

原著

Psychological and behavioral factors affecting learning activities

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Abstract : This study focused on the factors affecting students' learning activities viewed from a psychological and behavioral perspective. A questionnaire survey designed to assess factors influencing academic performance was administered to paramedical university students. For the psychological aspect, Rosenberg's Self-Esteem Scale was used to evaluate one aspect of students' mental state. The modest correlations between self-esteem and academic performance do not indicate that high self-esteem leads to good performance. For behavioral aspects, this study found that higher junk food intake could reduce learning activity. Excessive junk food intake may negatively affect learner behaviors associated with motivation.

Keyword : *learning activities, academic performance, junk food, self-esteem, paramedical students*

1. Introduction

Universities offering paramedical courses are expected to help their students obtain professional qualifications. While students and their guardians remain focused on acquiring qualifications as the desired outcome, teachers must motivate their students to sustain efforts toward improving their academic grades – a task that is often recognized as challenging. The students' educational achievement before admission is a factor influencing their academic grades. However, many other factors influence students' academic performance, such as the learners' environment, motivation to learn, mental health, and financial difficulties¹⁻³⁾. Studies have reported that social origins and associated differences in accessing professions are more complex than differences in prior academic achievement alone^{4,5)}. Another study described medical students' motivation and found no differences in motivation strength according to sex, nationality, or age⁶⁾. Intrinsic motivation for academic development is critical to overcome one's environment, and success at school is strongly influenced by students' ability to put time and effort into their studies⁷⁾. Babenko *et al.* reported that dedicated personal activities, such as sports, appear to be associated with the desired motivation qualities for learning in medical students⁸⁾. In a study exploring

academic motivation, Kuniyoshi found that practical and profitable aspects largely influenced university students' motivation to learn, and the students in their study primarily intended to obtain a qualification⁹⁻¹⁰⁾. A similar tendency was seen in a study of university students in a teacher training course¹¹⁾. However, few studies of learning motivation in paramedical university students have been undertaken.

Students taking a paramedical course at university have a practical purpose for obtaining their professional qualifications. However, to maintain their motivation to improve academic grades, they need to have a clear purpose and strong aspirations linked to their intrinsic motivation. Hence, this study focused on psychological and behavioral factors affecting learning activities. A questionnaire survey was conducted with paramedical university students to explore the factors leading to academic performance.

2. Methods

2.1 Participants

The survey was conducted with Department of Medical Engineering students in the Faculty of Health Sciences from 2017 to 2019. Questionnaire responses were collected after informed consent had been obtained, and partially completed questionnaires were excluded from the analysis. The final number of

Table 1. Rosenberg Self-Esteem Scale

	strongly agree	agree	disagree	strongly disagree
1) On the whole, I am satisfied with myself.	4	3	2	1
2) I take a positive attitude toward myself.	4	3	2	1
3) I am able to do things as well as most other people.	4	3	2	1
4) I wish I could have more respect for myself.	1	2	3	4
5) I feel I do not have much to be proud of.	1	2	3	4
6) I certainly feel useless at times.	1	2	3	4
7) I feel that I have a number of good qualities.	4	3	2	1
8) I feel that I am a person of worth, at least on an equal basis with others.	4	3	2	1

respondents was 295 students (168 males). This study was approved by the Junshin Gakuen University Ethics Committee (file number 29-09) following the Declaration of Helsinki.

2.2 Questionnaire

The questionnaire was designed to assess the factors influencing academic performance. The questionnaire items evaluated in this study included: priority for college life, priority for future vision, physical condition, the number of junk food meals per day, and study time per day. Rosenberg's Self-Esteem Scale was administered in the first year of this survey.

For the psychological aspect, questions regarding *priority for college life* and *priority for future vision* were included in the questionnaire. *Priority for college life* refers to aspects that the students regard as most important in their current college life. Possible answers included: 'study', 'hobby or leisure', 'acquaintance with friends', 'part-time job', 'acquisition of personal qualification', 'nothing in particular', and 'other'. *Priority for future vision* refers to aspects that the students regard as most important in their visions of the future. Possible answers included: 'become a medical worker, researcher, or educator', 'prioritize personal life', 'seek another occupation', 'set up a household', and 'other'.

For behavioral aspects, *physical condition*, *junk food intake*, and *study time* were the main focuses. *Physical condition* referred to the health of students, with potential answers selected from 'no problems' or 'poor condition', with further multiple answers allowed

including 'sleeplessness', 'headache', 'spiritless', 'anorexia', 'fatigue', and 'irritation'. *Junk food intake* referred to the number of junk food meals in a day. In this study, junk food was described as food contains few nutrients such as instant noodle or snacks. *Study time* referred to independent study time (excluding lecture time at the university). The length of study time was evaluated as the average time per weekday, irrespective of the study nature or context (e.g., preparing for a lecture, writing a report, autonomous study).

For the psychological aspect, the Rosenberg Self-Esteem Scale¹²⁾ was used only in the first research year. The question items in the scale are shown in Table 1. The scale is a ten-item Likert scale with responses on a four-point scale ranging from 'strongly agree' to 'strongly disagree'. The scale can also be modified to measure self-esteem by asking respondents to reflect on their current feelings. In this study, the scale was limited to eight items to enable comparison with previous research conducted in Japan¹³⁾. The potential answers – 'strongly agree', 'agree', 'disagree', or 'strongly disagree' – were evaluated using a scoring system¹²⁾ with marks allocated from 1 to 4. As the questionnaire was composed of both positive and negative questions, the allocation of marks was conducted with weighted scoring, and some items (items 4, 5, and 6) were reverse scored, as shown in Table 1.

2.3 Statistical analysis

Statistical significance was assessed using the Chi-

Table 2. Results of the questionnaire

		Male ratio (%)	Female ratio (%)	<i>p</i> value
Numbers of responders	295	168 (56.9 %)	127 (43.1 %)	
Priority for college life				
study	162 (54.9 %)	94 (56 %)	67 (52.8 %)	ns
hobby or leisure	64 (21.7 %)	32 (19 %)	32 (25.2 %)	ns
acquaintance with friends	41 (13.9 %)	30 (17.9 %)	12 (9.45 %)	< 0.05
part-time job	17 (5.8 %)	8 (4.8 %)	9 (7.09 %)	ns
acquisition of personal qualification	0 (0 %)	0 (0 %)	0 (0 %)	ns
nothing in particular	9 (3.1 %)	2 (1.2 %)	7 (5.51 %)	< 0.05
others	2 (0.7 %)	2 (1.2 %)	0 (0 %)	ns
Priority for future vision				
medical worker	202 (68.5 %)	116 (69 %)	86 (67.7 %)	ns
researcher	6 (2 %)	5 (3 %)	1 (0.8 %)	ns
educator	4 (1.4 %)	3 (1.8 %)	1 (0.8 %)	ns
personal life	60 (20.3 %)	32 (19 %)	28 (22 %)	ns
another occupation	8 (2.7 %)	4 (2.4 %)	4 (3.1 %)	ns
household	10 (3.4 %)	6 (3.6 %)	4 (3.1 %)	ns
others	5 (1.7 %)	2 (1.2 %)	3 (2.4 %)	ns
Physical condition				
no problem	225 (76.3 %)	133 (79.2 %)	92 (72.4 %)	ns
poor condition (multiple answers allowed)				
sleeplessness	31 (10.5 %)	15 (8.9 %)	16 (12.6 %)	ns
headache	18 (6.1 %)	5 (3 %)	13 (10.2 %)	< 0.01
spiritless	46 (15.6 %)	19 (11.3 %)	27 (21.3 %)	< 0.05
anorexia	14 (4.7 %)	5 (3 %)	9 (7.1 %)	< 0.05
fatigue	48 (16.3 %)	20 (11.9 %)	28 (22 %)	ns
irritation	20 (6.8 %)	8 (4.8 %)	12 (9.4 %)	ns
Junk food intake [/day]				
0 time	107 (36.3 %)	63 (37.5 %)	45 (35.4 %)	ns
1 time	145 (49.2 %)	86 (51.2 %)	58 (45.7 %)	ns
2 times	41 (13.9 %)	17 (10.1 %)	24 (18.9 %)	< 0.05
3 times	2 (0.7 %)	2 (1.2 %)	0 (0 %)	ns
Study time [h/day]□	0.8 ± 1.08	0.77 ± 0.99	0.85 ± 1.2	ns
Rorsenberg self-esteem scale	19.1 ± 3.88	19.2 ± 3.94	18.9 ± 3.79	ns

Note: Data are shown as numbers (%); ± = standard deviation; ns = not significant

**P*-values show significant differences between males and females.

squared test for gender difference, Welch's *t*-test for difference between two groups, and Pearson's correlation coefficient. A *p*-value of < 0.05 was considered statistically significant. Statistical analyses were performed with SPSS software (version 19.0; SPSS, Tokyo, Japan).

3. Results

3.1 Questionnaire items

The results of the questionnaire are shown in Table 2. With regard to *priority for college life*, the majority (54.9%) responded 'study', followed by 'hobby or leisure' (21.7%) and 'acquaintance with friends' (13.9%). Significant gender differences were seen in

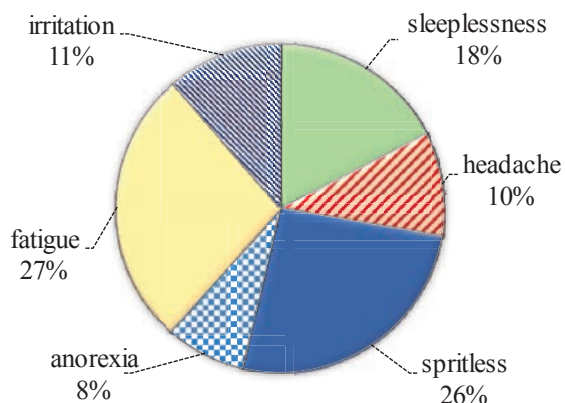


Figure 1. Number of respondents reporting poor physical condition. The data are shown as percentage of each condition.

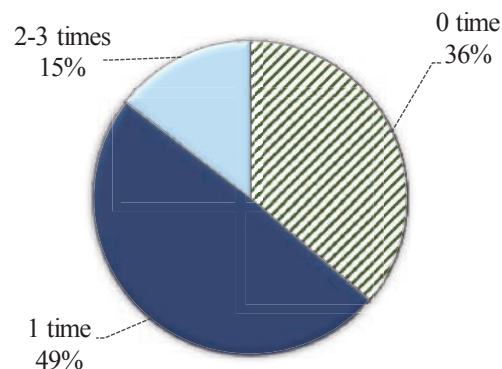


Figure 2. Number of respondents reporting junk food intake as meals. The data are shown as percentage of each intake frequency category per day.

'acquaintance with friends' (male > female, $p < 0.05$), and 'nothing in particular' (male < female, $p < 0.05$).

For *priority for future vision*, the majority of students indicated 'become a medical worker' (68.5%), followed by 'personal life' (20.3%). Other answers were reported by a small minority of 5% or less. Significant gender differences were not seen for this questionnaire item.

Concerning *physical condition*, approximately one quarter of the respondents were in poor condition (23.7%), described as 'fatigue' (16.3%), feeling 'spiritless' (15.6%), 'sleeplessness' (10.5%), 'irritation' (6.8%), 'headache' (6.1%), and 'anorexia' (4.7%) (Figure 1). These indicators of poor health

were more common in females, with significant gender differences noted in the symptoms 'headache', 'spiritless,' and 'fatigue' ($p < 0.01$, $p < 0.05$, and $p < 0.05$, respectively).

For *junk food intake*, the majority of respondents answered 'once' (49.2%), followed by 'never' (36.3%), and 'twice a day' (13.9%) (Figure 2). Significant gender differences were seen for the response 'twice' (male < female, $p < 0.05$). The average *study time* was 0.8 ± 1.08 [h/day] with no gender differences noted. For the Rosenberg Self-Esteem Scale, the average score was 19.1 ± 3.88 , with no gender differences noted.

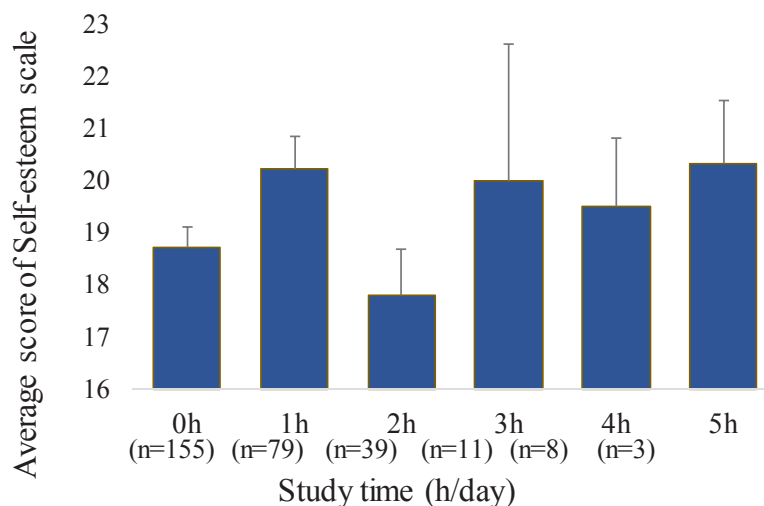


Figure 3. Comparison of the number of respondents obtaining mean scores on the self-esteem scale in relation to the study time. Data represent the mean \pm SD of score on self-esteem scale.

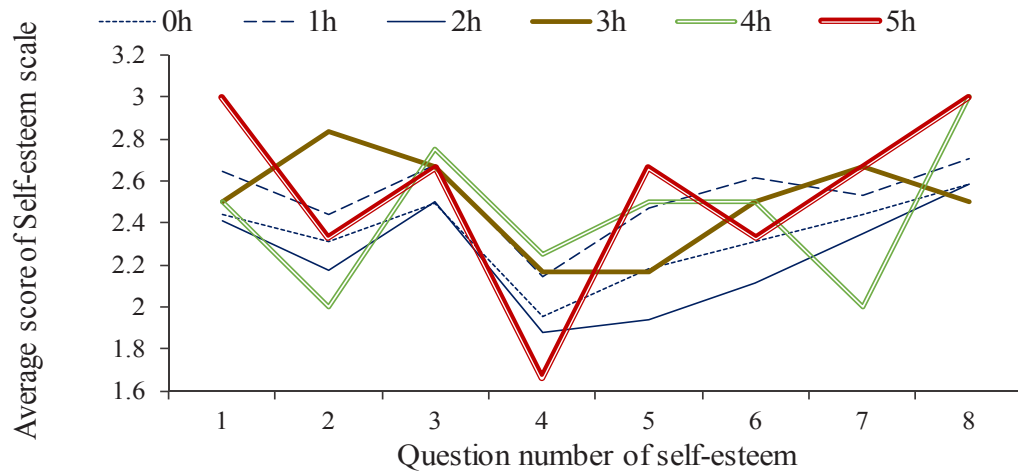


Figure 4. Comparison of the number of respondents obtaining mean scores on the self-esteem scale in relation to individual questions about self-esteem. Data represent the mean scores on the self-esteem scale.

3.2 Comparison of Rosenberg Self-Esteem Scale scores and study time

Scores on the Rosenberg Self-Esteem Scale were compared with study time. Figure 3 compares the numbers of students obtaining mean scores on the self-esteem scale according to study time. The group with the highest study time (five hours per day) achieved the highest number of points on the scale, as well as the group who studied for over three hours a day scored relatively high on the self-esteem scale. However, the lower study group (under two hours study a day) obtained inconsistent results. Next, the points for each question on the scale were compared with study time. Figure 4 shows the mean score for each question on the self-esteem scale according to study time. The highest study group (five hours per day) obtained high scores for many question items. Interestingly, only question 4 – ‘I wish I could have more respect for myself’ – showed the lowest points for the highest study group. On the whole, this tendency was not noted across the study groups.

3.3 Comparison of physical condition and study time

Figure 5 shows the results for respondents who indicated ‘poor physical condition’ according to study time. The results showed that the low study group (‘0 hours’ of study time per day) had a higher proportion of ‘fatigue’, ‘sleeplessness’, and ‘headache’. In contrast,

the higher study group (over 3 hours a day) showed a greater proportion of participants characterized by ‘spiritless’ and ‘irritation’. ‘Headache’ showed a decreasing trend as the study time increased. Data are shown in Table 3 and Appendix 1.

3.4 Comparison of junk food intake and other items

Figure 6 shows the results of the respondents reporting poor physical condition according to the frequency of junk food intake. Trends between poor physical condition and junk food intake were confirmed. Mostly, the frequency of poor physical

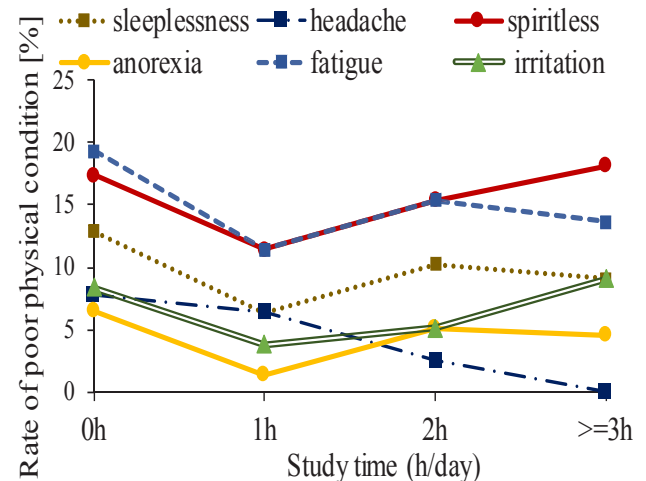


Figure 5. Relationship between respondents with poor physical condition ratings according to study time. Data represent percentage of respondents [%].

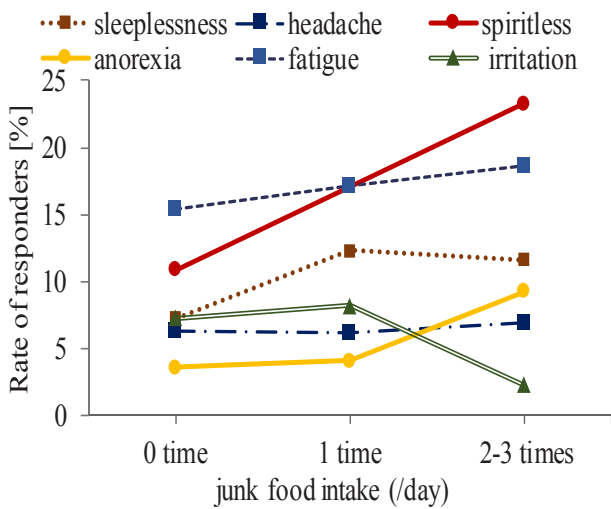


Figure 6. Relationship between respondents with poor physical condition ratings according to the frequency of junk food intake. Data represent percentage of responders [%].

condition increased as junk food intake increased. This was particularly notable for the condition of ‘spiritless’. Contrary to this, ‘irritation’ decreased as junk food intake increased (showed in Appendix 2).

Because junk food intake correlated with poor physical condition, other questionnaire items were compared with junk food intake. Figure 7 shows the number of respondents selecting ‘study’, ‘hobby or leisure’ or ‘acquaintance with friends’ as their priority

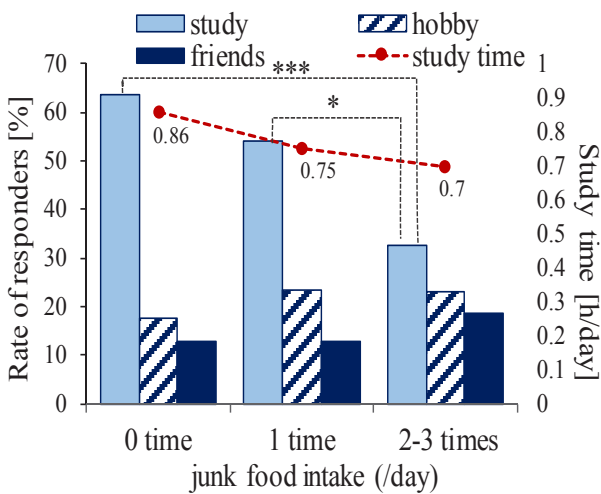


Figure 7. Comparison of the percentage of respondents by college life priority (bar graph) and the average study time (line graph) according to the frequency of junk food intake. Data represent percentage of responders for each priority item [%] and the mean value of study time per day [h/day] (*: $p < 0.05$, ***: $p < 0.001$).

for college life, according to junk food intake. The number of respondents who answered ‘study’ decreased as junk food intake increased. Significant differences were seen between those who never consumed junk food and those with junk food intake of 2–3 times per day ($p < 0.001$), and those who consumed it once and 2–3 times per day ($p < 0.05$). In contrast, the number of participants selecting ‘hobby or leisure’ or ‘acquaintance with friends’ increased as frequency of junk food intake increased. The average study time also decreased as the frequency of junk food intake increased, though the difference between junk food intake of 0 time and 2–3 times was not statistically significant ($p = 0.33$).

Figure 8 shows the number of respondents considering ‘becoming a medical worker’, ‘personal life’ or ‘setting up a household’ as their main future vision, in relation to junk food intake. Those who have junk food 2–3 times per day demonstrated the lowest rate of ‘becoming a medical worker’ and the highest rate of ‘personal life’ in response to the question about their vision. A significant difference was seen in the number of participants responding with ‘personal life’ between those who had junk food once and those who have it 2–3 times per day ($p < 0.001$).

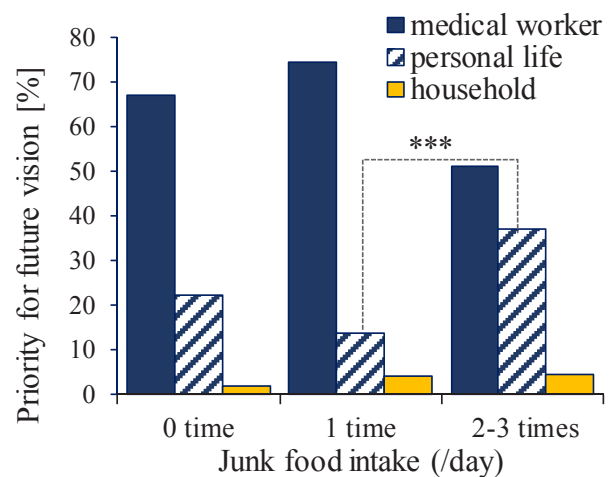


Figure 8. Comparison of the percentage of respondents by future vision priority (bar graph) and the average study time (line graph) according to the frequency of junk food intake. Data represent percentage of responders for each priority item [%] and the mean value of study time [h] (***: $p < 0.001$).

4. Discussion

This study focused on psychological and behavioral aspects that affect learning activities. The Rosenberg Self-Esteem Scale was used to evaluate students' psychological health. The scale is widely used as a self-esteem measure in social science research¹²⁾. The results obtained in this study showed that learning activities, evaluated by independent study hours per day, were not related to scores on the self-esteem scale. Average scores for each group divided by independent study hours were scattered, and there was no relationship between the points on the scale and learning activities. Some studies have reported strong links between learning activities and self-esteem¹³⁻¹⁵⁾. In contrast, others observed no relationship between them¹⁶⁾. Where there is a large discrepancy between a student's aspirations and what they feel capable of, they may experience low self-esteem – a possible reason for the discrepancy found. In general, high self-esteem is considered to give rise to good performance¹⁷⁾ and high self-esteem is partly the result of good school performance. However, the modest correlations between self-esteem and school performance do not indicate that high self-esteem leads to good performance¹⁸⁾. This was also evidenced by the results obtained in this study where the higher study group (more than three hours per day) had scores exceeding 20 points, while the group that studied for less than two hours per day showed wide-ranging scores, including both high and low scores.

For behavioral aspects, this study considered the possibility that dietary habits affect students' aspirations. The group with higher junk food intake showed significantly less learning activity, lower independent study time, lower priority to study in college, and low desire to be a medical worker. In contrast, they were more likely to emphasize personal interests like 'hobby or leisure' or 'acquaintance with friends' as a priority for college life, and 'personal life' was cited as a priority for the future. Furthermore, the excessive intake of junk food was also considered to affect physical condition. In this study, the number of participants in poor physical condition increased as

junk food intake increased.

Junk food generally contains few nutrients but is high in saturated fat and sodium, and low in fiber¹⁹⁻²⁰⁾. Eating junk food over a long period rather than healthy nourishing meals, could result in a low nutrient condition that negatively influences typical, vigorous actions. The chances of being 'spiritless' increased as the frequency of junk food intake increased in this study.

Junk food has long been noted as a problem associated with obesity. Consuming junk food increases the risks of developing diseases such as diabetes, heart disease, and cancer at a younger age and reducing life expectancy²¹⁻²⁵⁾. However, this study indicates that excessive junk food can negatively influence psychological vitality. The nucleus accumbens (NAc) plays a critical role in motivating behaviors, including food-seeking and feeding in animals. In an animal experiment with rats, it was reported that junk food reduced excitability in medium spiny neurons (MSNs), structures forming the NAc core and mediated by an increase in inward-rectifying potassium current²⁶⁾. However, it is not known whether consumption of sugary and fatty junk food alters MSN excitability. In this study, irritation – a characteristic of poor physical condition – decreased as junk food intake increased. That could be related to the increase in inward-rectifying potassium current by excessive intake of junk food. Irrespective of causal mechanism, the results obtained in this study suggest that excessive intake of junk food has a negative effect on motivating behaviors for learners. For learners studying to be medical technicians, high awareness of one's future is important to foster learning motivation. To ensure a vigorous psychological state for self-improvement, daily guidance about nutritional food could be an important element of learning.

Several limitations of this study should be considered. First, the respondents overlapped across the years of study. Because learners' awareness may change, this study used all the questionnaire results obtained during the investigation period. To confirm the results observed in this study, a further survey to

note annual changes is necessary. Second, to confirm the hypotheses developed in this study, more data from other universities are needed for comparison.

In summary, this study focused on psychological and behavioral factors affecting learning activities. From a

behavioral perspective, eating habits seem important and may contribute to learners' psychological outlook, because excessive intake of junk food can negatively influence behaviors associated with motivation in learners.

Appendix

1. Results of respondents with poor physical condition ratings according to study time in Fig. 5.

study time	sleeplessness	headache	spiritless	anorexia	fatigue	irritation
0h	12.90	7.74	17.42	6.45	19.35	8.39
1h	6.33	6.33	11.39	1.27	11.39	3.80
2h	10.26	2.56	15.38	5.13	15.38	5.13
>=3h	9.09	0	18.18	4.55	13.64	9.09

*Data represent percentage of respondents in each divisions [%].

2. Results of respondents with poor physical condition ratings according to the frequency of junk food intake in Fig. 6.

junk food	sleeplessness	headache	spiritless	anorexia	fatigue	irritation
0 time	7.27	6.36	10.91	3.64	15.45	7.27
1 time	12.33	6.16	17.12	4.11	17.12	8.22
2-3 times	11.63	6.98	23.26	9.30	18.60	2.33

*Data represent percentage of respondents in each divisions [%].

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