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# Assessment of Preferred Learning Styles of Medical Students at Wah Medical College Using VARK Questionnaire

Saleh Ahmed, Khola Waheed Khan, Shezadi Sabah Imran, Musarat Ramzan, Syeda Robina Mushtaq Rizvi, Hurmat Saeed

**ABSTRACT**

**Objective:** To assess the distribution of different learning styles and modalities among medical students and to identify any underlying association of socio-demographic characteristics of students with their preferred learning styles.

**Study design and setting:** This is a cross-sectional survey which was conducted among medical students of Wah Medical College, Wah Cantt, for a duration of three months i.e. May 15th, 2023 to August 15th, 2023.

**Methodology:** 271 students meeting the inclusion criteria were selected using the convenience sampling technique. Our data collection instrument was a questionnaire which consisted of two portions. The first portion was about the socio-demographic profile of the participants and the second portion consisted of the VARK questionnaire. Data was analysed using SPSS (version 23). The chi-square test was applied to determine the associations. A p-value less than 0.05 was considered significant.

**Results:** A total of 271 students submitted the questionnaire with a mean age of 20 ± 1.7 years. The majority were female (62.4%). Kinesthetic learning was opted by 60.5% of students while quad-modal, tri-modal and bi-modal learning was opted by 35.1%, 33.2% and 31.7% of students respectively. The difference in learning styles used by students of varied clinical exposure was established (p=0.01).

**Conclusion:** The most preferred learning style was kinesthetic and the majority of the students used quad-modal learning. It is also concluded that there is a difference in learning styles used by students in the pre-clinical and clinical years of medical education.

**Keywords:** Learning styles, Medical students, Specialization, VARK

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## INTRODUCTION:

The learning mechanism is different for every individual in terms of cognition and attitude, which affects the learning of the student.[1] One should be aware of the strategies that can be used to improve learning as the medical field requires the students to be at par in the domains of knowledge, skills and attitudes.[2] Self-directed learning makes one a life-long learner which is a need of the modern era. Now the students must learn to take responsibility for their learning process and achievement of their goals, which requires enormous self-regulation.[3] To achieve this, students use various learning styles depending upon their preferred sensory modalities, which results in the diversity seen in classrooms in regard to how a student learns.[4]

A number of learning style models have been utilized in health professionsÊeducation involving medical, nursing, and pharmacy students.ÊThe frameworks used included the Pharmacist Inventory of Learning Styles, Honey and Mumford Learning Style Questionnaire, VARK (Visual,

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Aural, Read/write and Kinesthetic), and Kolb Learning Style Inventory. The VARK model assesses the learning preferences of students based on sensory modalities.[5] The available literature on VARK inventory is suggestive of the fact that it can lead to improved learning among medical students and can also serve as a tool to make teachers aware of the preferred learning methodologies used by their students.[6] The associated "VARK help-sheets" provide strategies for enhancing learning experiences for each preferred learning style, which is very useful for one's own learning.[7] Identification of preferred learning styles among students can also help the teachers provide personalized guidance to the students who are weak in memorizing and grasping complex medical concepts.[6]

The teacher's role as a facilitator in this era of student-centred learning has become crucial. They must also understand that active teaching strategies must replace traditional teaching methods.[8] A teacher's understanding of the pattern of learning styles being used by students of his/her own institution is very important as demographic factors like age, gender, previous school attended, and academic achievements can also influence the use of specific sensory modalities to learn.[2,9]

Keeping all this in view, our study will assess the distribution of different learning styles and modalities among medical students of our institution. It will also attempt to identify any underlying association of socio-demographic characteristics of students, like gender, clinical exposure, and choice of field for specialization, with their preferred learning styles to improve their learning experience. The study also aimed to create awareness among medical students regarding the use of the VARK framework and its associated "help-sheets" to identify the methods that can be used to improve their learning.

**METHODOLOGY**:

For a duration of three months, we carried out this cross-sectional survey among the medical students at Wah Medical College, Wah Cantt. from May 15th, 2023 to August 15th, 2023. Sample selection was done by inclusion criteria i.e. all the medical students studying in 1st, 2nd, 3rd, 4th and 5th year of MBBS degree program in the college, who gave consent to be included. Forms incompletely filled were excluded. Sampling was done using the convenience technique. The sample size was calculated to be 271, using the WHO sample size calculation formula for prevalence studies considering P=0.228[10] and the margin of error to be 5%.

$$N = [Z^2P (1-P)] / e^2$$

$$N= (1.96)^2 \times 0.228 (1-0.228)/ (0.05)^2$$

$$N= 271$$

Where Z = Value for 95% confidence interval, e = Alpha error, P = Prevalence

The data collection was initiated after getting approval from the institutional Ethical Review Committee of Wah Medical College via letter no. WMC/ERC/IRB/038 dated 15th May, 2023. Informed consent was obtained, and the data collection was done using Google Forms. Our online questionnaire consisted of two portions. The first portion was about the socio-demographic profile of the participants and included the variables of age, gender, year of study, and choice of specialization

The second portion consisted of the "VARK questionnaire version 8.01". To use the VARK questionnaire, permission was acquired from "VARK LEARN Limited". This portion "consisted of 16 questions with 4 choices, each of them corresponding to a specific sensory modality preference. Respondents were allowed to choose two or more options according to their preference."[11]

The research team decoded each student's responses to the VARK questionnaire to assess their preferred learning style and modes using the link (https://vark-learn.com/the-vark-questionnaire/).[12] The results were mailed back to the students so that they could use the "VARK help sheets" to improve

Table 1: Demographic characteristics of students

| | Characteristic | n % |
|---|---|---|
| Gender | Male | 102 (37.6) |
| | Female | 169 (62.4) |
| Student group | Pre-clinical | 132 (48.7) |
| | Clinical | 139 (51.3) |
| Field of specialization | Medicine and Allied | 112 (41.3) |
| | Surgery and Allied | 151 (55.7) |
| | Basic Sciences | 04 (1.5) |
| | Public Health | 04 (1.5) |

Figure 1: Distribution of students on the preferred learning styles

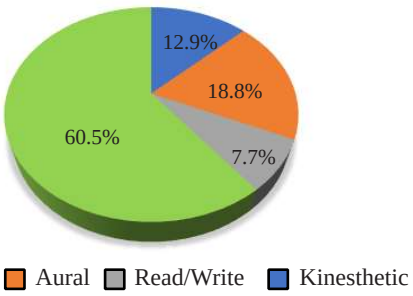
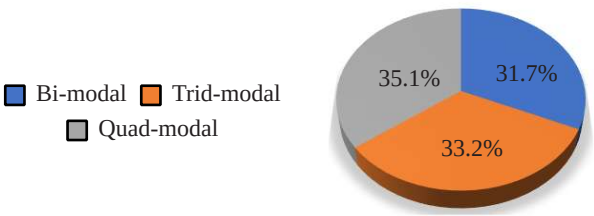



Figure 2: Distribution of learning style modes basis of among students



their learning.

IBM SPSS version 23 was used for the purpose of data entry and analysis. "The learning modalities were categorized as unimodal (V, A, R or K), bi-modal (VA, VR, AR, VK, AK and RK), tri-modal (VAR, ARK, VRK and VAK) and quad-modal (VARK)". [4] The students were also categorized based on clinical exposure into pre-clinical students and clinical students where students from 1st and 2nd year were labelled as pre-clinical and students from 3rd year to 5th year were labelled as clinical. The fields of specialization are the specialities that the medical students will opt for postgraduation, and, in this study, are general categories based on similar competencies. The medicine and allied category included fields like Internal Medicine, Cardiology, Paediatrics, Pulmonology and Diagnostics. The surgery and allied category included all the surgical fields, including Gynaecology and Obstetrics. The basic sciences category included the fields taught in the non-clinical years of medical school, like Anatomy and Biochemistry. The category of Public Health included all the fields related to preventive medicine and healthcare administration.

Data analysis was carried out by using descriptive and inferential statistics. Frequency tables and charts were created. The Chi-Square test was applied to determine the association between the demographic factors and learning style preferences among students, and a p-value<0.05 was taken to be significant.

Table 2: Frequency distribution of learning style combinations

| Learning combinations | n % |
|---|---|
| VA | 6 (2.2) |
| VR | 2 (0.7) |
| AR | 8 (3.0) |
| VK | 24 (8.9) |
| AK | 42 (15.5) |
| RK | 4 (1.5) |
| VAR | 10 (3.7) |
| ARK | 8 (3.0) |
| VRK | 7 (2.6) |
| VAK | 65 (24) |
| VARK | 95 (35.1) |

**RESULTS:**

271 students submitted the questionnaire with a mean age of 20 ± 1.7 years. Majority of the respondents were female (62.4%). The response rate was 82.5%. Maximum students who consented for the study were from clinical sciences group (51.3%). Surgery and Allied was chosen as the most preferred choice of specialization as shown in Table 1. Upon assessment of preferred learning style among students, it was found that out of 271 students, 164 (60.5%) majorly used kinesthetic, 51 (18.8%) majorly used aural, 35 (12.9%) majorly used visual and 21 (7.7 %) majorly used read /write as the preferred learning style as shown in Figure i. The student's VARK questionnaire responses showed multimodal learning pattern as shown in Figure ii. Out of 271 students, 95 (35.1%) chose quad-modal learning, 90 (33.2%) chose tri-modal learning while 86 (31.7%) opted for bi-modal learning as the preferred learning mode.

The most preferred learning combination was VARK which was chosen by 35.1 % of the students followed by VR as the least preferred learning style combination as it was only chosen by 2 students out of 271 as shown Table 2

Upon assessing the association between the socio-demographic profile of the medical students and their preferred learning styles, a significant difference was observed only in learning stylesadopted by students in the pre-clinical and clinical yearsof medical school (p=0.01), as shown in Table 3.

**DISCUSSION:**

Our study aimed to assess the distribution of different learning styles and modalities among medical students at our institution and to find any possible association with sociodemographic factors. All the participating students chose multimodal learning, while the most preferred learning style was kinesthetic. On further assessment, a significant difference was observed only in learning styles adopted by students in the pre-clinical and clinical years of medical school.

A learning style is one'schosen manner of using one's senses for the purpose of learningrather than being an abilityitself. People differ in their natural, ingrained, and preferred

Table 3: Association of preferred learning styles and sociodemographic factors

| Variables | | Visual n % | Aural n % | Read/Write n % | Kinesthetic n % | p-value* |
|---|---|---|---|---|---|---|
| Gender | Male | 17 (16.7) | 24 (23.5) | 8 (7.8) | 53 (52) | 0.13 |
| | Female | 18 (10.7) | 27 (16.0) | 13 (7.7) | 111 (65.7) | |
| Student group | Pre-clinical | 21 (15.9) | 18 (13.6) | 5 (3.8) | 88 (66.7) | 0.01 |
| | Clinical | 14 (10.1) | 33 (23.7) | 16 (11.5) | 76 (54.7) | |
| Field for Specialization | Medicine and Allied | 11 (9.8) | 29 (25.9) | 8 (7.1) | 64 (57.1) | 0.27 |
| | Surgery and Allied | 24 (15.9) | 21 (13.9) | 12 (7.9) | 94 (62.3) | |
| | Basic Sciences | 0 (0.0) | 1 (25.0) | 0 (0.0) | 3 (75.0) | |
| | Public Health | 0 (0.0) | 0 (0.0) | 1(25.0) | 3 (75.0) | |

methods of assimilation, processing, and retention of new knowledge and abilities so they use different styles for learning.[13] Keeping this in view, a study was conducted in Pakistan at the national level among students of different medical colleges. This study also reported similar results where kinesthetic was the most preferred learning style while multimodal learning was preferred by the majority of students.[2] In the international context, exactly similar results were reported in a study conducted at a Saudi university.[14] On the other hand, a study conducted in a medical college of Lahore reported contrary results in terms of mode of learning as the majority of students opted for unimodal learning, but the most preferred learning style was again kinesthetic.[15]

A study conducted in India regarding the assessment of learning style preferences among medical students suggested that gender differences in learning preferences should be assessed.[16] Our study made an attempt in this regard and found that there is no association between gender and learning styles used by students. The Saudi medical university study also confirmed our finding that no statistically significant difference is present across gender among students in preference for different learning styles.[14] Contrary to it, two studies conducted in Lahore reported that there is a significant difference in learning style preferences among male and female medical students.[2,15]

Our statistical data showed that the students in the sample who were 21 years old, most of them preferred the kinesthetic learning style (37 out of 60 students), whereas a review study, which explored learning styles across the globe, showed that age factor has no relationship with learning styles.[17] It included postgraduate and undergraduate medical students, while our study was conducted among undergraduate students. A survey conducted among Brazilian undergraduate dentistry students using the Felder & Soloman Index (ILS) as the learning style inventory also had similar findings with regard to age and gender.[18]

A study conducted at Central Park Medical College, Lahore, and another study conducted in Iran found that the learning preferences of the students and their academic years are strongly associated.[15,19] In our study, we also found that students in the preclinical and clinical stages had significantly different learning styles. A study suggested that the preclinical curriculum involves theoretical instructional strategies majorly, while clinical students are likely to have a learning style involving the psychomotor domain.[20] According to the statistical data collected from WMC undergraduate medical students, we found that both pre-clinical and clinical students preferred the kinesthetic learning style which is an active form of learning.

A study conducted by researchers at Shiraz Medical University, Iran, highlighted the fact that it is crucial to understand the major determinants influencing the choice of medical speciality in order to develop evidence-based legislation, as itis an intricate phenomenon that can impact the effectiveness of healthcare systems. The study identified that certain personal determinants like demographics and educational factors such as learning experiences affect the choice of speciality among medical students. It also emphasized that the effect of these factors may be further explored [21] In our research, we explored the effects of different learning styles on the choice of speciality among undergraduate medical students of Wah Medical College and identified that there isno association betweenthem. On the contrary a study conducted in a Canadian medical university concluded that the residents who use kinesthetic learning style are more inclined towards learning the surgical skills.[22] Our study was a single-center study, and a non-random sampling technique was used. These factors limit the generalizability of our results. On the other hand, this study gave us an overview of the learning styles used by the students of WMC. Our study is an attempt to create awareness about personalized education, and our findings will contribute to enhancing the teaching-learning process. For medical students, it will raise awareness that they can have certain learning styles and can choose appropriate study materials to improve their learning experience. For teachers, it will let them know that knowing students' preferences can allow them to design varied teaching methods and they need to start addressing different learning styles as it promotes inclusivity in the classroom.

**CONCLUSION:**

Our study concluded that the most preferred learning style among medical students is kinesthetic, and the majority of them use quad-modal learning. It is also concluded that there is a significant difference in learning styles adopted by students in the pre-clinical and clinical years of medical school. Since our findings are consistent with the national literature, we recommend that active learning strategies should be included in the medical curriculum by incorporating hands-on activities, interactive workshops and activities involving more rigorous practice of clinical skills. Due to multimodal learning preferences, teaching should be done using a variety of learning resources, including visual aids, auditory materials, and kinesthetic tools. Most importantly, faculty development should be carried out in the institutions in order to train medical educators to adapt teaching methods for kinesthetic learners. Tailoring educational approaches to students' learning preferences can enhance their understanding and retention of medical concepts. Policy makers should prioritize flexibility and inclusivity in medical education.

**Authors Contribution:**
**Saleh Ahmed:** Conception; manuscript design and drafting
**Khola Waheed Khan:** Data analysis; Manuscript Editing.
**Shezadi Sabah Imran:** Critical analysis and manuscript review
**Musarat Ramzan:** Critical analysis and manuscript review
**Syeda Robina Mushtaq Rizvi:** Data analysis; Manuscript Editing
**Hurmat Saeed:** Data analysis; Manuscript Editing

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