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Face-to-Face and Distance Learning and Teaching Styles as Perceived by Tanta University First Year Medical Students

Fatma G. Sobeeh¹, Yasmeen M. El-Harty², Nahla A. Nasef³, Eman M El-Beltagi⁴, Rana E. El-Gabeery⁵, Hussesin Aldaqadossi⁶, Maii A. Shams Eldeen⁵, Mona M. Abo El-Noor¹

¹ Forensic Medicine & Clinical Toxicology Department, Faculty of Medicine, Tanta University, Tanta, Egypt

² Medical Physiology Department, Faculty of Medicine, Tanta University, Tanta, Egypt

³ Medical Biochemistry Department, Faculty of Medicine, Tanta University, Tanta, Egypt

⁴ Histology & Cell Biology Department, Faculty of Medicine, Tanta University, Tanta, Egypt

⁵ Medical Microbiology Department, Faculty of Medicine, Tanta University, Tanta, Egypt

⁶ Urology Department, Faculty of Medicine, Fayoum University, Fayoum, Egypt

Abstract

Background:

Learning style is the way by which learners understand and process information in different learning circumstances. After COVID-19 era, medical education has been shifted to distance learning, besides conventional face-to-face learning. The students' learning styles are key factors during this shift in the educational process to achieve students' satisfaction and ensure efficacy of the teaching and learning process. The aim of this research is to explore the first-year medical students' learning style patterns and the association with their preferences towards face-to-face or distance learning.

Methods:

A cross-sectional study was carried out among a sample of 328 first-year medical students at Tanta University, using an online questionnaire that included socio-demographic data, VARK questionnaire, and the students' preference towards face-to-face or distance learning. Statistical analysis was performed to assess the association between different study variables.

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Results:

The quadrimodal pattern of learning styles was significantly prevalent among the participant students (66%), followed by the unimodal pattern (19%). The significantly dominant unimodal style was the kinesthetic pattern (56%). About (67.7%) of students significantly preferred face-to-face learning. There was a strong statistical significance between students' preferences of face-to-face or distance learning and individual learning style patterns where the quadrimodal and the unimodal patterns showed significant favour towards face-to-face learning.

Conclusion:

Regarding first-year medical students' learning styles, the quadrimodal pattern of learning was significantly prevalent among the participants. They significantly preferred the face-to-face learning approach. An integrated learning model seems more likely to be useful and approved by first-year medical students as it will suit their different learning styles and will improve students' performance.



Keywords: Learning styles; Medical students; Face-to-face learning; Distance learning.

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Introduction:

Education is the process of promoting learning, or acquiring knowledge, skills, values, beliefs, and desirable habits [1]. As medical educators, different instructional methods need to be implemented to enhance the quality of education and improve students' learning, engagement, and motivation [2].

Learning style has been described as a multi-factorial process combining cognitive, behavioural, and affective aspects that impacts how the learners perceive, process, retain, and reproduce concepts efficiently and effectively [3]. Every learner has (a) distinctive learning style(s), and one student may adopt single or multiple modes of knowledge acquisition [4]. Studies have shown that when students' learning styles are compatible with the used learning approaches in an educational organization more students' satisfaction, greater achievement and better educational process outcomes are expected [5-8].

Many methodologies have been adopted around the world to assess different learning styles, schemes, and models [9-13]. One of the most popular is the VARK Questionnaire created by Fleming and Baume. The estimated high validation and reliability of the VARK Questionnaire make it one of the widest used approaches [14].

The VARK model divides learning preferences into four modes according to the sensory pathways: visual (V), aural/auditory (A), read/write (R), and kinesthetics (K) [15]. Visual learners prefer presentation of information as figures and charts. Auditory learners prefer to hear data through lectures and discussions. Read/write learners prefer information to be presented as text. Finally, kinesthetics learners prefer concrete experiences that connect the material to reality [16].

The students can be described as unimodal, who possess one dominant VARK style of learning. However, many students exhibit multimodality, with dominance of one style or two. The multi-modal pattern can be further

sub-categorized into bimodal (demonstrating two styles); trimodal (demonstrating three styles); or quadrimodal (demonstrating all four styles) [17].

Medical education is an ever-evolving process. It has been quickly shifting over the last few decades from a teacher-centered passive to a student-centered active approach [18]. After COVID-19 era, medical education has widely switched to distance and/or blended learning (integrating both conventional face-to-face and distance learning). During this shift, the students' learning style is a priority that needs to be addressed in the educational system in order to achieve the desired learning outcomes while facing additional and different challenges [19].

Moreover, determining the preferred learning methodologies in association with the students' learning styles is a crucial element for a fruitful educational process. Awareness about learning styles can be useful for both students and educators. Educators can tailor the teaching process to correlate with the learning styles of students and similarly, students with knowledge of their learning styles could be empowered to identify and use the techniques of learning best suited to their individual needs, resulting in greater student engagement and successful educational progress [18, 20].

Therefore, this study aimed to explore the prevalence of different learning styles among a sample of first year medical students at the Faculty of Medicine, Tanta University, who were subjected to both distance and face-to-face learning, and relate those students' preferred learning approach to their learning styles.

Subjects and Methods:

Study design:

An analytical cross-sectional study was conducted to achieve the purpose of the current research.

Study setting and timing:

This study was carried out for three months at the above mentioned Faculty.

Study population and sample size:

First-year medical students (Medicine & Surgery Bachelor Program-credit points [MSBP-CP]) were included in the study, as they were subjected to both face-to-face and distance learning. First-year courses include principles of each of anatomy, physiology,



histology, biochemistry, pharmacology, microbiology, pathology and parasitology, Professionalism, Patient-Physician Communication (PPC), Host Defence and English are also taught. At our educational institution, students experience a dynamic and engaging learning environment through a blended approach to course delivery. A significant portion of the curriculum is delivered through face-to-face lectures, where students have the opportunity for direct interaction with instructors and peers. Complementing the face-to-face component are online lectures, offering students the flexibility to access content at their convenience. This includes live interactive lectures and recorded lectures. Face-to-face learning includes lectures using multimedia resources such as PowerPoint presentations and videos, practical sessions using tools such as microscopes, specimens, sphygmomanometers. Self-directed learning is also appropriately used. Distance learning is conducted by synchronous lectures using the official Microsoft Teams adopted by Tanta University usually off-campus. Online asynchronous recorded lectures are also uploaded to the Faculty's official Moodle platform. The calculated sample size was 302 students, using OpenEpi for sample size calculation. The average total population is 1500. The percentage of kinesthetics learning style (Effect size) is 43%, so at CI 95%, sample size will be at least 302 [21, 22].

Data collection and procedure:

Data were collected from first year medical students during the second semester of the academic year 2022-2023 through an online self-administered questionnaire. It was electronically designed using google-forms and delivered to the students through the faculty official students' platform (Microsoft Teams), in addition to other social media applications (WhatsApp®, Telegram® and Facebook®). The questionnaire included three sections:

i) The first section: for socio-demographic data e.g., name, gender and academic ID.

ii) The second section: for determination of the students' learning style. It was done using the latest English version of the VARK Questionnaire (version 8.01). Approval for using this questionnaire was obtained from the VARK author through VARK website (<http://www.vark-learn.com>). A brief presentation was made for students regarding the procedure to fill in the questionnaire and the expected benefits for them. Students who didn't complete the questionnaire properly were excluded from the study.

The questionnaire consisted of 16 multiple-choice questions with four options each. The purpose of each question was to specify the learning style of each participant. The student was able to choose more than one option to allow multimodality. The VARK Questionnaire was used by different previous studies, and its validity and reliability were well assessed [23-25].

iii) The third section: for determining the students' preference towards face to face or distance learning.

Statistical analysis

Data generated from the VARK Questionnaire were analysed according to the guidelines described on the VARK website. To calculate the percentage of students for each VARK component, the number of students in each learning style modality was divided by the total number of students participating in this study. Later, data from the overall questionnaire were tabulated and analysed using Statistical Package for Social Sciences (SPSS 26; IBM Corp., New York, NY, USA). Descriptive statistics were provided as numbers and percentages for the study variables. Chi-square test was used to test the association between students' preferred learning style and their preferred learning method either as face-to-face or distance learning. P-value ≤ 0.05 was considered significant.

Results:

The total number of participants was 332 students. Responses with missing data in the questionnaire were excluded. The final analysed sample was 328

undergraduate first year medical students of which 153 (46.65%) were males and 175 (53.35%) were females. The overall taken steps and results of the present study are summarized in Fig. (1).

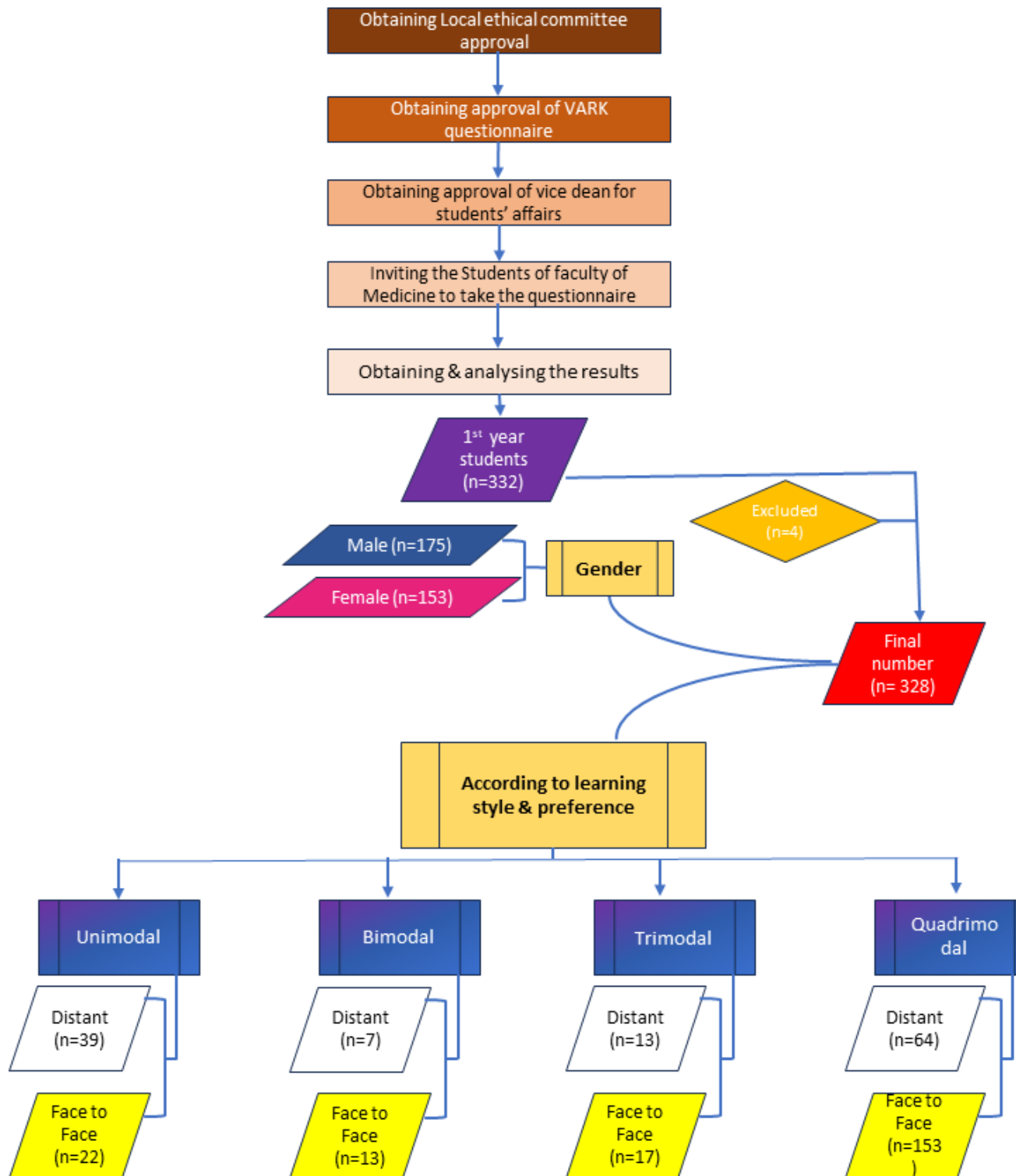


Fig. (1): A representative flow chart for the overall taken steps and results of the present study

Regarding the prevalence of learning style modalities in the current study, most students (81%) were significantly multimodal. The significant VARK mode

among the whole students was the quadrimodal (66%) as shown in Fig. (2).

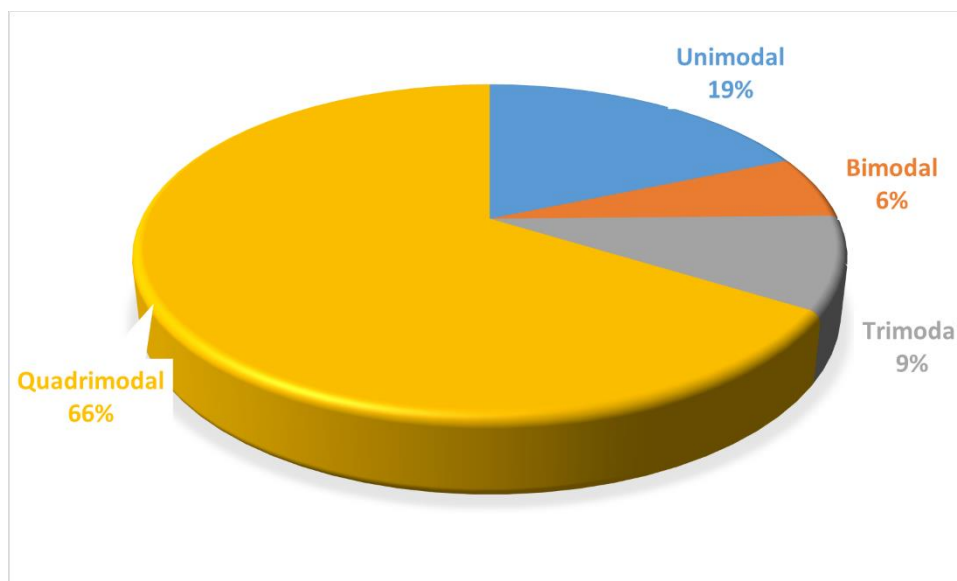


Fig. (2): VARK mode distribution among first year medical students (values are expressed as percentages) (N= 328)

The quadrimodal learning style showed significant prevalence among males and also among females, (as calculated using chi-square goodness of fit test) while no significant association between learning styles and gender was detected upon using Cochran Armitage test for trend) as shown in Table (1).

Table (1): Distribution of VARK learning styles & its association with the gender among the first-year medical students. (N= 328)

Gender		Learning styles				Chi-square
		Unimodal N= 61	Bimodal N= 20	Trimodal N=30	Quadrimodal N=217	P-value
Male N= 153 (46.65%)		30 (19.6%)	12 (7.84%)	14 (9.15%)	97 (63.4%)	<0.001*
Female N= 175 (53.35%)		31 (17.71%)	8 (4.57%)	16 (9.14%)	120 (68.57%)	<0.001*
Cochrane Armitage test for trend	Test statistic	0.861				
	P-value	(>0.05) 0.353				

Chi-square Goodness of fit test & Cochran Armetage test for trend were used *Significant at p<0.05

Among the unimodal group, the significantly prevalent style was the kinesthetic one representing (56%) as shown in Fig. (3) and Table (2). Among the trimodal group, the

significantly preferred combination of sensory modalities is “visual, aural, kinesthetic,” as illustrated in Table (2)

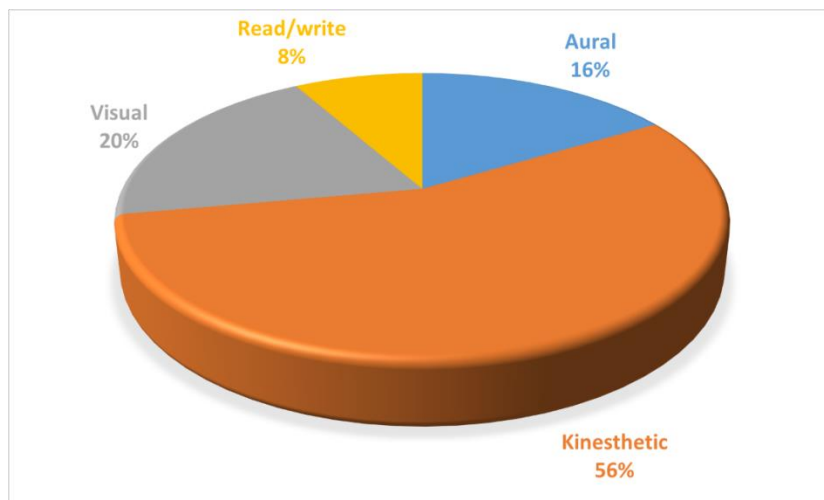


Fig. (3): Sensory modality preference among students with unimodal learning style (values are expressed as percentages) (N= 61)

Table (2): Distribution of VARK learning styles among participant students. (N= 328)

Total Participants N= 328	Distribution of learning styles among participants		
	Modal subtypes	Number (%)	P-value
Quadrimodal	N= 217 (66.2%)		
Trimodal N= 30 (9.1%)	aural, kinesthetic, read\write	6 (20%)	<0.05*
	visual, kinesthetic, read\write	4 (13.4%)	
	visual, aural, kinesthetic	17(56.6%)	
	visual, read\write, aural	3 (10%)	
Bimodal N= 20 (6.1%)	aural, kinesthetic	8 (40%)	>0.05)
	kinesthetic, read\write	2 (10%)	
	read\write, aural	0	
	visual, kinesthetic	3 (15%)	
	visual, read\write	1 (5%)	
	visual, aural	6 (30%)	
Unimodal N= 61 (18.6%)	Aural	10 (16.4%)	<0.001*
	Kinesthetic	34 (55.7%)	
	read\write	5 (8.2%)	
	Visual	12 (19.7%)	
P-value	<0.001*		

Chi-square Goodness of fit test was used

*Significant at p<0.05

Regarding the preferred learning approach, students showed significant preference towards face-to-face

(67.7%) rather than distance learning, as represented in Table (3) & Fig. (4). Hence, most of the students with



different sensory modalities significantly preferred the face-to-face learning as shown in Table (3) and Fig. (5). There was a strong statistical significance ($p < 0.00001$) upon relating face-to-face and distance learning

preference to individual patterns where the quadri and the unimodal patterns showed significant favour towards face-to-face learning ($p < 0.05$) as shown in Table (3).

Table (3): Association of VARK learning styles with the preference of learning approach among participant students. (N= 328)

Total Participants N= 328	Modal subtypes	Preferred learning method		
		Distance N= 106	Face-to-face N= 222	P-value
Quadrimodal		64 (60.4%)	153 (69%)	<0.001*
Trimodal N= 30 (9.1%)	aural, kinesthetic, read\write	2	4	Total = 17 (7.7%) >0.05
	visual, kinesthetic, read\write	3	1	
	visual, aural, kinesthetic	8	9	
	visual, read\write, aural	0	3	
Bimodal N= 20 (6.1%)	aural, kinesthetic	1	7	Total = 7 (6.6%) Total = 13 (5.8%) >0.05
	kinesthetic, read\write	1	1	
	read\write, aural	0	0	
	visual, kinesthetic	2	1	
	visual, read\write	0	1	
	visual, aural	3	3	
Unimodal N= 61 (18.3%)	Aural	1	9	Total = 22 (20.7%) Total = 39 (17.5%) <0.05*
	Kinesthetic	13	21	
	read\write	2	3	
	Visual	6	6	
P-value		<0.001*	<0.001*	<0.001*

Chi-square Goodness of fit test was used

*Significant at $p < 0.05$

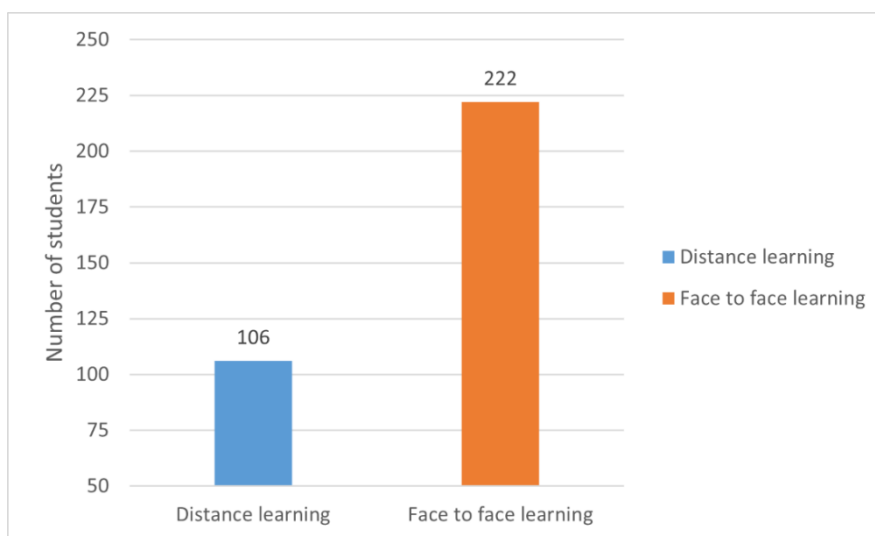


Fig. (4): Preference of learning method (Face-to-face vs distance learning) among first year medical students (N= 328)

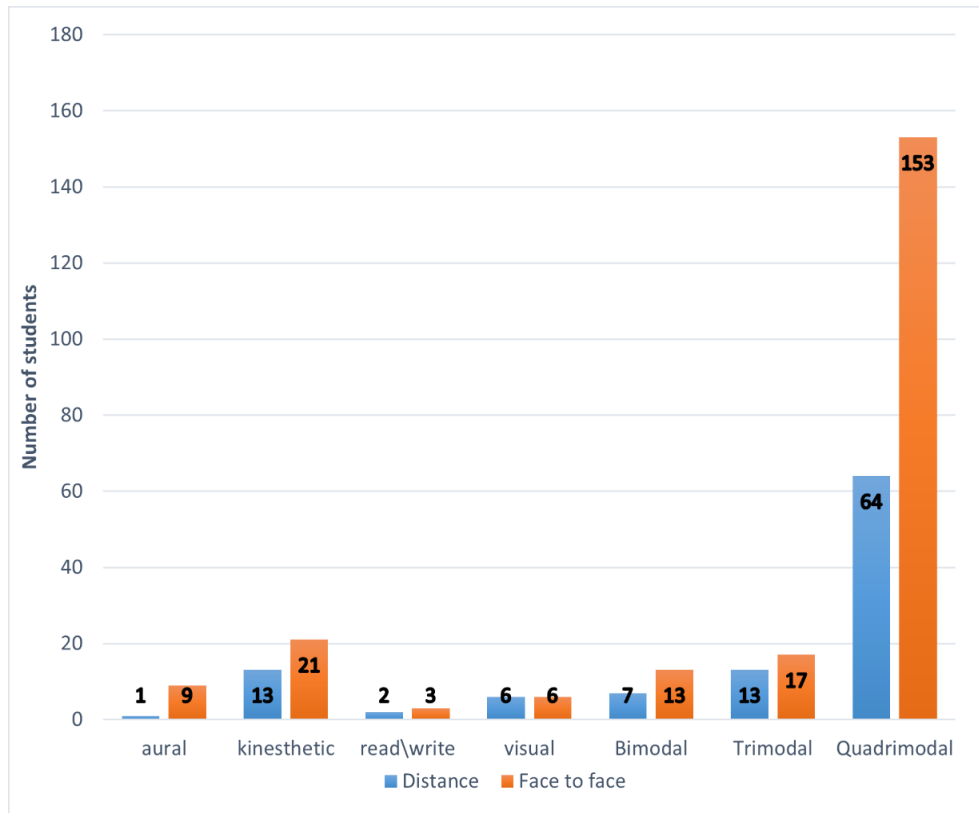


Fig. (5): First year medical students’ learning style & their preferred learning method (Face-to-face vs distance learning) (N= 328)

Discussion:

In the academic world, it is noteworthy that learning styles play a critical role in the educational process which is the product of student and teacher inter-activity within a safe learning environment. This cross-sectional study was carried out aiming to explore the prevalence of different learning styles among first-year medical students at Tanta University and its association with their preferences towards face-to-face or distance learning in male and female students. In the present study, more female students were recruited as compared to male students (53.35% and 46.65%, respectively) with no significant impact of the gender on learning style patterns and both genders were significantly quadrimodal, (Table 1). The impact of gender on learning styles pattern has been of interest to many researchers. Our results are in line with previous studies by Chouhan, et al. 2023 and Khan, et al. 2022, who did not find any significant impact of gender on learning styles [26, 27]. Nuzhat, 2013 at King Saud Bin Abdul Aziz University for Health Sciences, who also reported no significant gender difference in the percentages of students who have multimodal or unimodal styles [28]. In contrast to our results, earlier study by Wehrwein, 2007 at Michigan State University,

reported statistically significant differences in learning styles between males and females as females were significantly unimodal, whereas males were multimodal learners [29]. Another study by Hashem, 2022 in Saudi Arabia revealed that males tend to be unimodal learners while females were significantly multimodal [2]. This difference in gender impact may be attributed to differences in age, culture, and academic level of the students participating in those studies [30].

As regard learning styles distribution among participants, the majority showed significant quadrimodal modality followed by unimodal, trimodal, and bimodal, respectively. The significant prevalence of multimodality in our study is in agreement with previous studies from other medical institutes in India, Turkey and Saudi Arabia [31-34]. Moreover, Kharb, et al. 2013 reported that majority of the first-year medical students demonstrated multimodal learning styles, which they explained by the fact that students prefer multiple modes of information presentation, with significant increase in learning when the educational environment caters to the students’ different learning styles which is known as the “Meshing Hypothesis” [35].



Multimodality is expected to be the most prevalent learning style as the human brain tends to utilize multiple senses to increase the probability of knowledge absorption [36]. Therefore, educators who effectively target multimodal learning would likely have a higher percentage of student comprehension via implementing variable instructional approaches such as auditory lectures, lecture handouts, videos, hands-on demonstrations, interactive elements, and others. In most situations, active learning sessions can be beneficial to all students, even those with other preferred sensory modalities [37].

On the other hand, some earlier studies from India, Pakistan and Iran disagreed with our results, showing prevalence of the unimodal pattern in larger proportion of students [38-40]. This variance in results might be related to different geographic locations and cultures, learners' stage, experience and motivation as well as different educational environments.

The study revealed that among the trimodal group, the significantly prevalent combination of sensory modalities is "visual, aural, and kinesthetics". This is in agreement with a study conducted by Balasubramaniam, et al. 2016 at Government Medical College & ESIC Hospital, Coimbatore, India, who found that in trimodal preferences, a combination of visual, auditory, and kinesthetics styles was the most adopted one [41]. This may be because these are the primary sensory inputs by which students can process and retain information as most students prefer learning by watching visual aids, listening to recorded lectures, and physically engaging with such acquired knowledge, so they can understand and perfectly remember information. Therefore, important for educators to recognize and accommodate these different styles to support their students' diverse needs.

As regard the unimodal pattern, our study demonstrates that the kinesthetics learners were significantly prevalent while the read/write learners were significantly the least prevalent. Our results are in accordance with a Saudi study which reported that the unimodal medical students tend to prefer the kinesthetics and the aural modalities while the read-write modality was significantly the least popular modality [34]. This could be explained by the fact that students in different medical specialties enjoy working with their hands while participating in different practical activities whether in labs or clinical environments.

In contrast, some studies reported the aural modality as the most prevalent unimodal style among medical students [42, 43]. This may be explained by the significant amount of information in the medical field conveyed through lectures and discussions. Aural learners can benefit from these auditory experiences by actively listening to lectures, participating in group discussions, and engaging in clinical conversations. Furthermore, medical education often involves complex concepts and terminology; therefore, aural learners may find it easier to understand and remember by hearing those concepts explained out loud.

According to our results, the first-year medical students showed significant preference for face-to-face learning rather than distance learning. This is aligned with other studies which reported that most medical students preferred face-to-face approach over the online one with recommendations to convert to a more integrated educational system that involves more face-to-face lectures [44-47]. This preference for face-to-face learning could be explained by the following points:

- i) It provides real-time face-to-face instruction and sparks innovative questions;
- ii) some students may be technophobes while others may prefer pre and post-class discussions, communal learning, and organic student-teacher bonding
- iii) Face-to-Face learning does not depend on networked systems and less prone to technical problems [48].

The preference of unimodal students for face-to-face learning in our study can be explained by being significantly kinesthetics learners, who require hands-on experience, patient interaction, physical demonstrations and clinical skills practice provided by face-to-face teaching. This is aligned with a study by Fahim, et al. 2021, who found that the majority of kinesthetics learners are dis-satisfied with their current distant learning experience [49].

Moreover, the preference of quadrimodal students for face-to-face learning in our study can be explained by their thrive to interpersonal connections, their capability of processing information in various ways by multiple learning styles, and by their ability to adjust themselves to diverse teaching methods [50, 51]. This agrees with a study of Ally, et al. 2022, as they found most quadrimodal students benefited more from face-to-face



lectures. However, Ally, et al. 2022 also found that the shift to the use of multimodal distant strategies such as audios via podcasts, voice over PowerPoint/Zoom videos, Microsoft Teams and discussion sessions enhanced the distant learning experience of multimodal students via using of multiple sensory inputs [17].

Almanar, et al. 2020, proposed that students preferred face-to-face learning as its activities cannot be replaced by virtual or online learning platforms. However, distance learning provided them with computation skills and made them autonomous and critical learners [52]. From our perspective, students' preference for a certain learning approach may depend on their learning styles pattern, the subject being taught, and the quality of the distant learning platforms, course design and resources. In contrast to our results, some studies found that kinesthetics learners prefer distance and online teaching as tactile stimuli achieved through touching and interacting with laptops and personal computers and virtual simulations may augment their learning experience with their ability to move freely during online sessions [53, 54].

In addition, some studies revealed that students generally find distant teaching platforms satisfactory as it allows them to access educational materials at their own pace and from any location [55, 56]. Mubayrik, et al. 2020, reported that most of medical students preferred distance learning and explained that by its easy accessibility and flexibility [57]. Another study also suggested that in face-to-face environment levels of anxiety among students feeling social disconnection and ineffectiveness were high [58].

The difference among studies as regard preference of different learning styles for face-to-face or distant learning can be explained by the different study material, platforms, and resource. However, most studies have shown that students learn better by using active learning strategies, since such strategies consider different types of learners [48]. Cognitive Load theory supports the fact that information acquired through various sensory inputs helps transfer of information into long-term memory [59]. Therefore, medical educators can address different learning styles by implementing multimodal strategies and engage the students in interactive learning experience [48, 60].

Conclusion:

To the best of our knowledge this is the first study that addressed the first-year medical students' learning styles

using the VARK inventory and their preferences towards face-to-face or distance learning at Tanta University.

The quadrimodal pattern of learning was the significantly prevalent preference among the participant male or female students. Students of variant learning styles preferred the face-to-face learning approach, especially the quadri and the unimodal patterns and showed significant inclination towards face-to-face learning. Therefore, it is important to increase students' awareness of their preferred learning styles and its impact on the choice of the best learning method, and hence, achieving better academic outcome.

An integrated learning model seems more likely to be useful and approved by first year medical students as it will suit their different learning styles and modalities.

Study strength:

- To our knowledge, this is the first study at Tanta University to discuss the learning style of medical students and its association with their preference for face-to-face or distance learning.
- This study highlights the differences in learning styles between the first-year medical students, improves their awareness about their learning styles and hence enhances their self-development skills.
- In our opinion, it will be a baseline sample for further studies aiming at potential changes in the methods of learning according to the students learning styles.

Study limitation:

- A particular sample of students from a single university was used. Therefore, the sample may have been biased and might not represent the population of medical students across Egypt. Further studies in multiple universities with a larger sample size on the current topic are therefore recommended.

Recommendations:

It is indispensable for educators to implement variable educational strategies that could satisfy all learning styles and make the learning setting more student-centered and interactive. Moreover, educators should practice and introduce more multimodal distant strategies such as audio-visuals, recorded videos, online interactive meetings and group discussion and different multi-sensory inputs in order to encourage students' engagement and motivation.

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Authors contributions:

Mona Mohamed Abo El-Noor and Maii A. Shams Eldeen conceived and designed the study. Nahla Anas Nasef, Eman M El-Beltagi, Rana Ehab El-Gabeery contributed to data collection. Yasmeen M. El-Harty and Fatma G. Sobeh analyzed the data. All authors contributed to data interpretation and wrote the first draft of manuscript. Also, all of them read, revised and approved the final manuscript.

Funding:

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Availability of data and material:

- Data supporting the current study are available from the corresponding author upon a reasonable request.

o Conflict of interests: The authors declare that they have no conflict of interests.

Ethics approval and consent:

The study was approved by the Medical Research Ethical Committee at Faculty of Medicine, Tanta University, Egypt (approval code: 36264PR188/4/23). The students responded voluntarily to the questionnaire and informed that the results will have no effect on their final grades.

Informed consents were taken from all participants. Confidentiality and anonymity of the data was considered by giving a code number for each participant. The study was approved by the medical research ethical committee at Faculty of Medicine, Tanta University, Egypt (approval code: 36264PR188/4/23). The students responded voluntarily to the questionnaire and informed that the results will have no effect on their final grades.

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