

# Do Learning Styles Influenced by Gender: A Qualitative Study Among Physiology Undergraduate Medical Students

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## Abstract

**Introduction:** Current and future trends in medical learning enforce huge burden of mastering a different set of competencies among medical student. Furthermore, the important task in medical education is to provide adequate and satisfactory student learning. Thus, better awareness of learning style preferences and various factors (such as gender) influencing learning styles, can help in delivery of rewarding, satisfying and pleasant learning experience to the students.

**Aim:** The study was planned with the aim of assessing the influence of gender on learning style preferences among Undergraduate Medical Students of Physiology.

**Materials and Method:** In this cross-sectional study among 100 undergraduate medical students of physiology, Visual, Aural, Read/write and Kinesthetic (VARK) questionnaire version 7.8 was used to collect information of students' learning style preferences. Descriptive statistics were used to describe the variables. Chi-square test was performed to evaluate the influence of gender on learning style preferences.

**Results:** In the study, 82.22% Males and 68.75% females exhibited multiple sensory preferences. Furthermore only 17.77% Male, 31.25% Female, preferred a single sensory modality for receiving information. However gender differences were NOT significant.

**Conclusion:** Most students both male and female had preferences for multimodal learning style. Furthermore gender had no significant association with learning style preference.

**Keywords:** Learning styles, VARK Questionnaire,

## Introduction

Learning means in what manner human accepts, comprehend and engross, information and experiences. Besides, it also includes memorizing and processing the information and experience, and further transformation into knowledge, skills, conduct, behavior and attitude.

Education is considered as important key for person's career path and for ensuring professional advancement<sup>1</sup>. Hence learning is lifelong educational process. Present and future trends in medical learning impose huge burden of mastering a diverse set of competencies among medical student. As a consequence, medical educational approaches are becoming more challenging, complex and multifaceted<sup>2</sup>.

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Moreover, the learning environment in medical education system is gradually transforming towards student-centered learning approaches, instead of conventional teacher-centered approach<sup>3</sup>. To address this goal, teachers should understand their students' learning style preferences. The students might have

a variety of preferences in learning based on the way they perceive, interpret, understand, and conceptualize information. Learning style is defined 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<sup>4</sup>

The arena of learning style is reasonably complex. In a review above 70 different learning styles models have been recognized<sup>5</sup>. Amongst the several characteristics that make up a student's learning style, one of the important is the sensory modality preferred by students for receiving information. The neural system describes three major sensory modalities that are used for taking in information: visual (V), aural (A), and kinesthetic (K) i.e. VAK. Fleming recently added a mixed sensory modality called reading/writing (R), and extended the classification system to VARK<sup>6</sup>. Students who favor V preference learn best by observing pictures, diagrams etc. whereas student preferring A learn best by listening or talking through material with themselves or others. While, R learner utilizes printed words and texts for internalization of information<sup>7</sup>; Finally, K kinesthetic learners perform best by getting involved physically such as touching and manipulating materials<sup>8</sup>. Individual learners may prefer one or more or all of these sensory modalities of learning; Learners with a single learning style preference are referred to as unimodal, whereas others preferring more than one styles are known as multimodal. The Fleming's VARK questionnaire was selected as instrument because it is a simple inventory that has been well-received, dimensions are instinctively understood and its applications are practical and also concise and easy & quick to complete<sup>9</sup>. We administered Fleming's VARK questionnaire for assessing sensory modality preference among physiology under graduate students.<sup>10</sup>

The learning style is influenced by individual characters such as age, gender, cognitive styles, personality, intellectual ability, sensory processes, academic achievement, temperament, culture, and creative thinking.<sup>11</sup> Due emphasis in recognition of influencing variables, systematic analysis of the consequence of each of variables on the learning process and application of the results will definitely contribute in further improvement of the education system, in general and learning processes, in particular.

However, one issue that has been discussed many times in the literatures is whether gender influences

learning preferences<sup>12</sup>. Likewise in previous few years, there has been a renewed interest in studies related to gender differences among medical students. Although, to comment on gender influence many researchers conducted studies by comparing sensory modality preferences in male and female students, those studies had reported mixed findings, For instance, one<sup>12</sup> found that gender difference exists in learning style preferences among students; on the other hand two other studies<sup>13</sup><sup>14</sup> found no significant difference in preferences between men and women. The inconsistency of findings on gender influence in learning style suggests that additional studies are necessary in this zone of research.

In line with such needs, this study was planned with the aim, to identify whether gender difference could influence the learning style preferences among first year medical student of rural medical college in India. Results of the study would be helpful for planning and executing teaching strategies, matched according to learning styles preferred by our medical students, male and female. Thus addressing the learning needs in proper fashion suited to them will maximize enthusiasm, motivation and learning for students of both genders.

## Method

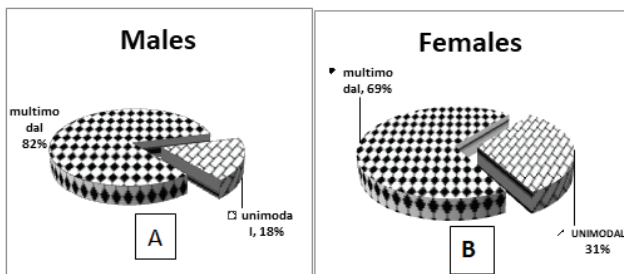
In this cross sectional comparative study, data was collected at department of physiology, JIU'S IIMSR, Warudi Maharashtra, among 100 first year medical students. Written informed consent was obtained from students.

Instrument used in this study was VARK Questionnaire Version 7 consisting of 16 questions. Each question is framed to categorize the learning style of respondents, as four perceptual preferences V, A, R and K. Among the four options respondents could select more than one option. Students choosing one option were considered unimodal while who choose two or more options were considered multimodal. Student selecting two, three and four sensory modality are called bimodal trimodal and quadmodal respectively. Satisfactory levels of reliability and validity of the VARK have been reported using factor analysis techniques<sup>15</sup>. It was informed to students that the VARK questionnaire was designed to assess learning styles preferences of students and study findings could be used for research purposes. Institutional Ethical committee had approved study.

Students' scores were calculated according to scoring system guidelines provided by VARK producers.

<sup>15</sup>The Pearson chi-square test was used to compare the distribution of learning style preferences between the male and female students, For each of the following situations, multimodality & unimodality, Quad, tri-& bimodality.

**Findings:** Among the 100 students, 93 students completed and returned the questionnaire, 48 female (F) and 45 males (M). Figure-1A&B shows 82.22%Males and 68.75% females exhibited multiple sensory preferences. Furthermore only 17.77%M, 31.25% F, preferred unimodal style. However gender differences of males and females students for multimodal or unimodal styles of information presentation was NOT significant ( $p>0.05$ ).



**Fig; 1: Distribution of Unimodality and Multimodality among Males and Female Students (Values Rounded to Nearest Whole Digit)**

Table no 1 shows the mean scores for individual VARK components. The kinesthetic learners had higher mean score of around  $6\pm 1.87$  in males and  $5.625\pm 2.742$  in female, followed by auditory learners.

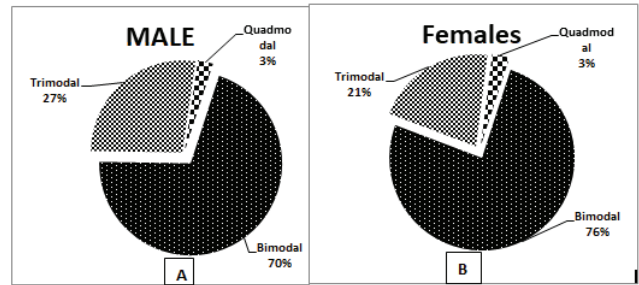
**Table 1 Descriptive statistics of VARK Scores among male and female**

GENDER	MALE		FEMALE	
	mean	SD	MEAN	SD
VISUAL	2.4	1.42	2.72	1.73
AUDITORY	5.133	1.98	4.791	2.414
READ/WRITE	2.4	1.57	2.917	1.976
KINESTHETIC	6	1.87	5.625	2.742

SD; standard deviation

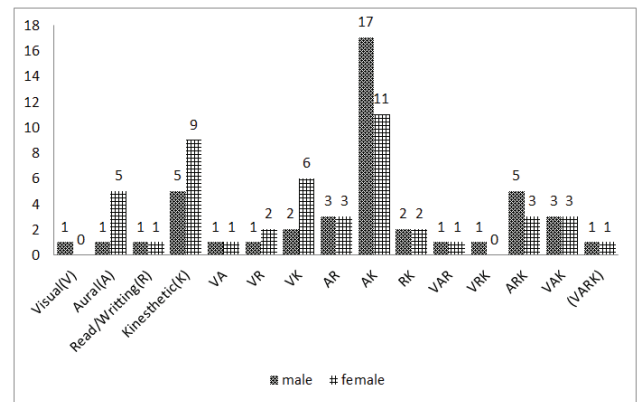
Figure-2A and B shows the percentage of male and female students' preferring two, three or four modes of learning styles (multimodal). Some students preferred two modes bimodal, (70.27% male vs75.75% females). Some students preferred three modes, trimodal (27.02% male vs21.21% female), and some preferred four modes quadmodal (2.7% male vs3.03% female). Furthermore, gender differences in the percentage of males and female

students who preferred bi-, tri-, or quadmodal styles of information presentation is not significant. ( $p>0.05$ )



**Figure 2: General multi-modal learning preferences among male and female students**

Figure-3 shows the detail distribution unimodal & multimodal learning style preferences among male and female students respectively. Most common preferred bimodal combination of modes was AK both in males and females (37.77% male vs22.91% female). Some students preferred AR combination (6.66% male vs6.25% female) and some students preferred VK combination (4.44% male vs12.5% female). Among trimodal learners, some preferred the combination modes, A, R, and K (11.11% male vs6.25% female) some preferred V, A and R (2.22% male vs2.08% female). Although none of these differences reached statistical significance, ( $p>0.05$ )



**Figure-3: Specific unimodal & multimodal preferences among male and female students**

Table no 2 shows individual percentage of different learning styles. It is observed that Kinesthetic learning style was found to be the most prevalent whether it was unimodal choice or contained within one of the multimodal combination such as AK, VK, VAK, VR, VRK or VARK, followed by Aural. Read-write and visual learning styles were the least prevalent single mode.

**Table 2: Gender differences of VARK**

Learning Styles	Male	Female	
Visual (V)	2.22%	0	NS
Aural (A)	2.22%	10.41%	NS
Read/Writing (R)	2.22%	2.08%	NS
Kinesthetic (K)	11.11%	18.75%	NS
VA	2.22%	2.08%	NS
VR	2.22%	4.16%	NS
VK	4.4%	12.5%	NS
AR	6.6%	6.25%	NS
AK	37.77%	22.91%	NS
RK	4.44%	4.16%	NS
VAR	2.22%	2.08%	NS
VRK	2.22%	0%	NS
ARK	11.11%	6.25%	NS
VAK	6.66%	6.25%	NS
(VARK)	2.22%	2.083%	NS

NS = Not significant

## Discussion

This study was undertaken with the purpose of assessment of gender differences in learning style preferences among undergraduate physiology students of medical college. All the responses are tailed properly and it was found in our study that, there were some differences in learning style preferences among the male and female students; however, these differences were not statistically significant.

Notably *both males and females preferred multimodal learning*; thus 82% males 69% of females had preferred multiple modes of presentation. Consequently as compared to females, the majority of males were multimodal learner. Boys may perhaps adjust to variety of teaching styles offered to them in a single day. Otherwise according to the information to be learnt, they may switch over to alternative learning styles on and off<sup>6</sup>. For instance, being visual learner for physiology of blood, and reading/writing type learner in muscle physiology, and auditory learner for gastrointestinal physiology. This preference for multimodal learning is in agreement with studies of first-year medical<sup>7 16</sup> and dental students<sup>17</sup>. As well, in these studies, gender differences were found to be not significant among dental<sup>17</sup>, medical students<sup>7</sup>. Similar result was found in study done by Shete et al<sup>18</sup> reporting that more than three fourth males and females were multimodal learner in medical undergraduates. Other study of undergraduate

physiology students by Raghuveter et al<sup>19</sup> multimodality was the choice of most of male and female students and gender influence found to be significant among students. 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.<sup>13</sup>

On comparing single mode of information males prefers 17.77%, and female 31.25%. Thus, when compared with males, the females preferred information to be presented in a single mode. Among the students participating in this study, kinesthetic preferences followed by aural preferences were the most prevalent single learning preferences both in males and female students. Our finding is comparable to the findings of study by Nuzhat et al<sup>11</sup> in Saudi undergraduate medical students; kinesthetic and aural preferences were found to be the two dominant single learning preferences among them. Similarly Shete et al<sup>17</sup> reported the kinesthetic and aural preferences were common in medical undergraduate student of India. Likewise the kinesthetic and aural preferences were also reported to be dominant among postgraduate dental students in the study by Tantawi et al.<sup>20</sup> But Murphy et al<sup>17</sup> found, read-write and visual styles as dominant single learning preferences among predoctoral U. S. dental students, which is in contrast to our study.

The results clearly state that both males and females predominantly preferred combination of auditory and kinesthetic sensory mode making AK as most common bimodal learning style; males being 37.77% and female 22.99%. Thus both genders preferred receiving information, arriving to the learner's ear by speech (auditory) "I learn from what I heard", as well as kinesthetic mode thus preferring to "learning by doing"

The findings of the our study can be beneficial for medical educator to generate a favorable and pleasant learning environment for medical students by integrating appropriate teaching strategies while designing and planning the courses. Instructors can also utilize VARK outcomes from every single class to become aware of the preferences and distribution of learning modes among the students and to adjust and fine-tune their technique of information delivery to resemble with these preferences. These adjustments would definitely advantageous to our learners both male and female. Furthermore it would be helpful for educators too in designing effective teaching

that will influence students learning through different modalities.

However, knowledge of students learning style must not be the only factor utilized for their effective learning practices<sup>21</sup> Nevertheless, in undergraduate courses, delivering the information through the method matching students' learning style preferences, resulted in higher achievement among students than when mismatched<sup>22</sup>. Awareness into the specific preferences of individual classes would help instructors tailor both their presentations and Method of assessment for each individual class. In addition, the present study suggests that males may have a broader range of learning preferences than females. It is essential for Instructors to be familiar of these differences and accordingly widen their range of presentation and teaching strategies and also must introduce active learning approaches. With active learning strategies, visual learners are reached by observing models, illustration, photographs and demonstrations. Auditory learners are directed through discussion, during peer instruction<sup>23</sup>and debate. Read and write type learners should be addressed through interactions with textual materials. Kinesthetic and tactile learners are fulfilled by handling models and role playing.<sup>24</sup>

**Study limitations:** The limitations of this study are small sample size, and designing this study only in the pre-clinical subject of the medical course. Further studies with larger sample size may support to detect whether any significant differences in this zone exist. The findings of the study should be generalized with caution in other settings in the region and worldwide.

### Conclusion

Identifying students' learning styles is undoubtedly, essential from pedagogical point of view. This study has revealed that, learning style preferences among the undergraduate physiology students are not sensitive to gender difference. Furthermore, the study found that both male and female physiology students have a strong preference for kinesthetic learning style, either single or in combination with other sensory modes. Undergraduate physiology students are multimodal learners.

**Conflict of Interest:** none

**Source of Funding:** self

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