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Research article

LEARNING STYLES OF FIRST YEAR MEDICAL STUDENTS STUDYING PHYSIOLOGY IN TAMIL NADU

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ABSTRACT

Background: Understanding the diversity of learning style preferences of first year medical students will help teachers of Physiology design teaching-learning activities that while catering to their preferences also challenge them to grow in categories that are against their preferences. Most research using the VARK (Visual, Aural, Read-write, Kinesthetic) questionnaire that assesses sensory modality preference alone showed that medical students studying Physiology were multimodal. **Aim:** The aim of this study was to determine the learning styles of first year medical students studying Physiology in India using the Index of Learning Styles (ILS) and to compare the learning styles of males and females. **Methods and Material**: The Index of Learning Styles (ILS) questionnaire was administered to 150 first year medical students studying Physiology in a private medical college in India as it assesses learning style preferences on four dimensions - active/reflective, sensing/intuitive, visual/verbal and sequential/global. **Results**: The majority of first year medical students were fairly well balanced in the sequential/global dimension (80.66%), active/reflective dimension (68%) and sensory/intuitive dimension (62%) of the ILS. However, in the visual/verbal dimension, the majority of students were visual learners (72.66%). There were no significant differences in the learning style preferences of males and females. **Conclusion:** The majority of our students were visual learners and were well balanced in the other dimensions, with there being no significant gender wise difference in learning styles. With this knowledge and findings about different dimensions of learning styles, other than sensory modality preference alone, effective teaching-learning activities can be developed.

Keywords: Index of Learning Styles, Learning styles, Medical students, Physiology

INTRODUCTION

Students differ in their learning styles, their approaches to learning and levels of intellectual development.[1] At present, the whole of human Physiology is being taught to medical students in India along with other basic science subjects in a period of one year, - their first year in Medical

College, when they are as it is struggling with making the transition from school to college. Teachers of Physiology have to be aware that their teaching strategy's effectiveness will vary with different types of students as Physiology is by nature a difficult subject.[2]

Elsewhere, many researchers have used Flemming's VARK (Visual, Aural, Read/Write, Kinesthetic) questionnaire[3] to investigate the learning style preferences of students of different courses studying Physiology.[2] Students are categorized into "visual, auditory, read/write and kinesthetic learners" on the basis of the sensory modality used to assimilate information.[3] Most researchers found that the majority of their Physiology students preferred to use at least 2 - 4 sensory modalities while learning, ie., they were multimodal,[4-6] while one study found that the majority (54%) were unimodal.[7] Some studies showed no significant differences in the VARK learning preferences of male and female students learning Physiology,[6,8] while one study showed that the majority of females (54%) were unimodal even though the majority of males were multimodal.[9]

Physiologists in India too have used the VARK or VAK (Visual, Aural, Kinesthetic) questionnaires to determine their students' learning styles. Out of 92 medical students in one study in Gujarat, 58.69% were multimodal.[10] In a study done on 430 first and second year medical students in four medical colleges in Tamil Nadu and Puducherry, it was found that 70.7% students were multimodal.[11] In another study done in Kota, Rajasthan, 92.98% of males and 76.27% of females preferred multimodal learning.[12] However, researchers who determined the learning styles of 199 medical students in Kolar, Karnataka, found that 62.31 % were unimodal in their first year and only 47.73% were unimodal in their final year.[13]

In view of these varied findings, it was decided to study the learning style preferences of first year medical students studying Physiology in India. However, the VARK questionnaire, though widely used by Physiologists, is basically a sensory modality preference assessment that focuses only on which sensory modality is used to internalize information when studying.[14] Given the complexity of professional courses in general and Physiology in particular, and knowing that learning is more complex, it was felt that a learning style questionnaire that took into consideration aspects like how students process information, what type of information they preferentially perceive, how they progress towards understanding, and not merely their sensory modality preference alone should be used. The Index of Learning styles[15] (ILS) is a questionnaire that assesses learning preferences on four dimensions – "active/reflective, sensing/intuitive, visual/verbal and sequential/global"[15] and is based on a learning style model formulated by Richard M Felder and Linda K Silverman[16] that takes the above aspects into consideration. Although initially designed for engineering students, it has subsequently been used by different higher education students and its reliability and validity have been proven for medical students.[17,18] Extensive research[16] and reviews of studies[1] on the learning styles of engineering students using the Index of Learning styles (ILS) revealed that most engineering students are active, sensing and visual with most creative students being global. A study on veterinary students showed that they were predominantly active, sensing, visual and sequential.[19] Orthodontic residents were found to be highly visual learners who preferred sensing and sequential learning styles.[20] First year osteopathic medical students who were active, intuitive, global and/or visual were found to be more likely to use online learning material.[21]

The present study was therefore undertaken to assess the learning styles of first year medical students studying Physiology in India using the Index of Learning Styles. Another aim of the study was to compare the learning styles of male and female first year medical students. It was felt that this information would help teachers of Physiology effectively design their teaching-learning activities, especially in the present

scenario in India where many curricular reforms are being proposed, with a growing emphasis on student centered teaching-learning methods.

METHODS

The study was conducted in the Department of Physiology of a private medical college in South India. 150 first year medical students participated in the study after obtaining due permission and written informed consent. There were 57 male students and 93 female students. The Index of Learning Styles (ILS) questionnaire[15], which is a 44 item instrument based on Richard M Felder and Linda K Silverman's learning style model[1] was administered to the 150 students to assess their preferences on four dimensions – "active/reflective, sensing/intuitive, visual/verbal and sequential/global."[15] In the ILS, there are 11 items (Eg: "I tend to understand something better after I"[15]) for each dimension (Eg: active/reflective). Each item has two forced choices (Eg: 'a'- "try it out"[15]; 'b'- "think it through"[15]) corresponding to each category of that dimension (Eg: 'a' corresponds to active and 'b' to reflective). All 150 students completed the questionnaire and scoring was done according to the instructions of the ILS.[15] For each dimension, the number of 'a' and 'b' responses were totalled and the smaller was subtracted from the larger (Eg: If there were 7 'a' and 4 'b' responses, then subtraction would result in 3 'a'). By convention, if the score was 1-3 it implies the student is fairly well balanced on that dimension, while scores of 5-7 and 9-11 signify moderate or strong preferences respectively for that category on the scale. [15] The percentage of first year medical students having a strong / moderate preference for each category of the four dimensions of the ILS and the percentage who were fairly well balanced were obtained. Gender wise analysis was also done. SPSS and Z-test for two proportions were used.

RESULTS

The majority of first year medical students were fairly well balanced in the sequential/global dimension (80.66%), active/reflective dimension (68%) and sensory/intuitive dimension (62%) of the Index of Learning Styles (ILS). However, in the visual/verbal dimension, it was found that the majority of students were visual learners (72.66%), with only 26.66 % being fairly well balanced and only one student among the 150 students (0.6%) being a verbal learner (Table 1).

Comparison of the strength of learning style preferences of male and female first year medical students in all four dimensions of the ILS revealed that there was no significant difference (Table2).

Table 1 – Strength of learning style preferences of first year medical students.

1. Active/Reflective			2. Sensing/Intuitive			3. Visual/Verbal			4. Sequential/Global		
Moderate - Strong Active	Well balanced	Moderate - Strong Reflective	Moderate - Strong Sensing	Well balanced	Moderate - Strong Intuitive	Moderate - Strong Visual	Well balanced	Moderate - Strong Verbal	Moderate - Strong Sequential	Well balanced	Moderate - Strong Global
31(20.66)	102(68)	17(11.33)	45(30)	93(62)	12(8)	109(72.66)	40(26.66)	1(0.6)	24(16)	121(80.66)	5(3.33)

Strength of learning style preferences expressed as the number of students (n=150) and percentage of students (in brackets) who had moderate - strong preference for each category and who were well balanced on each of the four dimensions of the Index of Learning Styles.[15]

Table 2: Comparison of the strength of learning style preferences of male and female first year medical students.

Dimen-sions	1. Active/Reflective			2. Sensing/Intuitive			3. Visual/Verbal			4. Sequential/Global		
	Moderate - Strong Active	Well balanced	Moderate - Strong Reflective	Moderate - Strong Sensing	Well balanced	Moderate - Strong Intuitive	Moderate - Strong Visual	Well balanced	Moderate - Strong Verbal	Moderate - Strong Sequential	Well balanced	Moderate - Strong Global
Males	9(15.78)	40(70.17)	8(14.03)	18(31.57)	36(63.15)	3(5.26)	40(70.17)	16(28.07)	1(1.75)	8(14.03)	48(84.21)	1(1.75)
Females	22(28.65)	62(66.66)	9(9.67)	27(29.03)	57(61.29)	9(9.67)	69(74.19)	24(25.80)	0(0)	16(17.20)	73(78.49)	4(4.30)
Z- score	-1.16	0.45	0.81	0.33	0.23	-0.97	-0.54	0.30	1.28	-0.51	0.86	-0.84
p value	0.25	0.65	0.41	0.74	0.82	0.33	0.59	0.76	0.20	0.61	0.39	0.40

Strength of learning style preferences of male and female students expressed as the number of male (n = 57) and female (n=93) students and percentage of male and female students (in brackets) who had moderate - strong preference for each category and who were well balanced on each of the four dimensions of the Index of Learning Styles.[15] Z- scores calculated using Z- test for two proportions, p value of <0.05 taken as significant.

DISCUSSION

This study was done to determine the learning styles of first year medical students studying Physiology in India using the Index of Learning Styles (ILS) [15] and to compare the learning styles of male and female first year medical students. While most studies on the learning styles of first year medical students studying Physiology have been done using the VARK/VAK questionnaire, we have used the Index of Learning Styles. Although strictly not comparable, our findings about the learning styles of first year medical students differed from the studies that used the ILS on engineering students,[1,16] veterinary students,[19] orthodontic residents[20] and osteopathic online learners[21] as the majority of our students were fairly well balanced in three of the four dimensions of ILS - the sequential/global dimension; active/reflective dimension and sensory/intuitive dimension. However, the finding that the majority of our students were visual learners is in agreement with the findings of other studies using the ILS [1,16,19,20,21]. The implications are discussed for each dimension separately.

Visual/Verbal dimension:

This dimension deals with the sensory channel through which information is processed.[1] Visual information consists of diagrams, plots, animations, etc. Verbal information not only includes spoken words but also written words as cognitive scientists have proven that the brain converts written words into their spoken equivalents and then processes them like spoken words.[15] In Indian medical colleges following a didactic curriculum like the present one, teaching is verbal as lectures and visual representations of auditory information (in the form of words

written in PowerPoint slides, overhead projector transparencies or on black boards) are predominantly used. Since the majority of our students are visual learners, potential for a learning/teaching style mismatch exists. However, if teachers of Physiology are aware that most of their students are visual learners and include many pictures, sketches, flow charts, graphs, animations, videos and even live demonstrations in their teaching-learning activities, this can be avoided.

Unlike the VARK/VAK questionnaire used by other researchers, Felder and Solomon have only two categories - visual and verbal, in this dimension of the ILS. As kinesthetic learning involves both information perception and processing, it has been included in the active/reflective learning style dimension under the active category[16]. The findings of our study, therefore differ from other studies using the VARK/VAK questionnaire that showed that the majority of students were multimodal and preferred two or more modalities [4,5,6,10,11,12] since ours showed that the majority prefer only one modality - visual. A study done to determine the learning styles of first year medical students in Turkey using the VARK questionnaire found a higher percentage of multimodality (63.9%) than other studies, with only 7.7% of students being auditory learners.[22]

Sequential/Global dimension:

This dimension categorizes students based on how they progress towards understanding - in a step by step manner (sequential) or in large jumps, holistically (global).[1] The majority of first year medical students in our study were fairly well balanced (80.66%) or had moderate or strong preferences for sequential learning (16%). As most formal learning favors sequential learners[16], the students of our study too would not possibly have much difficulty. Topics in Physiology are presented to them in an orderly, logical manner, starting from the simple and progressing to the complex. For the sake of the 3.33% of global learners, teachers should strive to present the big picture of any teaching-learning activity first, before presenting details and should encourage creativity. However, it is important to realize that we are not analyzing individual learning styles to teach each student according to their preference. Rather, as suggested by Felder and Brent, a good teacher would adopt a balanced style, at times matching their student's preferences, but at other times going against their preferences, thus forcing them to grow and develop the abilities of both learners.[1] In this case, they should eventually possess the abilities of both sequential and global learners which would be invaluable to them once they begin practicing medicine.

Active/Reflective dimension:

In our study, only 11.33% of our students were reflective and 68% were well balanced. However, 20.66% were active learners. Classification into the active/reflective category of this dimension is on the basis of how students prefer to process information.[1] Felder and Silverman who formulated the learning style model on which the ILS is based point out that this dimension of the ILS is a component of another learning style model developed by Kolb.[16] Since active learners prefer actively participating in discussions or physical activities they are unable to learn in passive situations like lectures. However, reflective learners too would not learn much during lectures unless given a chance to think about or examine the perceived information.[16] Lectures by most teachers do not give them this chance. But it is possible for teachers of Physiology to help both active and reflective learners simultaneously even during their lectures by using brainstorming or providing a few minutes for students to think about what is being taught in the lecture.

Sensing/Intuitive dimension: Although the majority of our students were fairly well balanced in the sensing/intuitive dimension, 30% of them had a moderate or strong preference for sensing. The division into sensing/intuitive learners is based on whether the student

preferentially perceives external information (sensing) or internal information (intuitive).[1] This dimension, according to Felder and Silverman themselves is based on Jung's theory of psychological types and even the Myers-Briggs Type Indicator (MBTI) measures the degree to which sensing or intuition is preferred.[16] Sensors like concrete information or facts while intuitive learners prefer abstract concepts like principles and theory. In engineering, a mismatch exists as intuitors are favoured, with concepts rather than facts being emphasized and lectures (consisting of words and symbols that intuitive learners prefer) being predominantly used, while the majority of engineering students are sensing.[1] Teaching of Physiology involves both explanations of concepts and stating of facts and to that extent, generally caters to both sensors and intuitors.

Gender wise analysis of learning style preferences: The findings of our study are in agreement with those of Slater and Meechan-Andrews[6,7] and the study on medical students in Turkey[22] as there was no significant difference in the learning styles of male and female students.

Limitations of the study: The findings of the present study are not representative of Indian medical students in different years of study, or students of Physiology of other courses or even first year medical students of other colleges in India. Also, since there is more to learning than just learning styles (for example, the learning approaches of students, their levels of intellectual development, motivation, etc.) an oversimplified approach in terms of addressing learning styles alone as a solution to all learning problems cannot be assumed.

Implications for future research: Longitudinal studies can be done to determine if there is any change in the learning styles of first year medical students with time, or even more relevantly, after implementation of the proposed curricular reforms in India. It would also be worthwhile to study the association between learning styles of first year medical students and other factors like performance in Physiology and attendance; and to analyze the learning styles of other undergraduate students studying Physiology (dental, nursing, etc.) and the learning styles of post-graduate students studying Physiology.

CONCLUSION

Our study done to assess the learning styles of first year medical students studying Physiology in India using the Index of Learning Styles (ILS), which we thought was more relevant instead of the commonly used VARK questionnaire, showed that the majority of our students were visual learners and were well balanced in the remaining three dimensions, namely the active-reflective, sensing/intuitive and sequential/global dimensions with there being no gender wise difference in learning styles. Given that the dimensions of the Index of Learning styles are components of other learning style models and classification of learners is not on the basis of the sensory modality preferences alone, the findings of our study are more informative. With the knowledge of these dimensions and the findings, teachers of Physiology can adopt balanced teaching styles to reach all their students; help them learn better using their learning style category in each of the four ILS dimensions; and challenge them to develop the abilities of the other category of learners in each dimension; instead of just focusing on sensory modality preference alone.

REFERENCES

1. Felder RM, Brent R. Understanding Student Differences. J. Engr. Education. 2005; 94(1): 57-72
2. Dobson JL. Learning style preferences and course performance in an undergraduate physiology class. Adv Physiol Educ. 2009; 33: 308-314
3. Flemming D. VARK. A Guide to Learning Styles (online) [cited 2013 Jan 6].Available

from: http://www.vark- learn.com/english/ page.asp?p_questionnaire
4. Lujan HL, DiCarlo SE. First-year medical students prefer multiple learning styles. Adv Physiol Educ. 2006; 30: 13-16
5. Murphy RJ, Gray SA, Straja SR, Bogert MC. Student learning preferences and teaching implications. J Dent Educ. 2004; 68: 859-866
6. Slater JA, Lujan HL, DiCarlo SE. Does gender influence learning style preferences of first-year medical students? Adv Physiol Educ. 2007; 31: 336-342
7. Meechan-Andrews TA. Teaching mode efficiency and learning preferences of first year nursing students. Nurse Educ Today. 2009; 29: 24-32
8. Alkhasawneh IM, Mrayyan MT, Docherty C, Alashram S, Yousef HY. Problem-based learning (PBL): assessing students' learning preferences using VARK. Nurse Educ Today. 2008; 28: 572-579
9. Wehrwein EA, Lujan HL, DiCarlo SE. Gender differences in learning style preferences among undergraduate Physiology students. Adv Physiol Educ. 2007; 31: 153-157
10. Shah C, Joshi N, Mehta HB, Gokhle PA. Learning Styles adopted by medical students. International Research Journal of Pharmacy. 2011; 2(12): 227-229
11. Anu S, Anuradha, Meena T. Assessment of Learning Style Preference among Undergraduate Medical Students – Using VAK Assessment tool. International Journal of Medical and Clinical Research. 2012; 3 (8) 229-231
12. Choudhary R et al. Gender Differences in Learning Style Preferences of first year medical students. Pak J Physiol. 2011; 7 (2): 42- 45
13. Shenoy UG, Kutty K, Shankar VMS, Annamalai N. Changes in the Learning Style in Medical Students during their MBBS course. International Journal of Scientific and Research Publications.2012; 2(9): 1- 4
14. Dobson JL. A comparison between learning style preferences and sex, status, and course performance. Adv Physiol Educ. 2010; 34: 197-204
15. Richard M. Felder and Barbara A. Soloman, *Index of Learning Styles* [cited 2013 Jan 6]. Available from: http://www.ncsu.edu /felder-public/ILSpage.html
16. Felder RM, Silverman LK. Learning and Teaching Styles in Engineering Education. Engr. Education. 1988; 78(7): 674-81
17. Cook, David A. Reliability and validity of scores from the Index of learning styles. Academic medicine. 2005; 80(10):97-101
18. Hosford CC, Siders WA. Felder-Soloman's Index of Learning Styles: Internal consistency, temporal stability, and factor structure. Teach Learn Med. 2010; 22(4):298-03
19. Neel JA, Grindem CB. Learning style profiles of 150 veterinary medical students. J Vet Med Educ. 2010; 37(4):347-352
20. Hughes JM, Fallis DW, Peel JL, Murchison DF. Learning styles of orthodontic residents. J Dent Educ. 2009; 73(3):319-27
21. Halbert C, Kriebel R, Cuzzolino R, Coughlin P, Fresa-Dillon K. Self-assessed learning style correlates to use supplemental learning materials in an online course management system. Medical Teacher. 2011; 33:331-333
22. Baykan Z, Naçar M. Learning styles of first - year medical students attending Erciyes University in Kayseri, Turkey. Adv Physiol Educ.2007;31(2):158-160