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Research Article

**ASSESSMENT OF LEARNING STYLES OF UNDERGRADUATE
MEDICAL STUDENTS USING VARK QUESTIONNAIRE AND
THE INFLUENCE OF SEX AND ACADEMIC PERFORMANCE**¹Dr. Muhammad Taha, ¹Dr. Gulfishan, ²Dr. Hira Khalid¹DHQ Teaching Hospital, Gujranwala²Jinnah Hospital, Lahore.**Abstract:**

Background: Learning styles of students, the visual, aural, read/write, and kinesthetic questionnaire is a simple, freely available, easy to administer tool that encourages students to describe their behavior in a manner they can identify with and accept. Teachers can use this knowledge to facilitate student learning. Moreover, students themselves can use this knowledge to change their learning habits. In medical education, the emphasis on covering a fixed syllabus in a limited time period with the delivered lectures provided little scope for assessment of learning styles and modification of teaching styles.

Aim: The aim is to assess the learning styles of undergraduate medical students and the effect of preferred style on sex and academic performance of student.

Study Area: Questions of different types regarding the topic were asked from the 4th year students of Gujranwala Medical College.

Data Collection: Questionnaire based on 32 questions was given to 65 students of Gujranwala Medical College for the assessment and collection of results. Moreover, discussions were also carried out with students on learning styles and their influence on academic performance.

Results: Topic discussion and questionnaire response rate is 100%. 93% students were in favor of using different learning techniques definitely effect the academic achievement of student. 88% result shows that medical students use more than one learning style to perform academically well. 60% results show that male and female both perform well irrelevant of adopted learning style.

Conclusions: Our results show that majority of the medical students preferred quad-modal learning technique followed by unimodal, then bimodal and in last tri-modal. Aural mode of VARK learning style score high as compared to others. Furthermore, there is no correlation between sex and preferred learning style. Both male and female perform academically well regardless of VARK style.

Keywords: VARK questionnaire, Learning styles, Modality, Undergraduate medical students, Academic performance.

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INTRODUCTION:

VARK is an acronym that refers to the four types of learning styles: Visual, Auditory, Reading/Writing and Kinesthetic. The VARK model acknowledges that students have different approaches to how they process information, referred to as "Preferred Learning Modes". The purpose is to facilitate learning and to encourage the learners to learn more effectively. The learning style is an individual's consistent way of perceiving, processing and retaining new information.

The term "Learning Styles" speaks to the understanding that every student learns differently. Technically, an individual's learning style refers to the preferential way in which the student absorbs, processes, comprehends and retains information. For example, when learning how to build a clock, some students understand the process by following verbal instructions, while others have to physically manipulate the clock themselves. Individual learning styles depend on cognitive, emotional and environmental factors, as well as one's prior experience. In other words: everyone's different. It is important for educators to understand the differences in their students' learning styles, so that they can implement best practice strategies into their daily activities, curriculum and assessments. A learner who favors visual information will more easily learn information presented in graphs, pictures, and overheads, whereas an auditory learner prefers lectures, reading out loud, and discussing ideas. Kinesthetic learners prefer learning by doing and will learn how to solve problems not by watching or listening to the solution, but by doing it themselves.

VARK questionnaire is a simple, freely available, easy to administer tool that encourages students to describe their behavior in a manner they can identify with and accept. Medical students gain information using different learning techniques. Some prefer unimodal strategy others give preference to multimode technique. The study of learning style preferences among this student population using the VARK questionnaire and determining the influence of sex and academic performance is likely to add on to our knowledge of these factors that potentially influence learning style. So this research is basically about the assessment of different learning techniques, adopted by the medical students using VARK modes to perform academically well.

OBJECTIVE

Our aim is to assess the different learning styles of Undergraduate Medical Students using VARK Questionnaire and its influence on:

1. Academic Performance of Students.

2. Gender

3. LITERATURE REVIEW

The learning style preference benefits the students as it would help them in formulating the appropriate learning strategies for enhancing their learning. Most of the previous studies which have been done in the medical arena on the learning styles have been conducted in other countries and the results have shown variations, may be due to the use of different teaching methodologies at the pre-medical level.

In 1996, a cross-sectional study was conducted on 100 medical students who were enrolled at SMS & R, Sharda University, India. The VARK questionnaire, version 7.1 was used to categorize the learning preferences/modes as visual, auditory, read and write and kinesthetic. The students were also asked to rank preferred VARK mode of learning. The majority (61%) of the students had multimodal VARK preferences. Among them, 41%, 14% and 6% preferred the bimodal, tri-modal and the quad-modal ways of information presentation. 39% of the respondents had unimodal learning preference. The most common unimodal preference was kinesthetic, followed by visual, auditory and read and write. Furthermore there is no influence of preferred VARK style on gender.

Similarly in 2000, Five hundred undergraduate students belonging to two consecutive batches in fourth year of undergraduate medical training from Kasturba Medical College in Mangalore were invited to participate in the exercise. 415 students (83%) were administered a printed form of the VARK questionnaire. Besides the questionnaire, we also collected demographic data, academic performance data and self-perceived learning style preferences. The majority of students in our study had multiple learning preferences (68.7%). The predominant modality of learning was aural (45.5%) and kinesthetic (33.1%). The learning style preference was not influenced by either sex or academic performance.

Previous researches shows that medical students adopt different learning styles to make them academically strong and competitive. They adopt different VARK modes to perform well. Discussions carried out in medical college among medical students conclude with the results that all four modes of VARK are of equal importance. It also depends on the mental capability of a student, how he wants to study. Learning style preference would affect the academic career of medical students.

MATERIALS AND METHODOLOGY:

1. **Study Design:** Cross Sectional descriptive study.

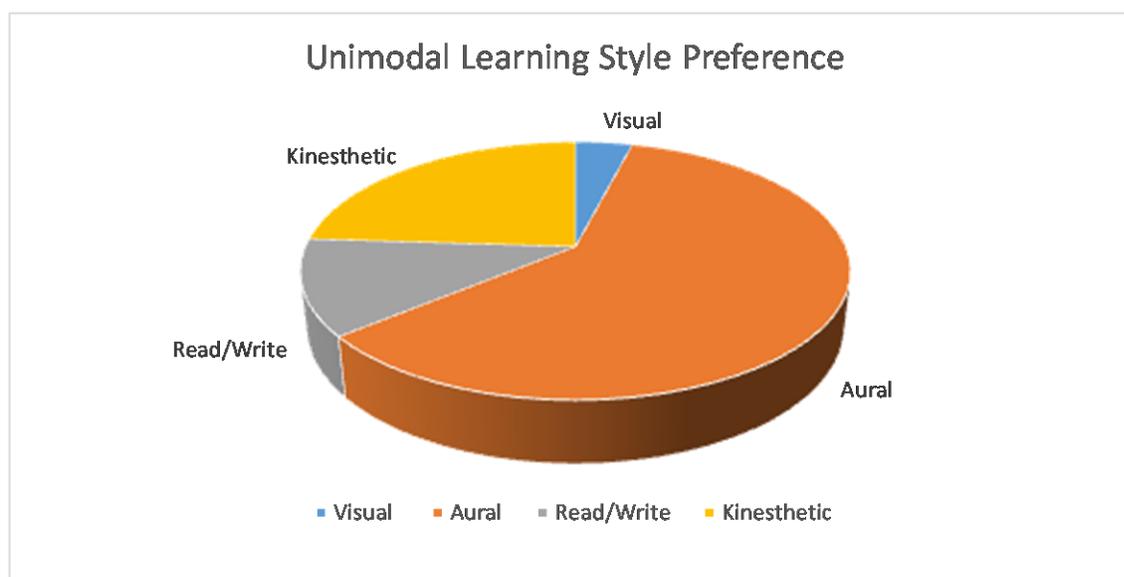
2. **Study Area:** Gujranwala Medical College and other Medical Colleges.
3. **Study Duration:** 2 Months
4. **Inclusion Criteria:** 4th Year Students of Gujranwala Medical College
5. **Exclusion Criteria:** Students of 1st, 2nd, 3rd and Final year of GMC, Students of other Medical Colleges and Non-medical students too.

Research is performed in Gujranwala Medical College keeping in touch with 65 undergraduate students belonging to fourth year of medical training after having completed the physiology, biochemistry, and anatomy courses in their first year. Questionnaire comprising of 32 questions with 5 options were given to them. Besides the questionnaire, group discussions were also carried out among batch fellows. Students were asked to describe their learning styles by choosing from the following options:

DATA COLLECTION METHODS:

- a. **Visual:** Learning from graphs, charts, flow diagrams, and demos.
- b. **Aural:** Learning from speech, lectures, and discussions.
- c. **Reading / Writing:** Learning from reading and writing.
- d. **Kinesthetic:** Learning from performing an activity, touch, hear, smell, taste, and sight.

Questionnaires were evaluated, discussions were concluded. Students were asked to return the questionnaire with their preferred VARK style and other details.



SAMPLING:

1. **Sample Size:** Includes 65 medical students of 4th Year of GMC.
2. **Sampling Technique:** Probability sampling
3. **Sample Selection:** Sample is selected as per demand of research

STATISTICAL ANALYSIS:

Modality preference of unimodal student's i.e. students adopted only one mode of learning from VARK modes are expressed as percentages. Similarly, VARK mode distribution among undergraduate students are also expressed as percentages irrelevant of sex. Frequency tables and pie charts between VARK style, Gender and Academic Performance are shown in results.

RESULTS:

Results are gathered from the filled questionnaire from 65 undergraduate medical students and discussion carried out with medical students from GMC. Of these 65 students, 52 (80%) were female and 13 (20%) were male students.

1. Learning Style Preference of Undergraduate Medical Students:

Out of 65 Students, only 25 (38.5%) students prefer unimodal learning style rest were in favor of using more than one learning style to perform

academically well. Out of these 25 students, 60% students prefer aural technique, 24% students use kinesthetic mode, 12% students prefer read/write style and remaining 4% students were in favor of using visual technique.

Ser	VAR K Style	Frequency (No of Students)	Percentage (%)	Cumulative Percentage (%)
1.	Visual	1	4	4
2.	Aural	15	60	64
3.	Read/Write	3	12	76
4.	Kinesthetic	6	24	100
Total		25	100	

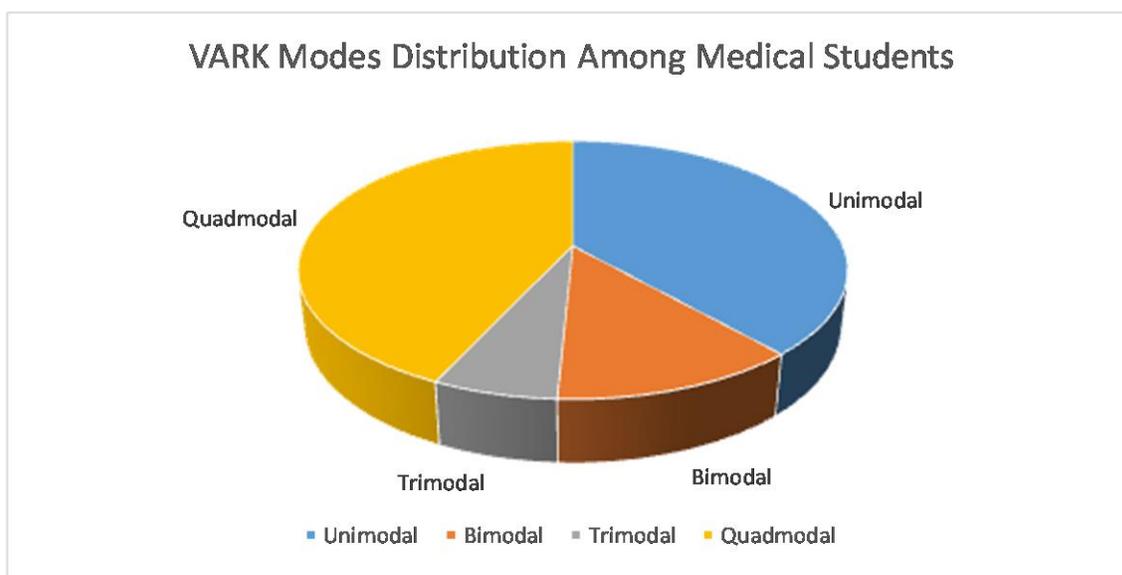


TABLE NO. 1
FIGURE NO. 1

2. VAR K Mode Distribution Among Undergraduate Medical Students:

As already mentioned, Out of 65 Students, only 25 (38.5%) students prefer unimodal learning rest were in favor of using more than one learning style to perform academically well. Among remaining 45 students, 28 students (43.1%) prefer Quad-mode learning technique, 8 (12.3%) students were bi-modal and 4 (6.2%) students were tri-modal.

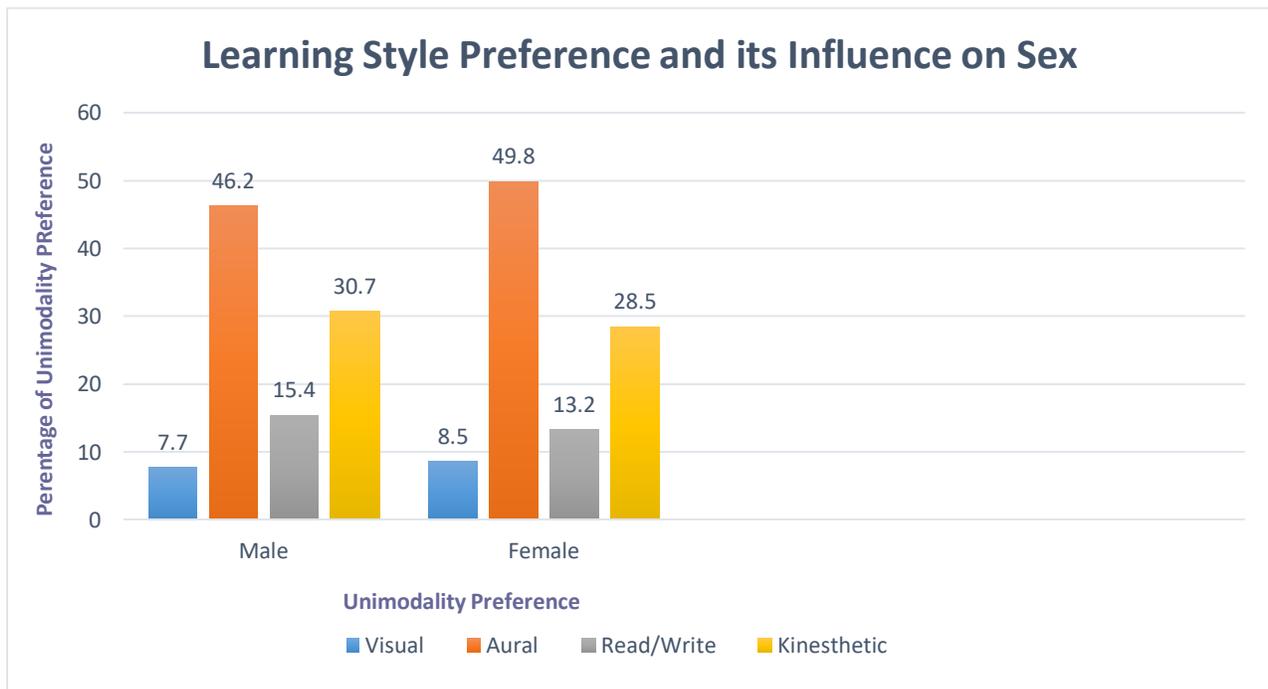
Ser	VAR K Mode	Frequency (No of Students)	Percentage (%)	Cumulative Percentage (%)
1.	Unimodal	25	38.5	38.5
2.	Bimodal	8	12.3	50.8
3.	Trimodal	4	6.2	57
4.	Quadmodal	28	43.1	100.1
Total		65	100.1	

TABLE NO. 2
FIGURE No. 2

3. Learning Style Preference and its Influence on Sex:

Modality preference among students of unimodal learning style on the basis of gender is shown in figure. Data analyzed from questionnaire as well as from discussion is shown in table. There is no significant effect of unimodal learning style on gender.

Ser	Sex	Frequency No. of Students	VARC Style	Percentage (%)	Cumulative Percentage (%)
1.	Male	13	Visual	7.7	7.7
			Aural	46.2	53.9
			Read/Write	15.4	69.3
			Kinesthetic	30.7	100
Total				100	
2.	Female	52	Visual	8.5	8.5
			Aural	49.8	58.3
			Read/Write	13.2	71.5
			Kinesthetic	28.5	100
Total				100	



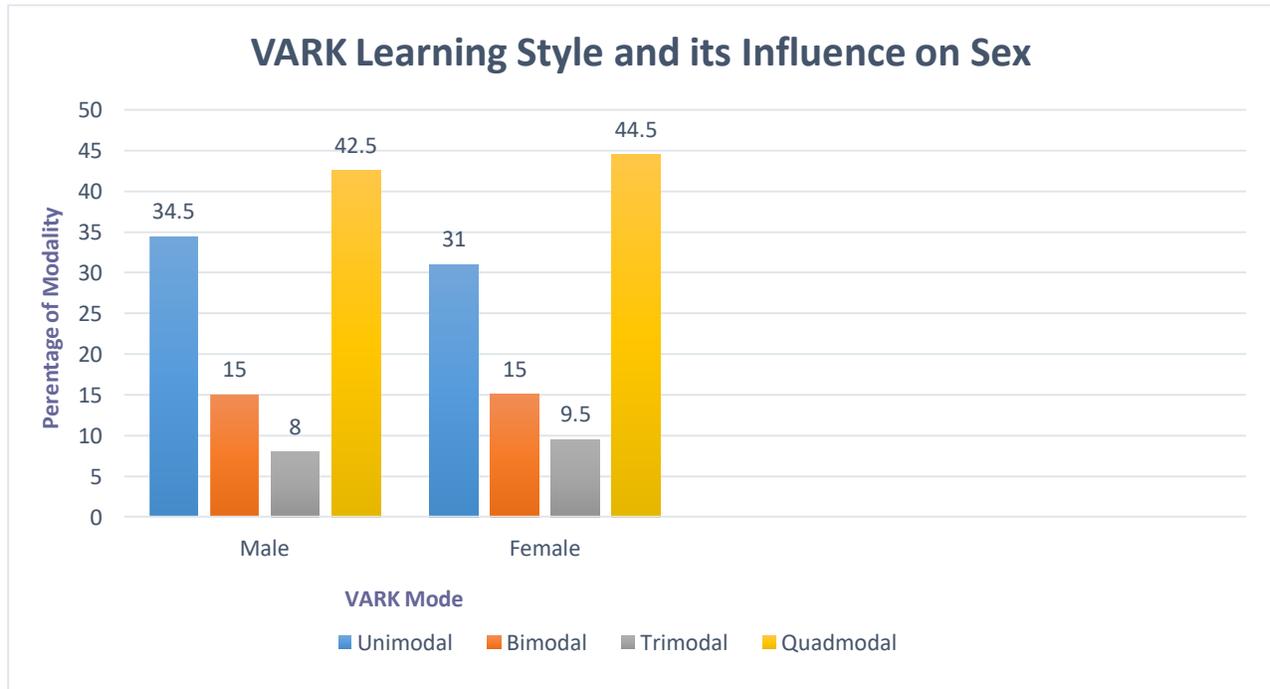


TABLE NO. 3
FIGURE No. 3

4. VARK Style and its Influence on Sex:

As per discussion and data analyzed from questionnaire, there is no significant effect of preferred VARK style on gender. In the exercise there were 13 male and 52 female students. Results are shown in table and figure.

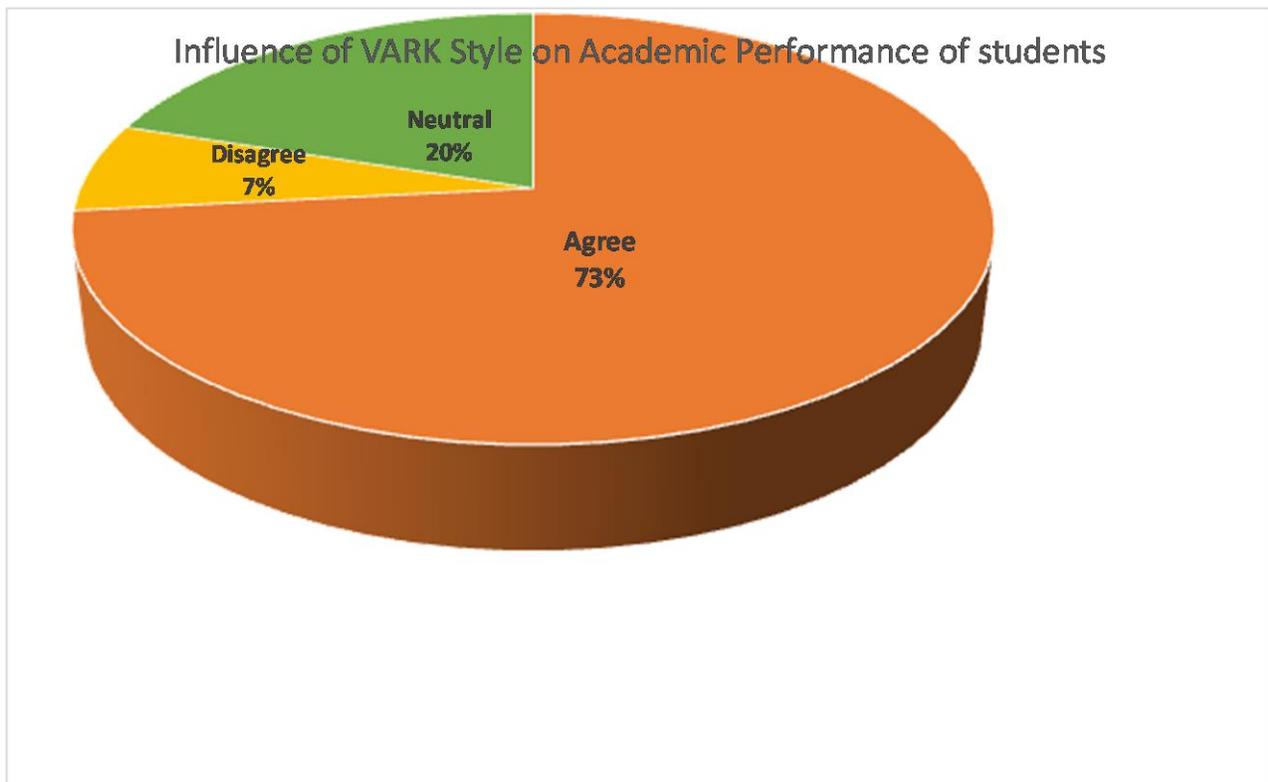
Ser	Sex	Frequency No. of Students	VARK Style	Percentage (%)	Cumulative Percentage (%)
1.	Male	13	Unimodal	34.5	34.5
			Bimodal	15	49.5
			Trimodal	8	57.5
			Quadmodal	42.5	100
Total				100	
2.	Female	52	Unimodal	31	31
			Bimodal	15	46
			Trimodal	9.5	55.5
			Quadmodal	44.5	100
Total				100	

TABLE NO. 4**FIGURE No. 4**

5. Influence of VARK Style on Academic Performance of Students :

Results show that there is a strong relation in academic performance of students and preferred VARK style. Out of 65 students, 73.4% students favors this statement. 6.7% students disagree on it and 20% student's remains neutral on this fact.

Frequency No. of Students	Influence of VARK style on Academic Performance	Percentage (%)	Cumulative Percentage (%)
65	Agree	73.4	73.4
	Disagree	6.7	80.1
	Neutral	20	100.1
Total		100.1	

TABLE NO. 5**FIGURE No. 5**

DISCUSSION:

VARK questionnaire is very versatile, freely available and easy to administer tool that encourages the student to study using different learning techniques to perform well. The educational world is acknowledging the importance of understanding the student's different learning style preferences and their role in attaining academic success. In the present study, therefore, we administered the VARK questionnaire to the fourth year medical students to determine their learning style preferences. A majority of the students (above 60%) exhibited multimodal learning style preferences, which indicated that they preferred multiple modes of information presentation. The results of previous studies which were conducted on medical students from various other countries also reported similar results. However, the percentage of students with multimodal learning style preferences in this studies varied from 40-60%. This implies that most of the students learn effectively as long as the teaching methods include a blend of activities that stimulate the visual, aural, read-write and the kinesthetic modalities. Furthermore, the increasing use of multimedia in teaching can provide opportunities for presenting multiple representations of the content (text, video, audio, images and interactive elements) to cater more effectively to the diverse learning styles of the students.

In the unimodal learning style category, we found that the most preferred mode was the aural one, followed by the Kinesthetic, the read-write and visual ones. Therefore, the active learning strategies such as role playing, simulations, use of models, debates, etc. which are preferred by the kinesthetic and aural learners would be more beneficial to the students than the traditional lecture formats.

In the present study, the percentage of the visual learners was much less as compared to those of the kinesthetic and the auditory learners. The variations in the learning preferences of the medical students from different countries could be explained on the basis of the differences in the teaching methodologies which are being used at the premedical level.

Our study used the VARK questionnaire to determine the learning preferences of undergraduate medical students and the influence of sex and academic performance on learning styles. The majority of the students in our study had multiple learning preferences. The dominant modality of learning among unimodal learners was aural (60%) followed by kinesthetic (24%). Students can understand their

own learning preferences, which can be contrary to their own perception. This helps them to actively engage in a learning environment.

Aural and Kinesthetic learning was an important component in the majority of the multimodal learners. The influence of sex on learning styles is also an important factor in overall research. Learning preference of female students starts from quad-modal followed by unimodal. Among those with unimodal preferences, both male and female students were predominantly aural (40%) and kinesthetic (30%). Hence, in our study sample, sex did not significantly influence the learning style preference. Considering the differing results from various studies, no generalizations can be made regarding the influence of sex.

Our research also assessed the influence of academic performance on VARK learning style preference. No correlation was found between the academic performance of students and their preferred VARK style.

SIMILARITIES IN RESULTS:

Data collected from previous researches shows similarities from our statistical results which are as follows:

Similarities:

All results of subject research are similar to previous studies. VARK style preference is same i.e. quad-modal then uni-modal leads to bi-modal and then tri-modal. This VARK mode preference is same in both males and females. Previous results shows that there is a strong relation in academic performance of students and preferred VARK style and in our research above 70% agreed on this statement. Similarly as per from previous research, learning style preference of students is in order of Aural, Kinesthetic, Read/Write and then Visual which exactly match our research results.

CONCLUSIONS:

Results based on discussions and filled questionnaire from the medical students and data collected from previous researches about the learning styles of undergraduate medical students in our institution we conclude that:

1. Learning style significantly influence the academic achievement of students.
2. Most of the students were multimodal learners, which is good from both a teaching as well learning perspective.

3. Aural and kinesthetic were the preferred sensory modalities of learning.
4. Neither sex nor academic performance had any relation to preferred learning style.
5. Statistical results show that medical students preferred more than one learning style to perform academically well.

RECOMMENDATIONS

1. Different learning styles should be highlighted by teachers through presentations and other media to create awareness among the students.
2. In changing learning formats, teaching strategies that could be meaningfully employed include mp3 recordings of lectures, audio recordings of power-point presentations, increased frequency of discussions and seminars, and issuing of lecture handouts.
3. Statistical results should be gathered after 4-5 months to check the academic graph of students, whether they are performing well or not.
4. By using a variety of teaching methods, teachers cater to different learning styles at once, and improve learning by challenging students to learn in different ways.
5. Students themselves should use different learning techniques to diversify the mind and enable him/her to perform well.

LIMITATIONS

Our study includes some limitations which are as follows:

1. Sample size of students should be increased to generalize the result.
2. Short study duration.
3. Results of research are gathered from GMC only. It should be gathered from 2-3 different medical colleges to create fineness in results.
4. The statistical data was based on self-reporting. This could have led to recall bias or inaccurate reporting.
5. While collecting data on self-perceived learning style preferences, students were allowed to select

multiple preferences. Hence, we were unable to determine the self-perceived dominant learning modality.

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BIO DATA & QUESTIONNAIRE➤ **BIODATA**

Name: _____

Gender: _____

Age: _____

Student of medical year: _____

➤ **QUESTIONNAIRE**

Answer the following questions by giving one option out of five options listed below:

Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree

1. Learning styles do significantly influence the academic achievement of student.
2. Are you satisfied with the learning style of Gujranwala Medical College?
3. Male and Female students have different learning styles and approaches.
4. Gradual change is effective as compared to instant change in learning technique.
5. Is this the responsibility of instructor to address the diversity of learning styles?
6. Using different learning techniques effect the academic grading of student.
7. Can learning style predict student satisfaction with different instruction methods and academic achievement in medical education?
8. Female medical students score academically well in changing learning styles.
9. Male medical students score academically well in changing learning styles.
10. First-year medical students prefer multiple learning styles.
11. Education of undergraduate medical students will be enhanced through the use of computer assisted learning.
12. Unimodal learning style significantly gives better academic response.
13. Learners having different learning style preferences would behave differently in the way they perceive, interact, and respond.
14. Changing learning techniques sharps the mind of medical student.
15. Teachers at medical school are often faced with challenges of improving student satisfaction with the learning environment.
16. Variation in learning style preferences among genders has implications on academic performance of medical students.
17. There is a strong need to improve learning style of undergraduate education to ensure that students are prepared to handle the challenges in future.
18. The VARK questionnaire provides greater understanding about information processing preferences, including a learner's ability to simultaneously use more than one learning mode.
19. The VARK questionnaire does not provide for a complete assessment of learning style, nor was it intended to.
20. VARK questionnaire is a simple, freely available, easy to administer tool that encourages students to describe their behavior in a manner they can identify with and accept.
21. All four learning styles of VARK i.e., Visual, Aural, Read/Write and Kinesthetic are of equal importance.
22. Statistical results show that medical students preferred more than one learning style to perform academically well.
23. The most common VARK mode distribution among students is quad-modal followed by unimodal then bimodal and in last tri-modal.
24. Comparison of the academic performance grade to individual modality preference did not show any correlation.
25. Kinesthetic mode of learning grade highest among other modes of learning.
26. Irrelevant of sex, mostly students prefer aural and visual modes of learning.
27. Students should have multi modes of learning which is good from both a teaching as well as learning

perspective.

28. In changing learning formats, teaching strategies that could be meaningfully employed include mp3 recordings of lectures, audio recordings of power-point presentations, increased frequency of discussions and seminars, and issuing of lecture handouts.
29. VARK questionnaire creates mind diversity in gaining knowledge through different modes and enables the student to perform well.
30. According to method of VARK, most of the female undergraduate medical students preferred more than one modality of learning.
31. There is no correlation between the academic performance of students and their preferred VARK style.
32. No doubt which VARK style is adopted by medical students, academically strong is one who study using different sources such as through E-books, internet lectures, Wikipedia and medi-net.