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Influence of Motivation on Academic Performance among Dental College Students

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Abstract

AIM: This study aimed to assess the influence of motivation on academic performance among dental undergraduate students.

METHODS: A cross-sectional study was carried out among a sample of 187 undergraduate dental students from the main dental colleges in the Riyadh region of Saudi Arabia using an electronic questionnaire. Students' academic performance was measured by their current grade point average (GPA). Motivation was assessed using the Motivated Strategies for Learning Questionnaire (MSLQ), which is a self-report instrument designed to assess students' motivational orientations and learning strategies in college, including goals and value beliefs for the studied program (intrinsic, extrinsic goals orientation and task value), beliefs about their skills to succeed in their studies (control of learning beliefs, self-efficacy for learning and performance), and their anxiety about program tests.

RESULTS: The results showed positive correlations between GPA and the motivation scale (r = 0.2296, p = 0.0019) and most of its subscales, including self-efficacy for learning performance (GPA). (r = 0.2997, p = 0.0001), control of learning beliefs (r = 0.2305, p = 0.0021) and task value (r = 0. 2243, p = 0.0021). Test anxiety showed negative correlation with GPA (r = -0.1943, p = 0.0100). Compared to their counterparts, male students, students perceived to be from middle class families and students living with their families were consistently showing significant correlations between GPA and most of the motivation subscales.

CONCLUSION: It can be concluded that motivation for learning can influence the academic performance of dental students. This influence can be affected by factors such as sex, socioeconomic factors and family support of the students.

Introduction

Dental students are usually chosen based on proofing superior cognitive abilities in standardised admissions tests as this showed to be a predictor of college grades [1]. Although this indicator might be helpful in the early years of college studies as it mainly mandates knowledge and cognitive abilities, dental college programs differ from other Academic programs by having extensive pre-clinical and clinical courses that demand other skills such as psychomotor, interpersonal, responsibility and communication skills. Therefore, non-cognitive differences might be useful in accurately predicting academic performance among dental students.

In this regards, many well established theories, such as Vroom's Expectancy theory, Locke's Goal-Setting Theory and Eccles's Expectancy-Value Theory, as well as an extensive body of literature have emphasized the importance of non-cognitive factors in enhancing academic performance [2], [3], [4], [5]. Motivation is one of the key non-cognitive factors in this context, which is linked to progress and achievement behaviours [6], [7]. It also seems to be potential key players in accurately predicting academic performance [8].

The potential importance of motivation in predicting academic performance among dental

students is based on previous research findings that link motivation to the improvement of several academic conducts [9], [10], [11]. This influence seems to be related to the relationship found between high motivation and self-regulation, in which highly motivated students showed to be more capable of planning and mastering their learning processes independently [12], [13], [14]. Also, researchers from multiple disciplines found that students with high levels of motivation have a superior learning outcome compared to their colleagues with lower levels of motivation [11]. Initial research on student learning and performance made a distinction between motivational and cognitive aspects and researched each of these topics in isolation. However, later work in this field recognised the importance of having both motivation and cognitive skills for students to have better academic performance [11].

The significance of this combination in improving academic performance is derived from social–cognitive theories and the notion that it could provide insights into the mechanism of this process as a determinant of how students can effectively and efficiently regulate their learning process and acquire new knowledge [15], [16]. This is because students who have appropriate cognitive skills and motivated enough to engage themselves in self-regulated learning are arguably more capable of viewing the learning duties as intrinsically stimulating and valuable and have both high levels of self-efficacy and capabilities of monitoring their own set goals which lead them to be more persistent with appropriate learning behaviors that eventually boost the learning outcomes [17], [18].

Also, researchers advocate that motivation and self-regulation can be adaptive to specific situations [12], [16]. This could explain why some students perform better than others (between-person variation) or better on some tasks but not on others (within-person variation). The suggested variation in motivations and the resulting behaviours based on the targeted tasks differentiate this prospect from meta-cognitive and self-regulatory abilities in which their nature is to be more stable between tasks. An example of this variation among motivation and learning behaviour is the different levels of motivation usually showed by students when they chose to study an optional subject compared to being forced to study a mandatory one. Another example can be seen when students are asked to do group presentations on interesting topics compared to more formal tasks, such as written reports.

There is some limited evidence related to the medical and nursing disciplines showing that high motivation was correlated with high academic outcome [19], [20], [21]. However, there is no evidence that could be found to show how these theories are applicable in the dental field. Therefore, there is a clear knowledge gap in the dental education field regarding the relationship between motivation and academic performance which need to be addressed. Advancement in this topic can help to teach staff and policymakers in the dental field to determine and focus on the factors that influence students' academic learning and performance. This can also help in facilitating early identification of at-risk students and in improving admission procedures to help select the best candidate who can fit the requirement of the dental programs.

This research aimed to assess the influence of motivational orientations on academic performance. The objectives were to assess, among a sample of dental undergraduate students in Riyadh region of Saudi Arabia, the relationship between student academic performance and several constructs of motivation orientations, including students' goals and value beliefs for the dentistry program (intrinsic, extrinsic goals orientation and task value), their beliefs about their skills to succeed in this program (control of learning beliefs, self-efficacy for learning and performance), and their anxiety about tests in the program.

Methods

Ethical approval for the study was granted from the Ethical Committee at Aston University, United Kingdom. This was a cross-sectional study using a self-report questionnaire assessing the students' Academic performance, demographics and motivational orientations among a sample of dental undergraduate students randomly selected from the main dental colleges in Riyadh region of Saudi Arabia. The estimated numbers of students in these schools were 1030 students. Using a margin of error of 5% and a confidence interval of 85%, the recommended sample size was 173. An extra 20% was added to count for potential non-response. This yielded a required sample of 208 students who were randomly invited to participate in this study. An online questionnaire was designed for this study in which an access link to it was sent to the invited students. A pilot study showed that the questionnaire takes less than 10 minutes to complete, which was explained to the participants in the information sheet attached to the invitation link and at the beginning of the questionnaire. Out of the 208 who were invited to participate in the study, 187 students participated (90%).

Students' academic performance was measured by their current grade point average (GPA), which is a commonly used measure to study undergraduate academic performance by calculating the mean of grades over weighted courses contributing to assessment of the final degree. GPA is also the most common measure for employment and postgraduate admission and is linked to both success

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and working status [22]. It also has shown good validity and reliability as a measure of academic performance [23]. In this study, students were asked to provide their GPA, which was in a range of 0 to 5.

The motivation was assessed using the motivation section of the Motivated Strategies for Learning Questionnaire (MSLQ) [24]. The MSLQ is a self-report instrument designed to assess college students' motivational orientations and learning strategies in college. The MSLQ theoretical structure, validity and reliability is well established in the literature [25], [26], [27]. Another key advantage of the MSLQ is that it has been developed using a social-cognitive concept of motivation and learning strategies that are based on the theoretical framework assuming that motivation is a dynamic process that reacts to the surrounding contexts and can vary between different situations [26]. The motivation part of the questionnaire consists of Thirty-one items in Six subscales that assess students' motivational orientations towards intrinsic and extrinsic goal orientation, value beliefs, their beliefs about their skills to succeed, and their anxiety about tests. Students responded to each item using a seven-point Likert scale ranging from 'not at all true of me' to 'very true of me'. Student's motivation level was attained by averaging the item responses in the MSLQ's motivation section. Covariates variables collected for assessment included age, sex, type of home and perceived family socioeconomic status (SES).

The study used the MSLQ which have been tested and used extensively showing acceptability among college students. Also, all the invited students were sent information sheets explaining the study content and the expected time needed for completing the survey as well as explaining clearly that the participation is voluntary and anonymous with the data only accessible by the main researcher. The design of the survey allowed the students to exit the survey at any time, if they wish, without being noticed or identified. After collecting this data, it was kept in a password-protected laptop during the data analysis and then stored safely in a password-protected storage desk.

Stata version 13.1 (STATA Corp, College Station, TX, USA) was used for the analyses. Data was first cleaned and checked for consistency. Then, the MSLQ scale and subscales were constructed by taking the mean of the items that made up that scale. Next, variables were inspected for normality using both graphical and numerical methods to determine appropriate statistical tests, which included using an unpaired t-test and one-way analysis of variance test (ANOVA) to compare the mean scores for motivation strategy for the variables that have two and more independent groups, respectively. Subsequently, correlations between the different MSQL subscales of motivation and GPA were tested. This was carried out for the MSQL subscales first. Then, MSQL subscales were further assessed while stratifying by covariate

variables to assess for any confounding effect on the relationship between GPA and motivation subscales.

Results

Differences in the Mean Composite Scores for Motivation Strategy by the Characteristics of Students

Regarding the mean composite scores for motivation strategy among the study participants (Table 1), the results of the independent sample t-tests showed no statistically significant differences of the mean composite scores for motivation strategy between male and female students ($p = 0.14$). However, the results of one-way analyses of variance (ANOVA) indicate that there were statistically significant differences between the mean composite scores for motivation strategy within the different groups of ages ($p = 0.03$) and study years ($p = 0.004$).

Table 1: Comparison of mean composite scores for motivation strategy among the study participants (n=175)

Student characteristics	n	Mean	SD	p-value
Sex				
Male	127	4.81	0.61	0.14 [a]
Female	47	4.96	0.53	
Age				
< 21	48	4.97	0.55	0.03 [b]
21-23	95	4.86	0.58	
> 23	31	4.63	0.60	
Year of study				
Year 1	56	5.91	0.54	0.004 [b]
Year 2	16	5.05	0.67	
Year 3	29	5.10	0.53	
Year 4	40	4.73	0.58	
Year 5	34	4.61	0.59	
Living				
Alone	22	4.90	0.47	0.92 [b]
With family	127	4.84	0.58	
With friends	25	4.85	0.71	
Perceived family SES				
Working class	13	4.62	0.63	0.49 [b]
Lower-middle class	14	4.84	0.49	
Middle class	98	4.85	0.61	
Upper-middleclass	9	4.81	0.62	
Upper class	34	4.97	0.54	

[a] Independent sample t-test; [b] One-way analysis of variance (ANOVA).

Correlations between Academic Performance and Motivation Subscales

As presented in Table 2, the Pearson product-moment correlation coefficient results showed statistically significant correlations between academic performance and most of the motivation subscales. The strongest correlation with academic performance was Self-efficacy for learning performance subscale ($r = 0.2997$, $p = 0.0001$) (Figures 1), followed by control of learning beliefs subscale ($r = 0.2305$, $p = 0.0021$) and Task value ($r = 0.2243$, $p = 0.0028$). The general MSQL scale was also found positively correlated with academic performance ($r = 0.2296$, $p = 0.0019$). On the other hand, test anxiety subscale showed negative correlation with academic performance ($r = -0.1943$, $p = 0.0100$).

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Table 2: Correlations between subscales of motivation and academic performance (n = 175)

Subscales	r [a]	p-value
Intrinsic goal orientation (average subscore)	0.0740	0.3303
Extrinsic goal orientation (average subscore)	0.0233	0.7594
Task value (average subscore)	0.2243	0.0028
Control of learning beliefs (average subscore)	0.2305	0.0021
Self-efficacy for learning performance (average subscore)	0.2997	0.0001
Test anxiety (average subscore)	-0.1943	0.0100
The composite score for motivation (combining the above average subscores)	0.2296	0.0019

[a] Pearson's product moment correlation coefficient.

The only subscales that showed no significant correlation were those related to goal orientation (Intrinsic goal orientation and extrinsic goal orientation).
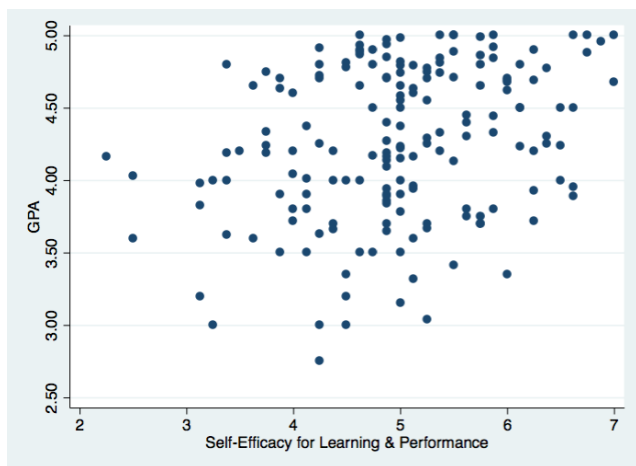

Figure 1: Correlations between self-efficacy for learning performance subscale of motivation and academic performance

Correlations between Task Value Subscale of Motivation and Academic Performance by the Characteristics of Students

Further analysis showed an effect of some factors on the relationship between academic performance and task value subscale of motivation. As shown in Table 3, the correlations between academic performance and task value subscale of motivation was statistically significant only among male students (r = 0.1969, p = 0.0265) compared to female, students aged above 23 years (r = 0.4763, p = 0.0068) compared to other age groups (Figure 2), students of the first and last academic year (r = 0.3324, p = 0.0123 and r = 0.5066, p = 0.0022, respectively) compared to students of middle years, and students living with their families (r = 0.2300, p = 0.7575) compared to those living in other types of accommodation. In regard to SES, this correlation was statistically significant only among students who perceived their family SES as middle and upper classes (r = 0.2839, p = 0.0042 and r = 0.4159, p = 0.0116, respectively) compared to lower class.

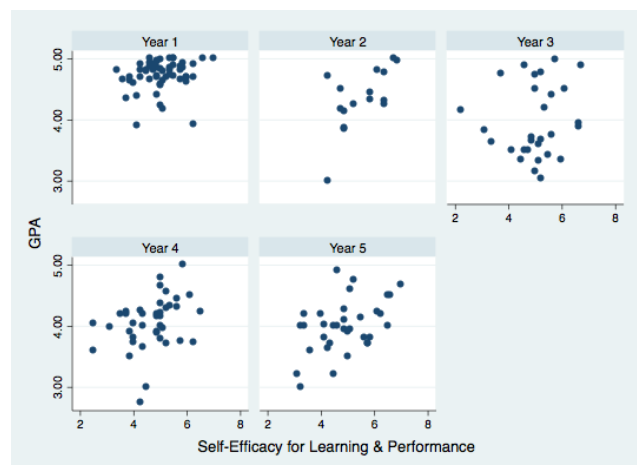

Figure 2: Correlations between Self-efficacy for learning performance subscale of motivation and academic performance, stratified by Academic year

Correlations between Control of Learning Beliefs Subscale of Motivation and Academic Performance by the Characteristics of Students

Looking at the confounding effect of the correlations between academic performance and control of learning beliefs subscale of motivation, the results indicated a statistically significant correlation only among male students (r = 0.2265, p = 0.0104) compared to female students, students aged below 21 years (r = 0.3605, p = 0.0118) compared to other age group, students of the fourth year (r = 0.3592, p = 0.0228) compared to other academic years, and students living with their families (r = 0.2517, p = 0.0043) compared to other accommodation types. In regards to SES, the correlation was statistically significant only among students who perceived their family SES as middle class (r = 0.2434, p = 0.0157) compared to other SES (Table 3).

Table 3: Correlations between motivation subscale and academic performance, stratified by students' characteristics

		Motivation Subscales						
		Task Value		Control of Learning Beliefs		Self-Efficacy for Learning Performance		Test Anxiety	
	n	r	p-value	r	p-value	r	p-value	r	p-value
Sex									
Male	127	0.1969	0.0265	0.2265	0.0104	0.2921	0.0009	-0.1024	0.2518
Female	47	0.0704	0.6382	0.2672	0.0695	0.1811	0.2233	-0.2399	0.1043
Age									
<21	48	0.1230	0.4048	0.3605	0.0118	0.2300	0.1158	-0.2636	0.0703
21-23	95	0.0849	0.4135	0.1118	0.2809	0.2971	0.0035	-0.1779	0.0846
>23	31	0.4763	0.0068	0.2185	0.2376	0.2761	0.1327	-0.0394	0.8334
Year of study									
Year 1	56	0.3324	0.0123	0.1052	0.4401	0.1886	0.1639	-0.2517	0.0613
Year 2	16	0.4948	0.0514	0.1350	0.6181	0.6333	0.0084	-0.3764	0.1507
Year 3	29	0.0398	0.8374	0.2662	0.1628	0.1172	0.5448	-0.1172	0.5450
Year 4	40	-0.2059	0.2024	0.3592	0.0228	0.3364	0.0338	-0.1347	0.4072
Year 5	34	0.5066	0.0022	0.1720	0.3306	0.4544	0.0069	-0.2256	0.1996
Living									
Alone	22	0.0698	0.7575	0.3349	0.1276	0.1487	0.5088	0.0035	0.9876
With family	127	0.2300	0.0093	0.2517	0.0043	0.5710	0.0014	-0.2584	0.0034
With friends	25	0.3457	0.0905	0.0424	0.8407	0.5066	0.0029	-0.0426	0.8399
Perceived family SES									
Working class	13	0.3069	0.3078	0.4259	0.1467	0.5111	0.0743	-0.3113	0.3006
Lower-middle class	14	0.2473	0.3940	0.3343	0.2428	0.0161	0.9564	0.2764	0.3388
Middle class	98	0.2839	0.0042	0.2434	0.0157	0.3079	0.0020	-0.3247	0.0011
Upper-middleclass	9	0.2208	0.5680	-0.2302	0.5513	-0.0614	0.8754	0.1639	0.6734
Upper class	34	0.4159	0.0116	0.2502	0.1536	0.0390	0.8266	0.0414	0.8161

n: observations; r: Pearson correlation coefficient.

Correlations between Self-Efficacy for Learning Performance Subscale of Motivation and Academic Performance by the Characteristics of Students

The results also showed that the correlations between academic performance and Self-efficacy for learning performance subscale of motivation were statistically significant only among male students (r = 0.2921, p = 0.0009) compared to females, students aged 21 to 23 years (r = 0.2971, p = 0.0035) compared to other age groups, students of second, fourth and fifth years (r = 0.6333, p = 0.0084; r = 0.3364, p = 0.0338; r = 0.4544, p = 0.0069, respectively) compared to other Academic years (Figure 2), and students living with their families (r = 0. 5710, p = 0.0014) compared to living in other types of accommodation (Table 3). The analyses of SES indicators showed a statistically significant correlation only among students who perceived their family SES as middle class (r = 0.3079, p = 0.0020) compared to other perceived family SES.

Correlations between Test Anxiety Subscale of Motivation and Academic Performance by the Characteristics of Students

As shown in Table 3, a significant correlation between academic performance and test anxiety subscale of motivation was only evident among students aged below 21 (r = 0.2636, p = 0.0703) compared to other age groups, and students living with their families (r = 0. 2584, p = 0.0034) compared to living in other types of accommodation.
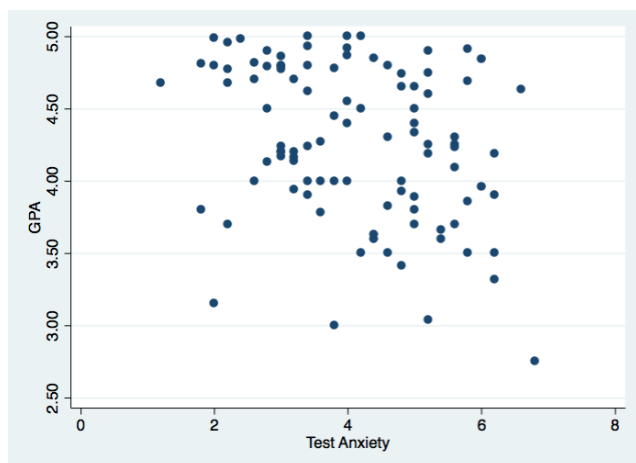

Figure 3: Correlation between test anxiety subscale of motivation and academic performance among students with middle-class families

The analyses of SES indicators showed that the correlation was statistically significant only among students who perceived their family SES as middle class (r = 0.3247, p = 0.0011) compared to other perceived family SES (Figure 3).

Discussion

This study examined the motivated strategies for learning and their association with the academic performances of a wide group of dental college undergraduate students from several dental schools in Riyadh region, Saudi Arabia. The study found statistically significant correlations between academic performance and the motivation scale as well as most of its subscales, including self-efficacy for learning performance, control of learning beliefs, task value and test anxiety. These results support the results of previous studies from other fields that showed such a relationship between academic performance and motivation strategy [8], [10], [28], [29]. The subscales that showed no significant correlation were those related to goal orientation (Intrinsic goal orientation and Extrinsic goal orientation) which was in line with previous research on the same topic [28].

The more in-depth analyses revealed that these correlations differ from one subscale to another based on how they react to other factors that affect this relationship. Interestingly, students living with their families were the only students who consistently showed significant correlations between academic performance and the motivation subscales, including task value, control of learning beliefs, self-efficacy for learning performance and test anxiety. To the author knowledge, this is the first study that shows such a unique effect. This effect might be because students living with their families have more exposure to positive feedback from parents, which found to be increasing self-efficacy of students [30]. Also, it might be because living with families in some cultures increase the students feeling of obligations for not causing shame or disappointment to their families after all the support they received. This kind of influence is seen commonly in middle- and far-east cultures [31], [32], [33].

Another factor that consistently confounds the relationship between academic performance and the motivation subscales is SES. Only students perceived their families to be a middle-class family showed significant correlations between academic performance and motivation strategies. The effect of SES is not unusual as it showed to be a well-known predictor of motivational orientation and academic performance [34], [35]. However, this study showed that it was the middle-class students who had this effect, not the higher SES as some previous research had found. This might be related to the differences in methods used to assess SES. This study used a proxy measure of SES to help in overcoming the issues related to asking about income as respondents often view this subject as sensitive and personal [36]. Further research is needed to examine this unique finding in more depth as the literature indicate that such an effect could be contingent upon several factors, such as student's minority status and school

location [35].

Additionally, even though no significant differences were found initially in the composite score for motivation between male and female students, the more in-depth analysis for each subscale showed that only males were having significant correlations between academic performance and motivation subscales, compared to a female student. These differences might be a result of the strong sex difference found in task preferences between boys and girls [37]. However, some previous results showed females having higher motivation scores than males [28], [29], [38], [39]. This variation could be related to the differences between both sexes in several factors including patterns of course-taking, achievement motivation and even educational experiences [40]. Analysing these differences was out of the scope of this study. However, further research is needed to analyse further sex differences for a better understanding of its role in this context as it has potential implications in education strategies.

This study used GPA as the outcome measure for Academic performance as it is the main outcome measure for students' Academic performance in universities and later on for employment and even showed to be predictive for employment [22], [41]. Although GPA is an objective measure with good internal reliability and stability [23], some factors could affect its validity, such as grade inflation and grading differences between universities [42], [43]. Further research could add to these findings by assessing different aspects of academic performance indicators, such as job offers, employment status and job performance.

Also, the use of students' self-reports to acquire this data might have introduced potential bias as students might be more inclined to self-enhancement, self-presentation and social desirability bias [41]. Even when students are trying their best to be honest and truthful, their self-reports might still be subjected to other limitations such as self-deception and memory biases [44], [45]. Nevertheless, this was judged to be the best available option considering other alternatives. For example, using University administration data as the source of the GPA could have jeopardised the anonymity of the questionnaire since it would be needed to make the questionnaires traceable. That action could have affected the study privacy protocol and participant's responses because of the increased likelihood of a potential source of biases as a result, such as social desirability distortion [46].

Another limitation of this study is related to the stratified analysis that was carried out to investigate about confounders and effect modifiers that could have impacted the relationship between academic performance and motivation strategy. The stratified analysis is a good tool to start with in such situations as it gives a fairly good picture of the role of confounders and effect modifiers. However, a key limitation to stratification is its inability to control simultaneously for multiple confounding variables. This study was the first to tap into such a relationship in dental education and therefore was meant to explore the potential correlations and initially discovered the potential confounders and effect modifiers. Doing in-depth and simultaneous testing for confounders would demand different design and much bigger sample to have enough power for such a level of analysis which was out of the scope of this research. Therefore, further research is needed to comprehensively assess the role of confounders and effect modifiers simultaneously which could bring up more details about the mechanisms of many of the correlations found by this study.

Considering the findings of this research, it seems helpful to give adequate attention to the enhancement of motivation in dental education and incorporate elements that stimulate intrinsic motivation among students. This theory is supported by previous research on medical education [47]. However, this has to be done while carefully considering factors that could affect this relationship, such as the type of family support, sex and SES, as some groups might act differently to these initiatives.

In conclusion, motivated strategies for learning, specifically self-efficacy for learning performance, control of learning beliefs and task value, are key factors for better academic performance among dental students. On the other hand, test anxiety can negatively affect the academic performance of dental students. This relationship might be affected by multiple factors, including the type of family support, sex and SES of the students. This emphasises the importance of carefully considering motivation strategies throughout the planning, implementation and improvement stages of academic programs.

Acknowledgements

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