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Research Article

Learning style preferences of first year medical and allied sciences students at Mahatma Gandhi Medical College and Hospital, Jaipur

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Abstract: Learning styles may be classified into four major sensory modalities – visual, auditory, read-write and kinesthetic, that one most prefers to use when internalizing information. The purpose of study was to evaluate the preferred learning style modality and to assess whether there was any difference in the learning style preferences among medical and allied sciences students. Total 273 first year students of various medical courses completed the questionnaire (113 M.B.B.S., 71 B.D.S., 68 B.Sc. Nursing and 21 B.P.T.) attending lectures in the Department of Physiology, Mahatma Gandhi Medical College & Hospital, Jaipur (Rajasthan) were included. Learning style preference was identified using the VARK online inventory developed by Fleming (1992). A questionnaire was also filled by the students which included their demographic profile, medical science stream and preferred sensory modality of instruction. Learning style of the students of various medical courses showed a statistical significant difference among both via Preferred ($p<0.001$) and VARK ($p<0.0001$). Within the group, VARK Preferred Sensory Modality was kinesthetic in M.B.B.S. ($p<0.041$), B.Sc. Nursing ($p<0.001$), B.D.S. ($p=0.055$) and B.P.T. ($p=0.253$) students. As per Preferred Sensory Mode, kinesthetic was the preferred mode in M.B.B.S. ($p<0.163$) and B.Sc. Nursing ($p<0.0001$) while auditory in B.D.S. ($p<0.001$) and visual in B.P.T. ($p=0.281$), respectively. The most common pattern was bimodal learning in students of various medical courses and statistically significant in M.B.B.S. and B.Sc. Nursing. Present findings suggest that kinesthetic was the preferred learning style by both Preferred Sensory Modality Preferences and VARK inventory tool, and was found to be statistically significant among the students of medical and allied sciences. The most common pattern was bimodal learning, with two dominant styles.
Keywords: Learning style preferences, Learning modes, Kinesthetic, Auditory, Visual, VARK.

INTRODUCTION

Educational researchers have reported that each individual has a specific learning style and if the method of information delivery conforms to their learning style, learning is more effective [1]. Learning style preferences are 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 [2]. Learning styles can be defined in terms of sensory modality in which a student prefers to take new information [3].

Fleming VARK Inventory Tool, the most widely accepted, used for assessing individual preferences for learning with sensory domains. VARK is an acronym that stands for four sensory modes of learning: Visual (V), Aural (A), Read/Write (R) and Kinesthetic (K), depending on the neural system with which a learner prefers to receive information [4].

Students with visual preference learn best by seeing or observing diagrams, pictures, graphs and flowcharts. Auditory learners gather information best by hearing or recording lectures, enjoy discussions and tutorials. Read/ Write learners prefer printed material to gain knowledge. Kinesthetic learners learn by using physical experience: touching, performing an activity, moving, lessons that emphasize doing, and manipulation of objects [5]. Students learners are capable of using all of these sensory modes input for learning, however, each individual has a unique preference, or set of preferences, in which one mode is dominant[6].

Physiology is an important component of the medical syllabus; the population of students that take physiology course is likewise very diverse and represents many different age, cultural, language and educational backgrounds. This diversity presents academics with increasing challenges to motivate and promote students understanding.

Disparity between learning and delivery of instruction may lead to frustration in students. This can be reduced by knowing the students learning style preferences which will aide in the development of the most effective teaching approaches and, moreover, also help to overcome the predisposition of many educators to treat the students of medical and allied sciences in a similar way, so as to improve student learning, retention and motivation [7].

Therefore, the present study was designed to evaluate preferred learning sensory modality amongst the first year students and to assess whether there exist any difference in the learning style preferences or not among medical and allied sciences students.

MATERIAL AND METHODS

The study was conducted in the Department of Physiology, Mahatma Gandhi Medical College & Hospital, Jaipur (Rajasthan) after obtaining the institutional ethical committee approval. The first year students of the various medical courses such as medical, dental sciences, nursing and physiotherapy who were attending lectures in the department, and willing to participate in the study were included, while students suffering from acute/chronic illness/ taking medication were excluded from the present study. An informed consent was taken from all the participants after explaining the details of the project.

The questionnaire consisted of two sections; the first section asked to furnish the personal details which included sex, age, degree program (M.B.B.S, B.D.S, B.Sc. Nursing, and B.P.T.) The questionnaire was administered during the last month of 1st year completion of their respective courses, so that students had as much experience as possible with the course resources and incorporated sensory modalities before they were asked to choose their preferences by selecting only one of the following choices:

a. V (looking at and making pictures, animations, graphs, tables, etc.),
b. A (listening to and participating in speeches, discussions, and question and answer sessions),
c. R (reading and writing text associated with the textbook, class notes, etc.), or
d. K (engaging in physical experiences, manipulating objects, etc.).

The second section of the questionnaire was composed of the 16 questions from the Fleming VARK inventory (7.1 version) and was used to determine students' assessed sensory modality preferences: Visual, Auditory, Read / write, Kinesthetic sensory modalities (VARK), by which they prefer to take information [8]. Students were allowed to choose multiple answers per item to adequately describe their preferred response(s) to the situation presented. The scoring algorithm on the VARK website was applied to identify each student sensory modality preferences[8].

Total 273 students (16-23 years) of various medical courses completed the questionnaire (113 M.B.B.S., 71 B.D.S., 68 B.Sc. Nursing and 21 B.P.T.), were included in the study while a total 24 students excluded as submitted incomplete questionnaire. Male preponderance was observed in all the medical courses except B.D.S. The data were analyzed using chi square ($\varkappa^2$) test and the statistical significance was set at $p<0.05$.

RESULTS

As depicted from table 1 that preferred Sensory Modality Preferences differ significantly statistically ($p<0.0001$) among students of various medical courses. Within the course , auditory and kinesthetic was preferred learning style mode in B.D.S. and B.Sc. Nursing students, respectively, and was statistically significant ($p<0.0001$). Though a statistically non-significant difference was found in learning style preferred mode in M.B.B.S. and B.P.T students, their preferred sensory modality was kinesthetic and visual, respectively. Auditory learning mode was least preferred among all courses except B.D.S. and was statistically significant ($p<0.0001$). Moreover, a statistical significant ($p<0.0001$) difference was also observed for kinesthetic learning mode among the students of various courses.

VARK (Table 2) Sensory Modality Preferences was statistically significantly ($p<0.0001$) differ among students of various medical courses. Kinesthetic was the preferred sensory modality for learning by VARK and was significant statistically ($p<0.0001$) among the students of medical courses, followed by auditory ($p<0.0001$), read and write ($p=0.180$) except B.P.T. The least preferred sensory modality for learning was visual except in BPT students though non-significant. Within the group, only students of M.B.B.S.($p=0.041$) and B.Sc. Nursing($p<0.0001$) showed a statistical difference in learning, kinesthetic was preferred learning style via VARK Sensory Modality preferences, similar pattern though non-significant was observed in BDS and BPT students.

As shown in Figure 1, students of various medical courses differ significantly ($p=0.004$) in learning style modes. Bimodal was the preferred learning style mode in the students of various medical courses and was statistically significant in M.B.B.S. ($p<0.0001$) and B.Sc. Nursing students ($p=0.027$). In students of all courses, the least preferred mode of learning was quad modal.

Table 1: Preferred Sensory Modality Preferences

Medical Courses	V		A		R		K		Total	$\varkappa^2$ df/p
	N	%	N	%	N	%	N			
MBBS	30	26.55	20	17.70	30	26.55	33	29.20	113	5.767 df=3 p=0.163
BDS	18	25.35	25	35.21	12	16.90	16	22.54	71	16.796 df=3 p<0.0001
B.Sc. Nursing	14	20.59	6	8.82	8	11.76	40	58.82	68	25.059 df=3 p<0.0001
BPT	9	42.86	2	9.52	5	23.81	5	23.81	21	4.527 df=3 p=0.281
Total	71		53		55		94		273	
$\varkappa^2$ df p	4.169 df=3 p=0.327		17.726 df=3 p<0.0001		6.488 df=3 p=0.118		24.789 df=3 p<0.0001			

$\varkappa^2$ =38.8; degree of freedom (df) = 9; p<0.0001

Table 2: VARK Sensory Modality Preferences

Medical Courses	V		A		R		K		Total	$\varkappa^2$ df p
	N	%	N	%	N	%	N	%		
MBBS	5	4.42	39	34.51	11	9.73	58	51.33	113	8.834 df=3 p=0.041
BDS	5	7.04	21	29.58	12	16.90	33	46.48	71	8.194 df=3 p=0.055
B.Sc. Nursing	1	1.47	5	7.35	4	5.88	58	85.29	68	25.839 df=3 p<0.0001
BPT	3	14.29	4	19.05	1	4.76	13	61.90	21	4.764 df=3 p=0.253
Total	14		69		28		162		273	
$\varkappa^2$ df p	6.139 df=3 p=0.138		17.798 df=3 p<0.0001		5.542 df=3 p=0.180		26.916 df=3 p<0.0001			

$\varkappa^2$ =35.0; df =9; p<0.0001

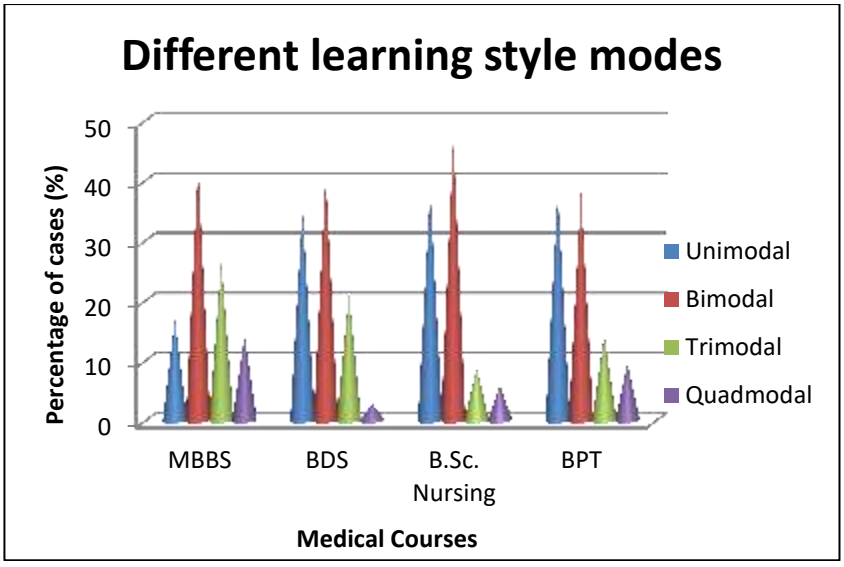

Fig1: Different learning style modes

DISCUSSION

Physiology is a subject that is complex and difficult for many students to internalize. It is therefore important for physiology instructors to take extra steps to make sure that they are effectively communicating the information to their students. When information is presented using students' preferred learning style, not only teachers are better able to connect with students but students also achieve higher scores [9-10].

In the present study, the students of various medical courses differ significantly ($p<0.001$) in learning style both by Preferred as well as VARK Sensory Modality Preferences. Moreover, kinesthetic and auditory learning style showed a statistical significant difference among the students of medical courses both via Preferred ($p<0.001$) and VARK ($p<0.0001$) Sensory Mode Preferences.

Within the group, Kinesthetic was VARK Preferred Sensory Modality in M.B.B.S. ($p<0.041$), B.S.c Nursing ($p<0.001$), B.D.S. ($p=0.055$) and B.P.T. ($p=0.253$) students. As per Preferred Sensory Mode Preference, again Kinesthetic was preferred mode in M.B.B.S. ($p<0.163$) and B.Sc. Nursing students ($p<0.0001$) while auditory in B.D.S. ($p<0.001$) and visual in B.P.T ($p=0.281$), respectively. The most common pattern was bimodal learning, with two dominant styles, in students of various medical courses and was statistically significant in M.B.B.S. ($p<0.0001$) and B.Sc. Nursing students ($p<0.027$).

Kinesthetic learners prefer the hands on approach to learning, or learn by doing. Students with this learning preference take in information best through practical sessions, case studies or computer simulations [11]. In the medical curriculum, case studies can be used to help these students apply content knowledge to clinical situations. The medical tradition of experiential learning is provided for kinesthetic learners through clinical rounds, laboratories, and cadaver dissections.

Moreover, in this study the least preferred Learning style was auditory in students of all courses except B.D.S. via Preferred Sensory Mode Preference and Visual via VARK. It is perhaps surprising that a very small percentage of students preferred aural modes of information presentation; an example of this mode is the classic lecture.

Contrast with the present study, Prabha V*;* [12] reported that dental students preferred auditory (learning from speech) mode of learning via VARK questionnaire, moreover, most of the students 57.96 % preferred a single mode of information presentation.

However, as is stated on Fleming's VARK website, a minority of people (~ 36 %) prefer to use one sensory modality when internalizing information (unimodal), whereas the majority of people (~ 64 %) prefer to use two, three, or all four modalities (multimodal) [8].

Dobson JL.*;* [13] conducted a study on undergraduate and graduate physiology students attending exercise courses but the relationship between perceived sensory modality preferences and status was not statistically significant ($\varkappa^2$ =1.55, p=0.67), similar to Fleming's VARK assessment.

Meehan-Andrews [11] reported that the majority of nursing students (out of 86) preferred to receive information via Kinesthetic sensory mode, the hands on approach to learning (keynote questions and real life examples) via VARK Questionnaire and least

preferred the aural mode, consistent with the present study and Bostrom L *et al.;*[14]. But, majority of the students, 54% preferred a single mode of information presentation [11].

As per M.B.B.S. students concerned, discrepancy in literature was found. Jindal M *et. al.;* [15] reported students prefer unimodal learning style that too auditory, similar to Shah et al. However, most preferred style was read-write according to Lujan and DiCarlo *et. al.;* [16] and Johnson *et. al.;* [5], and Kinesthetic according to Kumar L *et. al.;* [17].

Muralidhara D.V *et. al.;*[18] reported that among the preclinical medical students respondents, 84% preferred multimodal style of learning, out of that, dual, trimodal and quadrimodal styles were preferred by 8.5%, 2.4% and 73.2% respectively. A similar report has shown that 60% of their subjects had two to four (multimodal) learning preferences and the remaining 40% of the students had one strong learning preference [19].

In other studies, assessment of learning styles preferences among first-year medical students showed that only 36.1% of the students preferred a single mode of information presentation in contrast to most students (63.8%) who had multimodal learning preferences [16, 20] as compared with a slightly lower percentage (i.e., 56%) in dental students [21]. Consequently, when teaching physiology to a diverse group of students, the most thorough and successful strategy is to present information using multiple learning styles [16, 22].

When the students are exposed to a teaching style that matches their learning style, students score higher marks on tests than those not taught in their learning style; and it is advantageous to teach and test students in their preferred modalities [23].

Having this information may assist in the development and implementation of course specific teaching approaches that will maximize student motivation and learning by tailoring instruction to student's needs [7].

Thus, different courses have different designs, training plans and various tutoring methods for matching each student group. Even we can take advantage of learning style assessment as a platform for both teachers in their planning, and teaching student's lifelong learning.

CONCLUSION

Thus, the present study suggests that courses that utilize manipulation, interaction, and active learning may have a greater likelihood of benefiting learners who experience academic challenge. This may be a generalizable concept, since one study of statistical education outcomes has shown that cooperative learning may be especially useful for students who prefer to learn by kinesthetic means [24].

Kinesthetic was the preferred learning style by both Preferred Sensory Modality Preferences and VARK inventory tool, and was significant statistically among the students of medical and allied sciences. Within the courses, a little discrepancy was there in Preferred Sensory Modality Preferences and VARK preferences. The most common pattern was bimodal learning, with two dominant styles.

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