Material : Health Instruction and Communication Technology

The Relationship among Class Evaluation, Health Condition and Lifestyle of College Students in Japan

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The purpose of this study was to evaluate how sleep time, ingestion of breakfast, commute time, and physical and mental health condition immediately before attending lectures influenced the students' evaluation of morning classes in Japanese universities/colleges. In the first semester of 2007, students (n=100, average age, 19) in the second year of University A who took the "Bioethics course," those (n=31, average age, 21) in the fourth year of University A who took the "Nutritional Epidemiology course," and those (n=49, average age, 19) in the second year of Junior College B who took the "Physiology of Nutrition course" were used as target subjects. Evaluation was conducted using a questionnaire in every session. Questions listed in the questionnaire were 1) sleep time; 2) whether or not a student had breakfast; 3) commute time; 4) physical and mental health condition at the moment (on a scale of 0 to 10, where 0 was worst condition and 10 was best condition); and 5) evaluation of class (on a scale of 0 to 10, where 0 was worst class and 10 was best class). There were significantly positive correlations between college students' physical and mental health conditions immediately before they attended a class and their class evaluation. Correlation coefficients were observed between the evaluation of class and physical and mental health condition in the following: overall Bioethics sessions (r=0.140, p<0.05), overall Physiology of Nutrition sessions (r=0.413, p<0.05), and overall Nutritional Epidemiology sessions (r=0.385, p<0.05). A high value must be attached to health education, including maintenance of college students' favorable lifestyles, for effective classes and the promotion of faculty development in universities/colleges.

Keywords: university, faculty development, sleep time, fatigue

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1. Introduction

Faculty development (FD) has been expected and promoted due to the current demand for a well-developed education for college students in Japan. The Ministry of Education, Culture, Sports, Science and Technology in Japan clearly stated in 2007 that "to maintain college students' quality at a high level at the time of their graduation is a social responsibility of the universities/colleges; thus, the universities/colleges have to provide well-developed education to point out such responsibility." To this end, the Ministry has strongly recommended that universities/colleges prepare a complete "syllabus" and perform "evaluation of class by students" in "class planning and education responsibility for educators."

Research on the practice of "lecture methods"

and "class research" has advanced in the field of "medical education." Kahyo (1992) developed questionnaires regarding evaluation of class, which targeted students attending course lectures on medical education (public health). Following this work, much research has been carried out regarding students' evaluation of class (Togo, 1994; Shores, 2000; Tanaka, et al., 2002; Shimamoto, et al., 2003; Tanaka, et al., 2004). Tanaka, et al., (2002) developed an original computer-scored answer sheet called "minute paper" for the evaluation of class, which students could complete in approximately 1 min. They used the sheet to evaluate all lecturers (n=202) who taught medical school classes, and then provided feedback to the lecturers on the results. As a result, the evaluation scores of the lecturers who were in the lowest 1/3 percentile in the initial year were significantly improved in the following year. This suggested that the "minute paper" method could raise the quality of the overall lecturers. Shimamoto, et al., (2003) reported that, when they implemented student class evaluation twice within a period of a course lecture (the first evaluation was anonymous and mandatory, the second one was anonymous and voluntary), only a few students returned indifferent intermediate evaluations; rather, most of the students specifically pointed out good and/or need-to-be-improved points of the lectures. Shimamoto, et al., also reported that students' remarks upon free description (the response rate, 30–40%) were mostly useful for improving the quality of lectures and the ability of the lecturers. Taken together, student class evaluations were valuable in enhancing the quality of education in the universities/colleges. On the other hand, it has been reported that college students' mental health condition is dependent on a regular lifestyle such as sleeping and eating (Kamioka, et al., 1998). Fukuda, et al., (2001) reported that college students' sleeping habits were irregular and that their bedtime and wake-up time became markedly later as they grew into junior high school, high school and college students. It has been pointed out that irregular sleeping habits not only have a negative influence on students' college lives, but also may cause circadian rhythm sleep disorders that result in social maladjustment when the students become members of society (Uchiyama, et al., 1996). College students' lifestyles have been profoundly affected by working part-time, playing games, and using the internet until late at night on the weekdays. Also of concern is that such living conditions may aggravate the students' physical and mental health conditions.

Subjective chronic fatigue (SCF) is perceived as a medically unexplained multisymptom complex associated with persistent fatigue, pain, and cognitive complaints (Zhang, et al., 2000). Subjective symptoms of fatigue (SSF) are a general phenomenon in daily life in Japan (Kobayashi, et al., 2006). The deterioration of lifestyle and the accumulation of SSF in college students may have a negative influence on their readiness for lectures. For example, upon attending a lecture, students in poor physical condition may not be able to concentrate on the lecture and, consequently, may have a tendency to give lower evaluation scores to the lecturer because they feel it is boring and not interesting. However, to date no research has been carried out to elucidate the relationship between students' evaluation of class and their lifestyles or physical and mental health conditions.

Therefore, the objective of the present study was to evaluate how sleep time, ingestion of breakfast, commute time, and physical and mental health conditions immediately before attending lectures influenced the students' evaluation of morning classes in Japanese universities/colleges.

2. Methods

2.1. Subjects and data collection

In the first semester of 2007, students in the second year of University A who took the "Bioethics course," those in the fourth year of University A who took the "Nutritional Epidemiology course," and those in the second year of Junior College B who took the "Physiology of Nutrition course" were used as target subjects (**Table 1**). Potential academic abilities of the students in the individual departments of the universities/colleges in the year 2007, represented by the adjusted standard deviation scores required to pass the entrance examinations of the individual departments (*i.e.*, the department to which the students taking "Bioethics" belonged, the department to which the students taking "Nutritional Epidemiology" belonged, and the department to which the students taking "Physiology of Nutrition" belonged), were 54, 59 and unknown, respectively, based on a survey performed by a major preparatory

Table 1 Contents of lecture courses

Lecture course	Session	Attendance	Responder	%	Syllabus	
					Theme	Tools (audio-visual aids)
Bioethics	1	129	100	77.5	Animal abuse/killing	Articles and material
	2	106	97	91.5	Ideas of life-and-death of the elderly	VTR, newspapers, and material
	3	107	95	88.8	Last days of life	Newspapers and material
	4	100	100	100	Life-prolonging treatment and euthanasia	Newspapers and material
	5	103	94	91.3	Artificial insemination	Newspapers and material
	6	98	98	100	Artificial abortion	Newspapers and material
	sum	643	584	90.8	---	---
Physiology of Nutrition	1	49	49	100	Measurement of body composition	Body fat measure, Caliper, etc.
	2	43	42	97.7	Measurement of heart rate during exercise	Heart rate monitor, etc.
	3	47	43	91.5	Simplified calculation of energy consumption	Time-budget questionnaire
	4	46	45	97.8	Measurement of blood glucose and lactic	Blood collecting device
	5	41	41	100	Measurement of physical fitness	Bicycle ergometer, etc.
	6	47	44	93.6	Measurement of blood pressure	Mercury manometer, Automated manometer
	7	46	47	97.9	Measurement of resting metabolic rate	Gas analyser
	8	45	40	88.9	Measurement of metabolic rate during	Gas analyser
	sum	364	355	97.5	---	---
Nutritional Epidemiology	1	27	27	100	Definition of epidemiology	Textbook
	2	20	20	100	Epidemiological indices (1)	Textbook
	3	16	16	100	Epidemiological indices (2)	Textbook
	4	18	18	100	Research design (1)	PC, VTR, and articles
	5	9	9	100	Research design (2)	Textbook and articles
	6	15	15	100	Risk factors and causal relationship	Textbook
	7	15	15	100	Systematic erorr and bias (1)	Textbook and articles
	8	18	18	100	Systematic erorr and bias (2)	Textbook and articles
	9	31	31	100	Screening	Textbook and articles
	sum	169	169	100	---	---

Bioethics: No survey was conducted during sessions 7 to 15, during which there was time for writing reports and group presentations.
Physiology of Nutrition: Each session was 180 min (90 min x 2) of practical work.
No survey was conducted during sessions 9 to 15, during which there were group presentations and other lectures.
Nutritional Epidemiology: No survey was conducted during sessions 10 to 15, which were for special lectures and research meetings.

school (Yoyogi Seminar, 2007).

One hundred students in the second year (average age, 19), 31 students in the fourth year (average age, 21), and 49 students in the second year (average age, 19) were taking Bioethics, Nutritional Epidemiology, and Physiology of Nutrition, respectively.

An evaluation was conducted using a questionnaire in every session, with the exception of some special sessions such as lectures by visiting lecturers and student presentations. Contents of the course lectures are shown in **Table 1**.

2.2. Questionnaire

Questions listed in the questionnaire included 1) sleep time, 2) whether or not a student had breakfast, 3) commute time, 4) physical and mental health condition at the moment (on a scale of 0 to 10, where 0 was worst condition and 10 was best condition) and 5) evaluation of class (on a scale of 0 to 10, where 0 was worst class and 10 was best class). Students answered questions 1 to 4 immediately after the session was opened, and question 5 immediately before the session was closed. In a preliminary study, they were able to complete answers to all the questions in 30–45 sec. Because previous research demonstrated the significance of the experimental condition in which students could complete the questionnaire within 1 min (Tanaka, et al., 2002), a small number of questions were used in the present study in order not to increase students' burden, and not spend a long time answering a large number of questions during the lecture.

As for ethical issues, students were well informed beforehand that the evaluation would be conducted on an anonymous and voluntary basis, and thus they were not obliged to return the questionnaire. The methodology of this study was approved by the Ethical Board of Tokyo University of Agriculture.

2.3. Statistics

The Mann-Whitney test was employed for taking breakfast. Spearman's correlation coefficients were used to test between evaluation of class and items. The Kruskal-Wallis test was used to investigate the

Table 2 Characteristics of evaluation of education and living conditions before class

Lecture course	Session	N	Evaluation of Education (pts)	Sleep Time (h)	Commute Time (h)	Physical and Mental Health Conditions (pts)	Take Breakfast yes	Take Breakfast no
Bioethics	1	100	8.1 ±1.7	5.2 ±1.9	1.2 ±0.8	5.4 ±2.3	84 (83%)	16 (16%)
	2	97	7.9 ±1.7	5.3 ±1.6	1.2 ±0.8	5.6 ±2.6	80 (82%)	17 (18%)
	3	95	8.0 ±1.9	5.5 ±1.8	1.2 ±0.9	5.5 ±2.3	78 (80%)	17 (18%)
	4	100	7.8 ±1.9	5.4 ±1.5	1.1 ±0.8	5.5 ±2.4	87 (86%)	13 (13%)
	5	94	8.2 ±1.8	5.5 ±1.6	1.2 ±0.7	5.7 ±2.5	82 (88%)	12 (13%)
	6	98	8.3 ±1.9	5.1 ±1.8	1.1 ±0.8	5.5 ±2.4	83 (86%)	15 (15%)
	sum	584	7.9 ±1.8*	5.3 ±1.7	1.2 ±0.8	5.5 ±2.4	494 (85%)	90 (16%)
Physiology of Nutrition	1	49	7.3 ±2.0	6.0 ±1.2	1.2 ±0.4	5.5 ±1.9	44 (92%)	4 (8%)
	2	42	7.6 ±1.8	5.8 ±1.4	1.2 ±0.4	5.5 ±1.9	37 (86%)	5 (12%)
	3	43	6.7 ±2.1	5.2 ±1.4	1.2 ±0.4	4.9 ±2.1	38 (86%)	5 (11%)
	4	45	6.0 ±2.7	5.5 ±1.5	1.2 ±0.4	5.0 ±2.1	42 (93%)	3 (7%)
	5	41	7.2 ±2.3	6.1 ±1.7	1.2 ±0.4	5.7 ±1.9	35 (83%)	6 (14%)
	6	44	7.2 ±2.1	5.4 ±1.3	1.2 ±0.4	4.9 ±2.3	38 (86%)	6 (14%)
	7	47	6.6 ±2.0	5.3 ±1.3	1.2 ±0.5	4.7 ±2.4	43 (91%)	4 (9%)
	8	40	6.6 ±2.6	5.5 ±1.4	1.2 ±0.5	4.8 ±2.4	37 (82%)	8 (18%)
	sum	355	6.9 ±2.2*	5.6 ±1.4*	1.2 ±0.4	5.1 ±2.1	314 (88%)	41 (12%)
Nutritional Epidemiology	1	27	8.6 ±1.2	5.7 ±1.7	1.1 ±0.7	6.1 ±2.2	26 (96%)	1 (4%)
	2	20	8.5 ±1.3	5.8 ±1.1	1.2 ±0.8	6.0 ±2.5	19 (90%)	1 (5%)
	3	16	8.9 ±1.2	5.9 ±1.3	1.4 ±0.6	6.2 ±2.5	14 (82%)	2 (12%)
	4	18	8.2 ±1.6	5.4 ±1.2	1.3 ±0.6	5.9 ±2.5	18 (100%)	0 (0%)
	5	9	7.4 ±2.6	5.1 ±1.6	1.2 ±0.7	6.2 ±2.5	9 (100%)	0 (0%)
	6	15	7.5 ±2.2	5.5 ±1.8	1.4 ±0.7	6.4 ±2.3	15 (100%)	0 (0%)
	7	15	7.5 ±1.3	6.2 ±1.2	1.1 ±0.6	6.2 ±2.2	14 (93%)	1 (7%)
	8	18	7.8 ±1.5	6.4 ±0.9	1.3 ±0.6	6.6 ±2.3	18 (95%)	0 (0%)
	9	31	8.1 ±1.4	5.5 ±1.3	1.3 ±0.6	6.5 ±2.2	30 (94%)	1 (3%)
	sum	169	8.1 ±1.6	5.7 ±1.4	1.3 ±0.7	6.2 ±2.3	163 (94%)	6 (3%)

Value: mean±SD, N(%).
Variations between sessions were tested by the Kruskal-Wallis test for each item; *p<0.05

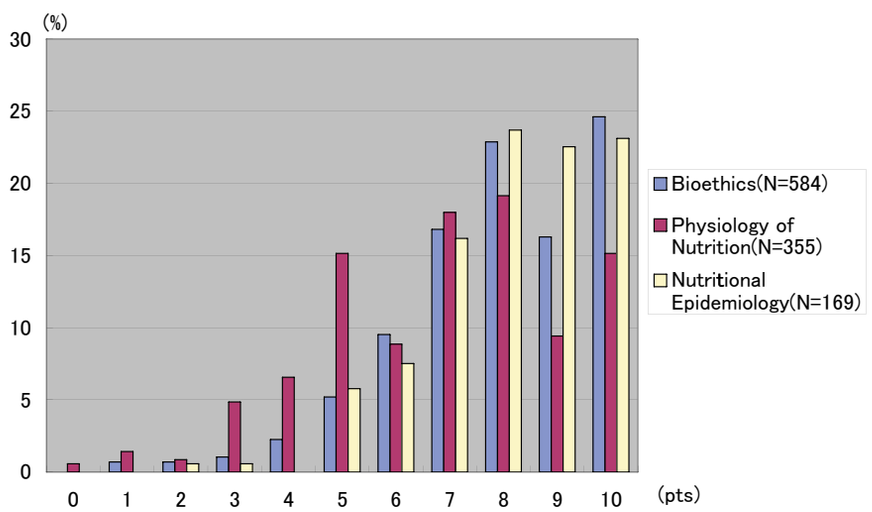

Figure 1 Distribution of class evaluation by students (sum)

differences among sessions. Differences among groups and correlation coefficients were judged significant at the level of 5% or less. SPSS® 11.0J for Windows was used for statistical analysis.

3. Results

The response rates were 77.5–100%, 88.9–100%, and 100% in Bioethics, Physiology of Nutrition, and Nutritional Epidemiology, respectively (**Table 1**). The average sleep times were 5.1–5.5 h, 5.2–6.1 h, and 5.1–6.4 h in Bioethics, Physiology of Nutrition, and Nutritional Epidemiology, respectively (**Table 2**). The average commute time of all the students was 1.1–1.4 h. The average score of all the students for physical and mental health condition was 4.7–6.6 pts. The rate of taking breakfast of all the students was greater than 80%.

The average scores for the class evaluation were 7.8–8.3 pts, 6.0–7.6 pts, and 7.4–8.9 pts in Bioethics, Physiology of Nutrition, and Nutritional Epidemiology, respectively (**Table 2**). There were significant variations among the sessions in Bioethics and Physiology of Nutrition, based on analysis by the Kruskal-Wallis test. The mode values of the class evaluation scores were 10 pts, 8 pts, and 8 pts in Bioethics, Physiology of Nutrition, and Nutritional Epidemiology, respectively (**Figure 1**).

Figure 2 and **Table 3** show the correlation between students' class evaluation and sleep time, commute time, and physical and mental health condition. There was a significant correlation between the class evaluation and sleep time only in the 7th session of Physiology of Nutrition (r=0.392). There were

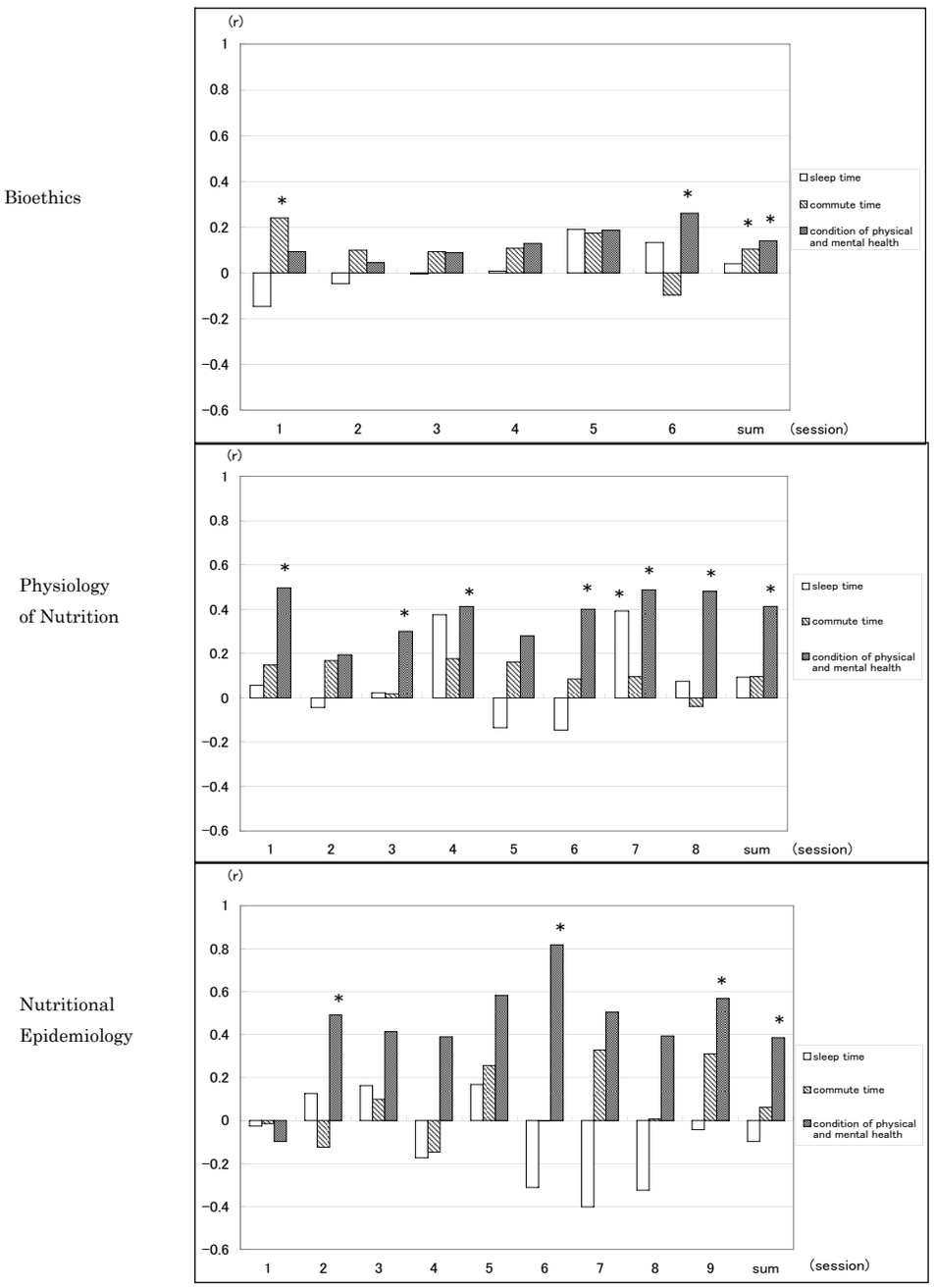

Figure 2 Relationship between evaluation of education and each variable
Spearman's correlation coefficient * $p<0.05$

significant correlations between the class evaluation and the commute time in the 1st session (r=0.240) and overall sessions (r=0.104) of Bioethics.

Significant correlations were observed between class evaluation and physical and mental health conditions in the following sessions: the 6th session (r=0.260) and overall sessions (r=0.140) of Bioethics, the 1st (r=0.496), 3rd (r=0.301), 4th (r=0.412), 6th (r=0.400), 7th (r=0.488), 8th (r=0.480), and overall (r=0.413) sessions of Physiology of Nutrition, and the 2nd (r=0.491), 6th (r=818), 9th (r=0.567), and overall (r=0.385) sessions of Nutritional Epidemiology. Based on results of the Mann-Whitney test, there were no significant correlations in any sessions between the class evaluation and whether or not a student had breakfast (data not shown).

4. Discussion

The present study was simply designed based on the hypothesis that students, whose lifestyles

Table 3 Correlation coefficients between evaluation of class and each item

Lecture course	Session	N	Sleep Time	Commute Time	Physical and Mental Health Conditions
Bioethics	1	100	-0.147	0.240*	0.093
	2	97	-0.047	0.099	0.044
	3	95	-0.005	0.092	0.087
	4	100	0.008	0.108	-0.128
	5	94	0.189	0.173	0.186
	6	98	0.132	-0.096	0.260*
	sum	584	0.039	0.104*	0.140*
Physiology of Nutrition	1	49	0.057	0.148	0.496*
	2	42	-0.043	0.168	0.194
	3	43	0.023	0.018	0.301*
	4	45	0.375	0.177	0.412*
	5	41	-0.135	0.161	0.279
	6	44	-0.146	0.085	0.400*
	7	47	0.392*	0.095	0.488*
	8	40	0.076	-0.038	0.480*
	sum	355	0.094	0.096	0.413*
Nutritional Epidemiology	1	27	-0.026	-0.014	-0.098
	2	20	0.126	-0.124	0.491*
	3	16	0.163	0.099	0.413
	4	18	-0.173	-0.147	0.390
	5	9	0.168	0.255	0.583
	6	15	-0.312	-0.002	0.818*
	7	15	-0.402	0.328	0.504
	8	18	-0.324	0.008	0.394
	9	31	-0.042	0.310	0.567*
	sum	169	-0.097	0.062	0.385*

Spearman's correlation coefficient * $p<0.05$

and physical and mental health conditions were not good, have a tendency to underestimate the quality of classes. The class evaluation that is conducted in the last session of each semester, which is adopted by most Japanese universities/colleges, may involve a recall bias and be strongly influenced by the impression of the last session. In contrast, the present study design had an advantage in that the data for the class evaluation were not obtained from a cross-sectional one-time survey, but were obtained from consecutive participation of students in all sessions.

As a result of the present study, we found that the student class evaluation consistently showed a positive correlation with the students' physical and mental health conditions immediately before classes began. In addition to the fact that researchers in school health agree on the necessity of health education for college students, the present study suggests that health education to improve one's lifestyle and to maintain a positive health condition is related to FD.

To teach classes with enthusiasm and provide good instruction is the most important role of lecturers in universities/colleges. However, irrespective of such efforts, learning effectiveness would be limited without the students' "readiness" to attend classes. The present study revealed that there was a large difference between students who gave high scores and those who gave low scores in the class evaluation, although the class was taught by the same lecturer; students in poor health had a tendency to give a low evaluation score for class. This suggests that health education for students, including improvement in their lifestyles, is an important factor to achieve a better class in Japanese university/college, as are the efforts by the lecturers themselves.

Kajioka, et al., (1999) reported that, in order to establish an appropriate health education program in university, it is necessary for instructors to consider the characteristics of departments and to provide basic health education. However, such health education does not seem to be very advanced in Japanese universities/colleges. Sleep time was generally short (less than 6 h for most of the students) in the present study. A study by Furuya, et al., (2006), suggested that sleep health was closely related to both stress and sleep habits, and that stress coping such as emotion-focused coping was important to obtain good sleep. Other previous research (Uchiyama, et al., 1996; Kamioka, et al., 1998; Fukuda, et al., 2001) has pointed out the relationship between sleep and mental health,

indicating a possible causal correlation between physical and mental health and a shortage of sleep.

Shortage of sleep and irregular life habits may cause SSF (*i.e.*, synonymous with SCF in this study). Nagane (2004) suggested that the motor and academic performances of children with greater SCF were significantly inferior to those of normal elementary school children in Japan. Guerin, et al., (1991) reported that good performance at school was associated with reduced drowsiness in school children from 9 to 11 years of age in Japan. This may also be the case for college students in their academic achievement and class evaluation.

On the other hand, it has long been pointed out that students' life events influence academic achievement (Lloyd, et al., 1980). In the present study, due to ethical issues, we could not investigate the relation between the class evaluation and students' academic achievement or their personal life events (for example, death or divorce of relatives, disappointment in love, etc.). To discuss the class evaluation in the context of these confounding factors is beyond the scope of the present study. Future studies, designed to avoid such ethical issues, could elucidate the influences of such personal life events on the class evaluation and its correlation with the students' academic achievement, measured by their Grade Point Average (GPA*).

There were several limitations to the present study. Students, whose adjusted standard deviation scores were in the high 50s, were used as target subjects; the level of their academic ability may have had an impact on the results of the survey. In addition, the class evaluation was not related to their taking breakfast; this was presumably due to the fact that all the students attending the 3 target lectures were studying nutritional sciences. Furthermore, the results of the class evaluation might have been different if other lecturers' classes were selected as targets, and the degree of correlation could have been different from that observed in the present study. These points may have caused a selection bias.

In Bioethics and Physiology of Nutrition classes, there were significant variations among the sessions (1st to 6th and 1st to 8th, respectively) by the Kruskal-Wallis test. This may have been due to the possibility that class evaluation was dependent on how difficult the class content was, and how much the students were interested in the class; however, this remains unclear because the present study did not include such questions. In addition, the reason correlation coefficients were small or large in the same classes may also be the difficulty of class contents, but it can not be shown as data because of the lack of student evaluation of the subjective difficulty levels of each session.

Moreover, most of the target subjects were female, which prevented discussion of the effect of gender difference. This was another important limitation of the present study and, therefore, further studies using male students are needed.

5. Conclusion

There were positive correlations between college students' physical and mental health conditions immediately before they attended a class and their evaluation of the class. A high value must be attached to health education, including maintenance of favorable student lifestyles, for effective classes and the promotion of faculty development in universities/colleges.

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* a number representing the overall average of a student's grades, in which an A is 4 points, a B is 3, a C is 2, a D is 1, and F in o. (by Longman Advanced American Dictionary).

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Main Works:
- Comprehensive health education combining hot spa bathing and lifestyle education in middle-aged and elderly women: One-year follow-up on randomized controlled trial of three- and six-month interventions. J Epidemiology, 16: 35-44, 2006.
- A systematic review of randomized controlled trials on the thrapeutic and health-promoting effects of spas. J Jpn Soc Balneol Climatol Phys Med, 69: 155-166, 2006.
- A systematic review of randomized controlled trials of exercise and lifestyle intervention for the health promotion of older adults: Issue and an model of intervention. Jpn J Geriatrics 44: 403-414, 2007.
- A cross-sectional study on the present state of spa bathing and health condition in male white- and blue-collar employees. J Jpn Assoc Balneol Climatol Phys Med, 70: 143-154, 2007.

Membership in Learned Societies:
- Japan Epidemiological Association
- Japan Society of Geriatrics
- Japanese Society of Public Health
- Japan Society of Balneology, Climatology and Physical Medicine
- Japanese Association of School Health