ASSOCIATION OF VISUAL, AURAL, READ/WRITE, AND KINESTHETIC (VARK) LEARNING STYLES AND ACADEMIC PERFORMANCES OF DENTAL STUDENTS

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ABSTRACT

Objective: To determine the learning style preferences of preclinical and clinical dental students, using Visual, Aural, Read/write, and Kinesthetic (VARK) questionnaire, and determine association between their learning styles and past academic performances.

Study Design: Cross-sectional study.

Place and Duration of Study: Fatima Memorial Hospital College of Medicine and Dentistry Lahore, from Mar 2014 to Aug 2014.

Methodology: One hundred and eighty dental students from first to final year classes and house officers, fulfilling the inclusion criteria were included in this study through non-probability consecutive sampling technique. Visual, Aural, Read/write, and Kinesthetic questionnaire was filled by all participants and association was established between learning styles and their past examinations scores.

Results: Out of 180 students, 36 students preferred visual, 31 favored aural, 32 chose read/write, 29 liked kinesthetic as single method, but 52 students' preferred multimodal learning strategy. The highest number of first and fourth year dental students used multiple learning styles whereas maximum number of second and third year students chose visual method but many house officers' chose kinesthetic method as their learning style. Pearson chi-square test showed no association between academic variables (poor, average and high achievers) and their learning preferences by considering students' scores in past annual examinations, whereas the students of third year, fourth year and house officers had significant impact of learning styles on their performances.

Conclusion: Majority of dental students preferred visual and multimodal learning styles while house officers preferred kinesthetic method. None of specific learning styles had any significant impact on learning outcome of poor, average and high achievers when compared to university scores while clinical classes showed vital influence of learning styles on their academic achievements.

Keywords: Academic performances, Effective preferences, Instructional strategy, Learning styles, Teaching implications, Visual, Aural, Read/write, and Kinesthetic questionnaire.

INTRODUCTION

The intention that students learn in many ways, has been considered as an important academic concern[1]. Learning style is a practice that covers a spectrum of modalities, preferences, and strategies that may be assessed by knowing individual' spreference for different information and mental activities[2]. When individuals become conscious of their learning style and teachers become aware of the styles of their learners, learning motivation and effectiveness increases[3]. In educational triangle of teacher, student and study topic, the learning style approach guides the professionals to focus on how students learn maximally[4]. Students become motivated to learning by knowing about strengths and weaknesses of their learning styles. The human assimilates knowledge about their environment through visual, auditory, read/write and kinesthetic sensory modalities. Based on sensory modality, the Neil Fleming has developed visual, aural, read-write, and kinesthetic (VARK) questionnaire to evaluate the learning preferences. Visual learners prefer printed information through diagrams, flow charts and arrows. Auditory learners like heard information and enjoy discussions, lectures, and tutorials. Read-write learners love printed words and texts as a means of information by

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textbooks, lecture notes and hand-outs. Kinesthetic learners internalize information best when physically involved in hands on activities. VARK is designed to initiate reflections for learning styles and arising a sense of awareness and motivation in students. Learning process differs significantly among individuals and each person adopts his own learning style due to variation in cognition and learning environment. Learning styles is a favorite method of learning to analyze, attain and interpret knowledge and if instructional strategies accommodate it, effective learning maybe anticipated. One learning style is neither preferable nor inferior but only vary with different characteristic strengths and weaknesses[5].

Many studies had shown a great disparity in learning styles among students. Learning styles are the personal qualities that improve learner's ability to gain and internalize knowledge through a better learning process. Traditional teaching using lectures and tutorial mainly focuses on contents rather than the process of learning. The effectiveness of learning process can be maximized by adopting multimodal learning styles through models and demonstrations for better scores[9]. A strong association between high academic performance and multimodal learning preferences has been publicised. However, some researchers did not find any significant correlations in learning style and past performances of students in examinations[6].

Dental educators are facing many challenges to improve student's satisfaction for curriculum and learning environment. Teaching efficacy is augmented when course design closely matches with student's learning style preferences. The students have diverse learning styles, but faculty teaches through a single mode in several dental institutions. This disparity creates frustration that forces the students to avoid lectures. Learning styles information may improve instructional delivery and reduce the level of distress in students[7]. The modification in teaching to address students' learning styles, may provide a better environment for learning.

Many factors can influence students' learning styles, including gender, age, culture, academic achievement and creative thinking. Preclinical and clinical dental students preferred multimodal learning styles and obtained higher GPA in examinations than students preferred single learning method due to skill based curriculum. In Jordan, third year nursing students with multimodal learning styles significantly showed higher grades in examinations. A high prevalence of multimodal preference was also reported in students from different dental schools in USA[8]. In south India, a high score of visual and multimodal styles is found in preclinical dental students. Another study from India has revealed multimodal and kinesthetic styles among clinical dental students but had no significant associationin learning preferences and performances[9]. In Malaysia, visual and kinesthetic approaches were reported in first year pharmacy students. Dental and medical students in Pakistan had aural and kinesthetic as single learning preferences. It is important for teachers to use different instructional strategy to accommodate individuals with diverse abilities, styles and preferences[10]. By doing so it is expected that students learning will improve or to help learners develop a broad range of capabilities.

The objective of this study was to identify the learning style preferences of first to final year dental students, using VARK questionnaire and to determine the association of learning styles with past academic performance based on university professional examination scores. It may enable the facilitators to modify the teaching methods and instructional strategies for effective learning experience and better outcomes.

METHODOLOGY

This cross-sectional quantitative study was conducted at Fatima Memorial Hospital Lahore after approval from the institutional review board. Non-probability purposive sampling technique was used and 180 volunteering dental students (1st year: 57, 2nd year: 36, 3rd year: 26, 4th year: 35 and House Officers: 26) were

included in this study from FMH College of Medicine and Dentistry Lahore Pakistan.

After ensuring confidentiality and taking informed consent, VARK questionnaire was distributed to preclinical (first and second year) and clinical (third, fourth year and house officers) male and female dental students. The returning rate of filled questionnaires was hundred percent. Student questionnaires were coded and tabulated to determine the distribution of VARK preferences. Preference ranking was calculated by counting all A (visual), B (aural), C (read/write) and D (kinesthetic) responses. Each category was equally weighted and dominant preference was defined by determining which category receives most responses as is prescribed in the VARK questionnaire. Academic performances of students were categorized into low (scored<50%), average (scored 50%-70%) and high (scored >70%) achievers based on scores obtained in annual professional university examinations.

Descriptive statistics were used to describe the quantitative variables. Frequency with percentage also calculated for each VARK component for every class. Pearson chi-square was used to determine whether an association exists between the categorical variables of class and learning preferences by considering student's performance in university professional examinations. The data was entered and analyzed by using SPSS version 20. The *p*-value of <0.05 was considered statistically significant.

RESULTS

Preferred learning styles of 180 dental students at different levels of education and house officers were given in table-I.

Pearson chi-square test was performed to determine the association between the categorical annual professional examinations performance variables (low, average and high achievers) of all BDS classes and house officers with their learning preferences. The result indicated that none of specific learning styles had any significant impact on learning outcome overall when compared to university scores of all classes (table-II). Similarly, the preclinical dental students (first and second year classes) had not shown any specific learing style related to their university performances significantly. However, the clinical classes of third year, fourth year and house officers showed significant impact on their scores by visual, multiple and kinesthetic modalities respectively (table-III). This may be due to increase acceptance of these methodologies among the students of clinical classes.

Table-I: Learning styles distribution in study groups.

Class	V	A	R	K	Multiple Methods
First year (n=57)	11 (19.3%)	11 (19.3%)	10 (17.5%)	11 (19.3%)	14 (24.6%)
Second year (n=36)	10 (27.8%)	8 (22.2%)	9 (25%)	3 (8.3%)	6 (16.7%)
Third year (n=26)	8 (30.8%)	5 (19.2%)	5 (19.2%)	3 (11.5%)	5 (19.2%)
Final year (n=35)	3 (8.6%)	4 (11.4%)	3 (8.6%)	4 (11.4%)	21 (60%)
House officer (n=26)	4 (15.4%)	3 (11.5%)	5 (19.2%)	8 (30.8%)	6 (23.1%)

Table-II: Learning Styles and Student's Grades in Study Groups.

Modalities	Students' Scores / Performances			*p*-value
	Low (<50%)	Average (50-70%)	High (>70%)	
Single Method (V)	6	4	26	0.623
Single Method (A)	7	4	20	
Single Method (R)	7	1	24	
Single Method (K)	4	4	21	
Multiple Methods	13	2	37	

DISSCUSSION

VARK method has limitations in reliability and validity and ignores factors like motivation, intellect, enthusiasm and engagement[11]. Its philosophy emphasizes teachers and academicians

to acknowledge different learning styles and encourages them to apply wide range of teaching approaches and instructional strategies[12-14].

The different learning styles make ultimate sense and have great face validity for learning professional. Among various learning styles, multimodal learning preferences have been considered typical for adult learners, as it improve the ability to learn effectively among adult learners in a variety of ways. The dental students are adult learners, having difference in learning styles[15]. The dental educators must identify the students' learning styles to accommodate variety of modalities during curriculum development for motivation and better learning outcomes[16-18].

Current study revealed a mixed pattern of learning preferences in first to final year undergraduate dental students. Most individuals have favored multimodal learning style where visual and kinesthetic styles were also dominant in the group. In this study, majority preclinical scholars have used single modal whereas maximum number of clinical students used multimodal methods. Similarly, the multimodal learning style was found to be a dominant learning preference among under-graduate medical, nursing, and midwifery students which is consistent with our findings[19,20]. Our results were also in agreement with other studies on undergrad and postgrad dental students used VARK as learning style inventory which may be due to similarity in teaching methodology among these institutions [2,8,10,21]. However kinesthetic and aural learning styles were also preferred among Pakistani dental students that is partially consistent with our results[11,19].

Murphey *et al*, found that kinesthetic and aural were less frequent in American students

Table-III: Association of learning styles and performances among study groups.

Class	Modalities	Performances			*p*-value
		Low (<50%)	Average (50-70%)	High (>70%)	
First year BDS (12-16)	Single Method (V)	3	1	7	0.788
	Single Method (A)	3	0	8	
	Single Method (R)	2	1	7	
	Single Method (K)	1	2	8	
	Multiple Methods	1	2	11	
Second year BDS (11-15)	Single Method (V)	0	0	10	0.304
	Single Method (A)	3	1	4	
	Single Method (R)	2	0	7	
	Single Method (K)	0	0	3	
	Multiple Methods	1	0	5	
Third year BDS (10-14)	Single Method (V)	0	0	8	0.032*
	Single Method (A)	0	0	5	
	Single Method (R)	3	0	2	
	Single Method (K)	0	0	3	
	Multiple Methods	2	0	3	
Fourth year BDS (9-13)	Single Method (V)	3	0	0	0.031*
	Single Method (A)	0	1	3	
	Single Method (R)	0	0	3	
	Single Method (K)	2	1	1	
	Multiple Methods	7	0	14	
House Officer (2008-12)	Single Method (V)	0	3	1	0.025*
	Single Method (A)	1	2	0	
	Single Method (R)	0	0	5	
	Single Method (K)	1	1	6	
	Multiple Methods	2	0	4	

than read/write and visual styles which is partly similar to findings of this study[8]. Likewise Saran *et al*, found multimodal and uni-modal preferences among preclinical dental students[17]. Indian first year medical and dental students favored aural and kinesthetic preferences[20,22]. The difference of learning styles may be explained by variation in gender, culture and academia of participants because all these factors have important influence on academic performances[8].

Khalid *et al*, demonstrated that 36% of the dental and medical students preferred kinesthetic as single method while the remaining 64% students preferred multiple learning styles, because those adult learners who know how to learn are capable of adjusting to any method[14]. In a research on clinical dental student, a multimodal and kinesthetic styles had been preferred but observed no significant correlations between the learning style preferences and the performances in examinations that may be due to decrease in sample size[13]. Chaudhary presented 27.6% medical students with visual method whereas 72.4% students with multiple learning styles and had no association with academic performance[23]. These findings were consistent with our outcomes because of similarity in syllabus and instructional methodology

In Jordan, third year nursing students showed a dominant read/write, kinesthetic followed by multiple learning styles. The researcher revealed significant higher grades in students having multimodal learning preferences due to competency based curriculum[9]. Similarly in Saudi Arabia, the studies performed on preclinical dental students with multiple learning styles, showed better GPA scores in comparison with individuals having single learning style[10,24]. These findings are not compatible with our results due to difference in courses, cultural background and educational settings as these factors have a higher impact on students' performance.

CONCLUSION

Preclinical and clinical dental students preferred multiple learning styles whereas visual and kinesthetic preferences are also prevailed in groups. Multimodal learning styles were highly liked due to better understanding. Preclinical classes had perception that single or multiple modalities had no impact on their learning performance while clinical classes had view that performance may improve by adopting different learning modalities.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any authors.

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