Factors affecting the academic performance of low-and high-performing dental students: evidence from Japan

Jung-Hui Lee[1]*

[1]Department of Dental Education, Kanagawa Dental University, Japan.

Correspondence: Jung-Hui Lee, Department of Dental Education, Kanagawa Dental University, Japan. kdukairos@yahoo.co.jp

ABSTRACT

This study classified participants into low- and high-performing student groups according to their grade point average (GPA) and explored the characteristics of each student group's profile, which comprised five domains: basic demographic characteristics, life habits, study habits, perceived academic competence, and career selection. An online cross-sectional survey was conducted with 147 dental students in Japan. Data were collected via an online questionnaire survey. The survey measured the five domain variables mentioned above and GPA as an indicator of academic performance. Chi-square and independent t-tests were performed to identify variables associated with academic performance. The chi-square test showed that the high-performing student group included more women ($p <$ 0.01). They did not stay out late (zero times per week) ($p < 0.05$) and tended to study in advance instead of cramming ($p < 0.01$). The independent t-test results showed that high-performing students had more sleep deficits ($p < 0.01$), greater interest in studying ($p \leq$ 0.001), higher academic self-efficacy ($p < 0.05$), higher academic achievement goals ($p < 0.001$). They evaluated themselves more positively for academic grades ($p < 0.001$) than low-performing students. This study emphasizes students' emotions related to interest in studying or academic self-efficacy. As an academic intervention for at-risk students, dental educators should affirm that students can succeed, even related to small achievements, instead of advising them on their poor performance. This strategy will promote a positive attitude toward studying.

Keywords: Dental students, Academic performance, Study strategies, Emotion, Japan

Introduction

A variety of factors related to dental students' academic performance have been investigated in previous research. For example, studies have examined life habits or study strategies as predictors of academic performance [1, 2]. However, little is known about how such factors used in prior research function together in influencing academic performance. The present study aimed to address this gap in the research by analyzing various factors together. Specifically, five domains based on previous research combined to create a student academic performance profile. These five domains included basic demographic characteristics, life habits, study habits, perceived academic competence, and career selection. In addition, Ihm *et al.* [3] reported differing factors affecting academic success between low- and high-performing students. Therefore, the participants in the present study were divided into low- versus high-performing students to identify differences in the five domains between the two groups of students.

Regarding the study habits domain of the student profile, the present study examined four aspects. "Study environment" concerns the location and the ambient noise occurring while the student studies. "Study attitude" is defined as the student's interest in studying and academic self-efficacy [4]. Third, "study time" concerns the amount of time studying. Finally, "study strategy" refers to the student's study schedule: what time of day (e.g., morning, evening) is set aside for studying and whether the student crams or studies in advance [2, 4].

Research indicates that in terms of study attitude, high-performing students possess strong academic motivation, are interested in studying, and have high academic self-efficacy [2, 5].

Based on this description, the present study tested two hypotheses. *Hypothesis 1* was that high-performing students would be more interested in studying than low-performing students. *Hypothesis 2* was that higher-performing students would have a stronger sense of academic self-efficacy.

Regarding time spent studying, *Hypothesis 3* was that high-performing students would study for more extended periods, based on Aleidi *et al*. [6]. They found a positive association between study hours and grade point average (GPA).

In terms of study strategies, McAndrew *et al*. [2] found studying in advance rather than cramming was a factor that contributed to academic success. In addition, half of the participants perceived studying in the morning as more effective. Therefore, *Hypothesis 4* predicted that high-performing students would study in advance. *Hypothesis 5* predicted they would prefer to study in the morning.

Two aspects comprised this study's perceived academic competence domain: "self-evaluation for an academic grade" and "academic achievement goals." Lee *et al*. [7] reported that low-performing students overestimated their academic grades. Therefore, *Hypothesis 6* was that low-performing students would have a higher self-evaluation for an academic grade. In addition, as ambitious educational achievement goals are associated with better academic performance [8], *Hypothesis 7* was that compared to low-performing students, high-performing students would have more ambitious academic achievement goals.

Finally, as independent rather than parental decision-making in selecting a career is related to better academic performance [9], *Hypothesis 8* predicted that self-decision in career selection would be more prevalent in high-performing students.

Prior research has investigated the five domains mentioned above individually related to academic performance. However, the present study examined the five domains simultaneously to create student profiles that clarify the differences between low-and high-performing students.

Materials and Methods

Participants

An online questionnaire survey was administered to one cohort of students at private dental schools in Kanagawa Prefecture in Japan from June to September 2021 after obtaining ethical approval from the author's institution (No. 757). The questionnaire, including information on the study's purpose, a written informed consent form, and questionnaire items, was uploaded to the student's online learning management system (LMS). The questionnaires were returned via the LMS, and informed consent was obtained from all the participants.

Measures

The questionnaire comprised categorical and continuous items representing the five domain variables: demographic characteristics, life habits, study habits, perceived academic competence, and career selection. Continuous items were rated using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Demographic characteristics

Participants were asked to provide information on their gender, age, and year in the program. Their GPAs were obtained from the Office of Academic Affairs.

Life habits

Five items were used to measure life habits. Two items on the sleep deficit and discrepancy in wake-up times during weekdays and weekends were derived from the Sleeping-Related Index used by Tamura *et al*. [10]. Two items pertained to physical fitness and the frequency of staying out late, based on the Lifestyle Scale of Hou *et al*. [1].

Finally, one item on smoking was included based on a study indicating smoking was associated with lower academic performance [6].

Study habits

This measure consisted of seven items that assessed the study environment, attitude, hours, and strategies. Two items asked about the place of study and environment sounds while studying to assess the study environment. Two questions from the Subjective Attitudes to Studying Scale developed by Ono [4] were used to measure study attitude: "Do you like studying?" and "Are you good at studying?" One item derived from Aleidi *et al*.'s [6] research was used to measure study hours. Lastly, two items assessed strategies based on the Study Strategies Scale by McAndrew *et al*. [2]: Participants were asked to report on their schedule (cramming vs. studying in advance) and the time of day that studying occurs (e.g., morning, evening).

Perceived academic competence

Two items assessed perceived academic competence. One item measured self-evaluation for an academic grade, derived from Ochiai's [11] Subjective Academic Grade Scale. The other item, measuring goals, was created for this study. The item question was, "Which is the target level of your academic goals?" Participants chose from six options: 1-avoiding repetitions of the academic year, 2-upper 50%, 3-upper 40%, 4-upper 30%, 50-upper 20%, and 6-in the top three.

Career selection

Career selection was measured by two items derived from the work of Okumura *et al*. [9]. Participants were asked about the degree of independent decision-making and the level of parental influence involved in selecting a career in dentistry.

Statistical analysis

All data were analyzed using SPSS Version 20. Chi-square and independent t-tests were conducted to identify variables associated with academic performance. The chi-square test was

performed on the categorical variables, with results expressed as percentages and frequencies. The independent t-test was conducted for continuous variables. Its results are expressed as means and standard deviations.

Results and Discussion

Demographic characteristics of the participants

Two hundred questionnaires were distributed to one cohort of dental students in the 2021 class at a University in Japan. One hundred seventy-six responses were collected (88% response rate). Twenty-five participants were excluded from the analyses because they were international students. Four Japanese participants were excluded due to insufficient responses. The final sample consisted of 147 Japanese students. **Table 1** shows their basic demographic characteristics. Participants were between 18 and 36 years, with a mean age of 22.4 years (SD = 3.93 years). Participants were divided into two groups, low- and high-performing, using the median score of the GPA of the second semester in the 2021 academic year. The GPAs ranged from 0 to 5.

Table 1. Participant characteristics

Characteristic	Total (n)	N	%
Year in program	147		
First		74	50.3
Fourth		73	49.7
Gender	147		
Male		87	59.2
Female		60	40.8
GPA	147		
≤2.8 (low-performing students)		73	49.7
≥2.81 (high-performing students)		74	50.3

Differences between low- and high-performing student groups

The chi-square test evaluated the categorical variables. **Table 2** shows only significant results. There were more women in the high-performing student group ($\chi2_{[1]} = 6.85$, $p < 0.01$). In addition, the high-performing student group's low staying out late frequency (zero times in a week) ($\chi2_{[3]} = 9.55$, $p < 0.05$) exceeded that of the low-performing student group. Furthermore, the high-performing student group exhibited more studying in advance, while the low-performing student group crammed more ($\chi2_{[1]} = 9.18$, $p < 0.01$). No significant differences were found between the two groups in terms of the study hours and the study time during the day ($p = 0.74$, $p = 0.23$, respectively).

Table 2. Results of the chi-square test comparing low-performing and high-performing student groups (LPSG vs. HPSG)

Variable	Response	Total (n)	LPSG N (%)	HPSG N (%)	p-value
Gender (%)		147			<0.01
	Male		51 (58.6)	36 (41.4)	
	Female		22 (36.7)	38 (63.3)	
Staying out late (%)		141			<0.05
	Zero times a week		39 (54.9)	51 (72.9)	
	Once a week		13 (18.3)	13 (18.6)	
	Two times a week		7 (9.9)	4 (5.7)	
	Over three times a week		12 (16.9)	2 (2.9)	
Study strategies (%)		144			<0.01
	Cramming		50 (69.4)	32 (44.4)	
	Studying in advance		22 (30.6)	40 (55.6)	

Table 3 presents the results of the independent t-test for continuous variables. Compared to the low-performing student group, the high-performing student group reported a larger sleep deficit ($t_{[144]} = -2.72$, $p < 0.01$), more interest in studying ($t_{[143]} = -3.33$, $p \leq 0.001$), greater academic self-efficacy ($t_{[144]} = -2.07$, $p < 0.05$), more ambitious academic achievement goals ($t_{[144]} = -7.38$, $p < 0.001$), and more positive self-evaluation for an academic grade ($t_{[145]} = -6.82$, $p < 0.001$). Independent decision-making in career selection was not significantly different between the two groups ($p = 0.17$). However, the lower-performing student group showed more parental involvement. Still, the difference was marginally significant ($p = 0.07$).

Table 3. Results of the t-test comparing low-performing and high-performing student groups (LPSG vs. HPSG)

Variable	Total (n)	LPSG N Mean (SD)	HPSG N Mean (SD)	p-value	95% confidence interval Lower	Upper
Sleep deficit	146	73	73	<0.01	-0.97	-0.15
		2.88 (1.29)	3.44 (1.20)			
Interest in studying	145	72	73	≤0.001	-0.95	-0.24

		2.38 (1.08)	2.97 (1.08)			
Academic self-efficacy	146	73	73	<0.05	-0.67	-0.02
		2.29 (1.10)	2.63 (0.89)			
Academic achievement goal	146	72	74	<0.001	-2.19	-1.26
		3.15 (1.54)	4.88 (1.27)			
Self-evaluation for an academic grade	147	73	74	<0.001	-1.52	-0.83
		2.11(0.97)	3.28 (1.12)			
Parental involvement	146	72	74	<0.10	-0.03	0.60
		3.03 (0.92)	2.74 (0.98)			

This study's results clarify the characteristics of low- and high-performing students' profiles. Regarding basic demographic characteristics, the academic performance of female students was stronger than that of male students. This result is consistent with Nawa et al. [12], who found that male dental students had a higher proportion of withdrawals or academic year repetitions than their female counterparts.

Regarding lifestyle habits, factors related to academic performance were "frequency of staying out late" and "sleep deficit." High-performing students tended to avoid staying out late and had a considerable sleep deficit. Periyasamy et al. [13] stated most dental students experience poor sleep quality, yet they do not notice it. High-performing students in this study knew they were getting inadequate sleep. Therefore, they might have avoided staying out late.

Regarding study habits, McAndrew et al. [2] reported that long hours of studying are related to higher academic performance. However, the present study did not support this relationship (Hypothesis 3). Hypothesis 4 was supported as study strategies (cramming vs. studying in advance) were related to academic performance. The combined results suggest that study quality rather than study quantity differentiated low- from high-performing students. In addition, the results showed that interest in studying ("Do you like studying?") and academic self-efficacy ("Are you good at studying?") were associated with higher academic performance. Therefore, Hypotheses 1 and 2 were supported. Umemoto et al.'s [14] findings showing emotional engagement for studying affects behavioral engagement positively and leads to higher test scores support this study's results.

Contrary to Hypothesis 6, low-performing students showed a lower self-evaluation rather than an overestimation. Hypothesis 7 that high-performing students would have higher academic achievement goals (e.g., within the top three) than low-performing ones, was supported. These results regarding self-evaluation for academic grades and academic achievement goals are consistent with Ozaki and Karasawa's [15] findings. They found that positive self-evaluation related to realizing ideal academic goals, while negative self-evaluation was associated with less ambitious ones.

In the career selection domain, Hypothesis 8, predicting that independent decision-making in career selection would be more prevalent in high-performing students, was not supported. However, interestingly, low-performing students scored higher in parental involvement. However, the finding did not reach statistical significance. Okumura et al. [9] argued that excessive parental involvement in future career selection could impede a student's autonomy. As the literature indicates a positive relationship between autonomous learning and GPA [16], lack of autonomy due to high parental involvement in career choice may partially explain the difference between low- and high-performing students.

As a limitation of this study, it should be noted that the items used to create the student profiles in the five domains did not have established construct validity and reliability. Therefore, the results should be interpreted with caution. Future research is required to develop valid and reliable subscales for student profile creation.

Holding aside this limitation, this study's results add substantially to our knowledge about what contributes to successful academic performance in dental students by comparing the profiles of low- and high-performing student groups. By using these results, dental educators can develop appropriate interventions for individual students. Specifically, educators can reinforce those factors that contribute to academic success in high-performing students and offer interventions that reduce factors related to poor academic performance in low-performing ones.

Conclusion

This study emphasizes students' emotions related to their interest in studying or academic self-efficacy. Positive emotions toward academics increase studying behavior [14]. In academic interventions specifically for at-risk students, dental educators should confirm what students can do, even with the slightest achievements, instead of advising them on their poor academic performance. This strategy could increase their self-confidence, promote better academic behavior, and lead to stronger academic performance.

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