

## ORIGINAL ARTICLE

# Learning Style and Academic Performance Among Clinical Years' Medical Students

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## ABSTRACT

**Introduction:** Many kinds of research have documented the correlation between learning styles and academic performance among medical students. This study aims to assess the learning styles amongst clinical years' medical students at the University of Cyberjaya and its relation with academic performance.

**Methods:** A cross-sectional study was done among randomly selected 148, clinical years' medical students of the University of Cyberjaya. A validated self-administered questionnaire was used to determine the learning style of the student. **Results:** This study revealed that 127 of the students (85.8%) had a unimodal style compared to the remaining 21 students (14.2%) had a multimodal learning style. Among the unimodal learners, more than half of the students were found to be visual learners (65.5%). Even though a higher percentage of students who are unimodal have good academic performance, it was found that a higher percentage of students that used a multimodal learning style had excellent academic performance (19%) compared to those who are unimodal learners (4%) (p-value of 0.026). **Conclusion:** A large percentage of students in this study are visual unimodal learners. There is a significant association between an individual's learning style and their academic performance. Awareness towards one's learning style is important for them to improve their academic performance hence indirectly applying better skills in the hospital setting.

**Keywords:** Learning style, Medical Student, Academic Performance

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## INTRODUCTION

Learning style refers to the concept of an individual's mode of study that give the most effective to them. It can be categorised into one or more styles such as visual, auditory, and kinaesthetic which is believed to be associated with the effectiveness of acquiring knowledge and improved learning by teaching according to their style (1,2).

Advocates of learning-style appraisal claim that ideal guidance requires diagnosing people's learning style and fitting the guidance in like manner. Subsequently, this gives educators the significance of distinguishing students' learning styles and using various styles of educating. On the other hand, students can develop the strength of their most favoured learning styles and improve on the use of other learning styles.

University of Cyberjaya (UoC) is a private institution located in Sepang District Malaysia. The university offers a range of undergraduate and postgraduate courses with focus mainly on healthcare programmes including medicine. The five years of the medical programme in UoC is divided into two phases. Two years of basic medical sciences phase where they learn on the foundation for basic medical knowledge followed by three years of clinical clerkships where students go through a series of clinical rotations in various hospitals. In clinical phase, students spend more time on active and independent learning in hospital wards compared to the classroom. Apart from that, a logbook is used as a guideline and to document all the progression and achievement of competencies of the students which includes assessment, case presentation, assignment, and feedback. Concerning learning styles in clinical years, completing the logbook requires mainly visual and kinesthetic learning styles while lectures, and group presentations mostly utilised auditory learning styles. Hence, the combination of learning styles is best to use in the clinical phase of the medical curriculum in UoC.

Bringing awareness towards an individual's learning style is important for clinical medical students to improve their academic performance hence applying good skills when they are in a hospital setting. Deep comprehension of methods to approaching learning would be useful for clinical educators to upgrade their conveyance of learning materials. This would also support medical school planning and suit the requirements of students in a progressively productive and financially savvy way.

Thus, this study aims to determine the preferred learning styles and its association with academic performance among clinical students in the UOC.

## MATERIALS AND METHODS

### Samples

A cross-sectional study was conducted from May 2019 to September 2019 among clinical year students in UOC. Stratified random sampling was applied to choose the samples. Out of 339 total students of doing clinical posting, 158 were randomly chosen proportionately by year of study. However, only 148 students agreed to participate in this study making the response rate at 94%. Inclusion criteria of participants in the study were Malaysian and clinical year students (Year 3 to Year 5). Students who refused to participate in the survey after two approaches, were considered as non-respondents.

### Tools

Data was collected by a self-administered questionnaire after class sessions. The learning style of the sample was determined by a validated questionnaire which was adapted from Learning to Study Through Critical Thinking by Beatrice (3). The questionnaire consists of 14 items with three options that represent visual, auditory, or kinaesthetic learning. The style that suits them for most of the items was determined as their preferred style. A multimodal learning style was defined as an individual who has a predominant preference for more than one learning style. Additional information was collected such as year of study, gender, ethnicity and grade point average (GPA) for that semester.

### Statistical analysis

The data was analysed by using SPSS version 27. Frequency and percentage were utilized for descriptive statistics. Meanwhile, Pearson Chi-square was employed to determine the association between the study variables. Fisher's exact test was performed if the assumptions of the chi-square test was violated. The level of significance was set at  $p$ -value  $< 0.05$ . All aspects of this study were reviewed and authorized by the UOC Research Ethics Review Committee (CUCMS/CRERC/ER/177).

## RESULTS

### Study Population

As shown in Table I, the total number of respondents were 148 medical students with the highest number of participants for this study from year four and 22 years old medical students which were at 47% and 41% respectively. With regards to gender and ethnicity, 73% of the respondents were females and 91% of them were Malays.

**Table I : Characteristics of the respondents**

| Variable              | Frequency  | Percentage |
|-----------------------|------------|------------|
| <b>Year</b>           |            |            |
| 3                     | 29         | 20         |
| 4                     | 70         | 47         |
| 5                     | 49         | 33         |
| <b>Age (years)</b>    |            |            |
| ≤20                   | 1          | 1          |
| 21                    | 11         | 7          |
| 22                    | 61         | 41         |
| 23                    | 56         | 38         |
| 24                    | 14         | 10         |
| ≥25                   | 5          | 3          |
| <b>Gender</b>         |            |            |
| Male                  | 40         | 27         |
| Female                | 108        | 73         |
| <b>Ethnicity</b>      |            |            |
| Malay                 | 134        | 91         |
| Chinese               | 2          | 1          |
| Indians               | 7          | 5          |
| Others                | 5          | 3          |
| <b>Marital Status</b> |            |            |
| Married               | 2          | 1          |
| Single                | 146        | 99         |
| <b>Total</b>          | <b>148</b> | <b>100</b> |

### Learning styles used among clinical years medical students

The proportion of the visual learners was the highest which was at 65%, followed by multimodal, auditory, and kinesthetic with 14%, 14% and 7% respectively. We found that the majority of clinical years medical students regardless of the year of study, age, gender, race and marital status were mostly unimodal visual learners (Table II). Auditory and kinesthetic

learning styles both interchangeably had the lowest proportions in all sociodemographic data.

We performed a chi-square test to assess the difference in the proportion of learning style between year, age groups, gender, and marital status, the results in Table II indicate there were no significant difference in the learning style between all the tested variables. Due to inadequate frequency on the race variable, resulting in the expected frequency of less than 5 were more than 80% of the total cells, we performed Fisher's exact test to see the difference. The p-value was less than 0.05 indicating the proportion of learning styles was different between Malay and non-Malay students.

### Association between learning styles and academic performance

A majority of the clinical years' medical students in UOC was found to use the unimodal learning style, specifically the visual style (Table III). From this number, a large proportion of them had just an average (GPA<3.00) or good academic performance (GPA 3.00-3.49). This was the same as for all students who used a unimodal approach towards their learning (auditory and kinesthetic).

However, those who used a multimodal approach is seen to have excellent academic performance (GPA  $\geq$ 3.50) (19%) as compared to those who are using a

**Table II : Learning Styles by Year and Sociodemographic Factors**

| Variable  | Unimodal |          |             | Learning style category |            | P value |
|-----------|----------|----------|-------------|-------------------------|------------|---------|
|           | Visual   | Auditory | Kinesthetic | Total Unimodal          | Multimodal |         |
| Year 3    | 20 (69)  | 2 (7)    | 2 (7)       | 24 (83)                 | 5 (17)     |         |
| Year 4    | 44 (63)  | 12 (17)  | 6 (9)       | 62 (89)                 | 8 (11)     |         |
| Year 5    | 33 (67)  | 6 (12)   | 2 (4)       | 41 (84)                 | 8 (16)     | 0.656   |
| $\leq$ 22 | 45 (62)  | 11 (15)  | 7 (10)      | 63 (86)                 | 10 (14)    |         |
| > 22      | 52 (69)  | 9 (12)   | 3 (4)       | 64 (85)                 | 11 (15)    | 0.866   |
| Male      | 28 (70)  | 1 (2)    | 4 (10)      | 33 (82)                 | 7 (18)     |         |
| Female    | 69 (64)  | 19 (18)  | 6 (6)       | 94 (87)                 | 14 (13)    | 0.482   |
| Malay     | 90 (67)  | 20 (15)  | 10 (7)      | 120 (90)                | 14 (10)    |         |
| Non-Malay | 7 (50)   | 0 (0.0)  | 0 (0.0)     | 7 (50)                  | 7 (50)     | 0.001*  |
| Married   | 2 (100)  | 0 (0)    | 0 (0)       | 2 (100)                 | 0 (0)      |         |
| Single    | 95 (65)  | 20 (14)  | 10 (7)      | 125 (86)                | 21 (14)    | 0.736*  |
| Total     | 97 (65)  | 20 (14)  | 10 (7)      | 127 (86)                | 21 (14)    |         |

\*Fisher's exact test

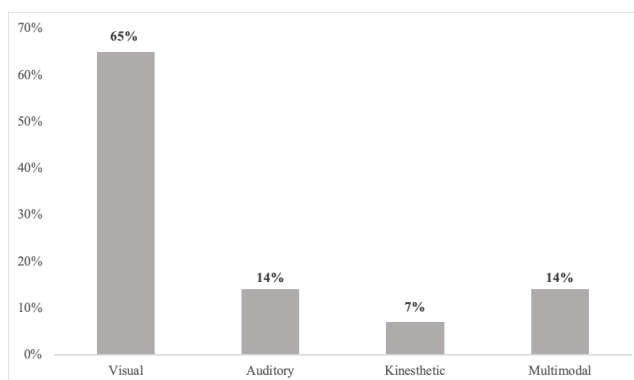
**Table III : Academic performance by learning style**

| Learning style | Academic performance, n (%) |             |             | Total (%) |
|----------------|-----------------------------|-------------|-------------|-----------|
|                | < 3.00                      | 3.00 - 3.49 | $\geq$ 3.50 |           |
| Visual         | 19 (20)                     | 74 (76)     | 4 (4)       | 97 (100)  |
| Auditory       | 2 (10)                      | 18 (90)     | 0 (0)       | 20 (100)  |
| Kinesthetic    | 4 (40)                      | 5 (50)      | 1 (10)      | 10 (100)  |
| Multimodal     | 4 (19)                      | 13 (62)     | 4 (19)      | 21 (100)  |

unimodal learning style which was only from 0 to 10%. A chi-square test was used to determine the association between learning style and academic performance (multimodal versus unimodal) and a statistically significant association was found between the variables (Table IV). The proportion of students got GPA  $\geq 3.50$  were higher in multimodal learning style group compared to unimodal group.

**DISCUSSION**

We found visual has the highest proportion of learning style (65%) as compared to the other unimodal learning styles and is seen as the dominant learning style amongst the clinical years’ medical students in UOC.



**Figure 1 : Learning styles used among clinical year students.** The proportion of the visual learners was the highest which was at 64%, followed by multimodal, auditory, and kinesthetic with 15%, 14% and 6% respectively.

**Table IV : Association between learning styles and academic performance**

| Learning Style | Academic performance, n (%) |             |        | Total (%) | Chi-square (df) | p-value |
|----------------|-----------------------------|-------------|--------|-----------|-----------------|---------|
|                | < 3.00                      | 3.00 - 3.49 | > 3.50 |           |                 |         |
| Unimodal       | 25 (19)                     | 97 (77)     | 5 (4)  | 127 (100) | 7.28 (2)        | 0.026   |
| Multimodal     | 4 (19)                      | 13 (62)     | 4 (19) | 21 (100)  |                 |         |

Compared to a study done in 2015, among pre-clinical medical students (n=419) in International Medical University (IMU), our findings are quite similar as they found that 81.3% of their students had unimodal learning style which is comparable to our value of 86%. However, among those who were unimodal, a majority of them were of the Kinesthetic type as opposed to us with Visual type as the majority (4).

This is a contrast to the study done by the Faculty of Medicine and Health Sciences of University Sultan Zainal Abidin (UniSZA) who found that among their 82 respondents, 84% preferred multimodal style of learning. The remaining 16% of the students preferred using a single mode. There were none for the visual mode amongst those who preferred unimodal styles (5). Similarly in another research, the majority of the students have a strong auditory modality of 53.33% (100 students) while the minority (4.44%,10 students) have kinesthetic learning style preference (6).

However, a few other studies had visual as the most popular learning style among students in tertiary level education. According to a study carried out among students in the Faculty of Computing at Universiti Malaysia Pahang, the most preferred learning style was the unimodal dimension with 49.8% which involves visual style, followed by the kinesthetic style (15.9%), and bimodal learning style (visual and kinaesthetic) with 11.9% of the respondents. Similar results were found in another study in Universiti

Kebangsaan Malaysia (UKM), where the majority of the respondents are visual learners with a percentage of 53.3% followed by kinesthetic (26.7%) and auditory learners (20%) (7,8).

It was observed in this study there was no association between learning style and sociodemographic factors such as age, gender and marital status (p>0.05). Our results are consistent with the study which found that there was no significant association between the learning style of students with gender, age, and marital status (6). However, a significant association was found between race and learning style (p=0.001) in our study. Previous study also revealed the same finding where the students preference of learning styles were influenced by their own socio-cultural factors (8). However with the limited size of the non-Malay samples, and no information on the students’ high school background, the generalisation of the finding should be interpreted with caution.

From our discovery, there was a statistically significant association between an individual’s learning style and their academic performance, higher percentage of students who used a multimodal learning style have GPA  $\geq 3.5$  compared to those who don’t. There is also evidence in our study that those who used a multimodal approach towards their studying are less likely to obtain GPA <3.00. Previous study was done among the same population (year 4 and 5 medical students) has reported similar observation where students with

multimodal style achieved a better academic performance than unimodal students, however no statistical significance was found in that study which might be due to limited sample size (9). Therefore, it is essential for clinical students to adapt with the teaching environment by improving their multimodal learning style by actively involving in teaching-learning activities. It was also consistent with a study done amongst dentistry students with a multimodal style group of students that had a higher GPA (10). Learning style is affected by educators' teaching style (11) which may require educators to use multiple learning styles to instill a multimodal learning style, not only in medical school, but starting from the early years of school. On the other hand, different findings were found in pre-clinical and general medical students (12,13,14).

As much as we would like to encourage students to embrace their individual learning styles and make the best out of it, we believe in the advantages a multimodal approach towards studying has to offer to both students and educators alike. A randomized controlled trial on brain training studies provided evidence that a multimodal intervention-based in which cognitive training with brain stimulation and exercise training be able to enhance learning significantly (15). Hopefully, by using a multisensory approach towards learning, the brain is able to process and store information and knowledge longer. Furthermore, as future doctors have to be lifelong learners in order to educate self, staff and patients, employing the multimodal approach is for their own short and long term advantage.

## CONCLUSION

Most of clinical students in UOC have a unimodal learning style with visual learning as the most preferred style. This study found that learning style preference was not associated with gender and age, however, it is associated with ethnicity and academic performance. Students' awareness of their learning style preference may enable them to plan a more effective study system in order to improve academic performance. This information may also be useful to medical schools, especially UOC in teaching and learning planning for clinical students in the future.

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