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Original Article

DOI: 10.55735/ns3dqf39

HJPRS

The Healer Journal of Physiotherapy and Rehabilitation Sciences

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Journal homepage: www.thehealerjournal.com

Influence of Learning Styles and Study Habits on Academic Achievement of Medical Students

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KEYWORDS

Academic achievement
Education
Learning styles
Study habits
VARK questionnaire

DECLARATIONS

Conflict of Interest: None

Funding Source: None

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ABSTRACT

Background: Academic achievement is a crucial predictor of learners' future academic status, reflecting their current performance and shaping their future educational opportunities. **Objective:** This research aims to comprehensively investigate the relationship between learning styles, study habits, and academic achievement among medical students. **Methodology:** This cross-sectional research was conducted from January 2023 to January 2024, after obtaining approval from the Institutional Ethical Committee and Review Board. The study was confined to medical students aged 18-26, pursuing MBBS, BDS, DPT, and D-Pharmacy degrees, enrolled in various academic years, from different universities. Those students with cognitive impairments or any disabilities were excluded from the study. The VARK questionnaire version 8.01, comprising 16 questions to identify the preferred learning styles of students, and the study habits inventory questionnaire, assessing the study habits of students. A self-administered, closed-ended survey through hard copies was distributed among the selected sample of medical students, and through face-to-face interviews, questionnaires were filled out, ensuring no mistakes in data collection. The participants' identities were kept confidential, and informed consent was obtained. Descriptive statistics were used to summarise the data, and the chi-square test was used for association. **Results:** Our study reveals that most students (63.6%) prefer unimodal learning, with a notable emphasis on kinesthetic methods (21.1%). Multimodal preferences were also observed: bimodal (24.2%), trimodal (8%), and quadrimodal (4%). A significant link between learning styles and academic achievement was found. While students excelled in note-taking, reading speed, writing, test preparation, and test-taking, and test-anxiety management, they struggled with time management and concentration. Notably, only time management and note-taking skills significantly correlated with academic success. **Conclusion:** This study highlights the diversity of learning styles among medical students, with a preference for kinesthetic learning. There is a significant relationship between learning styles and academic achievement. However, challenges in time management and concentration persist, necessitating targeted interventions. Effective time management and note-taking skills emerge as critical factors influencing academic success, underscoring the need for personalised strategies to support student achievement.

How to cite the article: Kumar V, Tanveer E, Tariq A, Jairam M, Kainat S, Ahmed H. Influence of Learning Styles and Study Habits on Academic Achievement of Medical Students. The Healer Journal of Physiotherapy and Rehabilitation Sciences. 2025;5(2): 387-393.

INTRODUCTION

Medical education is renowned for its exceptional academic and emotional demands, surpassing those of other professions.[1] Consequently, medical students often experience significant stress stemming from their academic pursuits.[2] Identifying the factors that influence medical students' academic success is a paramount challenge and concern in medical education. Academic achievement is a critical parameter that predicts future academic status, career advancement, and professional competence.[0] Learning styles refer to the preferred ways individuals absorb, process, comprehend, and retain information. Students utilise various learning styles and sources to acquire knowledge, often favoring specific sensory modes such as visual, aural, read/write, or kinesthetic.[6] Research has demonstrated that individuals exhibit diverse approaches to learning, and a single strategy or approach cannot cater to the optimal learning needs of all individuals.[7]

Individuals learn in different ways, and lecturers may not always share material and learning experiences that match students' learning preferences, which can affect academic performance.[4] Knowing one's learning style can help students discover suitable approaches and strategies for better learning and performance.[5] This study aims to evaluate learning style preferences using the VARK Questionnaire and determine the relationship between learning styles and academic achievement in medical students.7

The VARK method, developed by Neil Fleming in 1987, is a widely used tool for assessing learning styles. It categorizes learners into Visual, Aural, Read/Write, and Kinesthetic modalities, and identifies individuals as unimodal or multimodal learners. Unimodal learners have a strong preference for one learning style, while multimodal learners use two or more styles. The VARK Questionnaire helps determine a student's learning style preferences, which can be useful in tailoring educational approaches to individual needs. Teachers can utilise knowledge of learning styles to implement tailored teaching strategies and methods, improving students' academic performance and enabling the implementation of a learner-centered curriculum.[4,5] Visual learners prefer graphical information like flow charts, pictures, and diagrams.[8] Aural learners learn best through listening and retain information by reading aloud or subvocalization.9 Read/Write learners learn by reading and writing, handling written content.[10] Kinesthetic learners internalise information best through hands-on activities, practice, and real-life examples.[11] Each learning style has unique preferences and techniques that enhance learning and retention. Study habits are the behavioural patterns adopted by students to facilitate the learning process, including external factors like effective study routines, time management, and learning strategies.[12] Educational experts emphasise promoting favorable study habits, closely associated with learning and academic success. Students with positive study habits are more likely to perform well academically, while poor study habits can lead to reduced academic performance and increased stress.12

Developing effective study habits is crucial for academic success, and students need to explore various strategies to determine the most effective ones for them.[13] Creating comfortable learning environments, implementing strategies like exerting effort, maintaining focus, and establishing a suitable study environment, can contribute to improved academic achievement.[0] The concept of study habits affects an individual's approach to studying, comprising techniques and abilities that aid in effective learning. Study habits are personalised strategies and practices that optimise the learning process. By identifying and implementing effective study habits, students can enhance academic performance and achieve educational objectives. Effective study habits are crucial for academic excellence, leading to better educational outcomes and superior performance. Study habits vary widely among individuals, and what works for one may not work for another.

A good academic attitude, efficient time management, and effective study techniques are essential for success. Many students, however, struggle to establish and maintain effective study habits.[0] Academic success is closely linked to the development of effective study habits. By establishing and adhering to productive study habits, students can enhance their ability to retain knowledge, improve their understanding, and achieve better academic outcomes. Good study habits promote discipline, time management, and information retention, leading to better test and exam performance. In contrast, poor study habits like procrastination and cramming can lead to inattentiveness and reduced academic

performance.[0] Insufficient study habits can negatively impact academic performance, resulting in poor grades or failure. Despite investing excessive time in memorizing study materials, some students may still face challenges. Therefore, conducting a thorough assessment of university students' study skills and habits can provide valuable insights into their areas of strength and areas that need improvement. This, in turn, facilitates the identification of appropriate interventions and strategies to enhance their learning outcomes. Therefore, developing effective study habits is a personal process, and students must explore various strategies to find what works best for them. By cultivating good study habits, students can boost their academic success and future career prospects, saving time, energy, and money. Students should understand their abilities, techniques to advance their progress, and strategies to enhance their knowledge and expertise more efficiently.[0]

Creating a comfortable learning environment is vital for developing good study habits. A conducive environment promotes concentration and focus, essential for effective studying. Students' attitudes, learning strategies, and study routines significantly influence their future career accomplishments [0]. Implementing strategies like exerting effort, maintaining focus, and establishing a suitable study environment can improve academic achievement. These practices enhance learning, comprehension, and overall performance, leading to positive outcomes in academic settings. This research aims to comprehensively investigate the relationship between learning styles, study habits, and academic achievement among medical students.

METHODOLOGY

This cross-sectional research was conducted from January 2023 to January 2024, after obtaining approval from the Institutional Ethical Committee and Review Board. The study was confined to medical students aged 18-26, pursuing MBBS, BDS, DPT, and D-PHARM degrees, enrolled in various academic years, from the following universities: United College of Physical Therapy, United Medical and Dental College, Dow University of Health Sciences, Jinnah Medical and Dental College and Ziauddin University, those students who provided complete and valid data were included and students not enrolled in a medical program or pursuing a medical degree, those with cognitive impairments or learning disabilities, and those not willing to participate were excluded. The survey was prepared after a review of the literature and discussion with subject experts.

The questionnaire consisted of four parts: informed consent, demographic data, The VARK questionnaire version 8.01, comprising 16 questions to identify the preferred learning styles of students, and The study habits inventory questionnaire, assessing the study habits of students. The questionnaire was designed to facilitate faster and easier responses from participants, resulting in more accurate data for the study. The researchers employed the non-probability convenience sampling method and determined the sample size using the Rao-Soft software calculator. For this study, a 95% confidence interval was chosen, with the desired margin of error at 5%.

Therefore, a sample size of 366 was calculated. A self-administered, closed-ended survey through hard copies was distributed among the selected sample of medical students and through face-to-face interviews, questionnaires were filled, ensuring no mistakes in data collection. The participants' identities were kept confidential, and informed consent was obtained. After completing the interviews, the data were imported into SPSS Version 25.0 software for analysis, and statistical methods for data collection and analysis were followed. Descriptive statistics were used to summarise the data, and the chi-square test was used for association. When determining associations, a p-value of less than 0.05 was deemed statistically significant.

RESULTS

A total of students, comprising 277 (75.7%) females and 89 (24.3%) males, participated in the cross-sectional study. Table 1 presents the demographic characteristics of the research participants, providing a comprehensive overview of the study population. Figure 1 displays a pie chart illustrating the distribution of learning styles among medical students, as categorised by the VARK questionnaire. The results reveal a clear predominance of unimodal learners, followed by bimodal, trimodal, and quadrimodal learners in decreasing order. This visual representation provides a concise overview of the diverse learning preferences within the student population. Table 2 reveals the dominant learning style preferences

among participants, with a clear inclination towards kinesthetic learning 1235 (21.1%) in the unimodal category. In the bimodal category, auditory-kinesthetic learning 452 (7.7%) emerges as the most preferred combination. Meanwhile, the trimodal category is led by visual-auditory-kinesthetic learning 166 (2.8%), and the quadrimodal category is dominated by visual-auditory-read/write-kinesthetic learning 235 (4%).

Table 3 illustrates the correlation between learning styles (Visual, Auditory, Reading/Writing, Kinesthetic) and Academic Achievement. The obtained p-value of 0.026 indicates a statistically significant relationship between learning styles and GPA. Figure 1 illustrates study habits among medical students, revealing varying levels of proficiency in different areas. Overall, while many students excel in note-taking, reading, test preparation and test-taking, reading speed, writing, and managing test anxiety, there is a notable deficiency in time management and concentration skills among a significant portion of the medical student population.

This reports the Pearson chi-square value, shedding light on the correlation between study habits and academic achievement. Notably, no statistically significant relationships were found between concentration, reading comprehension, test preparation and test-taking skills, reading speed, or writing skills, and academic achievement. However, there were significant associations between time management and academic achievement, as well as between note-taking and academic achievement, with p-values below 0.05.

DISCUSSION

In the investigation of learning style preferences, our study aligns with the findings of MD Zain et al., highlighting kinesthetic learning as the predominant preference. This pattern is consistent across surveys, revealing a diminished inclination towards Read/Write learning styles among the sampled student populations.[21,22,24] Furthermore, a parallel trend emerges in the study conducted by L Khanal et al. (2022) and Chandrika G Teli et al., as well as in our research, indicating that AK (Auditory, Kinesthetic) learners are notably prevalent among Bimodal learners. Notably, the explorations conducted by Chandrika G. Teli et al. and Danya Hashem et al., in conjunction with our study, affirm that many students exhibit a preference for Unimodal learning styles, with a particular emphasis on Kinesthetic modalities.[5,19,22] Moreover, the research conducted by Chandrika G. Teli et al. and our study suggest that among trimodal learners, those who are primarily visual, auditory, or kinesthetic (VAK) learners are more prevalent. These consistent findings contribute to the understanding of learning style preferences, providing valuable insights for educational practitioners and researchers.[5]

In alignment with previous research by Shirazi et al. and Abouzeid et al., our study establishes a statistically significant relationship between learning styles and academic achievement. Furthermore, our findings echo the conclusions of Md Zain et al., highlighting a positive and significant influence of Visual (V) and Kinesthetic (K) learning style preferences on students' academic performance. However, diverging from these perspectives, the study conducted by Muhammad AL-Roomy et al. in 2023 introduces an exact dimension, indicating a positive correlation between individual learning styles and GPA, while revealing a negative association with group learning styles.[0,0,24,0] In a study conducted by Bentil et al., findings indicated that undergraduate students predominantly engaged in homework and assignment practices, followed by concentration-

Table 1: Demographics of participants

Variables		Frequency	Percentage
Gender	Male	89	24.3
	Female	277	75.7
Age (years)	18-20	80	21.9
	21-23	248	67.8
	24-28	38	10.4
Field of study	DPT	129	35.2
	MBBS	119	32.5
	BDS	79	21.6
	D-Pharm	39	10.7
Year of study	1st year	38	10.4
	2nd year	80	21.9
	3rd year	65	17.8
	4th year	70	19.1
	Final year	113	30.9
GPA of students	1.5-2.0	1	0.3
	2.1-2.5	17	5
	2.6-3.0	91	26.6
	3.1-3.5	152	44.4
	3.6-4.0	80	23.4

related study habits, reading and note-taking, study habits. Notably, time management-related study habits were identified as the least practised among the participants. Conversely, our research underscores challenges faced by students in time management and concentration, while highlighting their proficiency in note-taking, reading comprehension, test preparation and taking, reading speed, writing skills, and test-anxiety management.[20] The research makes valuable contributions to understanding the impact of learning styles and study habits on medical students' academic achievement.

The study primarily employed quantitative measures, limiting insight into qualitative aspects of learning experiences. Focusing on medical institutions in Karachi, Pakistan, restricts generalizability. Relying solely on GPA overlooks subtle success indicators. The cross-sectional design captures a snapshot but hinders establishing causal relationships or tracking changes over time. Convenient sampling may introduce selection bias, and excluding students with cognitive impairments limits inclusivity. These limitations underscore the need for cautious interpretation and present opportunities for improvement in future research endeavours, aiming for a more comprehensive understanding of the subjects.

CONCLUSION

The findings emphasize the varied connections between learning styles, study habits, and academic achievement, underscoring the need for personalised educational methods. The significant correlation between learning styles and academic success highlights the importance of tailored approaches in education. The study also identifies common student challenges, such as time management and concentration issues, which call for specific interventions. Key factors influencing academic success include effective time management and note-taking, which are essential for developing personalised strategies. By addressing these study habits through customised interventions, educators can greatly improve students' academic performance. It is crucial for educators to accommodate different learning styles, focus on interventions that target study habits, leverage existing strengths, and create an environment that supports both academic success and student well-being.

DECLARATIONS

Consent to participate: Written consent had been obtained from patients. All methods were performed following the relevant guidelines and regulations.
Availability of Data and Materials: Data will be made available upon request. The corresponding author will submit all dataset files.
Competing interests: None
Funding: No funding source involved.
Authors' contributions: All authors had read and approved the final manuscript.

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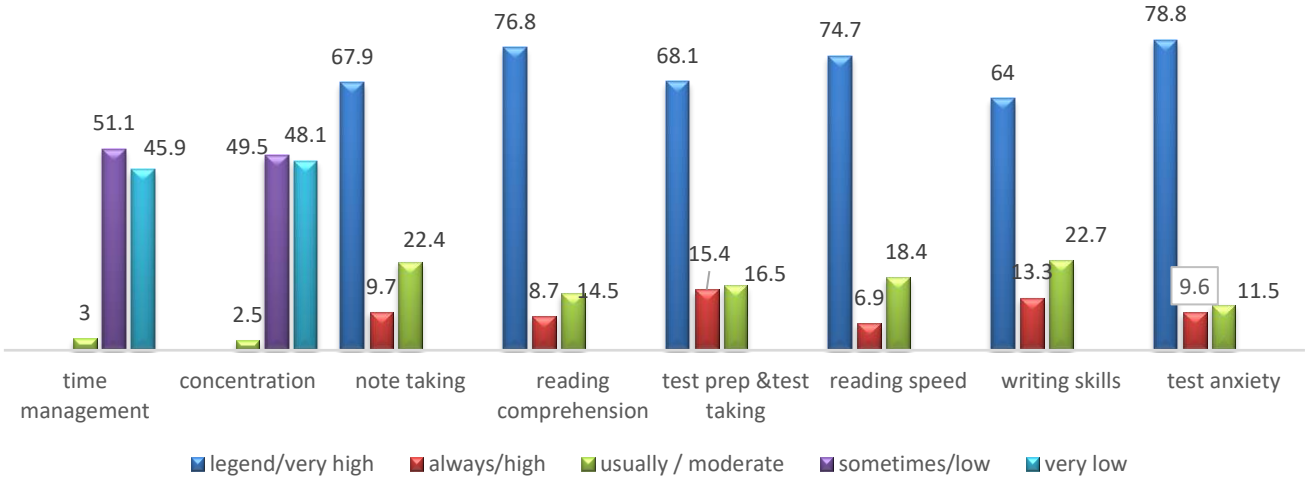
Table 2: Learning style preferences of medical students

Learning Styles		Frequency	Percentage
Unimodal	V	720	12.3
	A	1089	18.6
	R	679	11.6
	K	1235	21.1
Bimodal	VA	228	3.9
	VR	102	1.7
	VK	246	4.2
	AR	189	3.2
	AK	452	7.7
	KR	205	3.5
Trimodal	VAR	51	0.9
	ARK	149	2.6
	VRK	101	1.7
	VAK	166	2.8
Multimodal	VARK	2325	4

Table 3: Correlation between learning styles

GPA	Visual	Auditory	Reading	Kinesthetic	p-value
1.5-2.0	1 (0.2)	8 (0.8)	2 (0.31)	4 (0.35)	
2.1-2.5	57 (8.3)	73 (7.3)	50 (7.85)	62 (5.4)	
2.6-3.0	164 (24)	245 (24.4)	186 (29.2)	278 (24.2)	0.026
3.1-3.5	297 (43.4)	455 (45.4)	247 (38.8)	527 (46)	
3.6-4	165 (24.1)	222 (22.1)	152 (23.9)	276 (24.1)	
Total	684	1003	637	1147	

Figure 1: Study habits of medical students



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