Factors Influencing ABFM-ITE Performance among Family Medicine Residents in Qatar: The Role of Learning Styles, Academic Stress, and Undergraduate GPA

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Abstract

Background: The association between learning styles and examination performance has been explored in various medical education settings. However, research focusing on Family Medicine residents, particularly in Qatar and the broader Arabian Gulf region, remains limited. Additionally, few studies have accounted for confounding factors when assessing this relationship. This study aims to determine the effect of learning styles on the American Board of Family Medicine In-Training Examination (ABFM-ITE) scores among Family Medicine residents in Qatar while exploring other influential factors that may confound the effect.

Methods :A cross-sectional study was conducted among Family Medicine residents in Qatar across postgraduate years 1 to 4. A self-administered online questionnaire was distributed to all 52 residents, with 21 responding. The questionnaire included the VARK learning styles assessment, motivation factors, stress levels, mentorship, and other relevant variables. Learning styles were analyzed as individual scores for visual, auditory, read/write, and kinesthetic preferences. Linear regression analysis was performed to examine associations with ABFM-ITE performance, with stepwise removal of non-significant variables. A p-value of <0.05 was considered statistically significant.

Results: Among the 21 participants, 9 (42.9%) were categorized as bimodal, 7 (33.3%) as multimodal, and 5 (23.8%) as unimodal. The kinesthetic (K) style was the most prevalent, appearing in nearly all dominant style combinations. The most common dominant learning styles were (A, K) in 5 participants, (K, V) and (A, K, R) in 4 participants each, and (K) alone in 3 participants. Regression analysis identified academic stress as a significant negative predictor of ABFM-ITE performance (β = -0.513 to -0.664, $p < 0.05$). Undergraduate GPA emerged as a strong positive predictor (β = 0.492 to 0.496, $p < 0.05$), while kinesthetic scores had a moderate positive effect (β = 0.354, $p = 0.032$).

Conclusions: Findings emphasize the importance of addressing academic stress and providing targeted academic support for lower-GPA residents. Implementing active learning strategies, including case-based discussions, simulations, and problem-based learning, may enhance performance for kinesthetic learners and improve engagement across all learning styles.

Trial registration
Not applicable.

Keywords:
Learning styles, VARK, Family Medicine, In-Training Exam, medical education, academic stress, performance predictors

Background

The Accreditation Council for Graduate Medical Education International (ACGME-I) accredited Family Medicine residency program in Qatar recruits 13 residents annually. Over four years of training, residents undergo rigorous academic and clinical preparation, culminating in the Qatar Board Medical Specialization Exam and the Arab Board Medical Specialization Exam. Upon successful completion, they become Family Medicine specialists, contributing to primary health care services across the Primary Health Care Corporation (PHCC) health centers in Qatar. Given their role in shaping the future of primary care, optimizing their academic success is essential to ensuring high-quality patient care delivery.

Understanding the factors influencing examination performance is crucial for enhancing the residency training process. Academic success in residency is shaped by multiple elements, including individual learning styles, academic stress, and prior academic performance, such as Grade Point Average (GPA). The American Board of Family Medicine In-Training Examination (ABFM-ITE) is a key assessment tool used to evaluate residents' medical knowledge through multiple-choice questions (MCQs). Its results inform remediation plans and guide academic improvement efforts.

One key factor influencing academic performance is learning style, which refers to an individual's preferred approach to acquiring, processing, and retaining information. The VARK (Visual, Aural, Read/Write, and Kinesthetic) learning model categorizes learners based on their dominant or multimodal learning preferences (1). Visual learners benefit from diagrams and charts, aural learners from discussions and lectures, read/write learners from textual materials, and kinesthetic learners from hands-on experiences and practical applications. Understanding residents' learning styles can help educators tailor instructional methods to optimize comprehension and retention, potentially improving examination performance.

This study investigates the impact of learning styles on ABFM-ITE scores among Family Medicine residents. By identifying key predictors of examination performance, the findings can support the development of tailored educational strategies to enhance learning outcomes. A deeper understanding of these factors will enable residency programs to optimize training methodologies, ultimately strengthening the competence and preparedness of future Family Medicine specialists.

The relationship between learning styles and academic performance has been explored in various medical education settings. Several studies have examined learning styles among residents across different medical specialties. Hassanzadeh et al. (2019) descriptively mapped the preferred learning styles among ophthalmology residents in Iran and found insignificant correlations between gender, residency levels, and learning styles (2). Similarly, Modi et al. (2015) studied the correlation between learning style and surgical performance using a simulator and found no significant relationship between them (3).

Conversely, some studies have reported a positive correlation between learning styles and examination performance. Muganlinskaya et al. (2021) examined the preferred learning styles of Internal Medicine residents in years 1 and 2 and found significant improvement in their In-Training Exam (ITE) scores (4). Olanipekun et al. (2019) investigated the association between Internal Medicine residents' learning styles and their ITE performance, concluding that residents with a diverging learning style performed better and had the highest mean score; however, the reported p-value of 0.14 was considered statistically insignificant (5). Amal et al. (2021) conducted a cross-sectional descriptive study on Family Medicine residents' learning styles and found that the majority identified as activists (60.5%), reflectors (44.7%), pragmatists (34.2%), and theorists (36.8%) (6). These studies primarily used the Kolb Learning Style Inventory as a data collection tool.

More recent research has employed Fleming's VARK learning style inventory. Kim et al. (2015) studied the association between learning style preferences and American Board of Surgery In-Training Examination (ABSITE) performance, finding that residents who preferred the read/write style performed better, while those with an aural preference scored the lowest ($p = 0.03$) (7). Kim and Gilbert (2015) further examined learning style preferences among general surgery residency applicants, reporting significant differences in USMLE Step 1 and 2 scores based on learning styles (both p-values < 0.05), although no significant differences were found for class ranks, interview scores, or final rankings (all p-values > 0.05)(8). Despite these contributions, prior studies have not accounted for various covariates that may influence the observed associations. Factors such as prior academic performance (GPA) (9), study habits and time spent studying (10), motivation (11), and stress levels (12) all play significant roles in academic performance. This gap in the literature is particularly evident in studies focusing on residents and medical students in the Arabian Gulf peninsula. One of the most relevant recent studies, conducted by Al Ali et al. (2021), examined Family Medicine residents' learning styles through a cross-sectional descriptive study but did not investigate their predictive value in relation to resident performance (6).

Given this gap, our study aims to explore the relationship between learning styles and American In-Training Exam (AITE) scores among Family Medicine residents. This research is particularly significant as it not only investigates the direct association between learning styles and exam performance but also considers other potential influencing factors. By addressing these gaps, this study seeks to contribute meaningful insights to medical education and residency training, particularly in the context of Family Medicine within the Arabian Gulf region.

Methods

Study Design and Setting

This study was a cross-sectional analytical study conducted to examine the relationship between learning styles and exam performance among Family Medicine residents in Qatar. The study was carried out at the Family Medicine Department in West Bay Training Center, a primary healthcare training facility affiliated with the Family Medicine residency program. The study targeted all Family Medicine residents enrolled in the residency program during the 2024 academic year. Using Cochran's formula, the estimated sample size required to achieve a 95% confidence level with a 5% margin of error was 46 residents. However, 21 residents ultimately participated in the study.

Participants were recruited via email invitations, and participation was voluntary. Only those who provided consent proceeded to complete the questionnaire. Residents were eligible to participate if they were actively enrolled in the Family Medicine residency program (PGY 1–4) and provided consent to complete the questionnaire, including self-reporting their American Board of Family Medicine In-Training Examination (ABFM-ITE) scores. Residents were excluded if they were on leave, did not take the ABFM-ITE, or did not complete the questionnaire. Additionally, those who withdrew from or were dismissed from the residency program during the study period were excluded from the analysis.

Data Collection and Measures

Data were collected through an online questionnaire developed using Microsoft Forms. Participants received an email with a link to the questionnaire and were asked to complete it at their convenience. The questionnaire consisted of multiple sections covering various research variables. Demographic information such as age, gender, and academic background was collected. Learning styles were assessed using the VARK Learning Styles Inventory, which provides individual scores for Visual (V), Auditory (A), Read/Write (R), and Kinesthetic (K) learning preferences. Based on the resulting scores, individuals with the highest dominant style were grouped into either Unimodal, Bimodal, Trimodal, or Multimodal. The latter three categories were concluded if the second, third, or fourth highest scores were within 3 cutoff points from the style with the highest score.

Motivation levels were evaluated using the strength motivation general practitioner (STRONG) questionnaire (13), and additional factors influencing exam performance were measured, including prior academic performance (undergraduate GPA), study habits, stress levels (academic stress), clinical experience, workload, access to learning resources, feedback, mentorship, and personal attributes. The ABFM-ITE scores were self-reported by participants as part of the questionnaire.

Data Analysis

All statistical analyses were conducted using IBM SPSS Statistics version 26. Descriptive statistics were used to summarize the respondents' demographic characteristics. The primary independent variables were the VARK learning style scores, which were treated as continuous variables in the analysis. To examine the relationship between learning styles and ABFM-ITE scores, a multiple linear regression model was employed. The model included other additional covariates to control for potential confounding factors. Statistical significance was set at $p<0.05$ for all analyses.

Results

The demographic characteristics of the study participants indicate a diverse group of Family Medicine residents, with notable variability in the disclosure of personal information. Among the 21 respondents, males and females were equally represented (28.6% each), while 42.9% preferred not to disclose their sex. Similarly, 42.9% of participants reported being between the ages of 26-30, whereas 14.3% were older than 30, and a substantial proportion (42.9%) opted not to reveal their age. This pattern extended to postgraduate year (PGY) levels and marital status, where nearly half of the respondents chose not to disclose their information (Table 1).

Fisher's Exact Test

A Fisher's Exact Test was performed due to the violation of chi-square assumptions, as 100% of cells had expected counts below 5 (minimum expected count = 0.95). The test did not reveal a statistically significant association between learning modality (Unimodal, Bimodal, Multimodal) and ABFM performance categories (Below Passing, Minimum Passing, Meets Expectation, Above Average)(14), $p = .394$ (two-sided). These findings suggest that preferred learning modality was not associated with the performance on the ABFM-ITE exam in this sample. Thus, H_1 is rejected and H_0 (Null Hypothesis) is accepted. There is no association between learning modality (unimodal, bimodal, etc.) and ABFM performance categories.

The bar chart (Figure 1) illustrates the distribution of learning modalities across ABFM performance categories. Bimodal learners were most frequent in the "Meets Expectation" category, while Multimodal learners were more evenly spread across categories. Unimodal learners had a lower presence overall. Notably, the "Above Average" category included only Unimodal and Multimodal learners. This visual trend aligns with the statistical results, confirming no significant association between learning modality and ABFM performance.

Table 1. Demographic Characteristics of Study Objects (n=21)

Characteristics		Frequency (%)
Sex	Female	6 (28.6%)
	Male	6 (28.6%)
	Prefer not to say	9 (42.9%)
Age group	26-30	9 (42.9%)
	> 30	3 (14.3%)
	Prefer not to say	9 (42.9%)
PGY Level	PGY2	3 (14.3%)
	PGY3	6 (28.6%)
	PGY4	3 (14.3%)
	Prefer not to say	9 (42.9%)
Marital Status	Single	6 (28.6%)
	Married	3 (14.3%)
	Married with children	3 (14.3%)
	Prefer not to say	9 (42.9%)

Table 2. Fisher's exact test of learning modality and ABFM-ITE performance categories

	Learn Modality				Test Result
ABFM score category	Unimodal	Bimodal	Multimodal	Total	
1 Below Passing Standard	1	2	2	5(23.8%)	p = .394
2 Minimum Passing Standard	2	3	1	6(28.6%)	(two-sided)
3 Meets Expectation	0	4	2	6(28.6%)	
4 Above Average	2	0	2	4(19.0%)	
Total	5(23.8%)	9(42.9%)	7(33.3%)	21(100%)	

Figure 1. Distribution of Learning Modalities Across ABFM-ITE scores categories

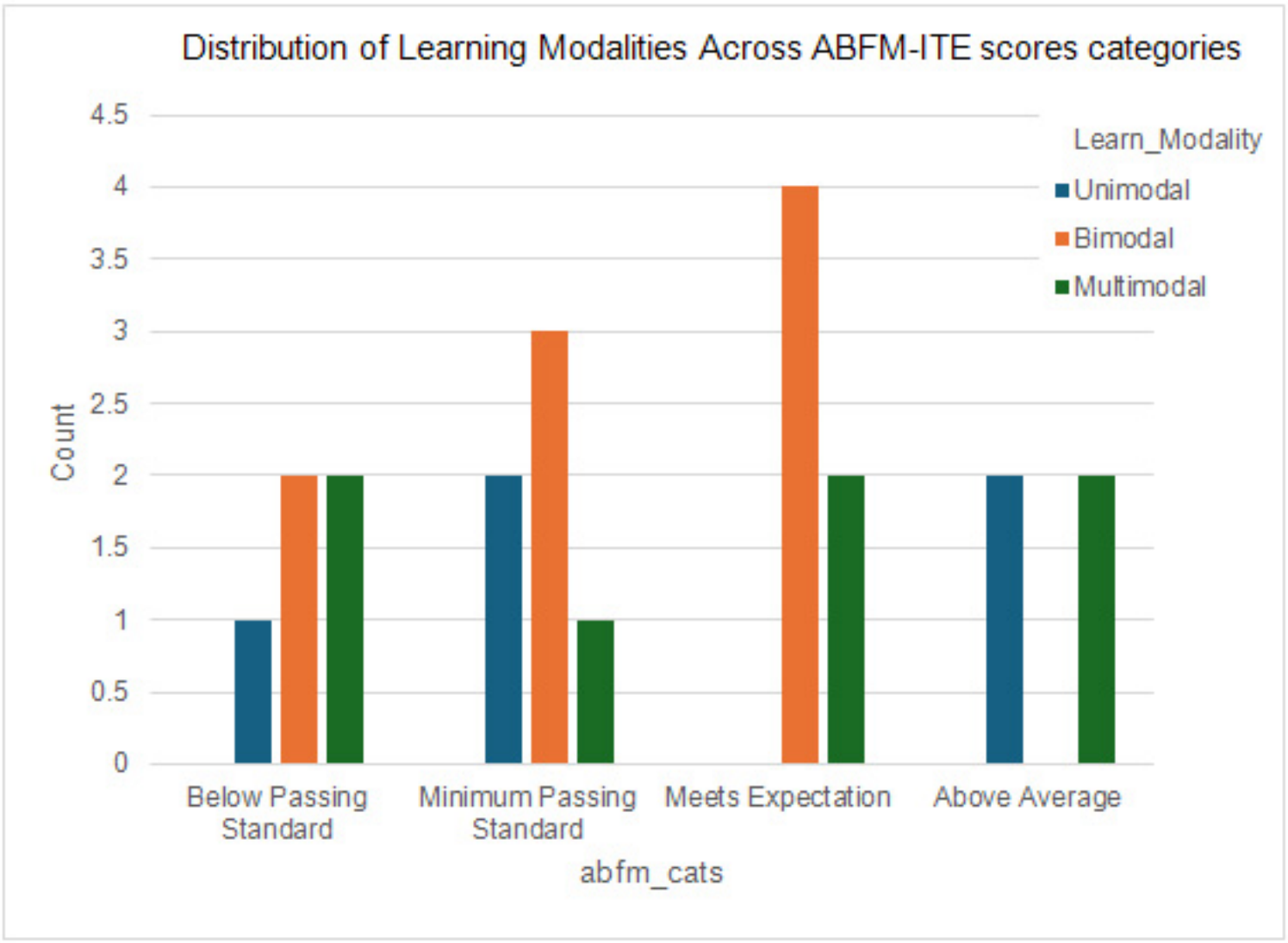
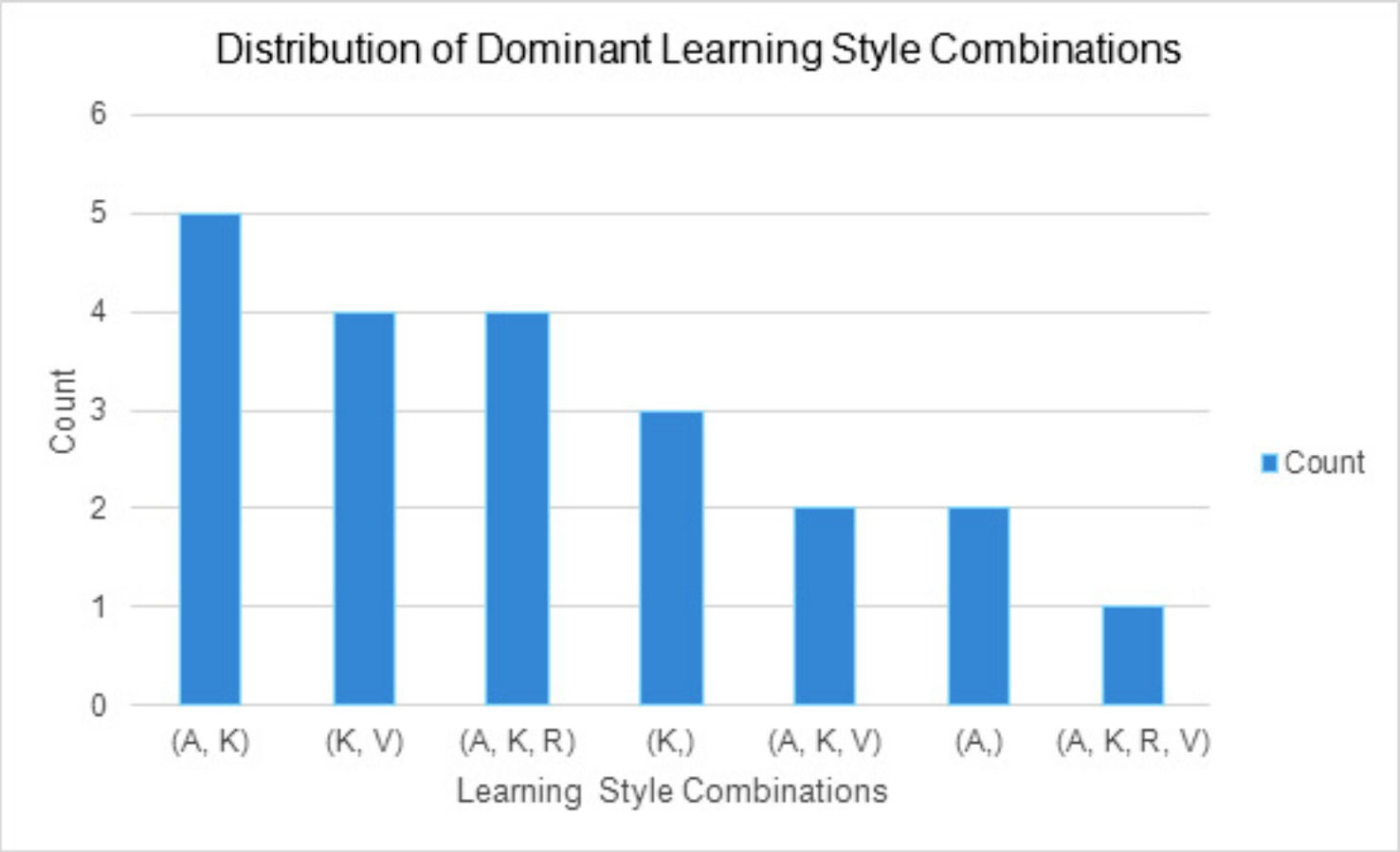


Figure 2. Distribution of Dominant Learning Style Combinations



General Linear Regression

To further investigate the relationship between learning preferences and ABFM performance, a stepwise general linear regression model was performed using individual VARK scores (Visual, Auditory, Read/Write, Kinesthetic) as continuous independent variables and ABFM raw scores as the dependent variable. In addition, academic stress, undergraduate GPA, motivation, and other variables were included as covariates.

The regression analysis identified Kinesthetic learning preference (K-score) ($p < 0.05$), academic stress ($p < 0.05$), and undergraduate GPA ($p < 0.05$) as significant predictors of ABFM score. However, Visual, Auditory, and Read/Write learning preferences did not exhibit significant associations with ABFM performance.

General linear regression models showed that academic stress was a significant negative predictor in all models, while undergraduate GPA and kinesthetic scores were positive predictors in Models 2 and 3. The final model (Model 3) explained 61.2% of the variance in ABFM-ITE scores ($R^2 = .612$, $p = .001$) (Table 3). Thus, we reject the null hypothesis (H0) that VARK scores (V, A, R, K) and other variables (e.g. academic stress, and undergraduate GPA) do not significantly predict ABFM in-training exam scores while accepting the alternative hypothesis (H1) that at least one of the VARK scores, academic stress, and undergraduate GPA significantly predicts ABFM in-training exam scores. Figure 3 illustrates the linear regression model predicting ABFM-ITE scores.

	β Coefficients, (95% CI), Effect Size		
Regression Variables	**Model 1**	**Model 2**	**Model 3**
Constant (without 95% CI)	649.181 (501.949 to 796.413)***	468.487 (282.675 to 654.299)***	358.155 (163.759 to 552.550)***
acad_stress	-57.343 (-103.358 to -11.329), -0.513*	-74.208 (-115.814 to -32.602), -0.664*	-71.949 (-109.398 to -34.500), -0.664***
ug_gpa	---	69.868 (17.349 to 122.388), 0.496**	69.385 (22.181 to 116.589), 0.492**
K_score	---	---	10.018 (0.983 to 19.053), 0.354*
Model Significance	.017	.002	.001
Durbin Watson	---	--	1.340
R Square	.264	.487	.612
Cook's distance	---	---	.057 (.000 to .494)
Variance Inflation Factors (VIF)	1.000	1.102	1.070

Dependent Variable is American Board of Family Medicine In-training Exam (ABFM-ITE) scores

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

Table 3: General linear regression models

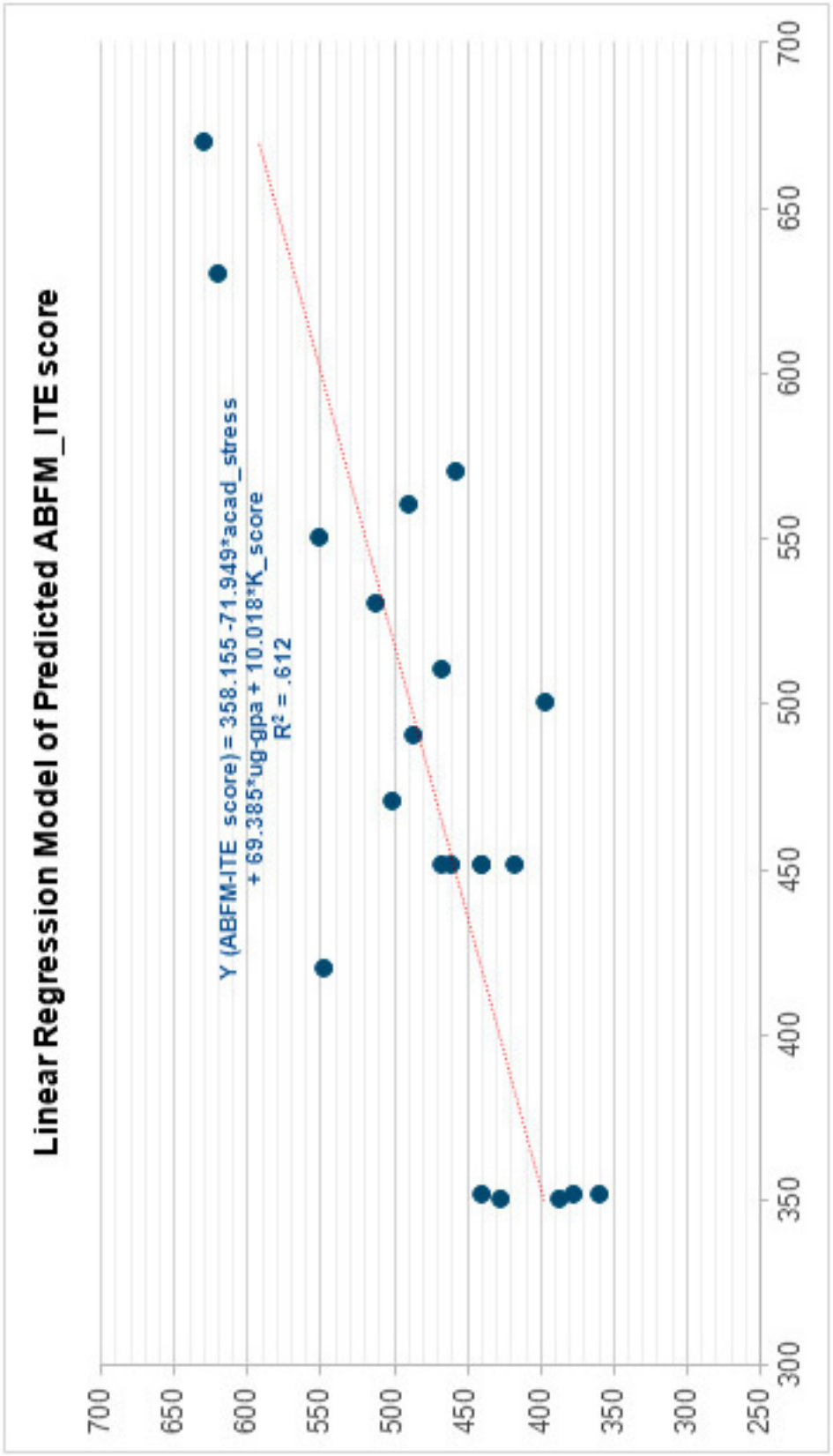


Figure 3.
Linear Regression Model of Predicted ABFM_ITE score

Discussion

The findings from Fisher's Exact test align with previous studies that reported no significant association between learning styles and performance on the EyeSi cataract surgery simulator (3) and between learning styles and previous GPA (15). However, our results contradict the findings of El-Saftawy et al. (16), who identified a significant association between two learning modes (trimodal and multimodal) and post-test results.

To further investigate potential associations beyond Fisher's test, we conducted a general linear regression analysis. In this model, we treated VARK scores as continuous variables and regressed them against ABFM-ITE scores while controlling for other covariates. As described in the Results section, kinesthetic learning style emerged as a significant predictor of performance ($\beta = 0.354$, $p = 0.032$), corresponding to an increase of 10.018 points in the ABFM-ITE score. However, this effect was relatively modest compared to academic stress ($\beta = -0.664$, $p = 0.001$), which had a strong negative impact, reducing scores by up to 71.949 points. Additionally, undergraduate GPA ($\beta = 0.492$, $p = 0.006$) showed a moderate positive association with ABFM-ITE performance, leading to an increase of up to 69.384 points. The final regression model obtained is as follows:

Y (ABFM-ITE score) = 358.155 (-71.949 * academic stress) + (69.384 * undergraduate GPA) + (10.018 * kinesthetic score)

Our linear regression analysis highlights the widespread dominance of kinesthetic learning style among participants, a finding consistent with Tonkaboni et al. (17), who reported increased utilization of kinesthetic learning with higher education levels. In contrast, Kim et al. (7) found that residents with a read/write learning style performed better on surgical in-training exams.

Adding to this complexity, Muganlinskaya et al. (4) observed significant improvement in in-training exam scores from PGY1 to PGY2 across all learning styles, while Olanipekun et al. (5) identified the diverging learning style as yielding the highest scores in Internal Medicine In-Training Exams, followed by assimilating and converging styles, which are based on Kolb's learning style model.

The discrepancies between Fisher's Exact test and the general linear regression analysis suggest that broad classifications of learning styles (e.g., unimodal, bimodal, and multimodal) may obscure subtle effects, such as the kinesthetic learning style's influence on ABFM-ITE performance. This may be due to the oversimplification inherent in categorizing individuals based on their dominant learning styles. By treating VARK scores as continuous variables, our regression model provided a more nuanced assessment, revealing that kinesthetic learning was significantly associated with higher scores, albeit with a smaller effect compared to other predictors. These findings emphasize the need for a more refined approach in evaluating the impact of learning styles on medical education outcomes.

The unexpected emergence of academic stress and undergraduate GPA as significant predictors of ABFM performance nuanced the focus of our study. We initially believed that learning styles would have a greater impact than other variables; however, our findings suggest that academic stress and undergraduate GPA play a more substantial role. Our results align with West et al. (2011), who reported that lower quality of life (QOL) and burnout symptoms were associated with lower scores on Internal Medicine in-training exams (18). Similarly, other studies suggest that chronic academic stress can impair cognitive functioning and hinder medical students' learning (19).

However, our findings contradict those of LeBlanc and Bandiera (2007), who found that junior residents performed better under high-stress conditions during in-training examinations, while intermediate and senior residents showed no significant changes in performance (20). This discrepancy may be explained by differences in stress type, namely, acute stress versus chronic stress. Acute stress, which is short-term, may enhance exam performance by increasing alertness and focus (21,22). In contrast, chronic stress, which persists over time, can lead to fatigue, anxiety, and impaired learning ability (23). Furthermore, Bogdanov et al. (2021) found that while acute stress did not directly impair cognitive function, it made individuals more likely to avoid effortful or demanding tasks (24).

Sources of Academic Stress

Among the 21 participants surveyed, multiple sources of academic stress were identified, as participants could select more than one stressor. The most frequently reported stressor was exams, cited 19 times (31.15%), indicating that most participants found exams to be a major source of stress. This aligns with existing research identifying exams as a key stressor for medical trainees (25,26).

Assignments were the second most common stressor (16 times, 26.23%), followed by time management challenges (13 times, 21.31%). Additionally, personal life difficulties (7 times, 11.48%) and clinical rotations (5 times, 8.20%) were reported as stressors. Multiple evaluations were mentioned once (1.64%), highlighting concerns about frequent assessments. These findings suggest that while exams remain the primary academic stressor, the combined burden of assignments, time constraints, and personal responsibilities significantly contributes to residents' overall stress levels.

Consistent with our study's findings, a systematic review demonstrated that previous academic records, such as GPA scores, are significant predictors of academic success, supporting the use of GPA-based selection criteria in medical education (27). Similarly, a study conducted in the UAE found that undergraduate

GPA, along with medical residency entry examination scores and multiple mini-interview results, could predict end-of-year-one performance among residents (28). However, conflicting evidence exists. A study examining anesthesiology residents found no significant correlation between undergraduate GPA and in-training exam (ITE) scores, suggesting that other factors may play a more influential role in certain specialties (29). These discrepancies highlight the complexity of academic performance predictors and the need for further research across different medical fields.

Conclusions

This study explored the relationship between VARK learning styles and American Board of Family Medicine In-Training Exam (ABFM-ITE) performance, revealing that kinesthetic learning style had a modest yet significant positive association with exam scores. However, academic stress and undergraduate GPA emerged as stronger predictors, underscoring the complexity of factors influencing resident performance. These findings suggest that broad categorizations of learning styles may overlook nuanced effects, highlighting the need for a more tailored approach to medical education, moving beyond broad learning style categorizations to consider individual learning preferences, particularly kinesthetic tendencies, alongside academic stress levels and prior academic performance. Incorporating hands-on techniques such as clinical simulations, 3D models or augmented reality (AR), and procedural task training can better engage kinesthetic learners.

Medical educators should design tailored interventions that accommodate these factors to optimize learning outcomes and exam performance. Additionally, the significant role of academic stress in resident performance underscores the importance of integrating stress management programs into medical training. Mindfulness training, resilience workshops, and structured mentorship programs can equip residents with effective coping strategies.

Furthermore, revisiting assessment methods and exam preparation approaches is crucial. Streamlining exams, optimizing study plans, and incorporating active learning techniques, such as simulation-based training for kinesthetic learners, can enhance knowledge retention while reducing stress. Strengthening mentorship and peer support systems can further provide residents with guidance on effective study techniques and coping mechanisms. Aligning with recommendations from Mian et al.(30), medical schools and residency programs should also implement systematic burnout monitoring and prevention initiatives, ensuring that residents have access to mental health resources, flexible scheduling, and institutional support for work-life balance.

Limitations

This study has several limitations that should be considered when interpreting the results. The small sample size (21 out of 52 residents) may have introduced participation bias, thereby limiting the generalizability of the findings. Additionally, a potential overrepresentation of kinesthetic learners could have introduced selection bias, influencing the overall results. The statistical power of the study may also have been insufficient to detect significant associations between VARK learning styles and American In-Training Exam (ITE) scores. Moreover, the reliance on self-reported VARK assessments without pre- and post-testing introduces the possibility of recall bias, potentially affecting the accuracy of reported learning preferences.

Given the exploratory nature of this study, its findings should be interpreted with caution, and future research involving larger samples and more rigorous study designs is warranted. Although demographic data were collected from more than half of the participants, they were excluded from the final analysis due to a substantial number of participants declining to share their demographic information. However, this omission does not undermine the study's primary objective of examining the relationship between learning styles and exam performance. Rather, the findings remain relevant for optimizing residency training strategies based on cognitive preferences rather than demographic factors.

List of abbreviations

ABFM-ITE: the American Board of Family Medicine In-Training Examination.
ABFM: the American Board of Family Medicine.
STRONG questionnaire: the strength motivation general practitioner questionnaire
VARK: Visual, Aural, Read/Write, Kinesthetic
GPA: grade point average
MCQ: multiple-choice questions
PHCC: Primary Health Care Corporation
ACGME-I: The Accreditation Council for Graduate Medical Education International
IBM© SPSS: International Business Machines Corporation Statistical Package for the Social Sciences

Declarations

Ethics approval and consent to participate
The study was conducted in compliance with the Declaration of Helsinki, Belmont Report, and Good Clinical Practice frameworks. It is approved by the Institutional Review Board (or Ethics Committee) of Primary Health Care Corporation, Qatar. IRB Reference No. BUHOOTH-D-24-00071. Informed consent obtained from all the participants.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MTA is responsible for planning and writing, AC collected data, analyzed and interpreted the data set on the impact of learning style on the ABFM-ITE scores. ZA, MHM and AB are responsible for revising the final manuscript, and MS is responsible for conducting the literature review. All authors read and approved the final manuscript.

References

1. The VARK Modalities: Visual, Aural, Read/write & Kinesthetic [Internet]. 2014 [cited 2025 Mar 10]. Available from: https://vark-learn.com/introduction-to-vark/the-vark-modalities/
2. Hassanzadeh S, Moonaghi HK, Derakhshan A, Hosseini SM, Taghipour A. Preferred Learning Styles among Ophthalmology Residents: An Iranian Sample. J Ophthalmic Vis Res. 2019 Oct 24;14(4):483–90.
3. Modi N, Williams O, Swampillai AJ, Waqar S, Park J, Kersey TL, et al. Learning styles and the prospective ophthalmologist. Med Teach. 2015 Apr;37(4):344–7.
4. Muganlinskaya N, Mollaeian A, Karpman M. Learning style preferences of internal medicine residents and in-training examination scores: is there a correlation? J Community Hosp Intern Med Perspect. 11(5):608–11.
5. Olanipekun T, Effoe V, Bakinde N, Bradley C, Ivonye C, Harris R. Learning Styles of Internal Medicine Residents and Association With the In-Training Examination Performance. J Natl Med Assoc. 2020 Feb;112(1):44–51.
6. Ali AAA, Nasrallah MS, Rashed MH, Ibrahim YA, Rasheed RM, El-Meedani HM, et al. Learning style among family medicine residents, Qatar. Pan Afr Med J. 2021 Feb 15;38:167.
7. Kim RH, Gilbert T, Ristig K. The effect of surgical resident learning style preferences on American Board of Surgery In-training Examination scores. J Surg Educ. 2015;72(4):726–31.
8. Kim RH, Gilbert T. Learning style preferences of surgical residency applicants. J Surg Res. 2015 Sep;198(1):61–5.
9. Alaqeel SA, Alhammad BK, Basuhail SM, Alderaan KM, Alhawamdeh AT, Alquhayz MF, et al. Investigating factors that influence residency program selection among medical students. BMC Med Educ. 2023 Aug 29;23(1):615.
10. Credé M, Kuncel NR. Study Habits, Skills, and Attitudes: The Third Pillar Supporting Collegiate Academic Performance. Perspect Psychol Sci. 2008 Nov 1;3(6):425–53.
11. Kusurkar RA, Croiset G, Galindo-Garré F, Ten Cate O. Motivational profiles of medical students: Association with study effort, academic performance and exhaustion. BMC Med Educ. 2013 Jun 19;13(1):87.
12. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. Acad Med J Assoc Am Med Coll. 2006 Apr;81(4):354–73.
13. Sapoutzis N, Schneider A, Brandhuber T, Berberat PO, Wijnen-Meijer M. Development and internal validation of an instrument to measure the motivation of residents for family medicine. Eur J Gen Pract. 2023 Dec 31;29(1):2212903.
14. Wang T, O'Neill TR. 2024 In-Training Examination Score Results Handbook. 2024;
15. Mozaffari HR, Janatolmakan M, Sharifi R, Ghandinejad F, Andayeshgar B, Khatony A. The Relationship Between the VARK Learning Styles and Academic Achievement in Dental Students. Adv Med Educ Pract. 2020 Jan 8;11:15–9.
16. El-Saftawy E, Latif AAA, ShamsEldeen AM, Alghamdi MA, Mahfoz AM, Aboulhoda BE. Influence of applying VARK learning styles on enhancing teaching skills: application of learning theories. BMC Med Educ. 2024 Sep 26;24(1):1034.
17. Tonkaboni A, Pareshkooh MK, Manafi S, Mendes RA, Kharazifard MJ. Different scoring methods of the VARK questionnaire to evaluate dentistry Students' learning styles. Eur J Dent Educ Off J Assoc Dent Educ Eur. 2023 Aug;27(3):515–9.
18. West CP, Shanafelt TD, Kolars JC. Quality of life, burnout, educational debt, and medical knowledge among internal medicine residents. JAMA. 2011 Sep 7;306(9):952–60.
19. Abdulghani HM, AlKanhal AA, Mahmoud ES, Ponnamperuma GG, Alfaris EA. Stress and Its Effects on Medical Students: A Cross-sectional Study at a College of Medicine in Saudi Arabia. J Health Popul Nutr. 2011 Oct;29(5):516–22.
20. LeBlanc VR, Bandiera GW. The effects of examination stress on the performance of emergency medicine residents. Med Educ. 2007;41(6):556–64.
21. Sanders R. Berkeley News. 1AD [cited 2025 Mar 4]. Researchers find out why some stress is good for you. Available from: https://news.berkeley.edu/2013/04/16/researchers-find-out-why-some-stress-is-good-for-you/
22. Kirby ED, Muroy SE, Sun WG, Covarrubias D, Leong MJ, Barchas LA, et al. Acute stress enhances adult rat hippocampal neurogenesis and activation of newborn neurons via secreted astrocytic FGF2. Fernald R, editor. eLife. 2013 Apr 16;2:e00362.
23. Girotti M, Bulin SE, Carreno FR. Effects of chronic stress on cognitive function – From neurobiology to intervention. Neurobiol Stress. 2024 Sep 2;33:100670.
24. Bogdanov M, Nitschke JP, LoParco S, Bartz JA, Otto AR. Acute Psychosocial Stress Increases Cognitive-Effort Avoidance. Psychol Sci. 2021 Sep 1;32(9):1463–75.
25. Onlock M, Nasser L, Riddell T, Snelgrove N, Pardhan K. Fear, health impacts, and life delays: residents' certification exam year experience. Cjem. 2023;25(6):468–74.
26. Mirzaei A, Jamshidian S, Haghani F. Identification of Residents' Stressors: A Review Study. Strides Dev Med Educ. 2023 Feb 1;20(1):58–65.
27. Patterson F, Knight A, Dowell J, Nicholson S, Cousans F, Cleland J. How effective are selection methods in medical education? A systematic review. Med Educ. 2016;50(1):36–60.

28. Al-Shamsi GS, Wasfy NF, Eldin MG, Talaat W. Assess the Relationship between the Emirates Medical Residency Entry Examination, Grade Point Average, and Multiple Mini Interview Scores and the Resident's End-of-Year-One Performance in the UAE. Dubai Med J. 2023 Apr 21;6(2):134–43.
29. Warrick SS, Crumrine RS. Predictors of success in an anesthesiology residency. J Med Educ. 1986 Jul;61(7):591–5.
30. Mian A. Medical Student and Resident Burnout: A Review of Causes, Effects, and Prevention. [cited 2025 Mar 6]; Available from: https://www.clinmedjournals.org/articles/jfmdp/journal-of-family-medicine-and-disease-prevention-jfmdp-4-094.php?jid=jfmdp