

The Relationship Among Students' Learning Styles, Health Sciences Colleges, and Grade Point Average (GPA)

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Introduction: Learning styles are an increasingly important area in education, affecting different aspects of the learning arena. They can predict how students might process information and solve learning problems differently even when engaged in the same learning activities.

Purpose: This study aimed to investigate the relationship among health sciences students' learning styles, college majors, and grade point averages (GPAs). A total of 247 male students belonging to King Saud bin Abdulaziz University at Riyadh were chosen intentionally for this study, which employed a quantitative procedure for collecting and analysing data.

Methods: The study used a survey research design, and data were obtained from the Perceptual Learning Style Preference Questionnaire (PLSPQ), which the students had to answer online. The collected data were analysed using the Statistical Package for the Social Sciences (SPSS 16). Descriptive analysis methods – such as means, standard deviations, frequency counts, and correlations – were employed.

Results: The results indicated that the students demonstrated a range of learning style preferences. The most frequently preferred style was the auditory learning style, followed by the kinaesthetic and individual learning styles. The least preferred style was group learning. The results also showed significant differences in the students' learning styles across colleges – with preferences towards the auditory, individual, and group learning styles – and insignificant differences for the visual preference, kinaesthetic, and tactile preference learning styles. Finally, the relationship between learning style and GPA was only positive with the individual learning style and negative with the group learning style.

Conclusion: These findings support the notion that the total learning environment affects students' learning styles and suggest several courses of action for students, teachers, and policymakers.

Keywords: learning styles, GPA, health colleges, academic success

Introduction

Every person's learning technique is unique. Students bring to the learning process their own variations, which then influence how they approach learning as a whole. Such learners tend to resort to their learning habits and draw on life experiences by linking them to new ones. As a result of these variations, some learners do better than others and achieve high outcomes. However, the extent to which individual differences can predict success or failure is yet to be determined because some of these beliefs are based on personal experiences and are not suitable for all learning situations and might hinder learning.¹ What prevents some people from learning, despite knowing their areas of weakness and strength, is their belief that they have a fixed identity – ie they cannot expand their capabilities to adopt new learning styles.² Himmele and Himmele³ (p27) explain this barrier by stating that “they may internalize the belief that they can only learn when content is presented in that particular way”.

Learning styles are defined by Reid⁴ (p8) as “an individual’s” natural, habitual, and preferred way(s) of absorbing, processing, and retaining new information and skills’. Among other individual variables such as language aptitude, language anxiety, and learning strategies, learning styles are an increasingly important area that has gained support and recognition in second language acquisition.^{5–10}

Learners’ individual differences are divided into two categories: (a) innate attributes, such as gender, age, and learning style; and (b) acquired attributes, such as attitude, motivation, and learning strategy use.¹¹ Otherwise, they fall into physiological and affective factors as opposed to cognitive factors.^{5,6} These individual differences are also interrelated and affect one another. Students tend to use their strategic competence while implementing different learning styles, ie metacognitive, social, and affective strategies. They utilise these strategies consciously or unconsciously to learn and that by combining these strategies with other individual variables – such as motivation, feelings, and perceptual preferences – students wind up with learning styles.¹¹

As such, different learning style models emerged based on some influential learning theories, including cognitive psychology. Cognitivists are concerned with mental processes such as reasoning, memory retention, problem solving, creativity, and so on because they aim to understand how people think and process information. When individuals become aware of their own mental processes, they become metacognitively aware of their learning.⁵ For example, in perceptual learning and the implementation of perceptual modalities, the visual, auditory, kinaesthetic, and tactile styles are included to design his Perceptual Learning Style Preference Questionnaire (PLSPQ).⁴ It suggests that experience is at the heart of learning and the development of learning and that knowledge is constructed via grasping and transforming experiences.¹² Four modes of learning inform his experiential model theory, ie abstract conceptualisation, concrete experience, active experimentation, and reflective observation. Student–student and student–teacher interaction inform Grasha’s model of learning, called the Grasha Riechmann Student Learning Styles Scale (GRSLSS), which categorises students’ real responses in learning environments into four groups, ie independent, avoidant, cooperative, dependent, competitive, and participant.¹³

Learning style research can be traced back to the seminal work of Witkin et al¹⁴ who maintain that individuals fall into the dimension of an analytic predisposition (ie field independence) or a more global dimension to the processing of information (ie field dependence). Much of the research on second language learning styles has examined cognitive styles and their association with learning styles on the one hand and cognitive styles with affective variables on the other hand.^{15,16} However, more variables should be considered in this research, such as the level of education, gender, and specification and their relationships with culture.¹⁷ How students prefer to be taught is another predictor of the students’ learning styles. Simulation-based learning in science courses allows students to show a high level of engagement and satisfaction when combined with kinaesthetic learning.¹⁸

Learning style awareness is of potential value to all language teachers, students, and policymakers. The learning styles that students implement often come into conflict with their teachers’ styles, or the students fail to suit their learning styles to different learning situations.¹⁹ As a result, students’ learning might not be as successful as expected. If teachers can identify these learning styles, then they can train their students to use them efficiently and be flexible in using different styles by providing the necessary instructional support. Teachers can also employ different teaching methods and activities.^{7,8}

Learning is affected by learning styles. The ability of students to adapt to various situations for their learning needs will result in high learning outcomes.^{20–23} An additional benefit of learning style research is that policymakers can consider other factors related to learning and teaching, such as curriculum design, materials development, student orientation, and teacher training.^{21,24} Nevertheless, some cognitive researchers have alleged that learning styles are “neuromyths” rather than valid psychological constructs. They cite an absence of conclusive validation studies of learning style assessment instruments and of convincing demonstrations that students taught consistently with their learning styles learn more than students whose styles are mismatched to their instruction. The previous account clearly shows that the number of publications both supporting and opposing this point of view is large and continually growing.^{25,26}

However, while several studies in the Saudi context deal with learning styles and academic success – mainly in EFL contexts, as far as this literature review is concerned – no single study has examined the relationship between learning

styles and both GPA and health sciences colleges. To that end, the purpose of this study is to fill in this gap and investigate health sciences students' learning styles in relation to their GPA and colleges at King Saud bin Abdulaziz University for Health Sciences. The study used a survey research design, ie quantitative in nature, and data were obtained from the PLSPQ. Three research questions were thus formulated for this investigation:

1. What are the learning style preferences of health sciences students?
2. Is there a significant correlation between learning style preference and health sciences colleges?
3. Is there a significant correlation between learning style preference and GPA?

Literature Review

Learning Styles: Definitions and Importance

Learning style has several definitions in the literature. For example, Reid⁴ (p8) defines it as “an individual's” natural, habitual, and preferred way(s) of absorbing, processing, and retaining new information and skills’. Oxford⁷ (p3) states that ‘learning styles are the general approaches – for example, global or analytic, auditory or visual – that students use in acquiring a new language or in learning any other subject’. Cornett²⁷ (p9) gives a similar definition – “the overall patterns that give general direction to learning behavior”. The word “style” by comparing it with two other terms, ie “process” and “strategy”.⁵ It is maintained that “process” is the most general among the three, while “strategy” is the most specific. According to Brown⁵ (p104), “style” is “a term that refers to consistent and rather enduring tendencies or preferences within an individual”. Some learning styles are associated with personality traits, such as anxiety, while others are linked to cognitive factors, such as ambiguity tolerance. In light of the above definitions, one would struggle to say that one definition is superior to another because every definition considers one angle and is from the researcher's area of interest or expertise.⁵ Nevertheless, all the definitions fit under the umbrellas of psychology, physiology, and cognition.¹⁰

Another way to define learning styles is to compare them with learning abilities. The term “learning styles” is not the same as the term “abilities”, but it explains how people prefer to implement their abilities to learn. Learning styles and thinking processes interact at different levels when students respond to different tasks.²⁸ Thus, it is emphasised that instead of saying that some learners have the abilities and potential to be “good learners”, it would be better to focus on different strategies that effective learners employ and relate this to success. Further, it is useful to relate success to students' styles and preferences.⁹

The existing literature maintains the importance of learning styles for different aspects of learning. For example, despite similarities or universal aspects between first and second language acquisition, these similarities do not account for individual differences or tell us how individuals prefer to learn and tackle different learning problems.⁵ Others relate styles to academic success in language learning or learning in general and to the relationship between reading strategies and learning styles.²⁹ Learning styles and learning strategies are associated with effective language learners who call on different learning strategies and are also aware of their learning process as a whole and their personal learning styles in particular.^{6,7} Another benefit of learning style research is its capacity to deploy learning style models for developing learning and teaching processes on the one hand and to make use of learning style models to guide young learners' preferences and development on the other hand.³⁰

Models of Learning Styles

Several learning style models and approaches account for differences in individuals' learning. These models fall into three dichotomous learning style models, ie simple (eg convergent/divergent thinking), compound (eg Kolb's, active/reflective, abstract/concrete), and complex (eg perceptual styles).³⁰ In L2 learning, four dimensions of learning styles – ie sensory preferences (eg visual or auditory), personality types (eg extroverted or introverted), desired degree of generality (eg global or analytic), and biological differences (eg biorhythms and location) – suggesting that the biological aspects are the least important to be considered by teachers.⁷

However, as different models of learning are highlighted in the literature and are used loosely, these models should be combined with the factors, characteristics, and features of each learning style to define them well.¹⁶ The factors affecting

students' style preferences include gender, field of study, current environment, and level of education. Some of these are genetic, while others are related to the student's environment and experiences.¹² Brown⁵ (p105) clarifies that "people's styles are determined by the way they internalise their total environment, and since that internalisation process is not strictly cognitive, we find that physical, affective, and cognitive domains merge in learning styles".

Dunn and Griggs³¹ (p3) hold that the interaction between learning styles and other characteristics is such that '[l]earning style is the biologically and developmentally imposed set of characteristics that make the same teaching method wonderful for some and terrible for others'. The previous quotes clearly show that several factors affect learning styles and have a direct connection to the learning process.¹²

Another important factor is the impact of environmental and cultural dimensions on learning styles.¹⁰ For this reason, one can say that styles are not fixed or stable traits in learning because their existence would be affected by learning contexts and situations. Such styles are guided by the total environment and not restricted to the cognitive domain but rather combine the physical and affective domains.^{5,7}

On the other hand, some scholars doubt the impact of learning styles on students' learning. More research support is needed regarding the consequences of endorsing individual learning styles.³² In response, it is suggested that both teachers and students should devote their time and effort to learning theories and practices that are empirically proven to be effective rather than examining learning styles.³³

Finally, given many models and categories to address learning styles, several tools for assessing these styles have emerged. Among those available are Kolb's Learning Style Inventory (1984), the Felder–Silverman Learning/Teaching Style Model (1988), and Reid's (1995) PLSPQ, originally developed in 1984). Different perceptual learning styles include the visual, auditory, kinaesthetic, tactile, individual, and group learning dimensions.^{4,12,15} Although this measure was first used by an L2 researcher with L2 learners, it was not L2 specific because its items could be applicable in other contexts other than the L2 field.³⁴ Since this questionnaire has been used in different contexts by many researchers, it shows a high degree of reliability and validity.

Studies on Learning Styles

Studies pertaining to the relationship between learning styles and how they might interact with success in language learning, academic achievement, or the major area of study have been carried out in different contexts. In the international context, the learning preferences of ESL students from different language backgrounds and compared learning styles with other variables, such as sex, level of education, field of study, and age have examined.²¹ The findings show that for medicine students, the auditory style is a major learning preference, and that the students hold a negative preference for group work. The impact of cultural differences and education-related variables such as gender, level of education, and area of specification on learning styles and find that the biggest impact is related to cultural differences, level of education, and area of specification and the smallest to age and gender.¹⁷ Similarly, the learning styles of clinical lab students and find that these students prefer multiple learning styles that enable them to retain information and enhance their learning experiences.³⁵ Their study concludes with the need for educators to create learning resources that cater to diverse learning styles and to allow teachers to try out different teaching methods.

Regarding the impact of learning styles on academic performance, the relationship between learning styles and the English achievement of Taiwan EFL college students belonging to three different levels of language mastery. The study reveals that while both high and intermediate students favour visual learning styles, including auditory and haptic, basic-level students prefer the haptic style.³⁶ Another study carried out to determine the relationship among learning styles, teaching styles, and academic performance and have found that the relationship between learning styles and teaching styles is positive for students who demonstrate visual learning styles, followed by those who prefer kinaesthetic styles, and that students who are visual and kinaesthetic perform better than students with bimodal learning styles.³⁶ Also the relationship between students' academic achievement and their learning styles and find no significant relationship between the two.³⁷ In a recent study on medical students, the relationship among learning styles, gender, and academic performance, more than half the students favour implementing two or more learning styles, specifically kinaesthetic and auditory. However, they have found no relationship

between learning styles and gender on the one hand and learning styles and academic performance on the other hand.³⁸

In the local context, the preferred learning styles of 120 Saudi EFL learners and finds that students prefer the kinaesthetic and tactile learning styles over other learning styles.³⁹ Another study investigates Saudi EFL students' learning preferences and find that they prefer tactile and visual learning styles, followed by auditory, group, and kinaesthetic learning styles.⁴⁰ In the same study, Saudi students express a preference for pair and group work and de-emphasised individual work given their collectivist culture. In different setting, 137 healthcare students enrolled in six different courses, investigating the relationship between learning styles and academic achievement, and find that most prefer visual, reading and writing, kinaesthetic, and auditory learning styles, in that order.²³ Similarly, the difference between students' preferred learning styles and teachers' preferred teaching styles is investigated to show a mismatch between the two categories; while the students prefer sensing, visual, active, and sequential learning styles, the teachers prefer abstract, verbal, passive, and global teaching styles.¹⁹ Finally, the relationship between students' learning styles and their satisfaction with the educational activities offered to them by the educational programme. They have found that although the students adopt several learning styles, there is no significant relationship between their learning styles and satisfaction on the one hand and their current university GPAs or other scores on the other hand.⁴¹

Methods

The Sample

The convenience sampling technique, which is a non-probability sampling method where the sample is easily approached, was implemented to collect data. This technique was employed because it saved time and effort; it would have been difficult for the researcher to visit different colleges to access students. A total of 247 male students belonging to King Saud bin Abdulaziz University at Riyadh took the questionnaire survey. The students were all second-year students and were assigned to different colleges based on their GPAs in their orientation year. Those with the highest GPAs would join the College of Medicine, followed by the College of Dentistry, the College of Pharmacy, the College of Nursing, the College of Public Health and Health Informatics, and the College of Applied Medical Sciences. The distribution of the sample is shown in Table 1.

Instrument

The questionnaire used for data collection was (PLSPQ). This questionnaire made use of the existing literature on perceptual modalities to develop this questionnaire and added two domains to account for L2 learning classrooms, ie sociological and social. The questionnaire items were organised to measure the following: items 6, 10, 12, 24, and 29 reflected the visual preference score; items 1, 7, 9, 17, and 20 indicated auditory learners; items 2, 8, 15, 19, and 26 indicated kinaesthetic learners; items 11, 14, 16, 22, and 25 reflected the tactile preference score; items 3, 4, 5, 21, and 23 measured the group preference learning score; and items 13, 18, 27, 28, and 30 reflected the individual learning score. The students were provided the link to the questionnaire via email and were encouraged to answer it at their convenience. After one week, all the students completed the questionnaire.

Table 1 Distribution of Study Sample According to College

College	Frequency	Percentage
College of Medicine	110	44.5
College of Dentistry	26	10.5
College of Pharmacy	23	9.3
Health and Health College of Public Informatics	22	8.9
Medical College of Applied Sciences	66	26.7
Total	247	100.0

To ensure the clarity and readability of the items and to check its internal validity, the questionnaire was given beforehand to three English teachers and 15 students for piloting, and their concerns and feedback were acknowledged. To check the external validity of the questionnaire, a random pilot sample of 35 students was employed. The Pearson correlation indicated that all the items had a high level of validity and were significant at the 0.01 level. For questionnaire reliability, Cronbach's alpha was run and ranged from 0.74 to 0.95, which meant that the questionnaire was reliable.

Data Collection and Analysis

As this research is quantitative in nature, for the data collection procedure, the questionnaire was distributed to second-year students at King Saud bin Abdulaziz University in Riyadh who had already been assigned to different colleges. The questionnaire items required about 15 minutes to complete, but some students were given more time as requested. To analyse the collected data, the Statistical Package for the Social Sciences (SPSS 16) was utilised. The descriptive analysis methods included means, standard deviations, and frequency counts, according to the research questions.

Results

The following section will be devoted to an analysis of the questionnaire by answering the three research questions, starting with the first: "What are the learning styles of health sciences students?"

Table 2 provides a general overview of the health sciences students' learning style preferences. The most frequently apparent preference style was the auditory learning style, followed by the kinaesthetic and individual learning styles. The least popular was group learning.

The following account answers the second research question, "Is there a significant correlation between learning style preference and GPA?" To answer this question, the researcher used one-way analysis of variance (ANOVA) to indicate the differences among more than two independent groups regarding their preferred learning styles according to their colleges.

Table 3 shows that the (F) values are not significant with regard to the learning styles of visual preference, kinaesthetic learners, and tactile preference, which indicates that there are no statistically significant differences among the responses in the study sample regarding the degree of the respondents' preferences for these learning styles based on their colleges. Table 3 also shows that the values of (F) are significant at the level of 0.05 or less among auditory learners, those with a preference for group learning, and those with a preference for individual learning, which indicates statistically significant differences in the responses of the study sample regarding the degree of their preference for these learning styles given the different colleges to which they belong. Using the least significant difference (LSD) test, the sources of these differences were revealed, as indicated in Table 4, and this answers the second research question.

Table 4 clearly shows significant differences at the 0.05 level on the health sciences students' learning style preferences according to their colleges, as follows:

Table 2 Means and Std. Deviations of the Respondents' Answers to Determine Their Preferred Learning Styles

Factor	Mean	Std. Deviation	Rank
Visual preference	3.57	0.71	4
Auditory learners	4.09	0.68	1
Kinaesthetic learners	3.77	0.82	2
Tactile preference	3.48	0.77	5
Preference for group learning	3.15	1.03	6
Preference for individual learning	3.68	0.96	3
Total	3.62	0.51	

Abbreviations: Std., Standard.

Table 3 One-Way Analysis of Variance (F-Test) for the Difference in the Study Participants' Responses About Their Preferred Learning Style Across Colleges

Factor	Source	Sum of Squares	df	Mean Square	F	Sig.
Visual preference	Between Groups	1.55	4	0.39	0.77	0.546 (N. S.)
	Within Groups	121.92	242	0.50		
Auditory learners	Between Groups	4.83	4	1.21	2.66	0.033 (0.05)
	Within Groups	109.78	242	0.45		
Kinesthetic learners	Between Groups	0.74	4	0.19	0.28	0.894 (N. S.)
	Within Groups	162.83	242	0.67		
Tactile preference	Between Groups	2.86	4	0.71	1.21	0.309 (N. S.)
	Within Groups	143.27	242	0.59		
Preference a group learning	Between Groups	14.08	4	3.52	3.47	0.009 (0.01)
	Within Groups	245.48	242	1.01		
Preference individual learning	Between Groups	9.06	4	2.27	2.51	0.043 (0.05)
	Within Groups	218.47	242	0.90		

Abbreviations: Sig, significant; df., degree of freedom.

Table 4 Multiple Range Tests: Least Significant Difference (LSD) Test for the Differences in the Respondents' Answers About Their Preferred Learning Styles According to Their Colleges

Factor	College	Mean	Medicine	Dentistry	Pharmacy	Public Health and Health Informatics	Applied Medical Sciences	In Favour Of
Auditory learners	Medicine	4.02						
	Dentistry	3.85						
	Pharmacy	4.11						
	Public Health and Health Informatics	4.39	*	*				Public Health and Health Informatics
	Applied Medical Sciences	4.20		*				Applied Medical Sciences
Preference for group learning	Medicine	2.94						
	Dentistry	3.19						
	Pharmacy	2.97						
	Public Health and Health Informatics	3.57	*		*			Public Health and Health Informatics
	Applied Medical Sciences	3.41	*					Applied Medical Sciences
Preference for individual learning	Medicine	3.83			*	*		Medicine
	Dentistry	3.67						
	Pharmacy	3.31						
	Public Health and Health Informatics	3.29						
	Applied Medical	3.67						
Factor	College	Mean	Medicine	Dentistry	Pharmacy	Public Health and Health Informatics	Applied Medical Sciences	In Favour Of
	Sciences							

Notes: *Indicates significant differences in the table The mean difference is significant at the 0.050 level.

Table 5 Pearson Correlation Coefficients to Measure the Relationship Between Health Sciences Students' Preferred Learning Styles and Their GPAs

Factor	Correlation Coefficient
Visual preference	0.0030
Auditory learners	−0.1093
Kinaesthetic learners	−0.0793
Tactile preference	−0.0326
Preference for group learning	−0.2441**
Preference for individual learning	0.2443**

Note: **The correlation is significant at the 0.01 level (2-tailed).

1. There are significant differences for auditory learners between the sample members in the Colleges of Medicine and Dentistry and the sample members in the College of Public Health and Health Informatics, in favour of the latter.
2. There are significant differences for auditory learners between the sample members in the College of Dentistry and the sample members in the College of Applied Medical Sciences, in favour of the latter.
3. There are significant differences in the preference for group learning between the sample members in the Colleges of Medicine and Pharmacy and the sample members in the College of Public Health and Health Informatics, in favour of the latter.
4. There are significant differences in the preference for group learning between the sample members in the College of Medicine and the sample members in the College of Applied Medical Sciences, in favour of the latter.
5. There are significant differences in the preference for individual learning between the sample members in the Colleges of Pharmacy and Public Health and Health Informatics and the sample members in the College of Medicine, in favour of the latter.

Finally, the following section answers the third research question: “Is there a significant correlation between learning style and GPA and health sciences college?” To answer this question, the researcher used the Pearson correlation coefficient to measure the relationship between the responses of the sample about their preferred learning styles and their cumulative grades. The following table shows the results obtained.

Table 5 clearly shows an almost non-existent relationship between the respondents' degree of preference for their learning styles – visual, auditory, kinaesthetic, and tactile – and their cumulative GPAs, and these results were not statistically significant. The table also reveals an inverse (negative) relationship between the sample's preference for group learning and their cumulative GPA averages, which indicates that the greater the students' preference for this style of learning, the more likely a decrease in their cumulative averages, and this relationship was statistically significant at the 0.01 level. However, Table 5 also shows a direct (positive) relationship between the sample's preference for individual learning and their cumulative GPAs, which indicates that the greater the students' preference for individual learning, the more likely a higher cumulative average, and this relationship was statistically significant at the 0.01 level.

Discussion

In response to the first research question – “What are the learning style preferences of health sciences students?” – the students employed different learning styles and expressed a preference for the auditory, kinaesthetic, and individual learning styles, in that order. The auditory learners chose items such as “When teachers tell me the instructions, I understand [them] better” and “I remember things I have heard in the class better than things I [have] read”. However, the findings are not inconsistent with those studies carried out in Saudi context.^{19,39–41} One possible reason for favouring the auditory style over other learning styles might be that the students enter the classroom with their own beliefs about learning, and such beliefs direct the way they approach learning and what activities they consider useful for learning.^{2,3} Before entering college, the students value rote learning and memorisation and believe that these approaches are beneficial to learning, where the students sit quietly and passively receive the information from their teachers. In this

case, the students see their teacher as their only reliable source of knowledge. Teachers might encourage such a belief by designing completely teacher-centred approaches. For this reason, the students would not receive enough learning experiences to become familiar with effective learning styles.²⁹

Also, unlike other studies whose respondents expressed a preference for group work,⁴⁰ the findings showed that the respondents preferred group work the least. The students were in favour of items such as “When I study alone, I remember things better” and “When I work alone, I learn better”. The reason behind this might be related to the students’ past learning experiences. As students finish their first year of study, they develop strategies for effective learning and become more independent – that is, the students prefer to look for the solutions themselves and deploy other learning styles which can be done individually.

In response to the second and third research questions, no significant relationship was found between the students’ visual, auditory, kinaesthetic, and tactile learning style preferences and their GPAs. However, the relationship was positive for those with a preference for individual learning and negative for those with a preference for group work. This suggests that the more the students prefer individual work, the more likely they are to earn a higher GPA, while a preference for group work would lead to a decrease in the GPA. Interestingly, these findings are consistent with those of other studies which found no relation between learning style and academic performance.^{37,41} This suggests a positive correlation between the two.^{9,22,29,36}

The positive relationship between individual preference and learning style might be due to other factors that are related to learning styles that could positively or negatively affect students’ preferences.^{12,31} This confirms that learning styles are not stable traits.^{5,7} Learning situations include environmental and cultural dimensions that are crucial in encouraging or discouraging students to call upon specific learning styles.¹⁰ For example, the teaching methods and styles that teachers prefer and deploy can lead their students to look for learning styles that match the teachers’ preferences. Another important factor is the form of assessment that teachers implement in the classroom. If teachers focus on summative assessments that emphasise quizzes and written exams and avoid project work, this can result in a competitive rather than collaborative environment among students.

With reference to the correlation between learning style preference and college major, several findings were revealed. First, there was a significant difference between students enrolled in the Colleges of Medicine and Pharmacy and those enrolled in the College of Public Health and Health Informatics, who preferred the auditory learning style. Also, there was a significant difference between dentistry students and applied medical sciences students, who preferred the auditory learning style as well. Second, a significant difference was found between medicine and pharmacy students and those of public health and health informatics, who showed a preference for the group learning style. This finding disagrees with that of some studies, that found that medicine students prefer the auditory and group learning styles.²¹ Similarly, there was a significant difference between medicine students and applied medical science students, who preferred the group learning style.

Finally, a significant difference was found between pharmacy students and public health and health informatics students, who showed a preference for the individual learning style compared to medicine students. Interestingly, for students who preferred the auditory and group learning styles, their GPAs after their orientation year were not as high as those of students belonging to the Colleges of Medicine or Pharmacy, for instance. When students finish their orientation year, they are assigned to different colleges based on their GPAs. The best (A+ and A students) would go to the medicine college, followed by (B+ and below students) the pharmacy, dentistry, public health and health informatics, and applied medical sciences colleges. For this reason, students belonging to these colleges prefer to listen to their teachers all the time and follow instructions. They also prefer to get help from their peers by working in groups. In addition, teachers’ teaching styles and the curriculum designs could affect students’ learning preferences.^{19,21}

Conclusion

This study examined the relationship among health sciences students’ learning style preferences, GPAs, and college majors in the Saudi context. Based on the findings and discussion above, one can conclude that the most preferred style was the auditory learning style, followed by the kinaesthetic and individual learning styles; the least preferred one was group learning. Students of the Colleges of Public Health and Health Informatics and Applied Medical Sciences showed

a preference to auditory learning compared to the medicine, pharmacy, and dentistry colleges. Also, while public health and health informatics and applied medical sciences students favoured the group learning style, students of medicine did not. Finally, no relationship was found between the students' learning styles and GPAs except for those expressing a preference for group and individual learning. While the relationship was positive for individual learning, it was negative for the group learning style, and pharmacy students were more inclined towards the former.

These findings suggest several courses of action for students, teachers, and policymakers, and they support the notion that the total cultural environment has an effect on learning styles.^{5,7,12} Students being aware of their own learning styles will enable them to implement multifarious learning-style preferences that are suited to different situations.^{1,3} This will also activate their metacognitive awareness, which would empower them to take control over their own learning. This can be applied beyond their classes, upon graduation, when they go to their workplaces. They need to diversify their learning styles so as to deal with their colleges and patients to best communicate and achieve their desired goals. By the same token, if teachers are aware of their students' learning styles, this will help them figure out any mismatch between teaching styles and learning styles and therefore expand their repertoire of teaching styles. For policymakers, it is important to consider learning styles in preservice teacher training and in designing educational programmes, as this is an important step to improve the quality of education.

The study has two limitations. The sample consisted of 247 health sciences students, and the study was conducted in a Saudi health sciences university. Another limitation was that the recruited sample comprised all male students. Future studies should include bigger and more varied samples from other health science colleges, eg both male and female students, while determining different factors that affect learning styles. Also, future studies using data collection tools other than questionnaires are needed to gain deeper insights into students' learning styles.

Disclosure

The author reports no conflicts of interest in this work.

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