

STUDY OF LEARNING STYLE PREFERENCES IN STUDENTS OF DIFFERENT PHASES OF MEDICAL UNDERGRADUATE COURSE IN RELATION TO GENDER AND ACADEMIC PERFORMANCE

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ABSTRACT

Background: To become effective faculty, he should understand a learner's characteristics and their learning style. Matching students' learning styles with a learning framework has resulted in improved test scores. This study was initiated to identify the learning styles of MBBS students and explored the relationship between learning style preferences and students' gender and academic achievement.

Methods: We conducted cross-sectional study on students from the medical college studying in MBBS second, final prof (part-I) and final prof (part-II). The VARK questionnaire was used to identify the learning style preference. Based on the instructions given for the VARK inventory, scores were calculated to determine the predominant learning modality used by each individual.

Results: The students of MBBS showed multiple learning preferences (52%) only slightly more than unimodal style (48 %). None of the students showed quadrimodal learning preference. In 2nd professional students, read-write was preferred mode followed by auditory while in final prof (both part 1 & 2) kinesthetic /read-write learning style was preferred in unimodal types. Female students scored higher in all four components as compared to male students. There was no relationship between learning style preference and academic achievement.

Conclusion: This study demonstrated that many medical students at this single medical institution prefer to learn using all VARK modalities. There can be different type of learners in a single batch of medical students, so educators' awareness of various learning styles of students is a must. Identifying differences in learning styles could potentially be used in medical curriculum.

KEYWORDS: Learning style preferences, VARK questionnaire, bimodal learners, trimodal learners.

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INTRODUCTION

Due to varied amount of knowledge acquired in medical college, medical students experience a different learning educational environment than

non-medical students. Learning expectations from medical students also vary according to their level or stage of medical education. A long history of didactic lecture, ease of information

transfer, focus on covering content are probably the reasons why educators still continue to use lecture sessions as the primary mode of education. However, according to medical council of India (MCI) directives, the new curriculum is being implemented as competency based undergraduate medical education in which traditional teacher centered approach is replaced by newer learner centered approach. As its name implies, the main focus in "learner centered approach" is on students, whereas the teachers are to play the role of facilitator[1]. This learner centered adult learning is selfdirected process. Learning tools can be provided to help students become better learners and encourage them to be self-directed in their learning endeavours. However, this can be possible to a greater extent, only if active teaching methods are used in classrooms. Active learning plays an important role in encouraging critical thinking skills like evaluation, analysis, and information interpretation, as opposed to passive learning in form of traditional lectures. Newer teaching learning techniques are being tried with a gradual shift of emphasis away from passive to active learning.

The Indian undergraduate medical curriculum leading to the MBBS degree is of 5.5 years in duration. It comprises of four stages: phase 1(MBBS first professional), phase-2(second professional), phase 3 (final professional) and internship. This medical curriculum does not have a mandatory module in identifying learning styles of medical students which is very important for motivating selflearning and active learning. To become effective teachers, teaching staff should understand a learner's characteristics and their learning style. Keefe defined a learning style as "the composite of cognitive, affective and physiological characteristics that serve as relatively stable indicators of how a learner perceives, interacts and responds to learning environment." [2].

Students have different learning style preferences due to difference in cognitive processing. When students' learning styles and instructors' teaching styles are aligned, it results in students improving their understanding of the course content. 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.

There are various theories of learning and learning styles that have been proposed. Kolb's learning inventory, Gardner's multiple intelligence theory were developed to explain different learning styles. Some other comprises of Felder-Silverman learning and teaching styles model, Dunn & Dunn model and VARK questionnaire [3,4].

VAR K questionnaire is one of the inventory tools used to assess learning styles, developed by Dr. Neil D. Fleming [5]. VARK questionnaire is a simple, freely available, easy to administer instructional preference tool. The VARK questionnaire provides greater understanding about information processing preferences, including a learner's ability to use more than one learning modes simultaneously. The acronym VARK stands for four major sensory modes of learning: Visual, Aural, Read/write, and Kinesthetic sensory modalities. Visual (V) preference includes the depiction of information in charts, graphs, flow charts, tables, and other pictorials used in lectures PPT with or without animation etc. Auditory (A) mode describes a preference for information that is "heard or spoken." Learners who have this as their main preference report that they learn best from lectures, group discussion, audio, using mobile phones, speaking or discussing cases. Read/write (R) preference is for information displayed as words or text. Kinesthetic (K) modality refers to the "perceptual preference related to the use of experience and practice in lab/clinical skill development". There are seldom instances where one mode is used, or is sufficient; that is why, the VARK questionnaire provides four scores (four-parts profile) and also why there are mixtures of those four modes.

There have been many attempts to enhance students' academic achievements. Students' academic achievements can be measured using many methods, including their problem solving abilities, clinical performances in fieldwork, terminal examination and the completion of an academic course. Matching students' learning styles with a learning framework has

resulted in improved test scores, whereas a mismatch between learning styles and curriculum has led to low levels of academic achievement [6]. Data from earlier studies have shown a possible influence of sex and academic performance on learning styles. However, the results have been conflicting, with some studies suggesting a sex difference in learning style in first year undergraduates, whereas others failed to demonstrate any difference [7,8]. There are still a number of important issues that have yet to be established, including the relationship between learning styles and academic achievement. Very few studies have been conducted and have failed to uniformly demonstrate an effect of learning style preference on academic performance [9,10]. To the best of our knowledge, very few studies have been conducted in India that address the issue of sex and academic performance in students of different phases (professionals) of MBBS course with regard to learning style preference. Since there are minimal published data on learning styles among undergraduates in medical colleges in northern part of India, we decided to undertake this project to identify the learning styles of MBBS students in one of the medical colleges in northern India.

This study was initiated to investigate the relationship between academic achievement and learning style preferences of medical students of different professionals. The study also explored the relationship between learning style preferences and students' gender and tried to find if there was any change in preference with advancement of level of education (i.e. different phases or professionals).

MATERIALS AND METHODS

We conducted this cross-sectional study on students from the medical college who were studying in their second, final prof (part-I) and final prof (part-II). This study was undertaken following approval of Institutional Ethics Committee. Students did not receive any incentive for participation. Informed consent in writing was obtained from students before the VARK questionnaire could be administered. The student's participation was voluntary, and the

study findings would only be used for research purposes.

Printed version of the questionnaire was given to students. Prior permission for using VARK questionnaire was taken through e-mail from Dr. Neil D. Fleming, who holds the copyright for it. The study and its purpose were explained to the students. The participants were asked to fill in their roll numbers, age, gender, and board of studies in a separate form of demographic profile. They were briefed about the meaning of VARK learning modalities to help them identify which modality they thought they used.

The VARK questionnaire consists of 16 questions with 4 choices for each, corresponding to a specific sensory modality preference. The modality that received the highest marks was the preferred sensory modality. The questions describe circumstances of everyday occurrence; thereby connecting to a person's learning experience. Students were instructed to choose the option that best explained their preference and circle the letter(s) next to it. They could choose more than one choice or leave vacant any question that they perceived as being not pertinent to them. Questionnaires were assessed based on previously validated scoring instructions and a chart. The entire exercise was completed in 30 min, after which the students returned the completed questionnaire with demographic data.

The answers marked by the students were then scored as V, A, R or K based on the key given in the VARK guide. Based on the instructions given for the VARK inventory, scores were calculated to determine the predominant learning modality used by each individual. Students were classified as unimodal or multimodal learners depending on whether they predominantly used a single learning modality (V, A, R, or K) or a combination of these (VA, RK, VAR, VARK, etc.). Those who used a combination of two learning modalities (VA, AR, RK, etc.) were classified as bimodal learners. Those using three (VAR, RAK, KVR, etc.) and those using all four (VARK) were classified as trimodal learners and quadrimodal learners, respectively. Academic achievement was measured by asking students to report their mark sheets of previous university professional examination. All marks are converted into

percentage marks and only theory/written exam marks were analyzed.

RESULTS

The total 364 MBBS students of three professionals were invited to participate in the study, 300 students (83%) consented to participate and returned the VARK questionnaire with demographic and performance (last annual exam marks sheet) details. Among the participants, 176 were males (58.67%) and 124 were females (41.33%). Mean age of participants was 20.1±3.65. Respondents were from 2nd prof (n=132), final prof part-1(n=52) and final prof part 2 (n=116).The demographic distribution is shown in Table 1.

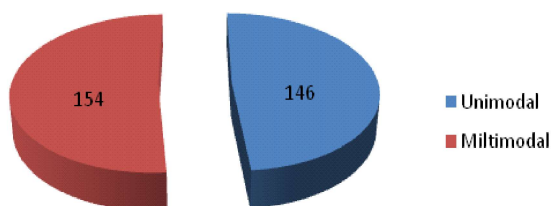
Table 1: Participants demographic distribution.

	2 nd prof (n=132)	Final prof part 1 (n=52)	Final prof part 2 (n=116)	Mean age±SD Total (n=300)
Age	17-23	19-23	20-24	(20.1±3.65)
Male	80	32	64	176
Female	52	20	52	124

Table 2: VARK learner types of students.

VARK types	2 nd prof	Final prof part 1	Final prof part 2	Total	
Visual	19	5	8	32	Unimodal 146
Auditory	23	2	3	28	
Read/Write	27	7	13	47	
Kinesthetic	17	6	16	39	
Bimodal	26	18	36	80	Multimodal 154
Trimodal	20	14	40	74	
Quadrmodal	0	0	0	0	
Total	132	52	116	300	

Fig.1:Unimodal and multimodal learning style distribution in MBBS students.



The VARK learner types of student are summarized in Table 2. Distribution of respondents in unimodal and multimodal learning styles depicted in figure 1 and figure 2. The students of MBBS showed multiple learning preferences (52%) only slightly more than unimodal style (48%). None of the students showed quadrimodal learning preference. Sensory modalities among unimodal learners are shown in Fig. 3. In 2nd professional students, read-write was preferred mode followed by auditory while in final

prof (both part 1 & 2) kinesthetic /read-write learning style was preferred in unimodal types.

Fig.2: Preference for unimodal and multimodal learning style among students of different prof.

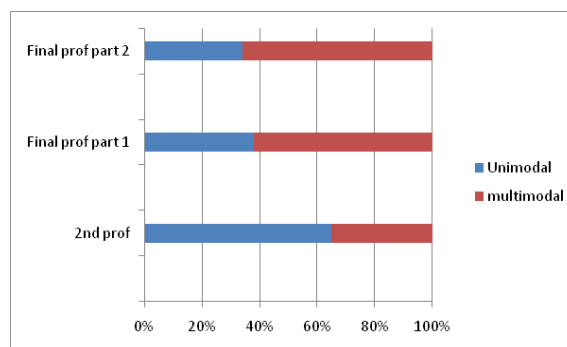


Fig.3: Learning style preferences among students with a single learning style (Unimodal)

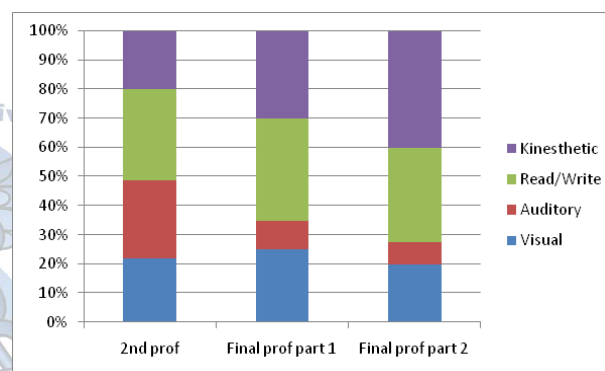
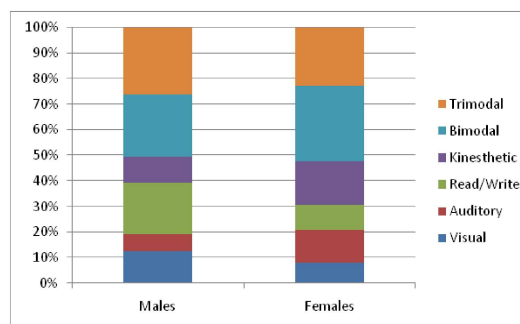


Table 3 and Fig.4 describes the learning style preferences separately for male and female students. VARK component scores in Table 4 shows the kinesthetic component had the highest mean score in both males and females.

Table 3: Gender wise distribution of VARK learner types.

VARK types	Males (n=176)	Females (n=124)
Visual	22	10
Auditory	12	16
Read/Write	35	12
Kinesthetic	18	21
Total (Unimodal)	87	59
Bimodal	43	37
Trimodal	46	28
Quadrmodal	0	0
Total (Multimodal)	89	65

Fig.4:Gender wise distribution of learning style preferences.



Taken for all students in study, female students scored higher in all four components as compared to male students (Table 4, Fig 5) while statistically significant gender difference was observed only in the mean auditory score.

Table 4: Gender differences in mean VARK component scores.

VAR K component	Male (n=176)	Female (n=124)	p
Visual	5.37±2.49	5.43±2.74	0.07
Auditory	6.37±2.52	6.88±2.71	0.01
Read/ Write	6.42±2.43	6.53±2.55	0.06
Kinesthetic	6.99±2.48	7.03±2.62	0.68

Fig.5: Gender differences in mean VARK component scores.

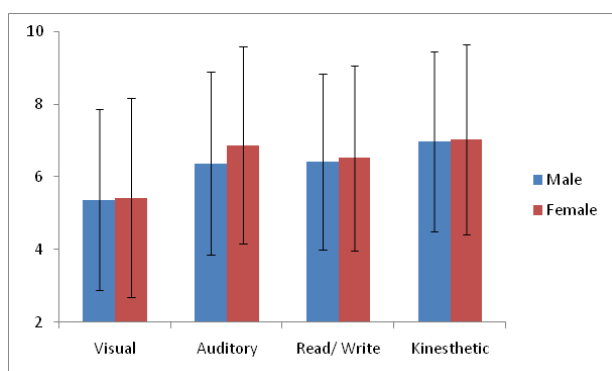
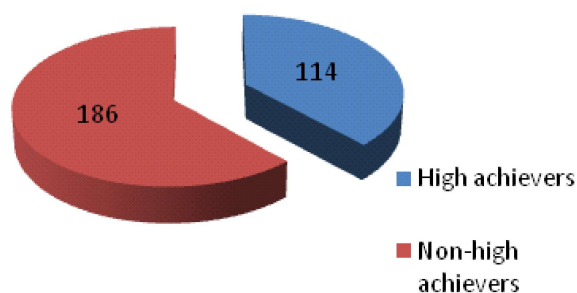


Table 5: shows mean VARK component scores among students of different years; ANOVA for the visual and read-write component was significant. Post Hoc analysis showed that these components had significantly high scores in final year (part 2) student’s cohort.

Table 5: Differences in mean VARK component scores among students of different prof.

VAR K component	2 nd prof	3 rd prof part I	3 rd prof part II	p	F
Visual	5.04±2.46	5.26±2.86	5.87±2.76	0.045	3.13
Auditory	6.62±2.51	6.54±2.75	6.98±2.71	0.067	2.73
Read/Write	6.01±2.62	6.43±2.81	6.99±2.22	0.009	4.83
Kinaesthetic	6.42±2.54	7.05±2.58	7.41±2.49	0.052	2.98

Fig.6: Number of students according to their academic achievement



Performance was analyzed by marks obtained in the last university examination and students were divided into two categories high achievers (>60 %) and low achievers (50-60 %) [Fig 6].

Table 6 shows that there was no significant difference in mean VARK component scores between high achievers and low achievers.

Table 6: Differences in the mean VARK component scores between high achievers and non-high achievers.

VAR K subscale	High achievers (38%)	Non-high achievers (62%)	P value
Visual	5.42±2.25	5.37±2.69	0.64
Auditory	6.64±2.52	6.58±2.68	0.42
Read/Write	6.59±2.46	6.52±2.38	0.38
Kinesthetic	6.94±2.31	7.06±2.56	0.58

DISCUSSION

In the current study, we used the VARK questionnaire to ascertain the differences in learning preferences among medical undergraduate students in various phases (professionals). Also, the preferred learning styles were related to gender and academic performance at the medical college. In the study most of students preferred to learn using all VARK modalities. The students in our study showed multiple learning preferences (52%), only slightly more than unimodal style (48 %). Using the research algorithm, we did not find any students who preferred the quadrimodal learning style.

Sensory modalities among unimodal learners showed that 2nd professional students preferred read-write mode followed by auditory while in final prof (both part 1 & 2) kinesthetic/read-write learning style was preferred. The results of the current study regarding dominant learning style were consistent with other studies. In a study conducted by Baykan and Nacar[10] on first year medical students to assess their learning styles by using VARK questionnaire, they states that 36.1% students preferred unimodal style and 63.9% preferred multimodal styles. Another study done by Samarakoon et al. [11] showed that the majority (69.9%) of first year medical students had multimodal learning styles, unimodal being only in 30.1%. Among the unimodal learners, the most of them were auditory learners (50%). Similarly, Nuzhat et al. [8] reported that the auditory mode was the most preferred learning style among the medical

students from Saudi Arabia. Lujan and DiCarlo, [12] reported that the most preferred learning style of first year medical students was Read/Write among the students from Indiana, USA. In our study, the second year students have just completed their first year of medical curriculum and now exposed to clinical teaching, till that they have been taught in lectures and departments of pre clinical subjects only. So they are just equal to first year undergraduates. They have dominant read/write mode followed by auditory mode. This may be due to the teacher-centered and lecture-based (listening) approach traditionally used in teaching.

The students of final year in our study have kinaesthetic mode as the dominant one. This goes in line with one of the study conducted by Stirling BV, [13] which reports that faculty were using teaching methods like kinaesthetic and visual as students' preferred the two learning styles as one of their most preferred method of learning.

One of the main findings of our study was that learning styles had similar trends both in male and female students; both sexes preferred to learn using all VARK modalities. The female students scored higher in all four components as compared to male students while statistically significant gender difference was observed only in the mean auditory score. This is in line with a study conducted by Naqvi A. & Naqvi F. [14] who reported non-significant difference of learning style and gender in all groups. However, Alkhasawneh et al [9] did not find any differences between gender and learning styles. On the other hand, the study conducted by Wehrwein EA, [15] states that both male and female students have significantly different learning styles.

Mean VARK component scores among students of different years for the visual and read-write component was significant and post Hoc analysis showed that these component had significantly high scores in final year (part 2) student's cohort.

Another important finding in our study is that there was no relationship between learning style preference and academic achievement. Academic performance was analyzed and students were divided into two categories. There

were no statistically significant differences in the mean VARK component scores according to academic achievement. This finding is not surprising as a study conducted in India [16] among undergraduate medical students found no statistical association between learning style preferences and academic performance based on grades. Gurpinar et al [17] also did not find a difference in the academic achievements of students in their first year of medicine when they were compared based on learning styles. Although some studies have reported the relationship between academic performance and the learning style preferences, a different instrument was used and this may not be comparable to the VARK questionnaire [18, 19].

When split into their respective terms, the majority still preferred more than one sensory modality for learning; however there was significant difference in the modal preferences among different terms of students on statistical analysis. These findings point to a fact that not every batch of students learns the same way and the teachers would have to alter their approach after assessing the learning preferences of students in every batch. In order to enhance learning experience of students, more visual learning tools like line diagrams, cycles, flow charts and mind maps would have to be included. The same applies to other sensory modalities as well; hence a teacher would have to make an effort to broaden his or her teaching methods to benefit as many students as possible in the class. Additionally, students can be assigned tasks and assignments that allow them to utilize their learning modalities in best possible manner. Multimodal learning might help to some extent to better some of the deficiencies in teaching.

Since there is no significance association between academic performance and the mode of learning, there is a scope to perform study on large group of students to understand the association between mode of learning and the academic performance.

This study has some limitations. First, the sample was from a single institution and may be biased and not representative of the population of medical students in India. A larger study from multiple locations is needed. Second, we

used a cross-sectional method as a study design, which is not ideal for determining relationships between variables.

CONCLUSION

In conclusion, this study demonstrated that many medical students at this single medical institution prefer to learn using all VARK modalities. The present study aimed to address the diversity of learning styles amongst medical students. From our study, we understand, there can be different type of learners in a single batch of medical students, so educators' awareness of various learning styles of students is a must. Identifying differences in learning styles could potentially be used in medical curriculum. Since there seems to be no single best teaching-learning strategy that can work for every student, it is the responsibility of the instructors to address this diversity of learning styles among students and develop appropriate learning approaches.

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