



Age and Gender as Determinants of Learning Style among Medical Students

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Authors' contributions

This work was carried out in collaboration between all authors. Author SM participated in design of the study and author MM carried out statistical analysis. Authors MGM and GAAF helped in draft the manuscript and revised the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Background: An awareness of learning styles may help teachers modify their teaching methods to improve the educational outcomes of their students.

Aim: The aim of this study was to determine the learning styles of medical students during their basic science training at Mashhad University Medical School (MUMS).

Methods: The VARK (Visual, aural, read/write and kinesthetic learning styles) questionnaire was used to gather information on learning styles in 245 medical students during their basic science

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training at MUMS in 2014. The questionnaire was previously assessed for its validity and reliability. Data were analyzed using SPSS software.

Results: Overall, 245 students (115 male/130 female) with a mean age of 22.17 ± 2.27 years completed the questionnaire. Of these students 91.84% preferred a single-modal learning style and 8.16% of students preferred a multi-modal learning style. Of the students with a preference for a single modal learning style, 20% (45 students) had a preference for visual, and 53.33% (100 students) for auditory learning styles respectively; 22.22% (50 students) of students were categorized as single read-write and 4.44% (10 students) were classified as having a kinesthetic learning style preference respectively. Among the multi-modal group, 25% (5 students) of students preferred a bimodal and 75% (15 students) preferred a quad-modal learning style. There was a significant association between learning styles with age and gender ($P < 0.05$), but there was no significant association between the preferred learning styles with marital status or place of residence ($P > 0.05$).

Conclusions: The key finding of our study was that learning style is age and gender dependent. Different teaching methods may be appropriate for men and women.

Keywords: Learning styles; medical students; age; gender; Mashhad.

1. INTRODUCTION

Teachers in medical schools need to ensure that their students are assimilating the appropriate knowledge and skills required for their future medical practice [1]. Some learners find parts of the curriculum difficult to assimilate, and this may be due to different preferences in learning style [2]; different styles of data acquisition and processing namely: seeing and hearing, reflection and action, thinking, or analysis and visualization [3].

Although students have different learning styles, most teaching in medical schools in Iran is based on didactic lectures [4]. This passive form of teaching promotes memorization for knowledge acquisition [5]. Recognizing that each student may have a different preferred sensory learning style can help instructors to employ flexible and effective instructional and media teaching methods [6]. If teaching methods better align with the students' learning styles, the learning outcomes may improve [7].

Keefe has defined learning style as "a combination of cognitive, affective, and physiological characteristics that serve as relatively stable indices in relation to how people receive information and interact with it and respond to the learning environment" [8].

Keefe and Reiff have suggested that a better understanding of the learning styles of students by teaching staff can reduce the level of dissatisfaction amongst their students, and improve their teaching outcomes [8,9]. Suskie [10] proposes that instructors should perhaps

modify their teaching methods to suit the learning styles of their students so that learning opportunities can be optimized. Jensen has defined learning style as the preferred method of thinking, understanding and processing information based on achieving the information and using it to learn and solve the issues [11]. Learning styles may be categorized into cognitive, emotional and physiologic. The cognitive approach is a commonly used and assumes that a student understands the topic and remembers the content. The cognitive approach is contained within the learning styles described by Dunn and Kolb and the VARK model [3,10].

The advantage of the VARK questionnaire is that the questions used describe real life scenarios that individuals can easily understand and relate to everyday experience. This approach is based on three principles: (1) everyone has the ability to learn academic subjects, but each individual has his own learning style; (2) when the different learning styles of learners is taken into consideration by lecturers, the learning motivation of their students is improved; (3) teaching content is best assimilated when several learning styles are used. Individuals acquire knowledge through four sensory channels: visual, auditory, read-write and kinetics. During the process of learning, students learn by experience, imagination, thinking and doing [12].

In their study of nursing students, Meehan-Andrews et al. [13] showed that 54% of the students prefer a single model learning style and 46% prefer a multi model learning styles. Amini

et al. [14] also showed that most Iranian medical students in their third semester, preferred a visual learning style.

Education experts believe that learners react to the learning environment through different sensory channels. It may be necessary to determine learners preferred styles so that a multimodal approaches to teaching are used.

Due to the practical nature of medical training, it is likely that a multimodal approach is required, and the selection of educational methods may be dependent on the preferred learning style of the student. The purpose of the present study was to identify the preferred learning styles of medical students at MUMS using the VARK questionnaire and to determine the influence of age and gender on learning styles.

2. METHODS

2.1 Setting

Medical Faculty at Mashhad University. The faculty consists of 43 departments that include anatomy, physiology, biochemistry etc. The total numbers of students in each academic year is approximately 300.

2.2 Sample

The study was conducted on medical students during their basic sciences phase of training at MUMS. The sample population of 245 individuals (115 males and 130 females), comprised students from all three years of preclinical training. The students were selected using a randomized clustering method from the all three years of preclinical training (Table 1). The data were collected between July and September 2014.

2.3 Ethical Consideration

Written informed consent was obtained from all participants and personal data were kept confidential. Ethics approval was obtained from the MUMS Ethics Committee.

2.4 Tools of Data Collection

The data-gathering tool was a questionnaire that consisted of two sections; one containing questions about age, sex, marital status and student grade point and a second section that comprised a standard questionnaire of learning styles by VARK. The VARK questionnaire was

developed by Fleming in Lincoln University, New Zealand (12). The questionnaire was translated into Farsi by language experts, and was approved as having the same meaning as the original text. Four lecturers confirmed the validity of the translated questionnaire. Reliability of questionnaires was obtained using a Test – Retest method. The reliability of the questionnaire was 0.98 using Cronbach's alpha coefficient (12). Questionnaires were piloted in 24 students in order to identify ambiguous questions. The ambiguous questions were re-edited and again the questionnaires were distributed among the students, and 16 multiple-choice questions were designed in such a way that each item was related to a particular style. The students chose options according to their preference. Options A-D were related to visual, listening, reading-writing and kinesthetic style, respectively. The questionnaire consisted of sixteen questions in four domains of learning: 1) visual, 2) aural, 3) read and write and 4) kinesthetic. Each question had four alternatives and each measured one dimension of learning style. Participants could choose more than one alternative for each answer. Each alternative associated with any particular style domain had one score.

The minimum and maximum score in a single model was zero and 16 respectively. Moreover, the minimum and maximum scores in the multi model method were 16 and 64 respectively.

A high score in each of the various learning styles indicated a higher affinity of the individual to that style of learning. If the individuals obtained an equivalent score in two or more of the fields, they were considered to have multi model learning styles. Finally, depending on the options selected, the total responses for each student were aggregated and the final score obtained. Data were analyzed using SPSS statistical software (version 15), using ANOVA and T-test. P value of less than 0.05 was considered significant.

3. RESULTS

3.1 Overall Learning Styles Preferred by Students

Two hundred and sixty five students were asked to complete the questionnaire. Sixteen students did not complete the questionnaire either because of limitation of time, or did not return the questionnaire. The total number of completed questionnaires was 245 (115 male/ 130 female)

with the mean age of the students being 22.17 ± 2.27 years. Two-hundred students were married and 45 students were single. Sixty-nine students were resident at the university.

Two hundred and twenty nine (91.84%) of students preferred a unimodal learning style and 8.16% of students (20 students) preferred a multi-modal learning style (biomodal, three modal, quad-modal).

The mean and SD for the raw scores of visual, auditory, reading-writing and kinesthetic learning styles were 4.18 ± 1.80 , 5.53 ± 1.95 , 3.80 ± 1.83 and 2.61 ± 1.64 , respectively. Of the students who preferred a unimodal learning style, 20% (45 students) were single visual, 53.33% (100 students) of students were auditory, 22.22% (50 students) were single read-write and 4.44% (10 students) of were kinesthetic learners. Among the multi-modal group (20 students), 5 students preferred two modes and 15 students did not have a preference in their learning styles.

3.2 Gender as a Determinant of Students' Learning Styles

There was a significant association between auditory ($P=0.026$) and reading-writing learning style of students with gender ($P=0.001$). However, no significant association was found between visual and ($P=0.06$) and kinesthetic ($P=0.23$) learning style of students with gender.

3.3 Age as a Determinant of Students' Learning Styles

There was no significant association between auditory ($P=0.06$), visual ($P=0.42$) and kinesthetic ($P=0.11$) learning style with age, but there was a significant association between reading-writing ($P=0.002$) learning styles of students with age.

There was no significant association between the visual ($P=0.79$), auditory ($P=0.24$), reading-writing ($P=0.58$) and kinesthetic learning styles ($P=0.76$) with marital status. Furthermore, no significant association was found between the visual ($P=0.13$), auditory ($P=0.77$), reading-writing ($P=0.24$) and kinesthetic learning style ($P=0.53$) with place of residence.

Analysis of variance showed no significant difference between learning styles and the year of training ($P>0.05$).

4. DISCUSSION

The results showed that the preferred style amongst the majority of medical students was the auditory learning style. Urval et al. [15] have previously shown that for medical students in India, the auditory style was dominant too. Lujan et al. [16] also showed that the preferred style of new students in physiology was the auditory style.

Javadinia et al. [17] investigated students from the Brigand University of Medical Sciences, studying at various years of basic sciences, pathophysiology, preclinical and clinical found that the preferred learning style was also auditory.

The dominance of teacher-centeredness in the training of medical students using a didactic approach to teaching that does not involve students in their mode of learning, has reinforced the approach of listening and taking notes by medical students. The auditory style is supported by discussion, questions and answers, and role-play. The results showed that after auditory styles, visual and reading styles were the next most preferred categories amongst Mashhad students of medical sciences [14]. Students with visual preferred style learn concepts that are presented through conceptual maps, figures, diagrams, and models.

Due to the important role of the visual sense in human learning, it may be important to make sufficient use of visual cues in communication and educational situations for these students instead of a reliance on speech and auditory senses alone. These issues should be considered by teachers, and visual media such as photos, images, models, diagrams and posters may be helpful.

Students who prefer auditory methods may be encouraged to read with friends, whilst students who prefer read and write methods have the characteristic of taking notes during lectures and assimilate information by slowly reading 'bite-sized' pieces of information; the opportunity should be provided for them to take notes. Giving read-write assignments and encouraging these students to interpret the charts and tables may be effective. Our data also suggests that during the basic sciences stage of training, instructors should perhaps offer students the opportunity to undertake practical works such as presenting

Table 1. The number and percentage of students in each year in the study sample and their genders

Year gender	First year		Second year		Third year		overall
	Frequency	Number	Frequency	Number	Frequency	Number	
Boys	19	28.4	47	45.6	49	63.4	115
Girl	48	71.6	56	54.4	26	34.6	130
Total	67	100	103	100	75	100	245

hypothetical models of body anatomy to students in anatomy class to boost their kinesthetic skills.

More than 90% of medical sciences students of Mashhad University preferred a single mode learning style. In a study conducted on medical students in Turkey, 36.1% preferred the single model and 63.9 % preferred the multi-model [18]. While in another study on freshman in Michigan University these values were 43.4% in multi model and 36.1 % in single model style respectively [15]. A lower percentage of students in our study preferred the multi model learning style. This difference may be due to cultural factors.

It is possible that the different approaches to education and training prior to tertiary education, cultural differences, and the field of study may affects the preferred learning style of students.

It has been suggested that students will recall 20% of what they read, 30% of what they hear, 40% of what they see, 50% of what they say and 60% what they are doing [19]. The corresponding values for students, who say, hear, see and do is approximately 90 percent [19].

In the present study, there were no students who preferred 3 or 4 modes of learning style that could be related to the lecturers approach to teaching.

In the present study there was a significant relationship found between gender and preferred styles of learning, including visual, auditory, reading -writing and kinesthetic–movement styles. Our data is consistent with the results of Amini et al. [14] in a study at Isfahan University. This study showed a significant relationship between gender and learning styles [12]. The sample size in these studies was smaller than in our study. However, in previous studies by Israa [20] and Javadinia et al. [16], no significant relationship between gender and students' learning styles was reported.

The current study revealed that there was no statistically significant relationship between the

place of student residence and learning style which was consistent with Samantha et al. [21]. Omar et al reported that there was no correlation between demographic variables such as marital status, income and students' learning style [22].

In this study the learning styles of students in MUMS was investigated for the first time. The Farsi translated version of the VARK questionnaire was fully validated [14]. Among the limitations of this study was the fact that the data was based on students' self-report reported preferences, although it used a validated questionnaire. Despite the relatively large sample size, there were relatively small group sizes for some of the subgroups.

Finally it should be mentioned that although the results of this study showed that the dominant learning style preference of the medical students in medical science university of Mashhad is the auditory style, other learning styles should be taken into consideration. Learning style preference may depend on the type of information being taught. If students are being taught about a particular condition, then a visual approach, illustrating the disease, may be better than a read-write approach alone. During the early phase of basic sciences training, instructors could use practical approaches, such as presenting hypothetical models of body anatomy to students in anatomy class to boost their kinesthetic skills [3]. Moreover, the learning styles of students may vary for the different fields of study. For example, Salimi et al. [23] reported that medical and nursing students prefer unimodal learning style while health services management students prefer a multimodal learning style. Identification of student's learning style may help students to become aware of their own learning style. Awareness of the student's learning style may support the skills development of graduates [24].

One limitation of this study was the use of a single questionnaire for collecting data. A further limitation was the study population that was limited to one university Faculty.

5. CONCLUSION

The key finding of our study was that learning style is age and gender dependent. Different teaching methods may be appropriate for men and women. Identification of student's learning style may help students to become aware of their own learning style. Awareness of the student's learning style may support the development of knowledgeable and skillful graduates.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Bertolami CN. Rationalizing the dental curriculum in light of current disease prevalence and patient demand for treatment: form vs. content. *J Dent Educ.* 2001;65(8):725-35.
2. Mcleod M. They all learn the same don't they? An evaluation of the learning style preference of the dairy industry. Annual Conference Proceeding; 2005, [cited 2010 Aug 25]. Available:http://www.regional.org.au/au/ap/en/2006/refereed/6/2868_mcleodm.htm
3. Mills DW. Applying what we know. *Student Learning Styles*; 2002. [cited 2010 Aug 3] Available: www.google.com/learningstyle
4. Keefe, James W. Ed Profiling and utilizing learning style. Reston VA: National Association of Secondary School Principals. 1988;52.
5. Silberman M. Active training. 2nd ed. San Francisco: Jossey-Bass/Pfeiffer. 1998;5-6,13-4.
6. Murphy RJ, Gray SA, Straja SR, Bogert MC. Student learning preferences and teaching implications. *J Dent Educ.* 2004;68(8):859-66.
7. Kolb AY, Kolb DA. Learning styles and learning spaces: enhancing experiential learning in higher education. *Acad Manage Learn Edu.* 2005;4(2):193-212.
8. Keefe JW. Learning style: An overview. In Keefe JW, (Ed.). *Student learning styles: Diagnosing and Prescribing Programs.* 1979;1-17.
9. Reiff JC. Learning styles. *Childhood Educ.* 1992;(69):96.
10. Suskie L. What are learning styles? Can we identify them? What is their place in an assessment program? *First Year Assessment Listserv*; 2003. [cited 2010 Aug 25]. Available:www.brevard.edu/fyc/listserv/remarks
11. Jensen GH. Learning styles. In Provost JA, Anchors WS. (Eds.) *using the MBTI instrument in colleges and universities*, Gainesville. Center for Applications of Psychological Type. 2003;123-55.
12. Fleming ND, Colleen M. Not another inventory, rather a catalyst for reflection. *To Improve the Academy.* 1992;137-155. Available:http://digitalcommons.unl.edu/po_dimproveacad/246
13. Meehan-Andrews TA. Teaching mode efficiency and learning preferences of first year nursing students. *Nurse Educ Today.* 2009;29(1):24-32.
14. Amini N, Zamani B, Abedini Y. Medical students' learning styles. *Iran J Med Educ.* 2010;10(2):141-7.
15. Urval RP, Kamath A, Ullal S, Shenoy AK,1 Shenoy N, UdupaL A. Assessment of learning styles of undergraduate medical students using the VARK questionnaire and the influence of sex and academic performance. *Adv Physiol Educ.* 2014;38:216-220.
16. Lujan HL, Di Carlo SE. First-year medical students prefer multiple learning styles. *Adv Physiol Educ.* 2006;30(1):6-13.
17. Javadinia A, et al. Learning styles of medical students in Birjand University of medical sciences according to VARK model. *Iranian Journal of Medical Educ.* 2011;11(6):584-589.
18. Zeynep Baykan, Melis Nacar. Learning styles of first-year medical students attending Erciyes University in Kayseri, Turkey. *Adv Physiol Educ.* 2007;31:158-160.
19. University of Newcastle. *Study Skills Guide* [cited 2007 Mar 12]; Available:<http://www.ncl.ac.uk/disability-support/dyslexia/studyskills.pdf>
20. Israa M. Problem-based learning (PBL): Assessing students' learning preferences using vark. *Nurse Educ Today.* 2008;28:572-579.

21. Samantha Lopez, et al. Examining the relationship among student perception of support, course satisfaction, and learning outcomes in online learning. *The Internet and Higher Educ.* 2011;14(3):158-163.
22. Trinidad OC. Demographics and learning styles of automotive technology students. Department of Work force Education and Development in the Graduate School Southern Illinois University Carbondale Proquest. 2008;40.
23. Salimi M, Sadeghifar J, Peyman P, Shams L, Jandagheian J, Khosravi A, et al. Visual, Aural, Read/Write, and kinesthetic learning styles preferences in students of Isfahan University of Medical Sciences, Iran. *J Health Syst Res.* 2013;8(7):1216-24.
24. Armstrong E, Parsa-Parsi R. How can physicians' learning styles drive educational planning? *Acad Med.* 2005;80(7):680-4.

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