning styles and methods. These strategies reflect individual preferences to master the multiple disciplines of medical education. This study investigates the impact of different learning styles on the academic achievement of medical students. The goal is to find the most effective learning style for medical students to improve their academic performance.

Methodology: A cross-sectional study of 239 medical students in Lahore was conducted. The data was collected through a self-generated questionnaire administered via WhatsApp and email. Students selected their predominant learning style from one of three options: self-study, group study, or online learning resources. Academic performance was measured as percentages of marks in each year of medical school. Univariate ANOVA tests were used to compare academic performance (the dependent variable) across different learning strategies (the independent variable).

Results: The results show that Self-study is the most prevalent learning strategy among the participants, with 62.3% of students engaging in independent learning using textbooks and lecture notes. Approximately 15.9% of students reported engaging in group study, while 21.8% used online learning resources. The ANOVA tests reveal no significant difference in academic performance based on study style for the first and second years ($p > 0.05$) of the MBBS course. However, for the third year, there is a statistically significant effect ($p = 0.024$) of study style on academic performance, albeit with a small to moderate practical significance.

Conclusion: Self-study was the most popular learning strategy among medical students in Lahore. However, there was no significant association between learning strategies and academic performance. This suggests that all learning strategies can be effective. Medical students should experiment with different learning strategies to find the best.

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INTRODUCTION:

Medicine is a demanding and rigorous undergraduate study program that requires students to master various disciplines and demonstrate competence in their studies. Effective learning is critical for acing during a medical degree, and students employ several ways to meet university requirements.[1]

Learning styles and strategies are two important concepts that are often confused. Learning styles refer to an individual's preferred method of taking in information, while learning strategies are more about the methods or techniques a student applies to understand and learn new information. The VARK model, one of the most extensively used learning style models, is based on the preferred sensory modality for learning and categorizes learning styles as visual (V), auditory (A), read/write (R), and kinesthetic (K).[2] Learning strategies can be broadly classified into self-study, group study, or utilization of online learning resources. Academic performance is a measure of a student's performance during his course of study and is represented by GPA, percentage, or scores.

An increasing collection of research is being conducted to investigate the influence of learning style on academic success. A study in a Saudi university concluded that students' preferred learning styles had no significant impact on their academic performance.[3] According to research conducted in Azad Kashmir, Pakistan, the majority of its participants (94.1%) favored a quad-modal learning technique that combined visual, auditory, read/ write, and kinesthetic modalities. However, no significant relationship was seen between learning style and exam performance.[4] A study conducted at a Malaysian university concluded that self-study was the most prevalent learning strategy by medical students.[5] According to a survey conducted at the College of Medicine at the University of Bisha in Saudi Arabia, auditory was the most favored learning mode among medical students (55.9%), followed by visual (38.3%). Male students showed a stronger preference for aural styles, while female students preferred visual styles. Aural learners had the highest average GPA.[6] Learning style can be influenced by personality traits as shown by a study conducted at Mansoura University in Egypt that indicated that certain personality traits were associated with specific learning styles. Moreover, higher scores in conscientiousness and agreeableness were linked to better academic performance.[7] A study in Iran found that medical students who used deep learning strategies and had higher outcome expectations achieved better academic performance, emphasizing the importance of effective strategies and positive expectations for academic success.[8] The research conducted at Universities Baiturrahmah in Indonesia discovered a substantial positive link between the quad-model learning style and academic success.[9]

A cross-sectional study conducted at Ardabil University of Medical Sciences in Iran investigated 469 medical students to explore the relationship between learning style, critical thinking skills, and academic performance. According to their findings, pupils with an assimilative learning style had higher

GPAs, and stronger critical thinking abilities were connected with improved academic achievement. The study revealed that learning style and critical thinking abilities strongly affect academic achievement among medical students.[10] The longitudinal research at Saveh University of Medical Sciences in Iran observed 101 undergraduate healthcare professional students to compare their learning styles at different stages of their course. The results showed a significant shift in learning styles over time. Initially, visual learning was preferred, followed by a combination of visual and kinesthetic learning. Towards the end of the course, kinesthetic learning became the most favored style, accompanied by tactile learning. The authors suggested that the change in learning styles could be attributed to the increasing emphasis on practical education as the students progressed in their program.[11]

There is no clear consensus on whether learning style influences academic performance. Some studies have discovered a link between learning style and academic success, whereas others have discovered none. Thus, this study seeks to fill the gap in the literature by investigating the relationship between learning styles and academic performance among medical students in Lahore.

METHODS AND METHOD:

1. **STUDY DESIGN:** Cross-sectional Study.
2. **SETTING:** Various Public and Private medical institutes in Lahore including King Edward Medical University, Allama Iqbal Medical College, Fatima Jinnah Medical University, Services Institute of Medical Sciences (SIMS), FMH College of Medicine & Dentistry, Avicenna Medical College, Akhtar Saeed Medical & Dental College and University College of Medicine & Dentistry (UCMD).
3. **DURATION OF STUDY:** The research lasted nine months, from January 2019 to September 2019.
4. **SAMPLE SIZE:** The sample size was calculated using the formula: Z is the standard deviation, given as 1.96 for 5% type 1 error (P-value <0.05). With a margin of error of 5%. The estimated sample size was 239 students. The power of the test was 90%.
5. **SAMPLING TECHNIQUE:** Convenient sampling using a self-generated questionnaire.
6. **SAMPLE SELECTION:**
   - **Inclusion Criteria:** Students registered to the MBBS program at their respective institutes, had passed at least the 1st year of MBBS, and gave informed consent.
   - **Exclusion Criteria**: Students who had not attempted the 1st professional (part I) examination or who did not give informed consent.
7. **DATA COLLECTION:** Data was collected on a self-generated questionnaire and it was sent to the students using WhatsApp or email.
8. **DATA ANALYSIS:** The data was analyzed using SPSS 28. The number of male and female students in each year of MBBS was presented by cross-tabulating gender and year of study. The frequency of students with various learning styles was presented using descriptive analysis. The mean percentages of marks for students in each year of MBBS based on their learning

approach were presented by comparing the mean percentages of marks in each year of MBBS with the independent variable of learning style. Univariate ANOVA was used to establish the statistical significance of the association between learning style (independent variable) and academic performance (dependent variable).

9. **ETHICAL CONSIDERATIONS:** Approval from Institutional Review Board (IRB) was obtained. There is no conflict of interest and there is no source of funding.

RESULTS:

A total of 239 medical students from different public and private medical institutes in Lahore participated in the study. Among these participants, 56.1% were males (n = 134), while 43.9% were females (n = 105). Most of the students, 72.4% of the sample, were between the ages of 21 and 22. The participants' average age was determined to be 21.71± 1.09 years. The distribution of students across different years of the MBBS course revealed that fourth-year students had the highest frequency, accounting for 64% of the participants (n = 153). (Table-1)

(Table-1) Gender of Subject -Year of Current Study

		Year of Current Study				Total
		2nd year	3rd year	4th year	5th year	
Gender of Subject	Male	23	31	68	12	134
	Female	5	10	85	5	105
Total		28	41	153	17	239

To analyze the learning and study strategies employed by the participants, a structured questionnaire was administered. The questionnaire focused on three specific strategies: self-study, group study, and utilization of online learning resources such as lectures available on platforms like YouTube, educational websites, and question banks. Among the participants, 62.3% of students engaged in Self-study as the primary learning strategy and allocated a significant portion of their study time to independent learning, utilizing their course textbooks and lecture notes. Approximately 15.9% of students reported that they engaged in group study with their friends to enhance their understanding of the course material. The use of online learning resources was reported by 21.8% of the students.

The academic performance of the participants was assessed by recording the percentages of marks obtained by the students in each year of their medical school. The mean percentages and standard deviations for each year are as follows (Table-2):

First year: The mean percentage of marks obtained by first-year students was 68.44%, with a standard deviation of 6.4%.

Second year: Second-year students achieved a mean percentage of marks of 70.71%, with a standard deviation of 6.7%.

Third year: The mean percentage of marks for third-year students was 67.31%, with a standard deviation of 9.074.

Fourth year: Fourth-year students obtained an average percentage of marks of 67.41%, with a standard deviation of 6.89%.

These data provide insights into the performance trends of medical students across different years of study. The standard deviations indicate the degree of variability in academic performance within each year.

Table-2: Mean Percentages of Marks in Each Year of Medical School

	N	Mean	Std. Deviation
Mean Percentage of Marks in 1st year	239	68.44	6.474
Mean Percentage of Marks in 2nd year	211	70.71	6.764
Mean Percentage of Marks in 3rd year	170	67.31	9.074
Mean Percentage of Marks in 4th year	17	67.41	6.893

The cross-tabulation of Study Style and the mean percentages of marks in each year of medical school showed that the students who utilized Online learning resources showed consistency in their academic performance as compared to the other groups (Table-3).

Table-3: Study Style and Mean Percentages of Marks in Each Year of Medical School

Study Style		MBBS First year	MBBS Second year	MBBS Third year	MBBS Fourth year
Online Learning Resources	Mean	69.63	70.44	70.18	70.00
	N	52	48	39	2
	Std. Deviation	5.622	6.876	10.182	7.071
Group study	Mean	69.61	72.26	63.77	66.75
	N	38	31	22	4
	Std. Deviation	7.695	6.880	9.724	2.500
Self-study	Mean	67.72	70.45	67.00	67.18
	N	149	132	109	11
	Std. Deviation	6.351	6.699	8.268	8.220
Total	Mean	68.44	70.71	67.31	67.41
	N	239	211	170	17
	Std. Deviation	6.474	6.764	9.074	6.893

Univariate ANOVA tests were used to compare the academic performance (dependent variable) across different learning strategies (independent variable). The results are summarized in **Table 4**.

Table-4: Univariate ANOVA Results for Study Style and Academic Performance

Dependent Variable	Source	F value	P-value	Partial Eta Squared
MBBS 1st year	Study Style	2.456	.088	.020
MBBS 2nd year	Study Style	.950	.388	.009
MBBS 3rd year	Study Style	3.808	.024	.044
MBBS 4th year	Study Style	.148	.864	.021

The findings show that there was no statistically significant variation in academic achievement based on study mode for the MBBS first, second, and fourth years. However, study style had a statistically significant influence on academic achievement in the MBBS 3rd year ($F = 3.808$, $p = .024$, $\eta^2 = .044$). The effect size suggests a small moderate practical significance.

To summarise the results, Self-study was the most prevalent learning approach for 62.3% of medical students. However, learning style was not statistically associated with academic performance in the 1st, 2nd, or 4th year, but was in the 3rd year. This may be due to the shift from theory to practice in the 3rd year, which requires different skills and learning approaches. The increased cognitive demands of the 3rd year may make study style more important for academic success.

DISCUSSION:

The purpose of this study was to explore the predominant learning strategies or styles that are being utilized by the medical students of various medical colleges in Lahore. For this purpose, 239 medical students were recruited in this study and the results showed that the Self-study was the most utilized mode of learning by the medical students in Lahore. The study findings suggest that there was no significant variation in academic achievement based on study style for the MBBS first, second, and fourth years.

However, in the third year, which marks the transition from preclinical to clinical education, study style had a statistically significant influence on academic achievement. This could be attributed to the shift in the learning environment and curriculum complexity during clinical rotations, where students need to apply theoretical knowledge in practical settings. The higher cognitive demands and the need to integrate theory and practice in the third year may require students to adapt their study strategies, resulting in varying academic outcomes based on study style.

The study conducted at Imam Mohammed Bin Saud Islamic University in Riyadh, Saudi Arabia, sought to evaluate medical students' learning patterns. A total of 113 students (95 males, 18 females) completed the VARK learning style questionnaire. The results revealed that the most common learning style among the students was multimodal (70%), followed by aural (21%), visual (9%), and kinesthetic (1%), but there was no significant relationship between the preferred learning style with academic performance.3 In contrast, our research revealed that 62.3% of the study subjects engaged in self-study, independently reading and studying their textbooks and study notes. About 21.8% of the participants utilized online learning resources along with their textbooks, thus adopting a multimodal learning approach. However, no significant association was found between learning style and academic achievement.

The study at Malaysia's University Tunku Abdul Rahman (UTAR) looked at the association between learning style and academic achievement in 235 medical students in their first, second, and third years at UTAR's Faculty of Medicine. The participants completed the VARK learning style questionnaire and the results revealed that visual learners and multimodal learners had slightly higher GPAs than their peers, but there was no significant association between the learning styles and academic performance.[12] The results of our study reflected the findings of this study in that the students utilizing online learning resources in addition to their textbooks (Multimodal learners) showed consistently better academic performance for most of their medical education than their peers, but there was no significant association between the learning style and academic performance.

In contrast to our study, where most students preferred to study from textbooks and lecture notes, the students in the other studies preferred to use a variety of learning resources. This difference may be due to several factors, including.

- The availability of learning resources,
- The students' learning styles, and
- The different study populations.

A study conducted at Universitas Baiturrahmah examined the relationship between learning style and GPA among 80 fourth-year medical students. The majority of students (80%) exhibited a quad-model learning style, which involves doing, observing, interacting, and reflecting. The study suggested a statistically significant association between the learning strategy and academic performance. The students with a quad-model learning style tended to have higher GPAs compared to those with different learning styles.[9] This finding is in contrast to our study, which found no statistically significant association between learning style and academic outcome.

The variations in findings between our study and the one conducted at Universitas Baiturrahmah could be attributed to several factors.

- Firstly, the Universitas Baiturrahmah study focused solely on fourth-year medical students, whereas our study encompassed students from the Second to Final year of MBBS.
- Secondly, the difference in results may stem from the use of different questionnaires, with Universitas Baiturrahmah utilizing the VARK questionnaire while we employed a self-generated questionnaire.
- Additionally, the inclusion of external factors, such as living facilities, in the Universitas Baiturrahmah study might have influenced their results differently compared to our study.

LIMITATIONS:

- Factors such as individual learning styles, motivation levels, and access to resources may have influenced the results.
- Furthermore, the study was limited to medical students and may not apply to other specialties or student demographics.

CONCLUSION:

In conclusion, this study aimed to investigate the different learning and study strategies utilized by medical students in Lahore and their impact on academic performance. The findings revealed self-study (62.3%) was the most widely used learning style by medical students. There were no statistically significant differences in academic performance among students employing various modes of learning and studying. The students utilizing Online learning resources did show a consistent and better academic performance than the other groups, but the results were not statistically significant. The study concluded that learning style does not appear to affect academic performance.

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