Research Article

Learning Styles and Academic Performance in Medical Students: A Study from Lahore, Pakistan

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Abstract

Background: Learning styles, as defined by the VARK (Visual, Auditory, Read/write, Kinesthetic) framework, represent distinct patterns in how students perceive, process, and retain information.Understanding the prevalence of different learning styles and their impact on academic performance is crucial for optimizing educational strategies, particularly in medical education.

Objectives: This study aimed to assess the distribution of learning styles among medical students and examine their association with academic performance.

Methods: A cross-sectional study was conducted at a public sector medical university in Lahore, involving 311 undergraduate medical students from years 2-5. Participants were selected using non-probability convenience sampling. Data collection utilized the validated VARK questionnaire, administered through Google Forms after obtaining ethical approval and informed consent. Statistical analysis was performed using IBM SPSS (Version 27.0), with Chi-square tests examining associations between learning styles and academic performance.

Results: Among the participants (mean age 21.77 ± 0.122 years; 58.8% male), 66.2% preferred multimodal learning strategies, while 33.8% used unimodal methods. Of unimodal learners, reading/writing was most prevalent (15.76%), followed by visual (7.30%), kinesthetic (5.4%), and auditory (5.1%) styles. Chi-square analysis revealed no significant association between learning styles and academic performance ($\chi^2 = 7.33$, $p = 0.696$).

Conclusion: While multimodal learning approaches predominate among medical students at the current study setting, learning style preferences do not significantly influence academic performance. These findings suggest that educational strategies should incorporate diverse teaching methods while considering other factors that may impact academic success. Future research should explore additional variables that influence learning outcomes in medical education.

Keywords: VARK learning styles, academic performance, medical students, multimodal learning, medical education
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Introduction

A learning style refers to an individual's preferred method of acquiring, processing, and retaining information.[1, 2] The VARK model, developed by Fleming and Mills, classifies learners into four categories: Visual (V), Auditory (A), Read/Write (R), and Kinesthetic (K). Some students exhibit a preference for a single mode (unimodal learners), whereas others benefit from multiple modes (multimodal learners).[3]

Previous studies have examined the distribution of learning styles among students from diverse educational backgrounds. In Australia, the majority of the students were multimodal learners with no differences observed between males and females, whereas 54% favored a unimodal learning style.[4] Similarly, among Malaysian students, 69.7% preferred multimodal learning.[5] A study from Turkey reported that 36.1% of first-year medical students had a unimodal learning preference, while 63.9% exhibited multimodal preferences.[6] Recent studies in Pakistan have highlighted the diversity of learning preferences among medical students, with reported variations in the prevalence of different learning styles. A 2022 study at a public sector medical university in Karachi found that 58% of students preferred multimodal learning approaches, while research from various medical colleges in Lahore reported 68.9% unimodal preference rates.[7]

However, research on the relationship between learning styles and academic performance has yielded conflicting findings. Some studies suggest that aligning instructional methods with students' learning preferences enhances

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academic performance, while others indicate no significant correlation. Academic performance is commonly assessed through cumulative grade point averages (CGPAs) and exam scores, reflecting students' ability to comprehend and apply knowledge. The Biggs model of learning suggests that students' approaches to learning, including their preferred styles, influence academic outcomes.[8] Students who are better able to think abstractly tend to do better in school, according to a recent study that identified a strong correlation between styles of learning and performance in the classroom.[9] Students' overall academic success is reflected in their CGPAs, but several elements might either hinder or encourage them to achieve high CGPAs.

International research provides varying perspectives on this relationship. A study from an Egyptian University have reported 49.6% preference for unimodal learning, with significant correlations between learning styles and academic performance ($p < 0.05$).[10] Turkish research found 80.8% preferring unimodal approaches with significant associations found between a specific learning style and academic outcomes.[11] These findings highlight the need for context-specific research in different educational settings, as the extent to which learning styles impact academic achievement remains a subject of debate.

Despite the potential implications for medical education, limited research has explored the relationship between learning styles and academic performance among medical students in Pakistan. This study aims to assess the prevalence of different learning styles among medical students and examine their association with academic performance. The findings could inform educational strategies and contribute to the broader discourse on optimizing medical education in Pakistan.

Methods

This cross-sectional study was conducted at a public sector medical university in Lahore, from February to September 2024, with protocol approval from the relevant Institutional Review Board and informed consent from all participants. A sample size of 311 was determined using the Raosoft sample size calculator, incorporating a 95% confidence interval, 5% margin of error, and 58% expected prevalence of multimodal learning style based on a previous study in Pakistan.[7] Non-probability convenience sampling was employed to ensure participant accessibility during the academic term. The study included undergraduate medical students from years 2-5, excluding first-year students to ensure sufficient exposure to medical education, and students with incomplete academic records or those who declined participation were also excluded. Data collection was conducted using the validated VARK questionnaire (Version 7.8), administered electronically via Google Forms to maintain participant anonymity. The VARK questionnaire, comprising 16 items, categorizes learning preferences into Visual, Auditory, Read/write, and Kinesthetic modalities. Academic performance data were collected through self-reported scores from recent university examinations, categorized into four performance brackets: <50%, 50-60%, 60-70%, and >70%. Data analysis was performed using IBM SPSS Statistics (version 27.0), with descriptive statistics including frequencies, percentages, means, and standard deviations, and the Chi-square test was used to examine associations between learning styles (categorical: visual, auditory, read/write, kinesthetic, and multimodal) and academic performance categories, with statistical significance set at $p < 0.05$.

Results

The study included 311 medical students with a mean age of 21.77 ± 0.122 years. Male participants constituted

Table 1: *Demographic Distribution of Study Participants by Gender (N=311)*

Gender	Frequency	Percentage
Male	183	58.8%
Female	128	41.2%

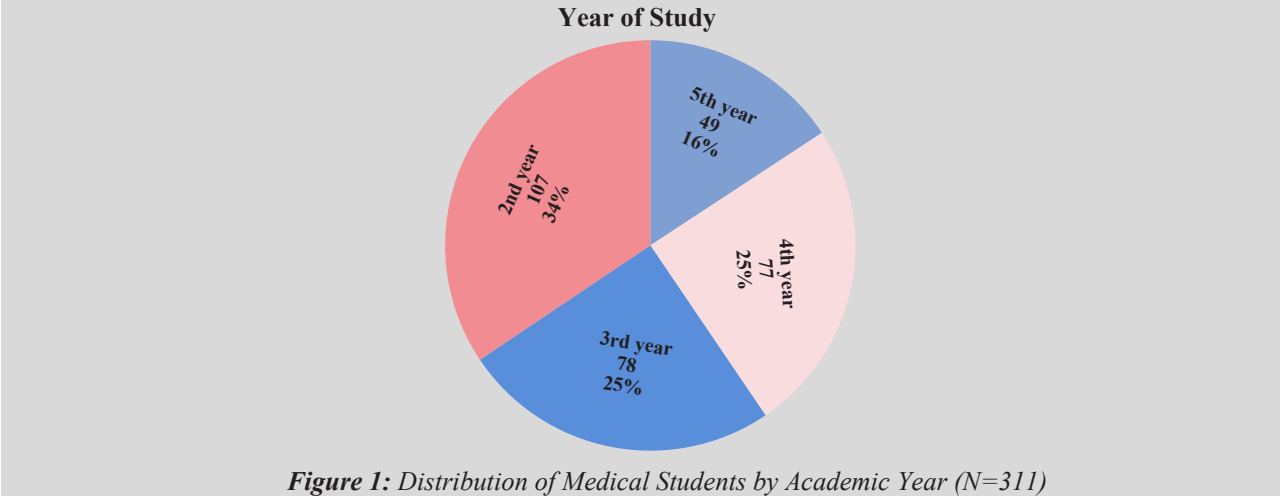

Figure 1: *Distribution of Medical Students by Academic Year (N=311)*

58.8% (n=183) of the sample, while females represented 41.2% (n=128) (Table 1). The distribution across academic years showed 34.4% (n=107) from second year, 25.1% (n=78) from third year, 24.8% (n=77) from fourth year, and 15.8% (n=49) from final year (Figure 1).

The distribution of learning styles revealed a clear predominance of multimodal learning styles, indicating hat 66.2% of students preferred multimodal learning approaches, while 33.8% opted for unimodal learning styles (Figure 2). Among unimodal learners, reading/writing emerged as the most common preference (15.76%, n=49), followed by visual (7.30%), kinesthetic (5.4%), and auditory (5.1%) modalities.

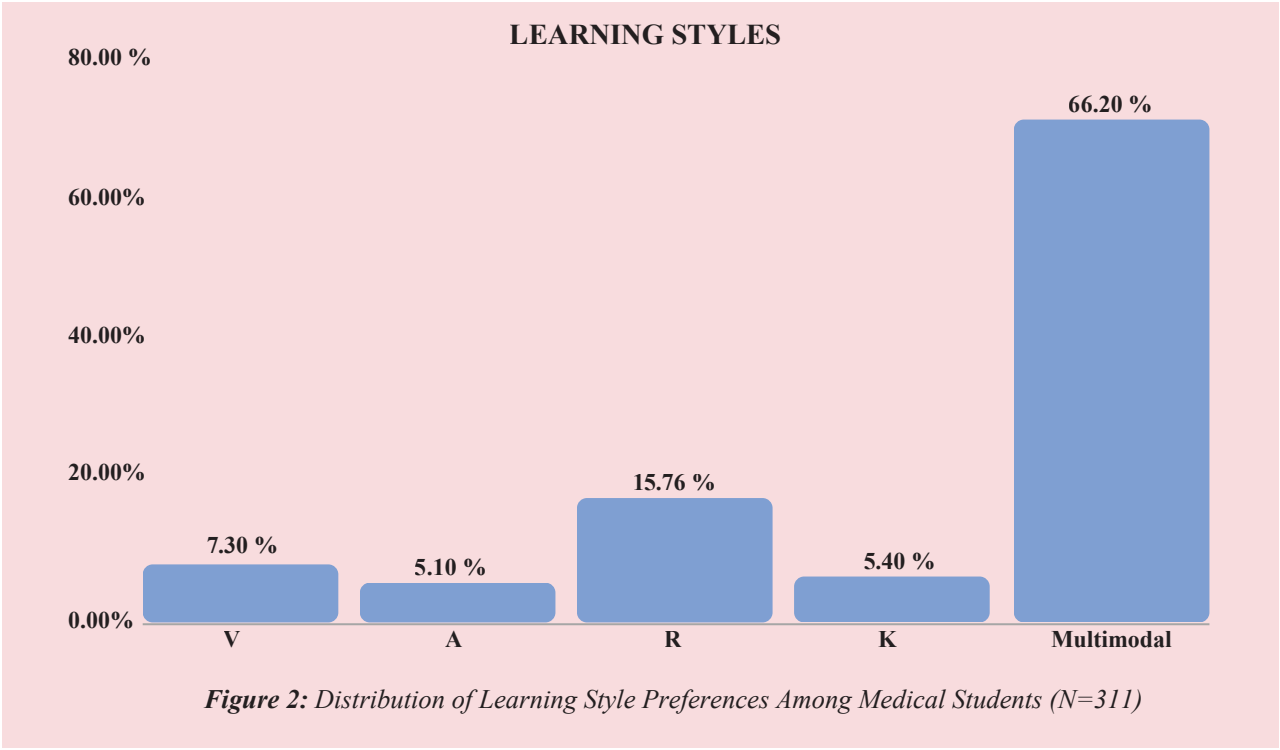

Figure 2: *Distribution of Learning Style Preferences Among Medical Students (N=311)*

The relationship between learning styles and academic performance was examined using Chi-square analysis, as presented in Table 2. While students with reading/writing preferences showed a tendency toward higher academic scores, the association between learning styles and academic performance was not statistically significant ($\chi^2 = 7.33$, $p = 0.696$).

Table 2: *Association Between Learning Styles and Academic Performance (N=311)*

Academic Performance	**Learning Style Modality (%)**	**P-value**
Category (%)	**Visual**	**Auditory**
----------	**----------**	**----------**
< 50	**54.5**	**18.2**
50-60	**40**	**15.6**
60-70	**29.9**	**22.4**
> 70	**34.5**	**14.9**
***Chi-square test used for analysis**		

Discussion

The findings indicate that the majority of medical students favor multimodal learning, consistent with previous studies conducted among medical and health sciences students (Chaudhary et al., 2015).[12] However, no statistically significant relationship was found between learning styles and academic performance. These results align with prior research suggesting that learning preferences alone may not determine academic success (Shirazi & Heidari, 2019).[13] The predominance of multimodal learning preferences (66.2%) contrasts with findings from other Pakistani institutions, such as the 52% reported by Khan AM. (2023) and 68.9% by Zahra et al. (2023), suggesting a contrasting pattern in medical education settings within the country.[7, 14]

The distribution of unimodal preferences, with reading/writing being the most prevalent (15.76%), differs from some international studies. For instance, Australian research found visual learning to be the dominant unimodal preference.[4] This variation might reflect differences in educational systems, cultural factors, or pre-university preparation methods.

The absence of a significant association between learning styles and academic performance ($p = 0.696$, suggests that additional factors, such as motivation, study habits, and cognitive strategies, may play a more crucial role in academic achievement. A study by Muniyapillai et al. (2022) similarly reported no strong correlation between learning styles and academic performance among medical students in Tamil Nadu.[15] These findings challenge some assumptions about the importance of matching teaching methods to learning preferences. This finding aligns with recent meta-analyses suggesting that learning style preferences may be less crucial for academic success than previously thought. However, several factors warrant consideration when interpreting these results.

The cross-sectional design of this study limits the ability to infer causality between learning styles and academic performance. This type of study design captures a snapshot of data at a single point in time, preventing the assessment of changes or developments over a period. Additionally, the reliance on self-reported academic performance data may introduce recall bias, as students might not accurately remember or report their academic scores. The use of a convenience sampling method, while practical for accessing participants during the academic term, may affect the generalizability of the findings to other populations or settings. Moreover, this study did not assess other factors that could influence academic performance, such as study habits, motivation, and socioeconomic status, which could potentially confound the results The findings suggest that while students may have preferred learning styles, these preferences alone do not determine academic success. Medical educators should consider implementing diverse teaching methods to accommodate various learning preferences, ensuring that all students can engage with the material in ways that suit them best. However, it is crucial to focus on evidence-based pedagogical approaches rather than strictly adhering to the matching of teaching methods to learning styles. Educators should also develop strategies to identify and address other factors that may influence academic performance, such as motivation, study habits, and the overall learning environment. By doing so, they can create a more holistic and effective educational experience.

Future research should include longitudinal studies to examine the stability of learning preferences throughout medical education. Such studies can provide insights into how learning styles may evolve over time and their potential long-term effects on academic performance. Additionally, there is a need to investigate other factors that may mediate the relationship between learning styles and academic performance, such as study habits, motivation, and cognitive strategies. Evaluating specific teaching interventions designed to accommodate diverse learning preferences could also provide valuable information on effective educational practices. Finally, multi-center studies should be conducted to validate these findings across different medical institutions in Pakistan, ensuring that the results are applicable to a broader context.

Conclusion

This study demonstrates that while medical students predominantly prefer multimodal learning approaches, learning style preferences do not significantly influence academic performance. These findings have important implications for medical education in Pakistan, suggesting that educators should focus on developing comprehensive teaching strategies that incorporate multiple modalities. However, it is equally important to consider other factors that may impact academic success.

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Authors Contribution:
MB, LZ: Involved in conceptualization of study and writing original draft.
MS, MN, LA: Involved in data curation, formal analysis and final review & editing.
RMK: Involved in design of study and final review & editing.

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