

## The relationship between learning style preferences from VARK model and academic performances among the students of Dentistry in 2016-2017

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Individual's learning style determines the mechanism of processing, internalization, and retention of new information. The higher education centers and professors need information and conformity to various learning styles to help students learn effectively. In addition, researchers believe that learning styles are one of the factors responsible for differences in students' academic performance.

**METHODS:** The sample of present study consisted of all the first-year to sixth-year dental students and the postgraduate students of School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran, in the second semester of 2016–2017. The subjects were included in the study using the census method (343 undergraduate and 59 postgraduate students). Data were collected using VARK questionnaire. The students' overall mean grades were used to evaluate their academic performance. The data were analyzed with SPSS software; also descriptive statistics (frequencies, central indices, and distribution) and analytical statistics were used. The correlation between learning style and the average of the students was evaluated with analysis of variance (ANOVA) test and chi-square test was used to evaluate the relationship of learning styles with age, gender, and grades of education.

**RESULTS:** 88.3% of the learners were unimodal and 11.7% used multi-modal learning style. No statistical correlation between the students' learning style and their academic performance was found ( $P = 0.066$ ).

**CONCLUSION:** The professors should be aware of the different preferences of students in learning styles and take the necessary steps to develop effective educational techniques that fit the students' learning styles.

**KEYWORDS:** Learning; Academic Performance; Education; Students; Dental

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The personal learning style determines how an individual processes, internalizes, and retains new information.<sup>1</sup> The majority of teachers and instructors believe that high-quality teaching helps effective learning. Effective learning depends on the learner's

active participation in the learning process. The higher education institutes and professors require knowledge and conformity to different learning styles in order to help students learn effectively.<sup>2</sup> One of the responsibilities of the medical group professors is to impart knowledge, attitudes,

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and skills and evaluate them. The motivation and performance of students are promoted when there is conformity between the teaching style and the students' learning style.<sup>3</sup>

Academic performance is a criteria of the success of academic activities in all the educational systems and its prediction is one of the most favorable fields for the majority of researchers.<sup>4</sup> Academic performance is defined as the outcome of an individual student's efforts in relation to official educational activities and in fact, all the endeavors of the educational system are directed toward it. Academic performance is a dependent variable and it is affected by various factors.<sup>5</sup> Learning styles are variables that have attracted researchers' attention to predicting academic performance.<sup>6</sup> Students prefer a variety of learning styles, while the professors use only one technique for teaching. Professors should have sufficient knowledge about using diverse learning methods among students.<sup>7</sup>

Different techniques are available to determine learning styles, one of the newest and the most intelligible of which is the VARK learning style questionnaire.<sup>2</sup> Researchers believe that learning styles are one of the factors responsible for differences in the students' academic performance. So, for professors, it is valuable to have knowledge about the educational preferences of learners and implement the most suitable learning strategies to increase the quality of learning and adjust it to the learners' interests.<sup>8</sup> Dental students need a certain type of practical training because of the major nature and professional importance of their job. The choice of these teaching methods and media depends on a variety of factors, including student's learning style. So, awareness of the student's characteristics and needs in the teaching-learning process helps the instructor in the logical design of education. There is no study in Iran that addresses the issue of VARK learning styles and academic performance in dental students. It is likely to promote the information about factors that affect learning style and its relation with educational performance by

implementing the VARK questionnaire.

There have been various researches in this area around the world including the studies of Salimi et al.,<sup>1</sup> Baykan and Nacar,<sup>3</sup> Asiry,<sup>7</sup> and Urval et al.<sup>9</sup> Salimi et al. in a research at Isfahan University of Medical Sciences, Isfahan, Iran, showed that 48.4% of students preferred single-modal and 51.6% of them preferred multi-modal learning styles. The results showed that learning styles and educational grades had statistical significant relevancy ( $P < 0.05$ ).<sup>1</sup>

In a study among medical students, Baykan and Nacar showed that 4.1% of students had single-modal learning style (1.5% kinematic, 1.2% auditory, 4.9% visual, and 1.5% reading/writing) and 2.9% had multi-modal learning style.<sup>3</sup>

Asiry conducted a research among dental student of King Saud University, Riyadh, Saudi Arabia. His findings show that 58.4% and 41.6% of the students prefer multi-modal and single-modal learning styles, respectively, and there is no relationship with educational levels.<sup>7</sup>

Urval et al.'s findings in medical students showed that the majority of them were multimodal and their dominant unimodal style was aural (45.5%) and kinesthetic (33.1%). It should be mentioned that sex or academic performance had no effect on learning styles.<sup>9</sup>

The major goal of the current research was to determine the dominant learning style of dental students of Kerman University of Medical Sciences, Kerman, Iran, using VARK questionnaire and also to investigate the relationship between learning style and academic performance. We hope that this study will provide valuable findings as a guide for teachers and curriculum designers to select the most suitable educational content and method.

## Methods

This cross-sectional research was performed at School of Dentistry, Kerman University of Medical Sciences in 2016–2017. 343

undergraduate and 59 postgraduate dental students were included in the study by using the census technique. Students transferred from other universities, guest students, and those not interested to participate in the study were excluded. Finally, statistical analyses were carried out on 236 undergraduate and 34 postgraduate dental students. All the students were given adequate information orally and were reassured that the data acquired from the study would be kept confidential and would only be used for statistical analyses. Students who were reluctant to complete the questionnaires were omitted. The Ethics Committee of Kerman University of Medical Sciences approved this study under the code of IR.KMU.REC.1396.1519.

In order to identify students' learning style, the VARK questionnaire was used. We implemented the standard VARK questionnaire of Salimi et al. in this research. Its validity and reliability have been measured previously. The experts confirmed the validity of the questionnaire by Cronbach's alpha coefficient ( $\alpha = 0.86$ ); its reliability was also approved.<sup>1</sup>

The questionnaire has been designed in two sections. The first section deals with demographic data and the second section consists of questions on learning styles. Each question has 4 choices and each choice surveys one of the aspects of learning style. The students can choose more than one choice for each question. Each choice in every aspect or field has one point. A higher grade in each learning style indicates a greater inclination for that style. If an individual achieves an equal score in two or more field, the learning style is considered multi-modal.<sup>1</sup>

In order to evaluate the educational performance of the students, their overall mean grades were evaluated from the beginning of their studies at the university until the time of this study. To eliminate the self-reporting limitation, the students' mean grades were also provided by the Education Office of the School and categorized as follows:

A mean grade of > 17 (out of 20): good educational performance

A mean grade of 14-17: moderate educational performance

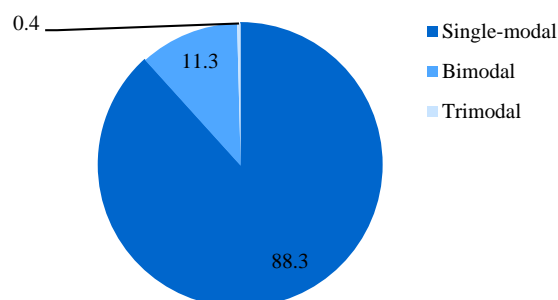
A mean grade of < 14: poor educational performance

The data were analyzed by SPSS software (version 22, IBM Corporation, Armonk, NY, USA); also descriptive statistics (frequencies, central indices, and distribution) and analytical statistics were used. Analysis of variance (ANOVA) test was used to assess the relationship between students' learning style and grade point average (GPA) and chi-square test was performed to assess the relationship of learning style preferences with age, sex, and educational levels.

## Results

The mean age of the students was 23.59 years and the students' mean grade point was 15.96. Of the students evaluated, 171 (63.3%) were women and 99 (36.7%) were men. In relation to the educational level, 236 students (87.4%) were undergraduate and 34 (12.6%) were postgraduate students.

Figure 1 shows distribution of learning styles among students. 88.3% of 270 students that were studied, had single-modal learning style, 11.3% had bimodal learning style, and 0.4% had tri-modal learning style.



**Figure 1.** Distribution of learning styles among students

Among 204 students with single-modal learning style, the highest frequency of learning styles was related to aural style, followed by read/write, kinesthetic, and

visual styles in descending order. There were 27 students using multimodal styles; the highest frequency was related to aural and read/write styles (48.14%). The frequency distributions of other combinations of styles are presented in table 1.

**Table 1.** Distribution of learning styles

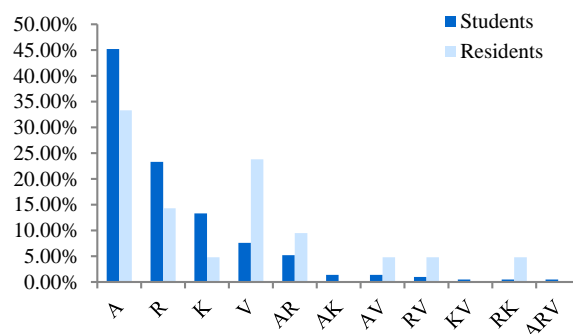
Learning style		n (%)
Single-modal	Aural	50.00
	Read/write	25.40
	Kinesthetic	14.21
	Visual	10.29
Multimodal	Aural and read/write	48.14
	Aural and kinesthetic	11.11
	Aural and visual	14.81
	Read/write and visual	11.11
	Kinesthetic and visual	3.70
	Read/write and kinesthetic	7.40
	Aural, read/write, and kinesthetic	3.70

Table 2 demonstrates the learning styles and characteristics of the dental students.

There was no significant relationship between the students' learning style and sex (P = 0.308) and no correlation were found between learning style and age (P = 0.388); also no statistically significant difference was found between learning style and academic performance (P = 0.668).

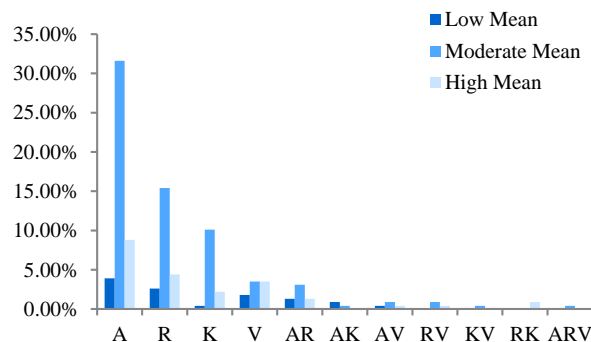
The undergraduate and postgraduate students did not have any significant difference in the learning style (P = 0.066).

Figure 2 shows distribution of learning styles in students and residents. 45.2% of undergraduate students and 33.3% of postgraduate students selected aural learning style as their dominant learning style.



**Figure 2.** Distribution of learning styles in students and residents

Figure 3 shows distribution of learning styles among students based on the mean grades. Of the students studied, 11.4% had low mean grades, 66.7% had moderate mean grades, and 21.9% had high mean grades. The aural learning style was the dominant learning style in all the three categories of students.



**Figure 3.** Distribution of learning styles among students based on the mean grades

### Discussion

Knowledge of learning style is a valuable skill that can help teachers solve educational problems and improve students' learning.<sup>3</sup>

**Table 2.** Learning style and characteristics of dental students

Characteristics	Learning styles					P	
	Auditory	Read/write	Kinesthetic	Visual	Multimodal		
Age (year) (mean ± SD)	23.11 ± 3.94	24.04 ± 4.41	22.66 ± 2.54	24.31 ± 3.01	23.30 ± 3.24	0.388	
Sex (%)	Male	32.4	44.2	51.7	38.1	33.3	0.308
	Female	67.6	55.8	48.3	61.9	66.7	
GPA (mean ± SD)	15.81 ± 1.42	15.83 ± 1.43	15.73 ± 1.28	16.34 ± 2.19	15.83 ± 1.77	0.668	
Educational level (%)	Undergraduate	93.1	94.2	96.6	76.2	81.5	0.066
	Postgraduate	6.9	5.8	3.4	23.8	18.5	

GPA: Grade point average; SD: Standard deviation

In the present study, undergraduate dental students (first to sixth year) and postgraduates completed VARK questionnaire in order to determine their learning style; then, the relationship between learning style and academic performance was assessed.

Single-modal learning style was used by most of the students in this study (88.3%) and aural was the dominant learning style (50.0%); also the least preferred one was visual (10.3%). These results are in line with the findings of Prabha<sup>10</sup> and Siddiqi et al.<sup>11</sup>

57.96% of dental students in Prabha's study had single-modal learning style, so that aural was the most dominant one and 42.04% of them had multi-modal style.<sup>10</sup> Siddiqi et al.'s study revealed that 52.0% of the dental students who were studying in first and second year were single-modal, while multi-modal style was preferred by 48.0% of them. Based on the results, the students used kinesthetic and aural styles.<sup>11</sup> 68.7% of the students used multiple learning styles in Urval et al.'s research and the dominant single-modal style was aural.<sup>9</sup> Javadinia et al. found that 48.6% of medical students preferred aural learning style,<sup>8</sup> that is in line with the present study. Baykan and Nacar reported that the unimodality preference of first-year medical students was 36.1% and multi-modality was 63.9% and kinesthetic (23.3%) was dominant in unimodals.<sup>3</sup> The majority of dental students at King Saud University preferred multimodal learning style (58.4%), while others preferred a unimodal learning style (41.6%) and in the unimodal learners, kinesthetic and aural styles (35.1%) were dominant.<sup>7</sup>

Learners with multimodal learning style have greater flexibility in acquiring knowledge compared to those with single-modal learning style.<sup>12</sup>

Multimodal students do not just use passive approaches to learning but also obtain the required information in different ways. Further, by using active learning methods, students' learning becomes better. Active learning methods enhance thought by

finding reasons, problem solving, and decision making skills. Educators can implement active learning strategies like discussion, models, role play, games, simulation, etc. in large classes too. These methods increase teamwork and generate more enthusiasm and motivation in students. Since dental students do clinical works, these learning strategies are very valuable for them.<sup>3</sup> In this research, just 11.7% of learners used multimodal learning style, while inactive methods such as aural was used by most of the students. Some factors can help boost the aural learning style and note-taking habits among students. These factors include the education methods, the dominance of professor-oriented system, and the professor being the sole speaker in classes from school to college.<sup>13</sup> In our university, it is assumed that all students are auditory and it is due to the effect of education methods in school years, which was mainly in a lecture format. It is difficult to change student's dominant learning style at university. However, students' clinical activities indicate that improving their learning abilities also requires the development of learning styles. Such a change in education strategies should occur during school, so that it can be manifested at the university, too. Learning styles are not unchangeable and they can be modified by altering the teaching techniques in various fields; therefore, adequate attention should be paid to the clinical and practical training in addition to learning styles.<sup>8</sup>

Sex and unimodal learning style did not have any significant relationship in the current study. Furthermore, grades of education did not have a correlation with learning modals. The results of a study by Salimi et al.<sup>1</sup> are different from those of the present study.

Salimi et al. did a study like the current one, and reported a correlation between sex and unimodal learning style; also the results showed that aural style was used by 21.3% of women and 12.9% of men. Grades of education and learning modals had

significant relationships ( $P > 0.050$ ).<sup>1</sup> Baykan and Nacar,<sup>3</sup> Javadinia et al.,<sup>8</sup> Urval et al.,<sup>9</sup> Ahmadi and Allami,<sup>14</sup> and Amini et al.<sup>15</sup> found different results in their studies. The learning style and educational grades did not show any statistical significant relationship. This research did not report any relationship between mean grade point and learning modals. These are in consistency with Behnam Moghadam et al.,<sup>2</sup> Baykan and Nacar,<sup>3</sup> Asiry,<sup>7</sup> Urval et al.,<sup>9</sup> Ahmadi and Allami,<sup>14</sup> and Hamouzadeh et al.<sup>16</sup> findings. There is no general comment about academic performance and learning style relationship. If learning styles become more active, they can have positive effects on students' educational performance. Using different educational methods is valuable for teachers, so that they can cover a variety of learning modes. Hence, the instructors should combine different educational and teaching strategies in each educational program to cover divergent learning styles.<sup>17</sup>

According to what mentioned above, changing the learning style of dental students of Kerman University of Medical Sciences to more active styles is necessary. The role of professors is vital to make students' learning styles more active. They can use motivational and incentive strategies to change students' learning styles. It is suggested that higher education authorities become sensitive to the use of teaching techniques and assessment of professors. In addition, they should arrange educational workshops to make the professors aware of teaching style.<sup>2</sup>

The research limitations were: first, students did not return some questionnaires; second, number of residents was low and their cooperation to fill out the questionnaires was not satisfactory; and third, some data were missed because of incomplete questionnaire filling.

### Conclusion

The results of the present study revealed that the dominant learning style of dental students of Kerman University of Medical Sciences was auditory. Most of the students preferred single-modal learning styles over multi-modal learning styles. This study showed no significant relationship between students' dominant learning style and their academic performance.

Based on this research, the attention to the empowerment of professors in learning styles is necessary. The professors should be aware of the students' preferences and the rate of using different senses in learning in order to implement multi-modal techniques and media for teaching.

### Conflict of Interests

Authors have no conflict of interest.

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