An Analysis of Gender Differences in Learning Style Preferences among Medical Students

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Abstract

Background: Learning style is a way of learning that allows the individual to learn best. Four learning styles which are often identified in students are *visual, auditory, reading/writing and kinaesthetic (VARK)*. The VARK focuses the learners to use their senses i.e. hearing, seeing, reading, writing and experiencing to learn. **Materials & Method:** A newest version of the VARK questionnaire (16 questions) was administered to 208 third and fourth year medical students (104 males and 104 females) during their course of forensic medicine course at SSR Medical College. The Students were allowed to choose multiple answers as per instruction given on the prescribed questions' sheet. The scoring algorithm of VARK was then applied to identify the modality preference of each student. **Result:** The results from a chi square analysis (x^2 =0.710, df = 3 and p = 0.871) indicated that there was no difference in learning preferences by gender. **Conclusion:** VARK encourages teachers to respect the diversity of the learners. The students have ability to learn in different ways, if the methods of teaching are appropriate to the students' preference.

Keywords: Learning styles; Gender difference; VARK; Medical Students.

Introduction

Learning style preference is the manner that allows the individual to learn most efficiently and effectively. According to Tanner el al [1], the knowledge of the students' learning style preferences is aid in the development of the most effective teaching approaches. The student population is very diverse with differing abilities and mode of learning. They prefer to take new information mainly by three major sensory modalities: visual (V), aural (A) and kinaesthetic (K), collectively known as VAK. This classification was further expanded by Fleming [2] to VARK by splitting the visual component into two categories: those who prefer graphical or pictorial representations of their incoming information (V) and those who prefer textual representations such reading/ writing (R). According to Miller [3], the students' motivation and performance can be improved by adapting teaching approaches to meet the different learning style preferences of these students.

There is a large amount of literature available on gender difference in learning. Honigsfeld analysed the learning styles of adolescents from diverse nations by age, gender, academic achievement, brain processing, culture and creative thinking, and found the gender as an important factor to influence the students' learning style [4]. Lie et al [5] reported that males have a preference for logical thinking and rational evaluation whereas females tend to look for personal connections and relevance with learning material. Chang [6] suggested that males are more achievement oriented and

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females are more performance oriented. Wehrwein et al [7] conducted a study on eighty six undergraduate physiology students and found a significant gender differences in their learning style preferences. Slater et al [8] observed that the female students tended to be more diverse than male students, encompassing a broader range of sensory modality combinations within their preference profiles. The present study was aimed to test the hypothesis that the males and females have different learning style preferences.

Methodology

Sample

A total of 208 third and fourth year medical students (104 males and 104 females) within the age ranging from 20 to 28 years have participated in this study. The study was conducted in the Department of Forensic Medicine, SSR Medical College, Mauritius in the year 2010.

Procedure

The newest version of VARK questionnaire [9] consists of 16 questions (Appendix-1) was applied to third and fourth year students for the assessment of their learning style preferences. The students were asked to complete the questionnaire in 15 minutes and allowed to choose multiple answers per question to adequately describe their preference(s). The students preferences were analysed for each of the four sensory modalities (V, A, R and K) and for all possible combinations of these modalities such as six possible bimodal combinations (VA, VR, VK, AR, AK and RK), four possible trimodal combinations (VAR, VAK, VRK and ARK) and one quadrimodal (VARK).

Scoring

The students' modality preferences were identified by using following steps:

1. The following VARK scoring chart (as mentioned in Table-1) [9] is used to find out VARK category for each question by encircling the letter(s) that correspond to the student's answers.

Table 1. VARK Scoring Chart

Questions	Categories			
	a	b	c	d
1	K	A	R	V
2	V	A	R	K
3	K	V	R	A
4	K	A	V	R
5	A	V	K	R
6	K	R	V	A
7	K	A	V	R
8	R	K	A	V
9	R	A	K	V
10	K	V	R	A
11	V	R	A	K
12	A	R	V	K
13	K	A	R	V
14	K	R	A	V
15	K	A	R	V
16	V	A	R	K

2. The score was calculated as table-II mentioned below:

Table II. Score Calculation Chart

Total number of circled Vs
Total number of circled As
Total number of circled Rs
Total number of circled Ks
Total

3. The students' modality preferences were identified by using a set of four stepping stones (Figure 1). The scores of each VARK category were entered on the stones from highest to lowest with their V, A, R and K labels[9].

Fig 1. A set of four stepping stones
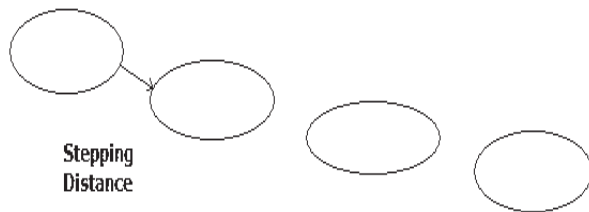

Stepping Distance

4. The stepping distance was derived from total score as mentioned below Table III [9]:

Table III. Calculation of Stepping distance

Total score	Stepping distance
14-21	1
22-27	2
28-32	3
More than 32	4

5. Now, the highest score on first stone was checked (ticked) and then the next stone was checked if the step is equal to or less than the stepping distance (Table IV).

6. If two or more preferences are checked, the student is considered to have multimodal preferences.

7. If the student has single preference, the strength was determined as mild, strong or very strong as below:

Table IV

Total Score	Difference between two highest scores									
	0	1	2	3	4	5	6	7	8	9 or more
21 or less	Multi-modal	Multi-modal	Mild	Mild	Strong	Strong	Very Strong	Very Strong	Very Strong	Very Strong
22-27	Multi-modal	Multi-modal	Multi-modal	Mild	Mild	Strong	Strong	Very Strong	Very Strong	Very Strong
28-32	Multi-modal	Multi-modal	Multi-modal	Multi-modal	Mild	Mild	Strong	Strong	Very Strong	Very Strong
More than 32	Multi-modal	Multi-modal	Multi-modal	Multi-modal	Multi-modal	Mild	Mild	Mild	Mild	Very Strong

Statistical analysis

Data were reported as percentages of male and female students in each category of learning style preference. A x^2 analysis was performed to determine if significant gender differences exist in the categories such as quadrimodal, trimodal, bimodal and unimodal.

RESULTS

Figure 2 shows the percentages of male and female students who preferred multimodal and unimodal styles of information presentation.

Chi square analysis

Chi square analysis was performed to determine whether there was any association between gender and learning preferences. The test revealed no significant association with x^2 =0.710, df = 3 and p = 0.871. In other words,

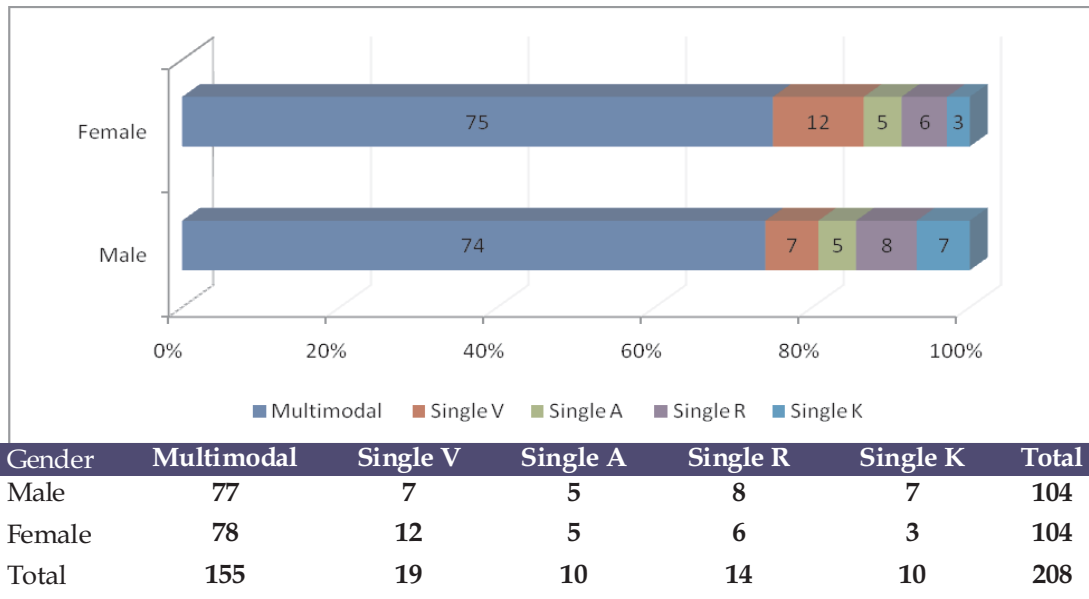**Fig 2.** Shows the percentages of male and female students' learning preferences

Gender	Multimodal	Single V	Single A	Single R	Single K	Total
Male	**77**	**7**	**5**	**8**	**7**	**104**
Female	**78**	**12**	**5**	**6**	**3**	**104**
Total	**155**	**19**	**10**	**14**	**10**	**208**

Fig 3. Shows the percentages of male and female students who prefer one, two, three or four modes of information presentations

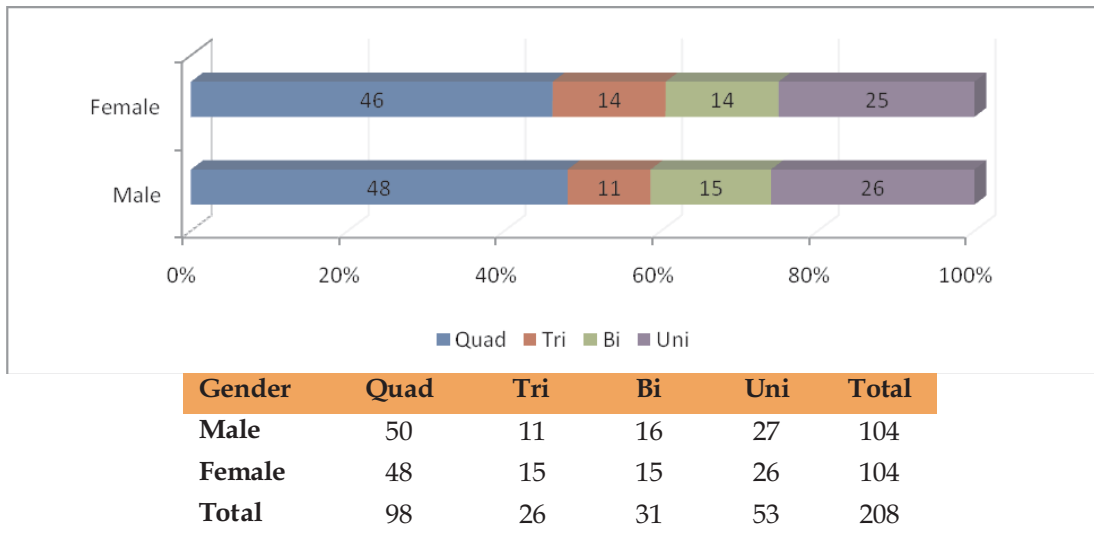| Gender	Quad	Tri	Bi	Uni	Total
Male	50	11	16	27	104
Female	48	15	15	26	104
Total	98	26	31	53	208

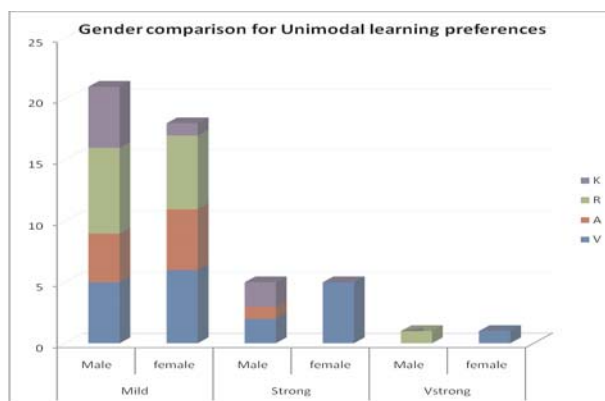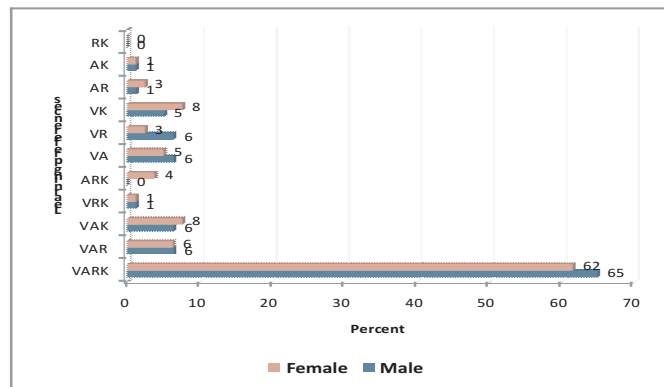**Fig 4.** Shows the gender comparison for unimodal learning preferences

Fig 5. Shows the breakdown of bimodal, trimodal and quadrimodal preferences by gender

there was no difference in learning preferences by gender.

Discussion

Gender * learning _ pref Cross tabulation

			learning_pref				Total
			bi	quad	tri	uni	
Gender	Male	Count	16	50	11	27	104
		Expected Count	15.5	49.0	13.0	26.5	104.0
	Female	Count	15	48	15	26	104
		Expected Count	15.5	49.0	13.0	26.5	104.0
Total		Count	31	98	26	53	208
		Expected Count	31.0	98.0	26.0	53.0	208.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.707 [a]	3	.871
Likelihood Ratio	.710	3	.871
N of Valid Cases	208		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.00.

The knowledge of student preferred learning styles is vital for the educators. Knowing students' preferred learning style helps to overcome the predisposition of many educators to treat all the students in a similar way (2). This study shows that both males and females preferred multimodal learning. This modality preference was almost similar in both male (75%) and female (74%) students who preferred learning by utilizing all four sensory modalities (VARK). This finding is supported by other previous studies conducted on medical (8, 10, 11) and dental students (12). These results are not surprising because in general sense, all physically unimpaired students use their all senses to take information at given time. In contrast, Wehrwein et al (7) observed that male undergraduate students of physiology preferred multimodal preferences, whereas female students preferred unimodal styles with a preference towards K. It is possible that multimodal learners may have stronger learning outcomes than unimodal learners.

Further studies are required to understand these findings.

The breakdown of multimodal preferences reveals no significant variations between the genders (female with 10 out of 11 and male with 9 out of 11 possible combinations). Slater et al (8) found greater diversity among the female population. They observed that male styles were concentrated in smaller subsets with only 6 (AK, AR and ARK are missing) of the 11 possible combinations. Dobson (13) indicated that females and males had significantly different learning style preferences.

Conclusion

VARK encourages teachers to respect the diversity of the learners. The students have ability to learn in different ways, if the methods of teaching are appropriate to the students' preference. This study revealed no significant difference in learning preferences by gender.l

References

1. Tanner K, Allen D. Approaches to biology teaching and learning: learning styles and the problems of instructional selection-engaging all students in science course. *Cell Biol Educ* 2004; 3:197-200.

2. Fleming ND. *I'm different; not dumb*. Modes of presentation (VARK) in tertiary classroom. In: Research and Development in Higher Education, edited by Zelmer A. Proceedings of the 1995 Annual Conference of Higher Education and Research Development Society of Australasia 1995; 35:308-13.

3. Miller P. Learning styles: the multimedia in mind. *Educ Resources Inform Center* 2001; 451:140.

4. A comparative analysis of the learning styles of adolescents from diverse nations by age, gender, academic achievement level and nationality. *Dissert Abstr Int* 2001; 62: 969.

5. Lie LY, Angelique L, Cheong E. how do male and female students approach learing at NUS? *CDTL Brief* 2004 Jan;7(1):1-3.

6. Chang WC. Learning goals and styles by gender- a study of NUS students. *CDTL Brief* 2004 Jan; 7(1):4-5.

7. Wehrwein EA, Lujan HL, DiCarlo SE. Gender differences in learning style preferences among undergraduate physiology students. A*dv Physiol Educ* 2007; 31:153-7.

8. Slater JA, Lujan HA, DiCario SE. Does gender influence learning style preferences of first-year medical students? *Adv Physiol Educ* 2007; 31:336-42.

9. Fleming ND. *VARK*: a Guide to Learn Styles (online) 2007. http://www.vark-learn.com/english/page.asp?p= questionnaire.

10. Baykan Z, Nacar M. Learning styles of first-year medical students attending Erciyes University in Kayseri, Turkey. *Adv Physiol Educ.* 2007; 31:158-60.

11. Lujan HL, DiCarlo SE. First-year medical students prefer multiple learning styles. *Adv Physiol Educ.* 2006; 30:13-16.

12. Murphy RJ, Gray SA, Straja SR, Bogert MC. Student learning preference and teaching implications. *J Dent Educ.* 2004; 859-66.

13. Dobson JL. Learning style preferences and course performance in an undergraduate physiology class. *Adv Physiol Educ.* 2009 Dec; 33(4):308-14.

Appendix 1. The VARK Questionnaire

1. I like website that have:

a. Things I can click on and do.

b. Audio channels for music, chat and discussion.

c. Interesting information and articles in print

d. Interesting design and visual effects

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

a. See the word in my mind and choose by the way it looks.

b. Sound it out in my mind

c. Find then in the dictionary

d. Write both words on paper and choose one.

3. You want to plan a surprise party for a friend. I would:

a. Invite the friend and just let it happen.

b. Imagine the party happening.

c. Make a list of what to do and what to buy for the party.

d. Talk about it on the phone and text others.

4. You are going to something special for your family. I would:

a. Make something I have made before.

b. Talk it over with my friends.

c. Look for ideas and plans from the pictures through books.

d. Find written instructions to make it.

5. You have been selected as a tutor or a leader for a holiday program which is interesting for your friends. I would:

a. Describe the activities I will be doing in the program.

b. Show them the map of where it will be held and photos about it.

c. Start practicing the activities I will be doing in the program.

d. Show them the list of activities in the program.

6. You are a buy a new digital camera or mobile phone. Other than price, what would most influence your decision?

a. Trying it.

b. Reading the details about its features.

c. It is the latest design and looks good.

d. The salesperson telling me about it.

7. Remember when you learned how to ply a new computer or board game. I learned best by:

a. Watching others to do it first.

b. Listening to somebody explaining it.

c. Clues from the diagrams in the instructions.

d. Reading instruction.

8. After reading a play you need to do a project. Would you prefer to?

a. Write about the play.

b. Act out a scene from the play.

c. Draw or sketch something that happened in the play.

d. Read a speech from the play.

9. You are about to hook up your parent's new computer. I would:

a. Read the instructions that came with it.

b. Phone, text or email a friend and ask how to do it.

c. Unpack the box and start putting the pieces together.

d. Follow the diagram that show how it is done.

10. You need to give directions to a person to go to a house nearby. I would:

a. Walk with them.

b. Draw a map on a piece of paper.

c. Write down the directions as a list.

d. Tell him the direction.

11. You have a problem with your knee. You would prefer the doctor to:

a. Show me a diagram of what is wrong.

b. Give me an article that explains knee injuries.

c. Tell me what is wrong.

d. Demonstrate what is wrong by using model.

12. A new movie has arrived in town. What would most influence your decision to go (or not to go)?

a. I heard friends talking about it.

b. I read a review about it.

c. I saw a preview about it.

d. It is similar to others you have liked.

13. Do you prefer a teacher who likes to use:

a. Demonstrations, models or practical sessions.

b. Class discussion and guest speakers.

c. A text book and handouts.

d. An overview diagram, charts and maps.

14. You are learning to take photos with your new digital camera or mobile phone. I would like to have:

a. Examples of good and poor photos and how to improve them.

b. Clear written instructions with lists and bullet points.

c. A chance to ask questions and talk about the camera's features.

d. Diagram showing the camera and how to use it.

15. You want some feedback about an event, competition or test. I would like have feedback:

a. That used examples of what I have done.

b. From somebody who discussed it with me.

c. That used a written description or table of my results.

d. That used graphs showing what I achieved.

16. You have to present you ideas to your class. I would:

a. Make diagrams or get graphs to explain.

b. Write few key words and practice what to say again and again.

c. Write out my speech and learn it by reading it again and again.

d. Gather examples and stories to make it real and practical.