

## GENDER INFLUENCE ON LEARNING STYLES OF UNDERGRADUATE MEDICAL STUDENTS

Dr Shete Anjali N<sup>1\*</sup>, Dr K D Garkal<sup>2</sup>, Dr Nidhi Yadav<sup>3</sup>, Dr. Rahul Salwe<sup>4</sup>, Dr. Beulah Rainer<sup>5</sup>

1. Associate professor, 3. Assistant professor, 4, 5. Senior resident, Department of Physiology, Government Medical College, Aurangabad 2. Registrar, MUHS, Nashik, Maharashtra.

\*Email id of corresponding author- [dranju01@yahoo.com](mailto:dranju01@yahoo.com)

Received: 20/07/2016

Revised: 29/08/2016

Accepted: 03/09/2016

### ABSTRACT

**Aim:** Students differ in the types of instruction to which they respond best (learning style preferences), the ways they approach their studies and their attitudes about the nature of knowledge and their role in constructing it—that is, their levels of intellectual development. Many factors have been found to influence students' learning styles, including gender, age, and academic achievement. The aim of the study was to assess the gender influence on the learning styles of medical students. **METHOD:** VARK questionnaire was given to 381 undergraduate medical students. The distributions of VARK preferences were calculated, and the learning style of each student was determined. Descriptive statistics were used to describe the variables. The chi-square test was used to compare the gender influence on learning style preferences. **RESULT:** Of the 381 students 200 were females and 181 were males. More than half of the students exhibited a multiple learning preference (67%); of those, 20 percent, 33 percent, and 47 percent were bi-modal, tri-modal, and quad-modal, respectively. Remaining 33% students had a single learning preference. The unimodal preference showed statistically significant difference between male and female students whereas there was no statistically significant difference in multimodal learning style preferences. **CONCLUSION:** More than half of medical students who participated in this study were found to have multimodal learning preferences. The most common single learning preference was Kinesthetic (K) followed by Aural (A). The unimodal learning style showed statistically significant difference in male and female students whereas no such difference was seen in multimodal style.

**KEY WORDS:** Learning style, VARK Questionnaire, Medical students, Gender influence.

### INTRODUCTION:

In the past three decades, the proposition that students learn and study in different ways has emerged as a prominent pedagogical issue.(1) Students differ in the types of instruction to which they respond best (learning style preferences), the ways they approach their

studies (orientations to studying and approaches to learning), and their attitudes about the nature of knowledge and their role in constructing it—that is, their levels of intellectual development.(2) A learning style describes a process or preference and is considered an umbrella term covering a spectrum of modalities,

preferences, and strategies.(3) James and Gardner defined learning preferences as the manner in which, and the conditions under which, learners most efficiently and effectively perceive, process, store, and recall what they are attempting to learn.(4) Learning preference is considered a component of the wider concept of personality.(1)One learning style is neither preferable nor inferior to another but is simply different, with different characteristic strengths and weaknesses.(2)

In the pedagogical triangle of teacher, students, and study subjects, the learning style approach trained professionals to focus on how their students learn or fail to learn. Knowledge of learning styles can be used to increase the self-awareness of students and tutors about their strengths and weaknesses as learners.(5) It has been proposed that the ability to typify students' learning styles can augment the educational experience.6Students with knowledge of their own learning preferences are empowered to use various techniques to enhance their learning, which, in turn, may impact their overall educational satisfaction.(6) Moreover, the logic of lifelong learning suggests that students will become more motivated to learn by knowing more about their own strengths and weaknesses as learners. In turn, if teachers can respond to each individual's strengths and weaknesses, then retention and achievement rates in formal programs are likely to rise and "learning to learn" skills may provide a foundation for lifelong learning. (5)

Various models have been developed to explain the different learning styles. These models can be grouped into four general categories: personality models, information-processing models, social-interaction models, and instructional preferences models. (7)

Among the instruments/inventories in the category of instructional preferences is the Visual, Aural, Read-write, and Kinesthetic (VARK) questionnaire developed by New Zealand educator Neil Fleming.(1,8) VARK is a short, simple questionnaire designed to help students learn more effectively and to help faculty members become more sensitive to the diversity of teaching strategies necessary to reach all students.(9)

The VARK instrument defines the learning preference based on the sensory modality in which a student prefers to take in new information. The three major sensory modalities are visual (V), aural (A), and kinesthetic (K), which are collectively known as VAK. Fleming expanded this classification system to VARK to include read-write (R, a mixed sensory modality that is not assessed under VAK). (10)Visual learners prefer the use of diagrams, flow charts, hierarchies, models, and arrows that represent printed information. Auditory learners prefer "heard" information and thus enjoy discussions, lectures, and tutorials when acquiring new information. Read-write learners prefer printed words and texts as a means of information intake; they also prefer lists, glossaries, textbooks, lecture notes, or handouts.(11) Finally, kinesthetic learners internalize information best when they are involved physically (e.g., touching and manipulating materials).(12) They prefer simulations of real practices and experiences, field trips, exhibits, samples, photographs, case studies, real-life examples, role playing, and applications to help them understand principles and advanced concepts.(11) Students may have one or multiple learning preferences.

The VARK questionnaire is not intended to box respondents into a mindset that they have been diagnosed or labelled. Rather, it is designed to

initiate discussions about, and reflections upon, learning preferences.(9)Ensuuing discussions about the questionnaire results may help create a sense of self-awareness for the student as to how he or she learns best and the motivation to seek out the best methods to improve learning performance.(13)Many factors have been found to influence students' learning styles, including gender, age, academic achievement, brain processing, culture, and creative thinking.(14) A number of studies have examined the influence of gender .Gender-based preference in learning style is one area in which males and females are unique.(15)In terms of gender, many of the studies have compared sensory modality preferences in women and men. Two of those studies (16, 17) found no significant difference in preferences between men and women, whereas one (18) did report a difference. It is important to point out that the sex differences described by Wehrwein et al. (18), while distinct, were descriptive in nature and were not supported by a statistical analysis. However, there have been very few studies in India on learning style preferences of medical students and whether these preferences are influenced by such factors as gender. Therefore, the aim of this study was to investigate the learning style preferences of undergraduate medical students by using the VARK questionnaire and to determine the association between learning style preferences and gender of students.

## METHOD

This descriptive cross-sectional study was conducted at the Government medical college, Aurangabad, India. A total of 381 undergraduate medical students (200 females and 181 males) participated in the study. The study was approved by the Institutional Ethical committee. The participating students were fully aware of the purpose of the study as it was explained in

the cover letter, and they were told that the information given would be used for research purposes only.

The English version (version 7) of the VARK questionnaire was used; it is available for free download at the VARK website (19) with instructions for analysis and suggestions for improving the learning experiences of students according to their learning style preference. The questionnaire consisted of sixteen multiple-choice questions, each with four options. Each question aims to place the respondents in a "learning situation."(11) The questionnaire uses observations of behaviours: concrete incidents that respondents can recall or imagine and identify with. In that sense, the VARK is indicative rather than diagnostic, and it focuses on only one of many elements of a learning style. (20) The VARK instrument was selected because it is concise and quick to complete and it provides useful information for students about their learning preferences. (13)Satisfactory levels of reliability and validity of the VARK have been reported using factor analysis techniques. (21)

The questionnaire was distributed to all students. The students were asked to complete the questionnaire and return it to the investigator. Instructions for answering the questionnaire were provided to the students. Each questionnaire was given a serial number that can be saved by the student for future reference and discussion about his or her learning style.

After data collection, the distributions of VARK preferences were calculated, and the learning style of each student was determined using the stepping-stone method explained on the VARK website. (19)Descriptive statistics (mean, standard deviation, and proportions) were used to describe the quantitative and categorical

variables. The Pearson chi-square test was used to compare the distribution of learning style preferences between the male and female students. The analysis was carried out using SPSS version 16. A p-value of  $<0.05$  was considered statistically significant.

## RESULTS

The response rate was 95% (381/400). Of the students (52.5%) were females (200/381) and (47.5%) were males (181/381). More than half of the students exhibited a multiple learning preference (67%); of those, 20 percent, 33 percent, and 47 percent were bi-modal, tri-modal, and quad-modal, respectively. Among students who had a single learning preference, (33%) the Kinesthetic learning style was found to be the most prevalent (44 percent), followed by Aural (31 percent). Read-write and visual learning styles were the least prevalent single mode with 18 percent and 7 percent respectively. (Table 1) Among the students who exhibited a bi-modal learning style, K/A (kinesthetic/aural) was the dominant preference combination. The majority of the male students had a single or quad-modal learning preference, whereas the female students had a quad-modal learning preference. (Graph 1 and Graph 2) The unimodal preference showed statistically significant difference between male and female students whereas there was no statistically significant difference between male and female learning style preferences. (Table 2).

## DISCUSSION:

It is important for medical educators to recognize that students have different learning styles. This recognition will help them to learn more about their students, reflect on the effectiveness of their methods of instruction, and consider accommodating a variety of learning preference

modalities. All of this knowledge will help them to develop more effective curricular approaches. **(13)**

In this study, multimodal learning preferences were found to be dominant among undergraduate medical students, which indicate that most of them preferred to learn by more than one mode of information presentation. Multimodal learning preferences are considered typical of adult learners. **(13)** This finding is in agreement with other studies on undergraduate **(13)** and postgraduate **(10)** dental students that have used VARK as learning style inventory. The multimodal learning style was found to be the dominant learning preference as well among undergraduate medical, nursing, and midwifery students. **(14, 18, 22, 23)**

Among the students participating in this study, kinesthetic preferences (44 percent) followed by (31percent) aural preferences were the most prevalent single learning preferences. The same preferences were also found to be dominant (10.5 percent for each) among postgraduate dental students. **(10)** Additionally, aural (11.6 percent) and kinesthetic (8.1 percent) preferences were found to be the two dominant single learning preferences among Saudi undergraduate medical students. **(14)** By contrast, Murphy et al. **(13)** reported that read-write (20.1 percent) and visual (14.5 percent) were the two dominant single learning preferences among predoctoral U.S. dental students.

Among the male and female students who participated in our study, there were some differences in learning style preferences; however, these differences were not statistically significant. The majority of male students preferred a single mode of learning, while more female students preferred multimodal (quad-modal) learning. Similarly, in other studies,

gender differences were found to be not significant among dental,(13) medical,(11) and midwifery students.(23) In contrast, significant gender differences were found among physiology undergraduates, where the majority of male students preferred a multimodal (VARK) learning style whereas the majority of female students preferred a single-mode of learning.(16) The medical college involves multiple subjects in basic sciences and introductory courses, some of which are theoretical with limited practical/ psychomotor skills; the student's approach to study may be different for different subjects. The methods of information delivery are varied according to the level and subjects being taught, ranging from lectures to group discussions, laboratory, and clinical demonstration as well as project assignments.

Medical students are adult learners who come into professional school with different styles of learning acquired through many years of study. (24)The first year in medical school can be overwhelming for many students due to the large amount of information and multiple subjects taught in both medical courses. A better understanding of learning styles by the faculty can help reduce the students' level of frustration and improve instructional delivery methods.(13) Furthermore, when students' awareness level of their preferred learning modality is raised, it can improve students' learning outcomes(22)and help them to actively cope with the academic demands of medical school.

According to Marcy, (25) a simple intervention such as administering a learning style inventory early in the students' didactic phase of education can lead to improved learning. It has been suggested that the faculty members who are consciously aware of their students' learning styles as well as their own are in a position to make more informed choices in course materials,

design, and learning processes that broaden the opportunities for effective learning in their courses. (1) It is helpful also for educators to know their teaching styles in order to examine and improve their teaching methodologies. This knowledge provides a guide to create more positive and effective learning environments for all students. It has been recommended that educators should use cooperative active teaching/learning methods as a vehicle to achieve the goal of training dentists to be critical thinkers, problem-solvers, lifelong learners, and skilful in peer- and self-evaluation and to help them acquire skills that support professional development.(26)

In this study, the students were informed that the learning preference results provided were a method for self-knowledge and were not intended to limit or label them to a certain mode of learning. VARK results can provide a vehicle for self-knowledge and help to explore opportunities for making the educational experience both more productive and enjoyable for students and faculty members. (13) According to Fleming and Baume, (3) knowing one's learning style can be beneficial if learners take the next step and consider how and when they learn as part of a reflective, metacognitive process, with action to follow. It is the beginning of a dialogue, not a measure of personality. However, Stellwagen (27) warned against misapplication of learning style inventories that may lead to stereotyping and prejudicial labelling of individuals. It may obscure the understanding that learning style evolves over one's life and one's academic/professional career. (13) Learning preferences, like other individual characteristics, should be viewed as a continuum.

Do students learn best if they use their preferred mode of learning? Some researchers have suggested that the student's strongly preferred

mode may not always be the best way to learn, depending on particular circumstances. Students may need to adapt to learning modalities differing from their preferences because of real-life environmental constraints. Some students may undergo a shift in learning preferences as the learning environment changes from lecture hall to preclinical laboratory to patient clinic. (13) The most effective learners are able to adapt to the style that the learning situation requires. Teachers can help them develop strategies for adapting to differing situations, especially when learning styles do not fit the task. (28) Grasha suggests that some faculty members introduce different modes of instructional delivery to acknowledge the diversity of the learners that they teach. (29) If teachers use a variety of teaching methods and styles, then learners are exposed to familiar and unfamiliar ways of learning that provide comfort and tension during the process, ultimately giving the learners multiple ways to excel. (28)

Limitations of the current study must be acknowledged, which is a convenience sample of students with different gender distribution from a single academic institution. Therefore, the sample might not represent the population of medical students across India. In future studies, larger sample sizes from multiple institutions are recommended. In addition, longitudinal studies are needed to track and compare learning preferences among medical students throughout their years in medical college.

## CONCLUSION

More than half (67 percent) of medical students who participated in this study were found to have multimodal learning preferences. The most common single learning preference was Kinesthetic (K) followed by Aural (A). The majority of male students had single or quad-

modal learning preferences, whereas more than half of the female students had a quad-modal learning preference. The results of this study can provide useful information for improving the quality of the teaching and learning experiences of medical students in their years in the medical college. For effective instruction, medical educators need to broaden their range of presentation styles to help create more positive and effective learning environments for all students. I would like to conclude with saying

*“Teach me my most difficult concepts in my preferred style.  
Let me explore my easiest concepts in a different style.  
Just don’t teach me all the time in your preferred style,  
and think I’m not capable of learning.”*

## REFERENCES

1. Hawk TF, Shah AJ. Using learning style instruments to enhance student learning. *Decis Sci J Innovat Educ* 2007; 5:1-19.
2. Felder RM, Brent R. Understanding student differences. *J Eng Educ* 2005; 94(1):57-72.
3. Fleming ND, Baume D. Learning styles again: VARKing up the right tree! *Educ Develop* 2006; 7(4):4-7.
4. James WB, Gardner DL. Learning styles: implications for distance learning. *New Dir Adult Contin Educ* 1995; 67:19-32.
5. Coffield F, Moseley D, Hall E, Ecclestone K. Learning styles and pedagogy in post-16 learning: a systematic and critical review. *Learn Skills Res Centre* 2004;1-205.
6. Romanelli F, Bird E, Ryan M. Learning styles: a review of theory, application, and best practices. *Am J Pharmaceut Educ* 2009; 73:1-5?
7. Claxton SC, Murrell PH. Learning styles: implications for improving education practices. ASHE-ERIC higher education report 4. Washington, DC: Association for the Study of Higher Education, 1987.

8. Fleming ND, Mills C. Not another inventory, rather a catalyst for reflection. *To Improve Academy* 1992; 11:137- 55.
9. MERLOT (Multimedia Educational Resource for Learning and Online Teaching): the active learning site with VARK learning styles inventory. At: [www.merlot.org/merlot/viewCompositeReview.htm?id=145206](http://www.merlot.org/merlot/viewCompositeReview.htm?id=145206). Accessed: January 30, 2012.
10. El Tantawi M. Factors affecting postgraduate dental students' performance in a biostatistics and research design course. *J Dent Educ* 2009;73(5):614-23.
11. Baykan Z, Nacar M. Learning styles of first-year medical students attending Erciyes University in Kayseri, Turkey. *AdvPhysiolEduc* 2007;31:158-60.
12. Dobson J. A comparison between learning style preferences and sex, status, and course performance. *AdvPhysiolEduc* 2010;34:197-204.
13. Murphy RJ, Gray SA, Straja SR, Bogert MC. Students' learning preferences and teaching implications. *J Dent Educ* 2004;68(8):859-66.
14. Nuzhat A, Salem R, Quadri M, Al-Hamdan N. Learning style preferences of medical students: a single-institute experience from Saudi Arabia. *Int J Med Educ* 2011; 2: 70-3.
15. Wehrwein E, Lujan H, DiCarlo S. Gender differences in learning style preferences among undergraduate physiology students. *Adv Physiol Educ* 2007; 31:153-7.
16. Alkhasawneh IM, Mrayyan MT, Docherty C, Alashram S, Yousef HY. Problem-based learning (PBL): assessing students' learning preferences using VARK. *Nurse Ed Today* 28: 572–579, 2008
17. Slater JA, Lujan HL, DiCarlo SE. Does gender influence learning style preferences of first-year medical students? *Adv Physiol Educ* 31: 336–342, 2007
18. Wehrwein EA, Lujan HL, DiCarlo SE. Gender differences in learning style preferences among undergraduate physiology students. *Adv Physiol Educ* 31: 153–157, 2007.
19. Fleming ND. VARK: a guide to learning styles. At: <http://vark-learn.com/english/page.asp?p=advice>. Accessed: December 20, 2011.
20. Fleming ND. The nature of preference. At: <http://vark-learn.com/english/page.asp?p=articles>. Accessed: December 23, 2011.
21. Leite W, Svinicki M, Shi Y. Attempted validation of the scores of the VARK: learning styles inventory with multitrait-multimethod confirmatory factor analysis models. *Educ Psychol Meas* 2010;70(2):323-39.
22. Lujan H, DiCarlo S. First-year medical students prefer multiple learning styles. *AdvPhysiol Educ* 2006;30(1): 13-6.
23. Zeraati A, Hajian H, Shojaian R. Learning styles of medical and midwifery students in Mashhad University of Medical Sciences. *J Med Educ* 2008;12(1,2):17-22.
24. Fang A. Utilization of learning styles in dental curriculum development. *N Y State Dent J* 2002;68(8):34-8.
25. Marcy V. Adult learning styles: how the VARK learning style inventory can be used to improve student learning— perspective on physician assistant education. *J AssocPhys Assist Prog* 2001;12(2):1-5.
26. Allers N. Teaching physiology to dental students: matching teaching and learning styles in a South African dental school. *J Dent Educ* 2010;74(9):986-92.
27. Stellwagen J. A challenge to the learning style advocates. *Clearing House* 2001;74(5):265-9.
28. Vaughn L, Baker R. Teaching in the medical setting: balancing teaching styles, learning styles, and teaching methods. *Med Teach* 2001;23(6):637-9.
29. Grasha T. The naturalistic approach to learning styles. *Coll Teach* 1990; 38(3):106-14.

Table 1: VARK observations in undergraduate medical students.

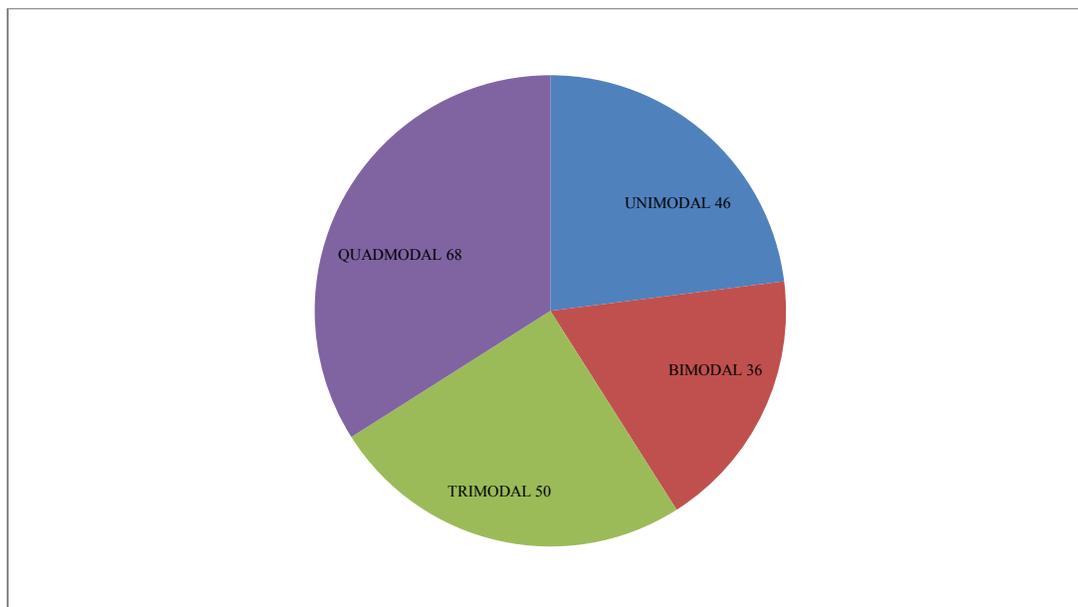
<b>UNIMODAL</b>	<b>VISUAL</b>	<b>AURAL</b>	<b>READ/WRITE</b>	<b>KINESTHETIC</b>
<b>33%</b>	7%	31%	18%	44%
<b>MULTIMODAL</b>	<b>BIMODAL</b>		<b>TRIMODAL</b>	<b>QUADMODAL</b>
<b>67%</b>	20%		33%	47%

Table 2: Gender differences of VARK

	<b>Unimodal</b>	<b>Bimodal</b>	<b>Trimodal</b>	<b>Quadmodal</b>
<b>Males (181)</b>	79 (44%)	15(15%)	35(34%)	52(51%)
<b>Females(200)</b>	46 (23%)	36 (23%)	50(33%)	68(44%)
	*** HS	NS	NS	NS

\*\*\*HS = highly significant, NS = Not significant

Graph 1: VARK IN FEMALE MEDICAL STUDENTS



Graph 2: VARK IN MALE MEDICAL STUDENTS

