



Association of academic performance with learning style preference of medical students: Multi-center study from Pakistan

Muhammad Hamid Chaudhary¹, Sadia Ayub¹, Ansar Aftab²,
Faiza Faiza³, Ushna Ahmed⁴, Javeria Khursheed⁵, Ehsan Ullah¹

ABSTRACT

Objectives: The purpose of this study was to assess preferred learning styles and determine their association with the academic performance of undergraduate medical students in various medical colleges in Pakistan. **Participants and Methods:** A cross-sectional study of 597 medical students from six medical colleges (~100 from each college) was performed. The validated VARK questionnaire version 7.0 was used to categorize the learning styles of students. The questionnaire consists of 16 items which identify four different learning styles: Visual, auditory, reading/writing, and kinesthetic (VARK). Descriptive statistics were used to identify the learning styles of students. Analysis of Variance (ANOVA) was used to compare the academic performance (marks obtained in last professional examination) between students having different learning styles. **Results:** The response rate was 82.9%. The results showed that mean scores for VARK styles were 4.28 ± 0.09 , 4.91 ± 0.08 , 4.54 ± 0.07 , and 4.75 ± 0.09 , respectively. Only 164 (27.6%) students preferred a unimodal learning style, i.e., 38 (6.4%), 56 (9.4%), 20 (3.4%), and 50 (8.4%) preferred the VARK modes, respectively, whereas 72.4% of students preferred multiple learning styles. ANOVA showed there was no significant difference of academic performance among the students having different learning styles. **Conclusions:** Majority of students prefers multimodal learning styles and learning style preference is not associated with academic performance in medical students across Pakistan. The results of this study provide useful information for improving the quality of the medical teaching and learning experiences of medical students. However, further research is needed to explore the association among learning style preferences, learning strategies, and academic performance.

KEY WORDS: Academic performance, learning style, learning preference, medical students, the visual, auditory, reading/writing and kinesthetic

¹Quaid-e-Azam Medical College, Bahawalpur, Punjab, Pakistan, ²Army Medical College Rawalpindi, Punjab, Pakistan, ³Allama Iqbal Medical College Lahore, Punjab, Pakistan, ⁴Dow University of Health Sciences Karachi, Sindh, Pakistan, ⁵King Edward Medical University, Lahore, Punjab, Pakistan

Address for correspondence: Muhammad Hamid Chaudhary, Quaid-e-Azam Medical College Bahawalpur, Punjab, Pakistan, Tel.: +92-334-6103019. E-mail: dr.hamid632@gamil.com

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INTRODUCTION

Learning style has been defined as the characteristic cognitive, affective, social, and physiological behaviors that serve as relatively stable indicator of how learners perceive, interact with, and respond to the learning environment [1]. Different learners have different learning habits; if the method of information delivery conforms to their learning habit they learn better [2]. While disparity can result in failure, that's why there is a great deal of interest amongst educators in identifying preferable learning styles of their students [3].

There are many methods available for assessing learning styles, with each method offering a distinctly different view of learning style preferences visual, auditory, reading/writing, or kinesthetic (VARK) learners [3]. VARK is one of these models, which is a perceptual, instructional preference model that categorizes

learning by sensory preferences. The VARK inventory developed by Fleming (2005) provides metrics for each of four perceptual modes: Visual (V), aural (A), read/write (R), and kinesthetic (K). The instrument contains a total of 16 questions with multiple-choice responses, and participants can choose more than one answer for each question. Although learners are not restricted to only one of four modes, they may show a strong preference for one particular mode. An individual's preference may range from a single mode to all four modes [4]. Some students enjoy a combination of VARK activities. Some learners have a preference for any one of these learning modalities (unimodal learners), whereas multimodal learners do not have a strong preference for any single method [5,6].

Medical students are adult thus they have already developed their own learning style. Henceforth, it is essential for medical educators to "tailor instructions" in such a way that the medical

students appreciate and follow it to learning [7]. Many types of research have been conducted to determine the correlation of learning style preferences with performance [8]. It has been repeatedly proved that the motivation and performance of the students are positively correlated with the instructions that are adapted to their predominant learning preferences [9]. The aim of this study is to assess learning preferences of medical students in Pakistan and apply it in educating them so they can learn better. Moreover, this study is conducted to ascertain any relation between academic performance and preferred learning style among undergraduate medical students in Pakistan.

PARTICIPANTS AND METHODS

It was a cross-sectional study conducted in six medical colleges in Pakistan namely Allama Iqbal Medical College Lahore, Amna Inayat Medical College Sheikhupura, Dow University of Health Sciences Karachi, King Edward Medical University Lahore, Quaid-e-Azam Medical College Bahawalpur, and Rawalpindi Medical College Rawalpindi. We randomly selected 120 undergraduate medical students from each college, however, ~100 students from each college returned completed questionnaires. Thus, the total sample size was 597.

The validated VARK questionnaire version 7.0 was administered after informed consent of the participants. The questionnaire consists of 16 items which identify four different learning styles: VARK. Descriptive statistics were used to identify the learning styles of students. Analysis of Variance (ANOVA) was used to compare the academic performance (marks obtained in last professional examination) among students having different learning styles.

RESULTS

Out of 720 students, who were administered the VARK questionnaire, 597 returned completed questionnaires. Thus, overall response rate was 82.9%. Mean scores for VARK styles were 4.28 ± 0.09 , 4.91 ± 0.08 , 4.54 ± 0.07 , and 4.75 ± 0.09 , respectively, as shown in Table 1.

Only 164 (27.6%) students preferred a unimodal learning style, i.e., 38(6.4%), 56(9.4%), 20(3.4%), and 50(8.4%) preferred the VARK modes, respectively, as shown in Figure 1.

Out of the total, 433 (72.4%) participants preferred multiple learning styles, i.e., bimodal, trimodal, and tetramodal learning styles. Frequency and percentage of each of these learning styles are shown in Table 2.

ANOVA showed there was no significant difference of academic performance ($P = 0.316$) among the students having different learning styles as shown in Table 3.

The effect of learning style on the academic performance was also analyzed by grouping unimodal (V, A, R, and K) and multimodal learning styles as shown in Table 4. Independent samples *t*-test was applied which showed that there was no significance of the effect ($P = 0.130$).

DISCUSSION

There are large number of styles by which a person learns and these styles keep on changing, compounding, and evolving as the person keeps on learning [10]. As medical students have to learn a plethora of knowledge and do their best to absorb the complex human body's physiological as well as pathological mechanisms, so educators find it most prolific to study how medical students learn. A variety of factors can influence student's learning approaches. These factors are age, gender, intelligence, level of persistence, culture and creative thinking, and more [11]. Keeping these factors in mind, we studied four basic styles of learning that are VARK and investigated which style was used most by the medical students and were there any differences in the academic performance among the students using different learning styles. These learning modalities are self-explanatory like in visual method student learn visually and in an aural by listening to the knowledge and information. In reading and writing modality students read and write to assimilate information as their primary way to learn. A kinesthetic learner uses all sensory ways to learn including somatosensory, auditory, and olfactory, gustative, and visual [12]. To see how students studying at major medical colleges in Pakistan using these modalities to develop learning style for them a validated and well-known VARK questionnaire version 7.0 was used. The purpose of this study was to segregate learning preferences of medical students and to use this data to see the most affective learning style in future studies to improve medical education

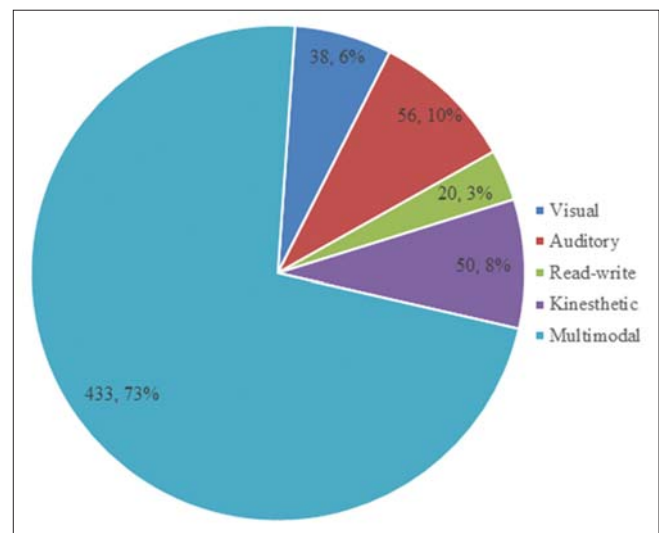


Figure 1: Frequency of visual auditory reading/writing kinesthetic unimodal learning style

Table 1: Mean scores of VARK components

VARK components	Score		SD
	Mean	SE	
Visual score	4.28	0.086	2.110
Auditory score	4.91	0.084	2.055
Reading/writing score	4.54	0.073	1.792
Kinesthetic score	4.75	0.094	2.287

SD: Standard deviation, SE: Standard error

Table 2: Frequency of each multimodal learning styles

Style	Frequency	Percent
Bimodal		
AK	38	6.4
AR	32	5.4
RK	28	4.7
VA	20	3.4
VK	28	4.7
VR	18	3.0
Trimodal		
ARK	40	6.7
VAK	26	4.4
VAR	44	7.4
VRK	26	4.4
Tetramodal		
VARK	133	22.3
Total	597	100.0

AK: Auditory kinesthetic, RK: Reading/writing kinesthetic, VK: Visual kinesthetic, ARK: Auditory reading/writing kinesthetic, VRK: Visual reading/writing kinesthetic, VAR: Visual auditory reading/writing, VARK: Visual auditory reading/writing kinesthetic

Table 3: Comparison of academic performance in students having different learning styles

Learning style	Mean	N	SD	P value
Visual	70.5658	38	10.18509	0.316
Auditory	69.7374	56	6.94664	
Reading writing	72.6000	20	10.31514	
Kinesthetic	69.3095	50	9.89992	
Multimodal	71.3106	433	8.07962	
Total	70.9912	597	8.37959	

SD: Standard deviation

Table 4: Comparison of academic performance having unimodal versus multimodal learning styles

Learning style	Mean	N	SD	P value
Unimodal	70.1480	164	9.09656	0.130
Multi modal	71.3106	433	8.07962	
Total	70.9912	597	8.37959	

SD: Standard deviation

standards in our country. This can help us to produce better health professionals in future by understanding learning styles and dynamics behind them.

Results of current study show that most of the students have been using multimodal learning styles which is simply because the human uses all of his modalities to learn and especially in medical education where students have to remember as well as conceptualize knowledge. He/she uses the multimodal method to absorb as much information as he/she can. Similar findings have also been reported by many investigators studying learning styles among medical students and other healthcare students around the globe in last many years [3,13-16].

In the present study, only 27.6% (164 out of 597) students preferred a unimodal learning style. Among the single learning modalities, the majority of students preferred auditory learning style. This result is in consistence with the study conducted by Nuzhat *et al.* [17] who found out that 11.6% students preferred

learning via auditory mode. However, in contrast to our results, a study carried out by Fleming [18] found read/write as preferred single learning modality in participants who completed VARK questionnaire online. Moreover, Dobson [19] found reading mode as preferred modality which is in contrast to our result.

In the present study, most of the medical students (433 out of 597-72.4%) preferred to learn using multiple learning styles, i.e., bimodal, trimodal, and tetramodal (all VARK) learning styles. These results are in accordance with the results found by the study conducted by Dobson [19]. In this study, only 22.3% students preferred tetramodal or all VARK modalities for learning.

Another important finding in this study is that there was no relationship between learning style preference and academic achievement. Only a handful of studies have focused on finding out the relation between academic performance and learning style trend using VARK questionnaire, and our results are consistent with these studies. There is no established trend regarding learning style preference and academic performance. Almigbal [20] conducted a study on 600 students in Saudi Arabia and concluded that there is no relation between Learning style preference and academic performance. Similarly, a study conducted in India [21] among undergraduate medical students found no statistical significant association between learning style preferences and academic performance. Similar results were found in two other studies concerning students in physiologic classes, which also report no association between learning style and course score [19,22].

By using this study and knowing in mind what is the most common method of learning used by the participants, we can embark further studies by incorporating the most common learning style in lectures and see what results it brings because there is one argument that students achieve higher scores at undergraduate level when lectures are made according to learning styles preferences [19,23]. Contradictory to this point another view is also present in literature which says it might be more useful to teach primarily in mismatched way, meaning that student is not taught in his preferred learning style as Grasha says learning by student in his/her preferred style is interesting only for initial some time then student starts becoming bore of it and want some change so changing and mismatching might elicit his senses more and help him to learn more [24].

There are several limitations to this study. The data was taken only from 6 medical colleges while there are 92 recognized medical colleges in Pakistan [25]. So, it might not be representing true medical students' population. Second, there might be many confounding factors like this data is gathered from five government-owned and one private medical colleges placed in different cities. There is large number of other public and private medical colleges in Pakistan which might be using innovative teaching technologies to mentor their students so in those colleges students might be using a better combination of audiovisual methods to learn. This study consisted of students in both pre-clinical and clinical years, and there may be the difference in learning style preferences in pre-clinical and clinical

years. Moreover, the purpose of the VARK analysis is to recognize how students prefer to take in and give out information. Learning preferences do not take into consideration multiple confounding variables such as motivation or setting, which influence student learning. Finally, a cross-sectional study is not ideal for determining relationships among variables.

The study shows that majority of medical students in Pakistan prefer multimodal learning. Learning style preference was found not to be associated with academic performance in the study population. This observation may be due to the fact that in a medical school all students have same mental capabilities to reproduce information learnt, they may vary in the way they assimilate information but their reproduction capacity is somewhat comparable. Thus, learning style preference doesn't affect the academic performance of medical students in Pakistan. This evidence may be useful for refining the quality of teaching and may impact how educators deliver information to students in the future. However, more studies need to be conducted among medical students regarding their learning style preferences and the factors that can impact educational achievements, especially in our region, as there are few studies in this area. The study also highlights the need for devising teaching techniques according to preferred learning style and further studies to see any improvement in academic performance of students with the use of students preferred learning style as a teaching method.

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REFERENCES

1. Mon AA, Fatini A, Ye CW, Barakat MA, Jen PL, Lin TK. Learning style preferences among pre-clinical medical students. *J Med Allied Sci* 2014;4:22-7.
2. Sadler-Smith E, Smith PJ. Strategies for accommodating individuals' styles and preferences in flexible learning programmes. *Br J Educ Technol* 2004;35:395-412.
3. Nuzhat A, Salem RO, Al Hamdan N, Ashour N. Gender differences in learning styles and academic performance of medical students in Saudi Arabia. *Med Teach* 2013;35:S78-82.
4. Hawk TF, Shah AJ. Using learning style instruments to enhance student learning. *Decis Sci J Innov Educ* 2007;5:1-19.
5. Shinnick MA, Woo MA. Learning style impact on knowledge gains in human patient simulation. *Nurse Educ Today* 2015;35:63-7.
6. Bataduwaarachchi VR, Dissanayake MM, Thillainathan S, Jayasekara RW. Perception of the learning strategies and the learning styles among first year medical students: A cross sectional survey. *South East Asian J Med Educ* 2013;7:15.
7. Collins J. Education techniques for lifelong learning: Principles of adult learning. *Radiographics* 2004;24:1483-9.
8. Wehrwein EA, Lujan HL, DiCarlo SE. Gender differences in learning style preferences among undergraduate physiology students. *Adv Physiol Educ* 2007;31:153-7.
9. Reh fuss MC, Borges NJ. Using narratives to explore other-directed occupational choice and academic success. *J Vocat Behav* 2006;68:64-72.
10. Keefe JW. *Learning Style: Cognitive and Thinking Skills*. Instructional Leadership Series. Reston, VA: National Association of Secondary School Principals; 1991.
11. Honigsfeld A, Dunn R. High school male and female learning-style similarities and differences in diverse nations. *J Educ Res* 2003;96:195-206.
12. Fleming ND, editor. *I'm different; not dumb. Modes of presentation (VARK) in the tertiary classroom*. Research and Development in Higher Education, Proceedings of the 1995 Annual Conference of the Higher Education and Research Development Society of Australasia (HERDSA), HERDSA; 1995.
13. Whillier S, Lystad RP, Abi-Arrage D, McPhie C, Johnston S, Williams C, *et al.* The learning style preferences of chiropractic students: A cross-sectional study. *J Chiropr Educ* 2014;28:21-7.
14. Kharb P, Samanta PP, Jindal M, Singh V. The learning styles and the preferred teaching-learning strategies of first year medical students. *J Clin Diagn Res* 2013;7:1089-92.
15. Al-Saud LM. Learning style preferences of first-year dental students at King Saud University in Riyadh, Saudi Arabia: Influence of gender and GPA. *J Dent Educ* 2013;77:1371-8.
16. Foster N, Gardner D, Kydd J, Robinson R, Roshier M. Assessing the influence of gender, learning style, and pre-entry experience on student response to delivery of a novel veterinary curriculum. *J Vet Med Educ* 2010;37:266-75.
17. Nuzhat A, Salem RO, Quadri MSA, Al-Hamdan N. Learning style preferences of medical students: A single-institute experience from Saudi Arabia. *Int J Med Educ* 2011;2:70-3.
18. Fleming N. VARK. *A Guide to Learning Styles*. The VARK Questionnaire; 2008.
19. Dobson JL. A comparison between learning style preferences and sex, status, and course performance. *Adv Physiol Educ* 2010;34:197-204.
20. Almgib al TH. Relationship between the learning style preferences of medical students and academic achievement. *Saudi Med J* 2015;36:349-55.
21. Urval RP, Kamath A, Ullal S, Shenoy AK, Shenoy N, Udupa LA. Assessment of learning styles of undergraduate medical students using the VARK questionnaire and the influence of sex and academic performance. *Adv Physiol Educ* 2014;38:216-20.
22. Dobson JL. Learning style preferences and course performance in an undergraduate physiology class. *Adv Physiol Educ* 2009;33:308-14.
23. Koch J, Salamonson Y, Rolley JX, Davidson PM. Learning preference as a predictor of academic performance in first year accelerated graduate entry nursing students: A prospective follow-up study. *Nurse Educ Today* 2011;31:611-6.
24. Grasha AF. *Learning styles: The journey from greenwich observatory (1796) to the college classroom (1984)*. *Improv Coll Univ Teach* 1984;32:46-53.
25. *Recognized Medical Colleges in Pakistan Islamabad*. Available from: <http://www.pmdc.org.pk/AboutUs/RecognizedMedicalDentalColleges/tabid/109/Default.aspx>. [Last accessed on 2015 Apr 21].

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