



## **Preferred Learning Style and Study Characteristics among Undergraduate Clinical Medical Students: A Study in National Defense University of Malaysia**

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### **Authors' contributions**

*This work was carried out in collaboration between both the investigators. Author SSA designed the study, managed the literature search, wrote the protocol, developed the questionnaire, collected the data and prepared the draft of the paper. Author SCR developed the questionnaire, collected data, performed data entry and analysis. Both authors revised the paper, read and approved the final manuscript.*

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### **ABSTRACT**

**Purpose:** Learning clinical science depends on the learning style and characteristics of the student as well as the learning environment and teaching characteristics. The aim of this study was to determine the preferred methods of learning style and study characteristics of undergraduate senior clinical medical students.

**Methods:** This study was conducted among 89 medical students of 4<sup>th</sup> and 5<sup>th</sup> year of the Faculty of Medicine and Defense Health, National Defense University of Malaysia, from 1<sup>st</sup> November 2019 to 31<sup>st</sup> July 2020. Each of the students was given a structured questionnaire for their responses to determine their preferred learning style and study characteristics.

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**Results:** The mean age of the students was 23.5 years (range 23-27 years). A combination of various methods of learning style that included reading/writing, hearing, seeing (observing), and practicing of skills was used in 69.7% of students. Preference of learning from making and reviewing notes of class teachings was 98.9%; e-learning 53.9%; memorizing key features 71.9%; and silent study 94.3% of students. Learning by a discussion with fellow students was preferred by 65.2% and interactions in the class were preferred by 56.2% of students. Observing skill demonstration by a teacher was preferred by 77.5% of students. Learning of a clinical skill by practicing on a real patient was preferred by 94.4% of students.

**Conclusion:** A combination of various learning styles is preferred by the majority of students for their learning. The students prefer to take and review class notes, study silently, use e-learning uploaded materials, interact in the class and learn a clinical skill by practicing on a real patient rather than simulated patients or mannequins. The preference of the student learning style and their choice should be taken into account for constructing teaching methods to achieve a better academic outcome.

*Keywords: Learning style; learning preference; learning habits; study methods; clinical medical students; medical education.*

## 1. INTRODUCTION

Learning of clinical science is a very challenging task in the life of a medical student [1]. The purpose of learning is to gain knowledge, skills, and attitudes. It is an active process in which the student and teacher have to work mutually to make the knowledge-sharing process enjoyable and easier for comprehension [2]. It depends on their learning style as well as the learning environment and teaching characteristics. The learning style is an individual's consistent way of perceiving, processing, storing, and recalling what they have to learn [3]. Every individual has a preferred method of gathering, processing, interpreting, organizing, and analyzing information [4]. Learning is improved if the learner knows the way they learn [5] and the instructional methods used by the teacher [6].

Fleming developed a VARK questionnaire to identify the sensory modalities adopted by the students through which they prefer to learn [7]. VARK is an acronym for the Visual (V), Auditory (A), Read/Write (R), and the Kinesthetic (K) sensory modalities. The Visual learners prefer to learn through seeing, auditory learners learn through listening. Read/write learners prefer to process information through writing and reading. Kinesthetic learners involve learning through touching, practice, and physical involvement. According to Fleming, students with visual preference learn best from materials presentation using pictures, charts, graphs, maps, and diagrams. Aural students prefer to learn through listening to lectures, tutorials, clinical conferences, playback recorders of learning sessions, and discussions. They would benefit by

using a voice recorder. Read/write learners are interested in making and reviewing notes, and, they like to read books and handouts. They would prefer to spend time in the library, rather than having a discussion session [1]. Kinesthetic learners gain a better understanding of information through experience and practicing as for example a skill. Examples of kinesthetic learning in clinical medicine include practical sessions, bedside history taking, clinical examinations, and performing technical procedures. The kinesthetic ones would like to attend workshops or hands-on seminars. They would like to spend more time in a skills laboratory. They would learn better by simulation or demonstrations. They would like a case presentation more than a theoretical discussion [1]. The students may be classified as unimodal (predominantly one mode of learning preference) or multimodal (preference for two or more modalities) learner. Most people learn best through a combination of the all. Some authors believe that students will only remember 20% of what they read, 30% of what they hear, 40% of what they see, and 60% of what they do [8]. In clinical medicine, use of different visual aids such as blackboards (now whiteboards and markers), overhead projectors, slides, and use of graphics, flowcharts, algorithm, and images in the PowerPoint presentation will improve the learning process of a visual learner. Auditory learning is achieved from collaborative learning events such as discussions, debates, and answering questions [9].

It should be noted that students can take active participation in their learning process. Listening to lectures without interaction is essentially a

passive learning method that encourages rote memorization and notes-taking as the means of assimilating knowledge [10].

There are 3 learning domains categorized as a cognitive domain (e.g., knowledge), psychomotor domain (e.g., skills), and affective (e.g., attitudes) domain. Bloom et al, in 1956 developed the Bloom's taxonomy describing the learning domain in educational objectives [11], which was revised by several authors to refine it, including Anderson et al. [12]. These domains have an impact on learning and are important for the preparation of learning objectives, learning outcomes and assessments in the medical curriculum.

Learning approach can be defined as the behavioral and intellectual responses elicited by students as a result of exposure to a learning situation [13]. Newble and Entwistle has identified three basic approaches of learners: deep, strategic, and surface [14]. A student with a deep approach to learning seeks meaning and a deep understanding of concepts. In a strategic approach, study is driven by the desire for high achievement. A surface approach involves investing a little time in the academic task and memorizing information with rote learning; they learn mere facts. Each learning approach results in a different learning outcome. Their learning preferences, superficial, deep, or strategic, are mostly determined by the assessment system adopted in examinations. A literature search reveals that deep and strategic approaches toward learning are more related to academic success [15].

Motivation for the study can be extrinsic like environment, curriculum, assessment, and rewards, etc., or it may be intrinsic like personality traits, habits and cognitive abilities [16]. A student's learning process is influenced by various factors such as their intrinsic motivation, gender, learning environment, and educational background [17,18].

The teaching strategy based on the understanding of students' learning style is an effective way to ensure students' achievement and motivation [19]. The aim of medical education is to provide adequate learning experiences to medical students so that they become competent, safe, and caring doctors. Proper guidelines, resources, and the environment for learning are important to achieve this. Student-centered teaching approaches are

most effective in small groups [20]. The key elements promoted in the SPICES model, student-centered learning, PBL, integrated teaching, community-based education, elective studies, and a systematic approach are now widely shared and accepted [21]. It is the learner who is at the center of the educational process and the teacher acts as a moderator or facilitator [22].

It is important for educators to understand the students' learning styles so that they can implement best and practice active strategies into their daily teaching and learning activities, curriculums, and assessments. Studies have found that students' performance improved significantly after learning style preference based teachings [23]. The use of active learning strategies improves thinking, reasoning, problem-solving, and decision-making skills in students [8]. Moreover, students by knowing their learning style can themselves augment their learning and support the areas of weakness of their performances. Learning is improved if the learner knows the way they learn [24].

Literature review reveals that a number of studies have been done in the past mainly with the pre-clinical (1<sup>st</sup> and 2<sup>nd</sup> year) undergraduate students to investigate their preferred learning styles [4,8,13,23,25-30]. However, there is a sparsity of studies on the learning preferences of exclusively clinical students (3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> year) in a medical institute [1,31]. Therefore, this study was conducted to investigate the preferred learning styles and study practice of the undergraduate clinical medical students in our university.

## 2. MATERIALS AND METHODS

This study was conducted among 89 medical students of 4th and 5th year of the Faculty of Medicine and Defense Health, National Defense University of Malaysia (NDUM), from 1st November 2019 to 31st July 2020. Kuala Lumpur. This is a prospective quantitative questionnaire study and a single preferred answer was obtained through closed-ended questions with multiple answer options. The medical program is for a period of 5-years; initial 2 years is a pre-clinical program. Once the student qualifies, only then he will proceed for a clinical course of 3-years duration. After qualifying the final year (final professional) examination they are awarded a Doctor of Medicine (MD) degree. The study was conducted

in one of the clinical teaching premises of our university. For its close proximity, the clinical teaching premise Hospital Angkatan Tentera Tuanku Mizan (Tuanku Mizan Military Hospital), Kuala Lumpur, was selected for conducting this study.

Inclusion criteria were (i) adult male and female undergraduate medical students undergoing MD degree course (ii) placed in clinical rotations (iii) belonging to 4<sup>th</sup> year and 5<sup>th</sup> (final) year and (iv) supplementary candidate of final professional examination. Exclusion criteria: were (i) the students unwilling to be included in the study and (ii) incomplete/ inadequate response to the questionnaire.

The respondents were informed that their identity will not be revealed to anyone and the confidentiality of the participants will be maintained. A structured data collection questionnaire was prepared and validated. There were total 16 questions. The questions were designed to cover the traditional way of learning e.g., by reading/writing (9 questions), hearing (3 questions), observing/seeing (1 question), practicing clinical skills (2 questions), and overall preference of learning style (1 question). The questions were constructed in a simple way so that it was easy to understand and every question could be answered.

Data collection was done by both authors. The students were free either or not to participate in the study. After a brief and clear explanation of the purpose and procedure of the study, the questionnaires were distributed to the students to give their opinions. Students responded anonymously to the study questionnaire. All participants were asked to tick one of their appropriate response against the questions. Completed questionnaires were collected. The information that was collected in the structured data collection form were entered and analyzed in Statistical Package for Social Sciences (SPSS) version -20.

### 3. RESULTS

This study was carried out among 89 students of the undergraduate medical program of the NDUM who were in clinical postings of 4<sup>th</sup> year and 5<sup>th</sup> (final) year. Out of 89 students, 46 were males (51.7%) and 43 (48.3%) were females. The mean age was 23.5 years (range 23-27 years). A combination of various learning styles that included reading/writing, hearing, seeing, and practicing (kinesthetic modality) was preferred by 69.7% of students (the so-called multimodal). Out of the total 89 subjects, 12.3% preferred learning by reading/writing, 3.4% by hearing, 3.4% by vision, and 11.2% by practicing a clinical skill respectively (Fig. 1).

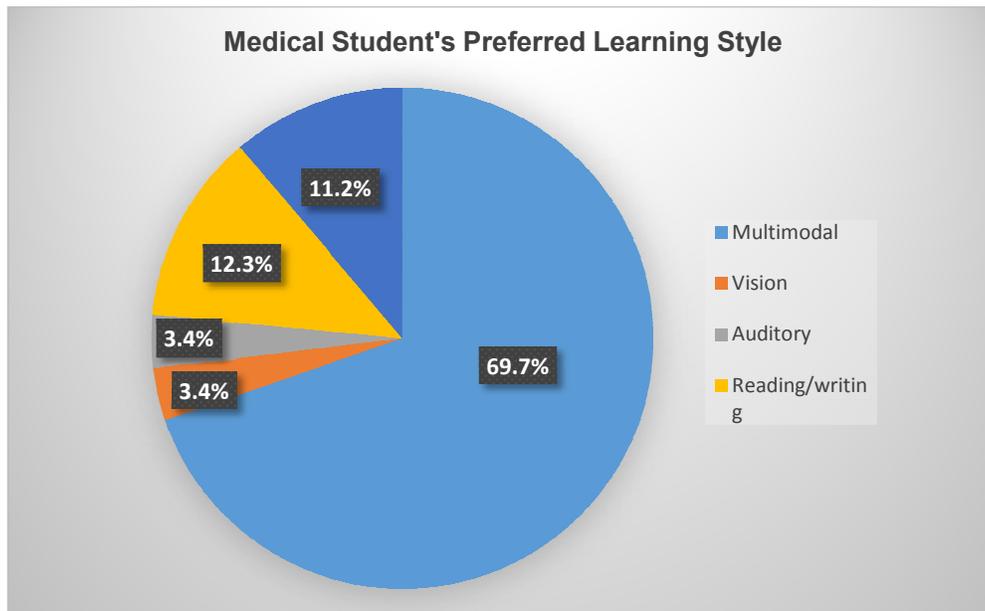


Fig. 1. Distribution of the preferred "Learning Styles" of clinical medical students (n=89)

Table 1 illustrates the preferred study practice of the students by reading/ writing. Out of the three methods for their subject-related learning, 61.8% of the students preferred reading handouts and lecture notes. Among all the students, 98.9% would prefer making notes of important points during class time. Regarding the use of books, 55.1% of students would prefer textbooks. 66.3% of students would use online uploaded teaching materials, whereas the remainder would not. It was found that 60% of students would prefer reading silently and occasionally loudly. Overall, the bulk of the students in this study were found to prefer studying silently (94.3%). Out of total students, 71.9% would memorize the key features in learning. 22.5% of students would prepare the timetable of their study and follow it, the remaining student would not follow or prepare any time table. Almost all students would study in the night, of whom 38.2% up to beyond midnight, while 3.4% of students do not study in the night.

**Table 1. Students' responses for questions on study practice by "Reading/ Writing" (n=89)**

S/No	Questions	Responses	
		Number	%
1	<i>Which one of the following is the most preferred choice of your learning by reading/ writing?</i>		
	• Internet (e.g. Googles)	3	3.4
	• Printed books/ e-books	31	34.8
	• Reading lecture notes/ study notes/ handouts	55	61.8
2	<i>Do you make notes of important points during the class?</i>		
	• Yes	88	98.9
	• No	1	1.1
3	<i>Among the books, which one you use most of the time for learning?</i>		
	• Text book	49	55.1
	• Condensed (short/hand)book	39	43.8
	• Do not read books	1	1.1
4	<i>Do you prefer to use e-learning for improving your knowledge?</i>		
	• Yes	48	53.9
	• No	22	24.7
	• Not sure	19	21.3
5	<i>Do you use e-learning (online uploaded teachings/ lecture slides, etc.)?</i>		
	• Yes	59	66.3
	• No	30	33.7
6	<i>Do you prefer to read silently?</i>		
	• Yes (always silently)	24	34.3
	• Yes, but occasionally loudly.	42	60.0
	• No (prefer always loudly)	4	5.7
7	<i>Do you memorize the key features in learning?</i>		
	• Yes	64	71.9
	• No	25	25.1
8	<i>Do you prefer to make a time table of your study and follow it?</i>		
	• Yes & I follow it	20	22.5
	• I make time table, but do not follow it	36	40.4
	• No, I do not make any time table	33	37.1
9	<i>Up to what time you study at night?</i>		
	• Until 10pm	7	7.8
	• Until 11pm	14	15.7
	• Until midnight	31	34.8
	• Beyond midnight	34	38.2
	• Do not study in the night	3	3.4

Table 2 illustrates the preferred learning styles of the student by hearing. Clinical case discussion was the preferred method of learning by hearing in 44.9% followed by lectures (30.3%). Out of total subjects, 65.2% would prefer discussion regularly with their reading partners/ classmates for learning whereas 1.1% would never discuss. Asking questions to a student in a class by the teacher was preferred by 56.2% of total students, whereas the remainder would either not prefer or not sure of that.

Bedside teaching with demonstrations by the teachers was preferred by majority (77.5%) of the students, while observing the doctors with patients in the clinics was least (4.5%) preferred method of learning by vision (Table 3). Our study showed that practicing skills on a real patient was preferred (94.4%) over practicing on simulated patients or mannequins. 46.1% of students would prefer to introduce a patient simulation teaching system in the university (Table 4).

**Table 2. Students’ responses for questions on study practice by “Hearing” (n=89)**

S/No	Questions	Responses	
		Number	%
1	<i>Which one is the most preferred method of your learning by hearing (when you are audience)?</i>		
	• Lectures	27	30.3
	• Tutorials	19	21.3
	• Seminars	3	3.4
	• Clinical case discussion	40	44.9
2	<i>Do you discuss teaching &amp; learnings with your reading partners/ classmates/ housemates?</i>		
	• Yes (regularly)	58	65.2
	• No	1	1.1
	• Minimum (occasional)	30	33.7
3	<i>Do you like asking you questions by the teachers in classes?</i>		
	• Yes	50	56.2
	• No	10	11.2
	• Not sure	29	32.6

**Table 3. Students’ responses for questions on learning methods by “Vision” (n=89)**

S/No	Questions	Responses	
		Number	%
1	<i>Which one is the most preferential choice of your learning by vision (observing/ seeing)?</i>		
	• Bed side demonstrations	69	77.5
	• Video (technical/ procedure skill)	10	11.2
	• Clinics (observing doctors with patients)	4	4.5
	• Hospital rounds	6	6.7

**Table 4. Students’ responses for questions on learning methods by “Practicing” (n=89)**

S/No	Questions	Responses	
		Number	%
1	<i>Which one is the most preferential method of your learning by practicing physically a skill?</i>		
	• On real patients	84	94.4
	• On simulated patients	3	3.4
	• On mannequins	2	2.2
2	<i>Do you think that patient simulation based teaching and learning should be introduced in clinical years in NDUM?</i>		
	• Yes	41	46.1
	• No	18	20.2
	• Not sure	30	33.7

#### 4. DISCUSSION

In our study, a combination of various learning styles that included reading/writing, hearing, vision, and practicing (kinesthetic modality) was preferred by 69.7% of students for their learning (multimodal). The rest of the 30.3% preferred a single learning style (unimodal). The preferred learning style by reading/writing was 12.3% of all students, by hearing 3.4%, by vision was 3.4%, and by practicing (kinesthetic modality) was 11.2%, respectively. A study carried out exclusively among the clinical medical students in one of the medical institutes of Malaysia, showed that 56% of the students had a multimodal learning style [1]. Multimodal was the most preferred learning style in some studies carried on preclinical medical students of Pakistan [25], Bangladesh [30] and India [4, 26]. In two other studies, one in Bangladesh [32] and one in Malaysia [33], that were conducted on preclinical and clinical students also found preferred multimodal learning styles in the majority of students. However, a study carried out on preclinical medical students at one of the universities of Malaysia revealed that 51.5% preferred a single mode of information presentation [8]. There are also studies in India [13, 27] and Saudi Arabia [28], which showed a unimodal preference of learning style among medical students.

The findings in this study indicate that among methods of learning by reading/writing, the most preferred was reading lecture notes/ study notes/ handouts (61.8%), followed by reading books (34.8%) and the use of the internet (3.4%). A study conducted with clinical students (3<sup>rd</sup> year with 54 students and 5<sup>th</sup> year with 36 students) at one of the medical college in Pakistan revealed that the use of internet was low (3.7% and 11% in 2 groups); the majority of medical students used books rather than the information media [31]. However, total dependence on study notes/lecture notes/handouts is inadequate for covering the vast syllabus of medical science. Traditional lecture-based predominant teachings in undergraduate medical educations are gradually fading away. Major concerns over highly lecture-based instruction include: students often become passive recipients (note-takers) of abundant information transmitted by teachers and are seldom or never actively involved in the learning process itself [34].

The bulk of the students (98.9%) of this study would make notes of teachings during all

classes. Ahmed and Asif [31] in their study, showed that 75% of students from both the groups (3<sup>rd</sup> and 5<sup>th</sup> year) took notes during their classes while the remaining did not do so. Our study revealed that reading textbooks were preferred (55.1%) over reading condensed books (43.8%). It appears that the preference for condensed/ handbook/ notebook in learning is seen in considerable number of students in this study. When asked whether they prefer e-learning or not, most of the students (53.9%) preferred to improve their knowledge. For their learning, most students (66.3%) would use uploaded teaching materials from the university e-learning service (ELS). The students were found to be more dependent on uploaded teaching materials in ELS. Therefore, adequate teaching materials, uploaded in the ELS provides one of the good methods for learning by the students. The bulk of the students in this study were found to prefer studying silently (94.3%) most often; however, 5.7% of students preferred always reading loudly for their learning. Our study revealed that memorizing the key features of learning was practiced by most of the students (71.9%).

Ahmed and Asif [31] found that few of the students did read loudly and most of the students would memorize what they studied. They found that 22 (24%) students made a timetable especially near the examinations and followed it. In our study, 20 (22.5%) of students would prepare the timetable of their study and follow it; and the remaining students would not follow or prepare any timetable

Among learning by hearing of lectures, tutorials, seminars, and clinical case discussions, 44.9% preferred learning by listening to clinical case discussions. Most of the students (65.2%) would discuss teaching & learnings with their reading partners and classmates. Many students in the study of Ahmad and Asif [31] would learn by a discussion of the topics with their fellows.

A considerable number of students (56.2%) would like to be asked questions by the teachers and preferred to interact with them during teaching sessions. A study done on 50 preclinical students at one of the universities of Malaysia also indicates question-based learning is very helpful for them to train their critical thinking and attract their attention during the lecture [29].

In our study, learning by seeing the bedside demonstrations of clinical skills by the teacher was preferred mostly (77.5%) rather than by

observing the video demonstration, clinics, and hospital rounds. The bulk of the students (94.4%) preferred learning of a clinical skill by practicing on a real patient rather than on simulated patients or mannequins.

## 5. CONCLUSION

A combination of various learning styles were preferred by the majority of students for their multimodal learning. The bulk of the students were fond of taking and reviewing notes of teaching, preferred e-learning, and studying silently. They would memorize the key features in learning. Most of the students, preferred to learn by observing the bedside demonstrations provided by a teacher and by practicing themselves. A great majority of the students preferred learning of a clinical skill by practicing on a real patient rather than simulated patients or mannequins. The preference of the student learning style and their choice should be taken into account for constructing teaching methods that are important to achieve a better academic outcome. Our study revealed that the clinical medical students have multiple learning styles. Therefore, the teaching sessions should have a combination of various activities.

## 6. LIMITATIONS OF THE STUDY

There are some limitations to this study. First, the study was conducted in the clinical medical students (only 4<sup>th</sup> and 5<sup>th</sup> year, and not 3<sup>rd</sup> year) of one medical institution in Kuala Lumpur. Hence, the findings of this study may not reflect the actual preference of learning methods of the clinical students of all the medical institutions of the country. Second, the questionnaire and study design was prepared before the COVID-19 pandemic; some part of the study was conducted before whereas some part, during the pandemic once the students were allowed to return back to university. In the lockdown period of the pandemic, the students were deprived of face-to-face bedside teaching in hospital wards which may influence some aspects of answering the questionnaire. Third, online teachings and assessments that were provided during the COVID-19 pandemic were not included in this study. The other limitation is the small sample size of students.

## CONSENT AND ETHIC APPROVAL

Informed consent was obtained from all the individuals who participated voluntarily in the

study. This study was approved by research and ethics committee of NDUM.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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