The Relationship Between Learning Style Preferences and Gender, Educational Major and Status in First Year Medical Students: A Survey Study From Iran

Ali Sarabi-Asiabar [1]; Mehdi Jafari [2,3]; Jamil Sadeghifar [4,*]; Shahram Tofighi [5]; Rouhollah Zaboli [6]; Hadi Peyman [7]; Mohammad Salimi [8]; Lida Shams [8]

[1]Research Center for Health Services Management, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, IR Iran
[2]Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, IR Iran
[3]Department of Health Services Management, School of Health management and Information Sciences, Iran University of Medical Sciences, Tehran, IR Iran
[4]Department of Health Education, School of Public Health, Ilam University of Medical Sciences, Ilam, IR Iran
[5]Health Management Research Centre, Baqiyatallah University of Medical Sciences, Tehran, IR Iran
[6]Department of Health Services Management, Health School, Baqiyatallah University of Medical Sciences, Tehran, IR Iran
[7]Research Center for Prevention of Psychosocial Injuries & Student Research Committee, Ilam University of Medical Sciences, Ilam, IR Iran
[8]Health Management and Economics Department, School of Public Health, Tehran University of Medical Sciences, Tehran, IR Iran

Corresponding Author: Jamil Sadeghifar, Department of Health Education, School of Public Health, Ilam University of Medical Sciences, Ilam, IR Iran. Tel: +98-9124474770, E-mail: jamil.sadeghifar@gmail.com

Background: Identifying and employing appropriate learning styles could play an important role in selecting teaching styles in order to improve education.

Objectives: This study aimed to determine the relationship between learning styles preferences and gender, educational major and status in first year students at Isfahan University of Medical Sciences.

Patients and Methods: A cross-sectional study employing the visual-aural-read/write-kinesthetic (VARK) learning style's questionnaire was done on 184 first year students of medicine, pharmacy, dentistry, nursing and health services management at Isfahan University of Medical Sciences in 2012. The validity of the questionnaire was assessed through experts' views and reliability was calculated using Cronbach's alpha coefficients ($\alpha = 0.86$). Data were analyzed using the SPSS ver.18 software and x^2 test.

Results: Out of 184 participants who responded to and returned the questionnaire, 122 (66.3%) were female; more than two-thirds (68.5%) of the enrolled students were at the professional doctorate level (medicine, pharmacy, dentistry) and 31.5% at the undergraduate level (nursing and health services management). Eighty-nine (48.4%) students preferred a single-modal learning style. In contrast, the remaining 95 students (51.6%) preferred multi-modal learning styles. A significant relationship between gender and single modal learning styles ($P = 0.009$) and between status and learning styles ($P = 0.04$) was observed.

Conclusions: According to the results, male students preferred to use the kinesthetic learning style more than females, while, female students preferred the aural learning style. Knowledge about the learning styles of students at educational institutes is valuable and helps solve learning problems among students, and allows students to become better learners.

Keywords: Medical Students; Learning Style; VARK; Survey

1. Background

Each student learns in different ways and this affects their performance. In medicine, students and teachers must update themselves and find appropriate ways for learning (1). In such situations learning styles can help them improve their learning ability (2). Teacher-based strategies can change to student-based strategies in learning environments, and this requires gaining knowledge about the learning styles of students and adapting teaching strategies (3). Identifying learning styles of students is important and is sometimes considered to be a teacher's responsibility (4). In order to achieve maximize performance, lecturers must adopt themselves with learning styles of students. Learning style is a complicated issue.

Several models have been proposed for determining learning styles. These models have various assumptions, and focus on different aspects (5). An individual's learning style specifies their way of processing, internalization and memorizing new information (6). Bertolami has proposed that one reason for students' frustration towards the curriculum is inconsistency between learning content and instructor's teaching methods (7). In order to increase motivation and improve students' performance as well as to meet their preferred learning styles, it is necessary to update and fit teaching methods and evaluate their efficacy (8). Despite criticisms regarding the current level of awareness about learning styles, such awareness

has been proved to be a small part of the learning process (9). Identification of preferred learning styles of students has helped overcome the tendency to have instructors with similar behaviors (10). In fact, instructors can instruct and teach more students, because there is better coordination between instructors and learning styles (11-18). Students process and acquire information in various ways such as seeing and hearing, as well as reflection and action, thought, analysis and imagination (19). There are different techniques for determining learning styles, the latest is the visual-aural-read/write-kinesthetic (VARK) learning styles questionnaire. This questionnaire was developed by Fleming at Lincoln University New Zealand, in 1998. This approach categorizes students into four classes according their interaction and response to learning environment: 1. Visual (V): learners who learn better through seeing visual educational material (diagrams, figures and pictures) with explanation; 2. Aural (A): learners who learn better through hearing and verbal teaching (listening to the lecture and explanations); 3. Read/write (R): learners who learn better if they take notes during the lecture or while reading written or printed material; 4. Kinesthetic (K): learners who learn better when they perform practical and experiential tasks and object manipulation by physical processes (20). Studies on learning styles of students suggest the importance of this issue (survey on Learning styles). For example, studies by Alkhasawneh et al. on nursing students (21), Bahadori et al. on health services management students (22), Peyman et al. on nursing and midwifery students (23), Murphy et al. on dentistry students (24), Lujan and DiCarlo on medical students (25), and Breckler et al. on physiology students (26) all demonstrate greater preference for the use of multidimensional learning styles. A few studies have previously been performed using the VARK questionnaire in Iran, however this study particularly looks at the preferred learning styles of first year students of medicine, pharmacy, nursing and health services management majors at Isfahan University of Medical Sciences using the VARK questionnaire.

2. Objectives

This study aimed to determine the relationship between learning styles preferences and gender, educational major and status of first year students at Isfahan University of Medical Sciences.

3. Patients and Methods

3.1. Sample

This research was a cross-sectional study. The target population was the students at a university of medical sciences in the center of Iran (Isfahan University of Medical Sciences). To guarantee greater representation of data, all first year students of medicine, pharmacy, nursing and health services management (N = 240) who

had been accepted at this university through the 2012 entrance exam were selected by the census method. From the target sample of 240 questionnaires, 184 questionnaires were completed and 11 were discarded as incomplete. Hence, the final response rate was 77%. The final sample consisted of 122 females (66.3%) and 62 males (33.7%); overall, more than two-thirds of the participants (68.5%) were studying at the general practitioner (GP) level and 58 students (31.5%) were studying at the bachelor of sciences (BSc) level.

3.2. Data Collection

Data were collected from students during the period between October and November 2012. Student consents were obtained for participating in the study and filling the questionnaire. Data were collected using a questionnaire composed of two parts. The first part included questions such as gender, educational major and status. The second part was the VARK standard questionnaire adapted from Fleming's "How Do I Learn Best" book (27), which was used in order to determine learning styles of students (Table 1). The VARK questionnaire is a learning preferences tool and version 7.0 consists of 16 multiple choice questions, each with four choices. In this study, the instrument was administered by hard copy, although it is also available online. All choices correspond to the four sensory modalities measured by VARK (visual, aural/auditory, read/write, and kinesthetic). The students can select one or more choices based on the sensory modality preferred by the student to take in new information. This questionnaire has been used by different studies in Iran and all over the world and its validity and reliability has been assessed (22, 23). The English version of the VARK questionnaire was translated and its validity approved by experts and its Cronbach's alpha coefficient was calculated ($\alpha = 0.86$). The researches visited the participants at their classes and distributed the questionnaires, and collected the answers once complete. Before filling the questionnaire, necessary information about the questionnaire was given by the researchers.

3.3. Data Analysis

Data are reported as percentages of students in each category of learning style preference. The number of students who preferred each mode of learning was divided by the total number of responses to determine the percentage. Data were entered and processed using the Statistical Package for the Social Sciences (SPSS) software, version 18 and the x^2 test.

3.4. Ethical Issues

According to the type of study, we were not required to gain any formal ethical approval from the University's Research Ethics Committee. The main ethical issues were the respondents' right of self-determination, anonymity and confidentiality. The questionnaires with a partici-

pant's information sheet on the nature of the study were distributed amongst the participants. Normally, questionnaires don't need a written consent form. Thus, the participants consented verbally. Furthermore, return of the completed questionnaire demonstrates their consent to participate in the study. The questionnaire data were kept confidential and respondents were assured of their right to withdraw at any time. The names of the respondents were not recorded on the questionnaire, thus rendering the data anonymous.

4. Results

A total of 184 students completed the questionnaire in 2012, so the responsiveness rate of the current study was 76.6%. From this group 122 individuals (66.3%) were female. Overall, more than two-thirds of the participants (68.5%) were studying at the general practitioner (GP) level and 58 students (31.5%) were studying at the bachelor of sciences (BSc) level. Among 184 students, 89 students (48.4%) and 95 students (51.6%) preferred single modal and multimodal learning styles, respectively (Figure 1). From the 89 students who preferred single-modal, 40 students (21.7%) chose the reading and writing (R) style, 34 students (18.5%) chose the auditory (A) style, 12 students (6.5%) chose the kinesthetic (K) style and three students (1.6%) chose the visual (V) style (Figure 2). From 95 students who preferred multi-modal, 27 students (20.1%) preferred bi-modal, 28 students (15.1%) preferred tri-modal and 30 students preferred quad-modal (VARK) (Figure 3). Eighteen students (9.8%) preferred auditory/reading and writing (AR) and 17 students (9.2%) preferred auditory/reading and writing/kinesthetic (ARK). More detail is given in Figure 4. From the 122 female students, 54 students (44.3%) preferred single-modal (three students chose V, 26 students chose A, 21 students chose R and four students chose K) and 68 students (45.7%) preferred multi-modal learning styles (28 students bi-modal, 19 students tri-modal and 21 students quad-modal) (Table 2). From the 62 male students, 35 students (56.5%) preferred single modal (eight students chose A, 19 students chose R and eight students chose K) and 27 students (53.5%) preferred multi-modal learning styles (nine students bi-modal, nine students tri-modal and nine students quad-modal). There was a significant difference between males and females regarding preferred learning styles ($x^2 = 13.531$, P = 0.009) (Table 2). Of the 126 GP students, 64 students (50.8%) preferred single-modal (two student chose V, 26 student chose A, 24 students chose R and 12 student chose K) and 62 students (49.2%) preferred multi-modal learning styles (28 students bi-modal, 15 students tri-modal and 19 students quad-modal) (Table 2). Of the 58 BSc students, 25 students (43.1%) preferred single-modal (one student chose V, eight student chose A and 16 students chose R) and 33 students (56.9%) preferred multi-modal learning styles (nine students bi-modal, 13 students tri-modal and 11 students quad-modal). There was a significant relationship between educational level and preferred learning

style ($x^2 = 7.887$, P = 0.04) (Table 2). From the 27 medicine students, 17 students preferred (63%) single-modal and ten students (37%) preferred a multi-modal learning style. Preference for a single modal learning style was 54.4%, 38.1%, 45% and 42.1% amongst pharmacy, dental, health service management and nursing students and the percentages for multimodal learning styles was 45.6%, 61.9%, 55% and 57.9%, respectively with no significant relationship (P = 0.23) (Table 2).
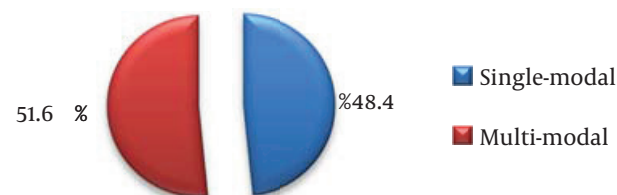
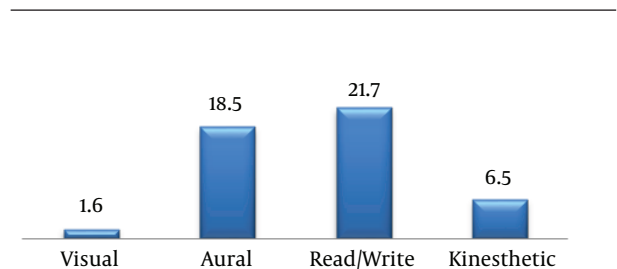

Figure 1. Overall Distribution of Learning Styles

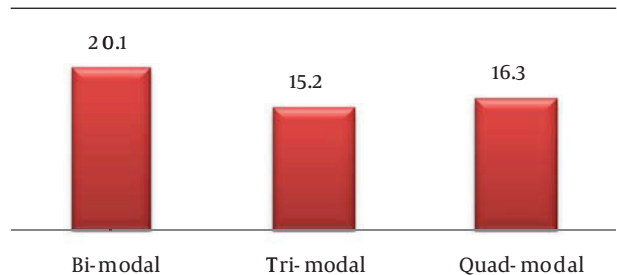**Figure 2.** Distribution of Single-Modal Learning Styles

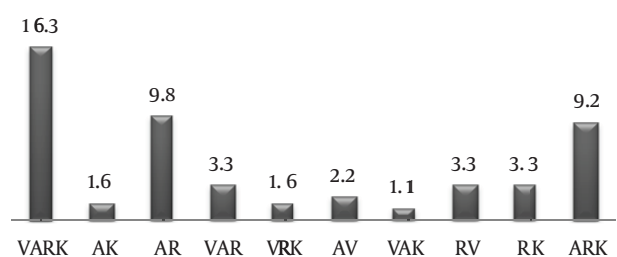**Figure 3.** Distribution of Multi-Modal Learning Styles

Figure 4. Distribution of Multi-Modal Learners, Segregated by Learning Styles

Table 1. Selected Questions from Flemming's Online VARK Assessment

You are not sure whether a word should be spelled 'dependent' or 'dependant'. You would:

A. Write both words on paper and choose one.

B. Think about how each word sounds and chooses one.

C. Find it in a dictionary.

D. See the words in your mind and choose by the way they look.

I like websites that have:

A. Interesting written descriptions, lists and explanations.

B. Audio channels where I can hear music, radio programs or interviews.

C. Things I can click on, shift, or try.

D. Interesting design and visual features.

A group of tourists want to learn about the parks or wildlife reserves in your area. You would:

A. Take them to a park or wildlife reserve and walk with them.

B. Show them internet pictures, photographs, or picture books.

C. Talk about or arrange a talk for them about parks or wildlife reserves.

D. Give them a book or pamphlets about the parks or wildlife reserves.

Table 2. Single and Multi-Modal Learning Preferences of Students According to Gender, Status and Educational Major [a]

	Uni-Modal	Bi-Modal	Tri-Modal	Quad-Modal	Sum	P Value
Number of students	89 (48.4)	37 (20.1)	28 (15.2)	30 (16.3)	184	
Gender						0.009
Male	35 (56.5)	9 (14.5)	9 (14.5)	9 (14.5)	62 (35.8)	
Female	54 (44.3)	28 (23)	19 (15.6)	21 (17.2)	122 (64.1)	
Status						0.04
Professional doctorate	64 (50.8)	28 (22.2)	15 (11.9)	19 (15.1)	126 (68.5)	
Undergraduate	25 (43.1)	9 (15.5)	13 (22.4)	11 (19)	58 (31.5)	
Educational major						0.23
Medicine	17 (63)	4 (14.8)	4 (14.8)	2 (7.4)	27 (14.7)	
Pharmacy	31 (54.4)	12 (21.1)	6 (10.5)	8 (14)	57 (31)	
Dentistry	16 (38.1)	12 (28.6)	5 (11.9)	9 (21.4)	42 (22.8)	
Health services management	9 (45)	2 (10)	3 (15)	6 (30)	20 (10.9)	
Nursing	16 (42.1)	7 (18.4)	10 (26.3)	5 (13.2)	38 (20.7)	

[a] Data presented as No. (%).

5. Discussion

The current study was performed on first year medical students of Isfahan University of Medical Sciences. The aim of this study was to determine the relationship between gender, educational major, and status with learning styles based on the VARK standard questionnaire. Awareness of learning styles of learners is very helpful in education systems and helps instructor identify and solve learning problems of learners. Similarly, it helps learners learn more efficiently (28). Being aware of learning style of learners can; 1) provide motivation for instructors to move towards learning styles of student from their own teaching method; 2) help overcome a single style in students of a specific group (a class, for example); 3) help improve teaching structure consider-

ing the students preferred teaching style; and 4) lead to development of educational approaches (25). Among 184 students filling and returning the questionnaires, 89 (48.4%) preferred only one learning style. Their dominant style was one of following: visual, aural, reading/writing or kinesthetic. Among those preferring only one learning style, 18.5% preferred to acquire information through lectures and they are called learners with the aural learning style. Furthermore, 21.7% preferred acquiring information through printed material and reading and writing, and these individuals are known as learners with the reading/writing learning style. Only 6.5% preferred learning though using all senses including touch, aural, smell, visual and visual senses. This group is called learners

with the kinesthetic learning style. Amongst those with a visual learning style 1.6% preferred acquiring information through figures, charts and flow charts. There was a significant relationship between genders of students and using single-model learning styles; female students preferred using aural learning style more than male students. In contrast, male students preferred using the kinesthetic learning style more than female students. The majority of candidates (51.6%) preferred using multiple learning styles. They had a balanced set of preferences and gain information in various ways. Less than half of them (20.1%) preferred the bi-model learning style, 28 (15.2%) preferred using the tri-model learning style and 30 (16.3%) preferred using all four learning styles. Overall, 43.5% of male students and 55.7% of female students preferred using the multi-model learning style. The multimodel learning style was the dominant learning style of students in studies of Alkhasawneh et al. (21), Koch et al. (29), and James et al. (30) on nursing students, Murphy et al. (24) and El Tantawi's (31) on dental students, Lujan and DiCarlo (25), Slater et al. (32) and Baykan and Nacar (33) on medical students, and Dobson's (34) on physiology students. As stated by Kharb, only 39% of people use the single-model learning style, while most students (61%) have the multi-model learning style (3). Students with the multi-model learning style prefer to gain information in various ways. They don't learn well just by one simple method of listening to instructors and memorizing new materials (35). In order to learn effectively, this group of learners should talk and write about what they are learning; they need to link new material to their background knowledge and experience and use it in routine life (35, 36). It should be noted that students only remember 20% of what they read, 30% of what they hear, 40% of what they see, 50% of what they say, and 60% of what they do. This figure increases to 90% for those saying they hear, see and do (37). Studies have shown that students learn better by using active learning strategies, since such strategies consider different types of learners (25, 36). Active learning strategies enhance thinking by improving problem solving and decision-making skills. Class discussions, participatory learning skills, role-playing, simulations and models are active learning strategies, which can be used in large classrooms. In addition, they improve team work and lead to increased motivation. Such experiences are valuable for medical students as team-work is part of their future career. According to the results, male students prefer to use the kinesthetic learning style more than female students while, female students prefer the aural learning style. Identifying learning styles of learners at the start of students entrance to the university is helpful due to the following reasons: 1) students become aware of their own learning style and thus can select better methods to enhance their learning; 2) instructors become informed about their student's preferences and this allows them to use teaching methods matched with the learning styles of their students; and 3) graduates

will have sufficient knowledge and proficiency resulting from real and effective learning. According to the results of this study students require different methods of teaching and it is better for both lecturers and students to set different styles of teaching in the frame of the course. Finally, this study was conducted with respect to medical students at Isfahan University of Medical Sciences, thus the results from other institutions may be different.

5.1. Limitations

This study had some potential limitations that may affect the results. The study was limited to a single university, with a limited, yet diverse student population. It is unlikely for the results of the statistical analysis to be attributed to chance, but this does not necessarily imply that they are valid outside this university or that they can be generalized to other settings. Another limitation of this study, and any study using the VARK questionnaire, is that it does not account for confounding factors such as socioeconomic status, race, culture, etc. However, the relatively homogenous population surveyed in this study is likely to be less effected by these factors (32). A strong point of the VARK questionnaire is that its questions and options are drawn from real-life situations and respondents identify with the results that they receive–they affirm the face validity of the tool. For example, 60% of respondents on the VARK website reported that their VARK results match what they perceive to be their learning preferences. Fewer than 5% reported that their results do not describe their preferred modalities. The remaining respondents say they do not know whether their results match their preferences. However, although self-perceptions are not always reliable, these data support the validity of the VARK questionnaire (32).

Acknowledgements

Author's Contributions

Study concept and design: Sadeghifar, Jafari, Zaboli and Ali Sarabi-Asiabar and Tofighi. Statistical analysis and interpretation of quantitative data: Peyman, Salimi and shams. Drafting of the manuscript: Peyman and Sadeghifar. Critical revision of the manuscript: Tofighi, Sadeghifar and Jafari.

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