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UNDERSTANDING LEARNING STYLES AMONG MEDICAL STUDENTS AT GOVERNMENT MEDICAL COLLEGE, VISAKHAPATNAM: A CROSS-SECTIONAL STUDY

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ABSTRACT **Background:** Understanding a student's degree of motivation and learning performance requires detection of learning styles. To accommodate these distinct student learning styles, teachers should also create a variety of learning resources in a variety of mediums. Hence this study was conducted with an objective to understand the learning styles among Medical students. **Methodology:** The study was conducted in October 2022 among 2nd and 3rd year M.B.B.S students at a medical college in Visakhapatnam. 286 out of 400 students gave their consent and responded. A Felder and Silverman Learning Style Model (FSLSM) Index of Learning Styles (ILS) questionnaire was used to identify student's learning preferences. **Results:** The mean (SD) age of the participants was 20.3± (0.91) years. The majority of the medical students was moderate-strong visual learners (76.3%) and fairly well balanced in the sequential/global dimension (71.7%), active/reflective dimension (61.5%) and sensory/intuitive dimension (61.2%) of the Index of Learning Styles (ILS). Conclusion: The findings of this study can be utilized to advise teachers to all dimensions in a balanced approach while teaching. This further helps in the improvement of the academic performance of the students.

KEYWORDS : Learning styles, motivation, and medical education, teaching.

Introduction

Learning is an acquired appropriate response to a stimulus that tends to change the environment. Different students have different learning preferences; therefore it is important for teachers to tailor their teaching to each student's learning preferences. Otherwise, students may attend class inconsistently or with little interest. Because it can be difficult to covey a lot of new information to students in a short amount of time in a way that they can understand, retain, and apply, it is vital that teachers are aware of students' learning preferences to accelerate the learning process. Students' academic success is influenced by their learning preferences therefore, it is important to research these preferences so that teachers can use them as guidelines when creating learning activities (1). More meaningful learning comes from teachers who thoroughly understand their students' learning preferences and then adjust their teaching accordingly. [2].

Many academics have used Flemming's VARK (Visual, Aural, Read/Write, Kinesthetic) questionnaire to assess the preferences of students in various courses (3). Based on the sensory modality used to take in information, students are divided into "visual, auditory, read/write, and kinesthetic learners." While one study (4) found that the majority (54%) of students were unimodal, most researchers found that the majority of their students were multimodal; they preferred to use at least two to four sensory modalities in learning. A learning style questionnaire that takes into account factors such as the way student's process information, what type of information they prefer to perceive, how they progress in comprehension, and not just their preference for sensory modalities, considered necessary and the knowledge that learning is more complex. One such questionnaire, called the Index of Learning Styles (ILS), measures learning preferences along all four dimensions: active/reflective, sensing/intuitive, visual/verbal, and sequential/global. (5)

In a study conducted in Tamil Nadu on first-year medical students studying physiology, it was found that most of them were well balanced in three out of four domains (1). In another study conducted on veterinary medicine students, they were shown to be primarily active, sensory, visual, and sequential learners according to the ILS questionnaire (6). The learning modes chosen by the orthodontic residents were sensory and sequential, and they turned out to be highly visual learners (7). It showed that first-year medical osteopathy students were more likely to be active, intuitive, global, and/or visual, and to use online learning resources (8). This indicates that in order to improve academic success, students must be given access to efficient learning strategies. This argues that students' ability to attain good academic results can be improved if students modify their learning styles and create a learning environment that suits their learning styles. There is a perceived movement in education today from teacher-centered learning to student-centered learning, where students learn how to internalize material themselves. A key component to effective teaching now is a thorough understanding of different learning styles and adjusting teaching methods accordingly. It can affect a student's academic performance and achieve educational goals while improving the efficiency of teaching techniques. (9) The present study was hence undertaken with the aim to understand the learning styles of second and third year medical students at a government medical college, Visakhapatnam using the Index of Learning Styles questionnaire. In particular, given the current situation in India, where numerous curriculum reforms are being proposed, with a growing emphasis on student-centered teaching-learning methods, it was believed that this information would assist teachers to design their teaching and learning activities effectively.

Methodology

Study Setting: This study was conducted in the Department of Community Medicine of Andhra Medical College, Visakhapatnam, Andhra Pradesh.

Study design: Cross sectional study.

Study participants: 2nd and 3rd year MBBS students of Andhra Medical College. A total of 400 students from both 2nd and 3rd MBBS students were administered Index of Learning Styles (ILS) questionnaire through Google forms among which only 286 students gave consent and answered.

Inclusion criteria: All the 2nd and 3rd year MBBS students of Andhra Medical College.

Exclusion criteria: The students who were not willing to give consent.

Study period: The study was conducted during the month of October 2022.

Data Collection tool: Index of Learning Styles (ILS) questionnaire.

There were 44 questions in total, and the answers were provided on the same page as each question. Students select the response they believe to be dominant from among the correct answers on the questionnaire's question items. There are no negative items since, in this survey, participants are asked to select the response that most strongly influences their lives rather than agree or disagree. For the purposes of this study analysis, processed data is utilized to represent the respondents' overall score, which is the total of their scores on all available items. Processing dimension - Active/Reflective, Perception dimension – Sensing/Intuitive, Input dimension – Visual/Verbal, and Understanding dimension – Sequential/Global, characteristics of which are shown in as shown in table 1.

Table 1: Characteristics of four dimensions of ILS

Active	**Reflective**
• 'Let's try it out' • Process information by physical activity • Learn by working with others	• 'Let's think it through' • Process information introspectively • Learn by working alone or in pairs
Sensing • Draws on physical sensation • Practical and observing • Prefer the concrete: facts and data • Prefer repetition	Intuitive • Draws on insight • Imaginative and interpretive • Prefer the abstract: theory and modelling • Prefer variation
Visual • 'Show me how' • Prefer pictures and diagrams	Verbal • 'Tell me how' • Prefer written and spoken explanations
Sequential • Understand in continual and incremental steps • Linear reasoning process • Convergent thinking and analysis	Global • Understand in large leaps • Tacit reasoning process • System thinking and synthesis

The table 2 below shows 44 questions in total, 11 of each dimension

Table 2: lists the items that make up the components of the questionnaire Felder learning style and Soloman Index Learning Style

Components of Felder's and Solomon Index Learning Style	Type	Question Items	Total
1	Active-Reflective	1,5, 9, 13, 17, 21, 25, 29, 33, 37, 41	11
2	Sensing-Intuitive	2, 6, 10, 14, 18, 23, 26, 30, 32, 34, 38	11
3	Visual-Verbal	3, 7, 11, 15, 19, 24, 27, 31, 35, 39, 43	11
4	Sequential-Global	4, 8, 12, 16, 20, 25, 28, 32, 36, 40, 44	11
Total Question Items	44		

In the ILS, there are 11 items (Eg: "When I am trying to learn something new, it helps me to") for each dimension (Eg: active/reflective). Each item has two forced choices (Eg: 'a'- "talk about it"; 'b'- "think about it") corresponding to each category of that dimension (Eg: 'a' corresponds to active and 'b' to reflective) (5). 286 students completed the questionnaire and scoring was done according to the instructions of the ILS (5). For each dimension, the number of 'a' and 'b' responses were totaled and the smaller was subtracted from the larger (Eg: If there were 6 'a' and 5 'b' responses, then subtraction would result in 1 '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 as shown in table 3.

Table 3: Students' learning style tendency

Learning style tendency	Category
9-11	Strong
5-7	Moderate
1-3	Balance

Data collection technique: A total of 400 students from both 2nd and 3rd MBBS students were administered Index of Learning Styles (ILS) questionnaire through Google forms among which only 286 students gave consent and responded. Statistical analysis: Data analysis was performed using Microsoft Excel and IBM SPSS 20 (Statistical Package for Social Science ver.20). The categorical variables are presented as percentages or proportions. Continuous variables are presented as mean and standard deviation. Demographics (age, gender and place of stay), percentage of marks obtained in the previous internal exam, educational qualification of mother and father were analyzed and compared with similar studies.

Results

The age of the students ranged from 18 to 25 years. The maximum number of participants was in the age range of 18-20 years (61.9%). The mean (SD) age of the participants was 20.3± (0.91) years. 164 out of 286 (57.3%) were female and 122 (42.7%) males. The majority of students reside in hostel 204 (71.3%) and about 82 (28.7%) were day scholars. The majority of the students 198 (69.2%) had schooling with state syllabus than compared to CBSE and ICSE. Among the 286 students, 148 secured 66.75% marks in recently conducted internal exam. The education status of the participants father, we found that 122 (39.2%) of them were graduates and around 34 (11.8%) had completed their education up to high school. Based on the mother education status of the participants, we found that 82 (28.7%) of them had a professional degree, 70 (24.5%) had graduated, and around 78 (27.2%) had completed education up to high school. (Table 4)

Table 4: Socio-demographic profile (n-286)

Category	Number of study participants	Percentage (%)
Age in years • 18-20 • 21-23 • 24-25	 177 108 1	 61.9 37.8 0.3
Gender • Male • Female	 122 164	 42.7 57.3
Year of study • 2nd year MBBS • 3rd year MBBS	 118 168	 41.3% 58.7%
Place of stay • Day scholar • Hosteller	 82 204	 28.7 71.3
Board of pre -university schooling • CBSE • ICSE • State	 64 24 198	 22.4 8.4 69.2
Percentage of marks secured in recently conducted internal exam. • <50% • 51-65% • 66-75% • >75%	 7 77 148 54	 2.4 26.9 51.7 18.9
Education of father • Illiterate • Primary school • Middle school • High school • Intermediate/Diploma • Graduate • Professional degree	 2 5 6 23 41 112 97	 0.7 1.7 2.1 8.0 14.3 39.2 33.9
Education of mother • Illiterate • Primary school • Middle school • High school • Intermediate/Diploma • Graduate • Professional degree	 6 10 13 55 50 70 82	 2.1 3.5 4.5 19.2 17.5 24.5 28.7

When the strength of learning style preferences was seen the following findings were observed. As shown in table 5, the majority of medical students (N=286) were moderate-strong visual learners (76.3%) and fairly well-balanced in the sequential/global dimension (71.7%), the active/reflective dimension (61.5%), and the sensory/intuitive dimension (61.2%) of the Index of Learning Styles (ILS).

Among the second-year medical students (n=118), it was observed that they were fairly well balanced in the sequential/global dimension (65.2%), the sensory/intuitive dimension (61%), and the active/reflective dimension (59.3%), and moderate-strong visual learners (44.1%) of the ILS.

Whereas the majority of third-year medical students (n=168) were moderate-strong visual learners (81.5%) and fairly well balanced in the sequential/global dimension (76.2%), the active/reflective dimension (63.1%) and the sensory/intuitive dimension (61.3%) of the ILS.

Table 5: Strength of learning style preferences of medical students

Dimension	Tendency	Distribution among Second-year students n=118	Distribution among Third-year students n=168	Distribution among overall students N=286
1.Active/Reflective	Moderate - Strong Active	17 (14.4%)	17 (10.1%)	34 (11.9%)
	Well balanced	70 (59.3%)	106 (63.1%)	176 (61.5%)
	Moderate - Strong Reflective	31 (26.3%)	45 (26.8%)	76 (7%)
2.Sensing/ Intuitive	Moderate - Strong Sensing	31 (26.3%)	42 (25%)	73 (25.5 %)
	Well balanced	72 (61%)	108 (61.3%)	175 (61.2%)
	Moderate - Strong Intuitive	15 (12.7%)	23 (13.7%)	38 (13.3%)
3. Visual/Verbal	Moderate - Strong Visual	81 (44.1%)	137 (81.5%)	218 (76.3%)
	Well balanced	34 (28.8%)	30 (17.9%)	64 (22.4%)
	Moderate - Strong Verbal	3 (27.1%)	1 (0.6%)	4 (1.3%)
4.Sequential/Global	Moderate - Strong Sequential	27 (22.9%)	26 (15.5%)	53 (18.5%)
	Well balanced	77 (65.2%)	128 (76.2%)	205 (71.7%)
	Moderate - Strong Global	14 (11.9%)	14 (8.3%)	28 (9.8%)

When the strength of learning style preferences was analyzed among male (n=122) and female (n=164) students in each dimension, it was observed that- the 23.9% among males and 37.5% among females were fairly well-balanced in Active-Reflective dimension of the Index of Learning Styles (ILS). It was also found that majority were fairly well-balanced among Sensing-Intuitive with 26.3% of males and 34.8% of females. Sequential-Global dimensions of ILS strength was found out to be fairly well balanced with males of 30.7% and 37.5%. Whereas strength of Visual-Verbal learning style was found to be at Moderate-Strong Visual tendency among majority with 30.7% males and 44.7% females as shown in table 6.

Discussion: In our study, a mean age of 20.3 ± 0.91 was observed among the 286 study participants. We used the Learning Styles instead of the VARK/VAK questionnaire used in most studies of the learning preferences of first-year medical students. Our research on the learning styles of second and third-year medical student's is consistent with studies conducted by the ILS on first year medical students of physiology (1) veterinary students (7), orthodontic residents (8), and osteopathic online learners (9) because the majority of our students were fairly evenly distributed across three of the four ILS dimensions: the sequential/global dimension; the active/reflective dimension; and the sensory/intuitive dimension. However, the majority of our students were visual learners, consistent with other studies using the ILS (1,7,8,9). The implications are discussed separately for each dimension.

Visual/Verbal dimension:

The sensory channel through which information is processed is the focus of this dimension. 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 primarily used in Indian medical colleges that follow a didactic curriculum like his currently exists. Since most of our students learn visually, there is a chance that their learning and teaching styles will not match. However, this can be avoided if teachers are aware that the majority of their students learn best visually and incorporate lots of illustrations, sketches, flow charts, graphs, animations, films and even live demonstrations into their teaching-learning activities.

Sequential/Global dimension:

The Sequential-global dimension categorizes students based on progress i.e., towards understanding - in a sequential (step-by-step manner) or in large jumps, holistically (global). In our study, the majority of students was fairly well balanced (71.7%) or had moderate or strong preferences for sequential learning (18.5%). Topics of medicine are presented to them in an orderly manner, initiating from the simple and progressing to the complex. For the benefit of the 9.8% of learners worldwide, teachers should encourage creativity. It is important to understand that we do not consider the individual learning preferences of each student when planning their lessons. Instead, a wise teacher would use a balanced approach, sometimes catering to the preferences of their students and other times going against them, forcing them to advance both learners' skills. In this instance, they ought to eventually have both sequential and global learning skills, which will be very helpful for them when they start practicing medicine.

Active/Reflective dimension:

In our study, only 7% of our students were reflective and 61.5% were well balanced. However, 11.9% were active learners. Students are categorized into the active/reflective group of this dimension based on their preferred method of information processing. Active learner's cannot learn in passive environments such as lectures, preferring to actively participate in discussions or physical activities. However, unless given the opportunity to reflect on or scrutinize the perceived material, reflective learners would also find it difficult to learn much during lectures. Most lecturers do not give students this opportunity during lectures. However, by using brainstorming or by giving students some time to reflect on what is being covered in the lecture, it is still possible to support active and reflective learners at the same time.

Sensing/Intuitive dimension:

Although the majority of our students (61.2%) were fairly well balanced in the sensing/intuitive dimension, 25.5% of them had a moderate or strong preference for sensing. Whether a student primarily detects internal information (intuition) or outward information (sensing) determines whether they fall into the category of sensing or intuitive learners. While intuitive learners prefer abstract terms like principles and theories, sensors prefer concrete information or facts. In order to adequately accommodate both sensors and intuitives, the lesson should include both facts and explanations of concepts.

Gender wise analysis of learning style preferences:

The findings of our study are in agreement with those of Suzanne Maria D'cruz (1), Slater and Meechan- Andrews (10,11) and the study on medical students in Turkey (12).

Limitations

Our study was conducted among second- and third-year students of a single medical college; hence the results may not be generalized. Factors such as students' level of intellectual development and their motivation were not taken into consideration.

Table 6: Comparison of the strength of learning style preferences of male and female medical students.

Category	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	7.2%	23.9%	12.6%	12.3%	26.3%	5.1%	30.7%	12.3%	0.7%	7.8%	30.7%	5.1%
Females	5.5%	37.5%	13.3%	13.7%	34.8%	7.8%	44.7%	10.6%	0.1%	11.3%	37.5%	4.4%

CONCLUSION

Our study, which assessed the learning preferences of second- and third-year medical students at Visakhapatnam using the Index of Learning Styles (ILS), found that the majority of our students were visual learners and were well-balanced in the other three dimensions, namely the active/reflective, sensing/intuitive, and sequential/global dimensions, with no gender differences. Based on these findings, it is of prime need that a teacher includes all dimensions in a balanced approach while teaching. This further helps in the improvement of the academic performance of the students.

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