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Original Article

Urban-Rural Differences in Subjective Symptoms of Fatigue and Their Relations with Lifestyle Factors in Young Male Japanese Students

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Abstract

Object: The purposes of this study were to investigate the actual status in subjective symptoms of fatigue (SSF) and lifestyles of young male students living in two different life spheres of the Tokyo metropolitan area and a rural area, and to find regional differences in these characteristics and relations between SSF and lifestyles in school life.

Methods: A questionnaire regarding SSF and lifestyle was administered to 412 healthy male students (16–18 yr) attending the two National Colleges of Technology located in the Tokyo metropolitan area (MA) and a local city (LC). Statistical techniques such as a chi-square test and Hayashi's Quantification Theory I analysis were used to examine relations between SSF and lifestyles.

Results and conclusion: A significant difference was found only in "feeling of physical disintegration," and the MA group was higher than the LC group. The MA students showed shorter sleeping hours and earlier awaken time compared with LC students. In the relations between SSF and lifestyles, sleeping habit was an important factor significantly relating to SSF in both groups. Paying attention to good sleeping habits is an important countermeasure for preventing SSF in the male students.

Key words: subjective symptoms of fatigue, lifestyle, regional characteristics, adolescence

Introduction

The change in the social structure in Japan is bringing about changes in the labor and living environments and lifestyle in ordinary families (1). Some of these changes in daily life conditions are considered to be a cause of the increase in physical and mental stress, and the subjective symptoms of fatigue (SSF) in the young that tend to increase every year (1). In a study investigating the actual condition of SSF for female Japanese junior college students, 343 of 418 students (82.1%) perceived symptoms of fatigue or languor, and half of them responded that these fatigue symptoms could not be recuperated after a night's sleep (2). Health education for the youth is considered necessary in establishing a desirable lifestyle, because disorder in the rhythm of living is indicated as one of the causes of these SSF (3), and the lifestyle established as a youth will be more of an influence in the future (4).

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In Western countries, assessments of SSF have been successful in health-care for patients with cancer or cardiac diseases (5). For example, in the Oncology Nursing Society (ONS) Foundation's Fatigue Initiative through Research and Education program, a "Fatigue scale" with a 5 point scale was used for after-care of cancer diseases, and contributes to an increase in patients with shorter hospital stays (5). In Japan, the SSF scales have been also used as an index to evaluate the physical and mental health status in the daily life of youths (6–8). Most Japanese SSF studies for youths, however, used SSF scales developed to assess occupational health and environments in labor populations with various ages. The SSF scale developed for youths should be used to assess SSF in youths. In addition, since lifestyle is closely related to regional characteristics, investigating these relations, considering regional characteristics, is important.

A chronic fatigue syndrome study from the Ministry of Health and Welfare of Japan in 1999 (9) investigated 4,000 people aged between 15 and 65 years old to determine the lifestyle factors related to fatigue in daily life. As a result of this investigation, many people (about 60% of the population) perceived symptoms of fatigue, and 36% of the population had chronic fatigue for six months and more. This investigation determined various factors influencing fatigue, such as lifestyle,

public transport facilities and geographic location, and suggested the necessity of countermeasures to prevent death from overwork and various other diseases. However, the above report and the current study differ in that the previous study focused on the assessment of chronic fatigue, and did not examine the regional differences in the relations between fatigue and lifestyles. The relation between SSF and lifestyle of Japanese youths is not fully known.

The purposes of this study were to investigate the actual status in SSF and lifestyles of young male students living in two different life spheres of a metropolitan and a rural area using the Subjective Fatigue Scale for Young Adults (SFS-Y) developed by Kobayashi et al. (8), and to identify regional differences in these characteristics and relations between SSF and lifestyles in school life.

Methods

Data collection

The survey comprised male students, aged 16 to 18 years, at two National Colleges of Technology located in the Tokyo Metropolitan area (MA) and a local city (LC). The MA is located in Hachioji City, Tokyo where the population is 510,000, and the population density is 2,758/km^2; while the LC is located in Sabae City, Fukui Prefecture where the population is 65,000, and the population density is 767/km^2 (10).

The number of students was: in LC, 1st grade: 200, 2nd grade: 210, 3rd grade: 202, totaling 612; in MA, 1st grade: 201, 2nd grade: 204, 3rd grade: 199, totaling 603. Purposive sampling was conducted on these populations to avoid data that may be influenced by fatigue based on class activities like gymnastics or athletics. As a result of this sampling, 366 students in 9 classes (1st grade: 3 classes, 2nd grade: 4 classes, 3rd grade: 2 classes) in LC, and 312 students in 8 classes (1st grade: 2 classes, 2nd grade: 3 classes, 3rd grade: 3 classes) in MA were sampled for the study questionnaire. Furthermore, the sample for analysis was selected using random sampling in order to equalize the sample size of each age group between MA and LC. Finally, a total of 412 data sets consisting of 206 from each of MA and LC were obtained (sampling ratio was about 34%, see Table 1). We gathered data in a class setting, and data was collected completely.

Prior to the survey, teachers explained to the subjects the purpose and the contents of the survey, the independence from the subject's school record and the protection of subjects' privacy. The survey was conducted at the beginning of a class in the morning, avoiding classes after physical education and other practice classes with a standing position in order to negate the effects of physical and mental work loads.

Table 1 Sample size in this study

Age (years)	16	17	18	Total
LC	67	109	30	206
MA	67	109	30	206
Total	134	218	60	412

LC: local city, MA: metropolitan area.

Questionnaire

A questionnaire included entries on personal characteristics (school name, grade, course, age, gender and the response time), SSF, performance status, subjective fatigue feeling, health self-evaluation, and lifestyles.

1. Subjective symptoms of fatigue

We used the Subjective Fatigue Scale for Young Adults (SFS-Y) developed by Kobayashi et al. (8) The SFS-Y consists of 24 items representing six subscales of "difficulty with concentrated thinking (F1)," "languor (F2)," "reduced motivation (F3)," "reduced vitality (F4)," "drowsiness (F5)" and "feeling of physical disintegration (F6)." Each item was assessed using a 7 point scale (1=not at all, 7=very much so). Each subscale score was calculated by summing the item scores in each subscale.

2. Performance status

Performance status (PS) is often used to assess the symptom of chronic fatigue. We used the following 4 point scale to assess the symptom of chronic fatigue. 0=You have no feeling of weariness, can participate in daily living, and can be active without any limitation. 1=Although you can participate in school life and do school work, you often feel symptoms of fatigue. 2=Although you can participate in school life and do school work, you often require rest because of whole body weariness. 3=Because of whole body weariness, you cannot go to school or do school work for a few days per month, and require bed rest at home. In the present PS, if the PS score is 3 or higher, chronic fatigue is suspected (17).

3. Subjective fatigue feeling

The subjective fatigue feeling was a question concerning a general feeling of fatigue (5). We used the following 4 point scale, considering the survey styles of the Prime Minister's Office of Japan (4) or the Ministry of Education of Japan (11); 1=no fatigue, 2=mild fatigue 3=moderate fatigue, 4=extreme fatigue.

4. Health self-evaluation

In a self-evaluation of physical health status, the students assessed their own physical health status when compared with that of other students using a 5 point scale of 1=excellent, 2=good, 3=average, 4=poor, 5=very poor.

5. Lifestyles

Questions on lifestyle were selected considering the lifestyle of the adolescence and the contents of Monden's questionnaire (6). In this study, however, questions on drinking and smoking habits were excluded from the analyzed data, because these may be influenced by bias in data gathered in a class setting. Dietary habits were assessed by the conditions of "have breakfast" and "eat snacks between meals". The question concerning the controlling body weight was assessed by "care about body weight", which closely related to a shift of health behavior in daily life. The questions and their rating scales were as follows:

1) Have breakfast: 1=everyday, 2=sometimes, 3=not at all

2) Hours of sleep (interval scale): 1=5 hours or less, 2=6 to 7

hours, 3=8 hours or more
3) Bedtime (interval scale): 1=before 12 midnight, 2=between 12 midnight and 1 a.m., 3=after 1 a.m.
4) Waking time (interval scale): 1=before 7 a.m., 2=between 7 and 8 a.m., 3=after 8 a.m.
5) Care about sleeping well: 1=very much, 2=somewhat, 3=no attention, 4=not at all
6) Eat snacks between meals: 1=habitually, 2=sometimes, 3=a little
7) Care about body weight: 1=very much, 2=somewhat, 3=no attention
8) Dwelling: 1=own house, 2=a lodging house or a dormitory
9) The method of going to school: 1=walking, 2=bicycle, 3=train
10) Club activity: 1=athletic club, 2=no athletic club, 3=independent (no participation)

Statistical analyses

Categorical frequencies of SSF items and lifestyle variables, and significant differences between LC and MA were determined using the chi-square test. The regional differences in the subscale scores of SSF were obtained using the t test. Furthermore, Quantification Theory I analysis (6) was used to investigate the comprehensive relation between SSF and lifestyles, using SSF as dependent variables and lifestyles as independent variables.

Results

Regional differences in SSF and lifestyles

Table 2 shows descriptive statistical values and the results of regional differences in the six SSF subscales and lifestyles. In the SSF subscale scores, regional differences were found only in "feeling of physical disintegration (F6)." This score in the MA group was significantly greater than in the LC group. Significant differences were also found in PS and health self-evaluation. Four LC students and seventeen MA students reached the third category of PS, i.e., the anchor point of the symptom of chronic fatigue. In lifestyle variables, significant differences were found in seven variables except for "have breakfast," "bedtime" and "dwelling."

Regional differences in the relation between SSF and lifestyles

Table 3 shows the results of Quantification Theory I analysis when using SSF subscales as dependent variables and lifestyles as independent variables. Multiple correlations (R) between each subscale and lifestyle variables ranged from 0.357 (feeling of physical disintegration: F6) to 0.487 (difficulty with concentrated thinking: F1) in the MA group, and from 0.259 (difficulty with concentrated thinking: F1) to 0.439 (drowsiness: F5) in the LC group. The multiple correlations of "difficulty with concentrated thinking (F1)" and "reduced motivation (F3)" tended to be somewhat greater in the MA group than in the LC group (R values of MA vs. LC were 0.487 vs. 0.259 in F1; 0.385 vs. 0.280 in F3).

Lifestyle variables with significant partial correlations to each SSF subscale in both groups were "care about sleeping well" and "care about body weight" in "drowsiness (F2)," "waking time" and "care about sleeping well" in "reduced vitality (F4)," "hours of sleep" in "drowsiness (F5)," and "waking time" in "feeling of physical disintegration (F6)." Furthermore, lifestyle variables significantly relating to three of more subscales were "waking time," "hours of sleep" and "care about sleeping well" in the LC group, and "have breakfast," "care about sleeping well" and "care about body weight" in the MA group.

Discussion

Fatigue in Japanese youth is influenced more by lifestyle compared with other age groups (7, 8, 13). The recent social environment is affected by various stressors such as noise, pollution of the environment, and human relations. Symptoms of fatigue and their relationships with lifestyles were suggested to differ according to regional characteristics (14). The present study suggested that some lifestyle factors that show a significant relation with the subjective symptoms of fatigue differ between the regions.

1. Regional differences in the characteristics of SSF and lifestyles

First, we compared SSF and lifestyles between the MA and LC groups. The complaint about "feeling of physical disintegration" in the MA group was significantly greater than that of the LC group. People living in the Tokyo metropolitan area were more exposed to various stressors than those living in rural areas (6) and this would be applicable to the students in this study. However, the effect of lifestyle on the symptom of "feeling of physical disintegration" may be relatively small, because it was reported that the "feeling of physical disintegration" is caused by a lack of exercise and poor posture while working (16).

The level of chronic fatigue, determined by the PS score in the present study, was higher in the MA than in the LC group. However, a significant regional difference was found in "feeling of physical disintegration," but not in "difficulty with concentrated thinking," which was reported to have a significant relation to chronic fatigue in the previous study (5). The diagnosis of chronic fatigue was based on a symptom reaching the third category of the PS: "because of whole body weariness, you cannot go to school or do school work for a few days per month, and require bed rest at home." In this study, the symptoms of chronic fatigue were found in some students in both regions (4 LC students and 17 MA students), and somewhat more in the Tokyo metropolitan area than in the local area.

Significant regional differences were found in "hours of sleep," "waking time" and "the method of going to school." The MA group tended to have shorter sleeping hours and an earlier awaken time compared with the LC group, and many MA students went to school by train. Although significant differences were found in sleeping habits, this result could be caused by the differences in the method of going to school and the time required, and it should not be interpreted that these sleeping habits in the MA group fall into disorder.

2. Regional comparisons of the relations between SSF and lifestyles

Kobayashi et al. (13) reported that in both male and female groups, "languor" showed the strongest relation to lifestyle among

Table 2 Mean and SD values and results of regional differences in each variable

			LC (local city)	MA (metropolitan area)	
		variable (score)	Mean (SD)	Mean (SD)	t value
SSF subscales	F1	Difficulty with concentrated thinking	15.2 (5.18)	16.3 (5.71)	–1.93
	F2	Languor	13.2 (5.47)	14.0 (6.06)	–1.31
	F3	Reduced motivation	12.5 (4.94)	13.4 (5.39)	–1.87
	F4	Reduced vitality	14.5 (5.26)	14.6 (6.07)	–0.11
	F5	Drowsiness	19.3 (4.82)	19.6 (5.31)	–0.57
	F6	Feeling of physical disintegration	13.6 (5.13)	15.6 (6.07)	–3.58**
			Rating categories	Frequency	Frequency	χ^2 value
Performance status			0 #	46	35	10.12*
			1	129	120	
			2	27	31	
			3	4	17	
Subjective fatigue feeling			1 No fatigue	37	35	0.53
			2 Mild fatigue	107	104	
			3 Moderate fatigue	41	47	
			4 Extreme fatigue	21	20	
Health self-evaluation			1 Excellent	7	16	13.42**
			2 Good	44	26	
			3 Average	102	90	
			4 Poor	38	45	
			5 Very poor	15	28	
Lifestyle items		Have breakfast	1 Everyday	147	140	2.53
			2 Sometimes	36	32	
			3 Not at all	23	34	
		Hours of sleep	1 5 hours or less	27	59	18.16**
			2 6 to 7 hours	147	131	
			3 8 hours or more	32	16	
		Bedtime	1 Before 12 midnight	35	44	3.41
			2 Between 12 midnight and 1 a.m.	95	77	
			3 After 1 a.m.	76	85	
		Waking time	1 Before 7 a.m.	50	94	24.66**
			2 Between 7 and 8 a.m.	105	88	
			3 After 8 a.m.	51	24	
		Care about sleeping well	1 Very much	19	43	12.85**
			2 Somewhat	107	84	
			3 No attention	54	48	
			4 Not at all	26	31	
		Eat snacks between meals	1 Habitually	29	36	8.19*
			2 Sometimes	135	107	
			3 A little	42	63	
		Care about body weight	1 Very much	31	21	7.81*
			2 Somewhat	83	65	
			3 No attention	92	120	
		Dwelling	1 Own house	154	166	2.02
			2 A lodging or dormitory	52	40	
		The method of going to school	1 Walking	56	45	63.92**
			2 Bicycle	93	31	
			3 Train	53	129	
		Club activity	1 Athletic club	119	85	9.81**
			2 Non athletic club	21	29	
			3 No participation	65	86	

Note. * $p<0.05$, ** $p<0.01$

#: 0=You have no feeling of weariness, can participate in daily living, and can be active without any limitations.
1=Although you can participate in school life and do school work, you often feel symptoms of fatigue.
2=Although you can participate in school life and do school work, you often require rest because of whole body weariness.
3=Because of whole body weariness, you cannot go to school or do school work for a few days per month, and require bed rest at home.

the five SSF factors of "drowsiness," "difficulty with concentrated thinking," "a feeling of impatience and physical disintegration," "languor" and "loss of vigor," and they suggested that determining the cause of "languor" would be a useful countermeasure for reducing SSF in youths. In the present study, however, the SSF subscale with the strongest relation to lifestyle was "drowsiness (F5)" in the LC group and "difficulty with concentrated thinking (F1)" in the MA group. As stated

Table 3 The results of Quantification Theory I analysis when using SSF subscales as dependent variables and lifestyles as independent variables

			F1 Difficulty with concentrated thinking		F2 Languor		F3 Reduced motivation		F4 Reduced activity		F5 Drowsiness		F6 Feeling of physical disintegration	
	Lifestyle items	Rating categories	CS	PC	CS	PC	CS	PC	CS	PC	CS	PC	CS	PC
LC group	Have breakfast	1 Everyday	−0.509	0.056	0.692	0.055	1.130	0.084	2.057	0.150*	0.865	0.100	−0.843	0.078
		2 Sometimes	0.545		0.291		0.204		0.582		−0.831		0.640	
		3 Not at all	−0.053		−0.185		−0.232		−0.439		0.059		−0.021	
	Hours of sleep	1 5 hours or less	0.783	0.074	2.080	0.134	0.263	0.064	1.116	0.076	0.726	0.073	1.915	0.145*
		2 6 to 7 hours	−0.321		−0.280		0.331		−0.170		−0.263		−0.398	
		3 8 hours or more	0.021		−0.572		−0.528		−0.280		−0.014		−0.380	
	Bedtime	1 Before 12 midnight	−0.491	0.116	−1.198	0.190**	−0.933	0.127	−1.749	0.166*	−0.932	0.154*	−1.265	0.218**
		2 Between 12 midnight and 1 a.m.	−0.408		−0.642		−0.233		−0.018		−0.269		−0.616	
		3 After 1 a.m.	1.252		2.365		1.371		1.643		1.472		2.396	
	Waking time	1 Before 7 a.m.	1.285	0.105	2.084	0.172*	1.465	0.098	1.759	0.140	1.442	0.148*	1.907	0.149*
		2 Between 7 and 8 a.m.	−0.074		0.144		−0.071		0.069		0.019		−0.035	
		3 After 8 a.m.	−0.742		−2.407		−0.904		−1.795		−1.293		−1.437	
	Care about sleeping well	1 Very much	−0.707	0.123	−1.233	0.176*	−0.134	0.110	−1.403	0.193**	−1.804	0.258**	−0.462	0.094
		2 Somewhat	−0.438		−0.632		−0.460		−0.628		−0.766		−0.299	
		3 No attention	0.550		0.975		0.543		0.975		1.450		0.254	
		4 Not at all	1.194		1.425		0.893		1.646		1.366		1.050	
	Eat snacks between meals	1 Habitually	0.828	0.113	0.914	0.074	−0.085	0.073	1.075	0.125	2.301	0.236**	0.318	0.030
		2 Sometimes	−0.425		−0.204		−0.204		−0.449		−0.704		−0.096	
		3 A little	0.801		0.039		0.732		0.711		0.659		0.097	
	Care about body weight	1 Very much	−0.175	0.097	2.096	0.167*	1.048	0.099	0.727	0.105	0.390	0.178*	0.004	0.116
		2 Somewhat	−0.517		−0.504		−0.445		−0.601		−0.948		−0.649	
		3 No attention	0.562		−0.278		0.058		0.304		0.738	0.178*	0.603	
	Dwelling	1 Own house	0.582	0.063	1.493	0.150*	0.806	0.088	0.518	0.089	0.606	0.112	1.100	0.119
		2 A lodging or dormitory	−1.677		−4.332		−2.339		−1.424		−1.831		−3.151	
	The method of going to school	1 Walking	1.478	0.063	4.657	0.175*	2.155	0.087	1.328	0.114	1.651	0.132	3.083	0.129
		2 Bicycle	−0.734		−1.899		−0.767		−1.001		−1.052		−1.405	
		3 Train	−0.227		−1.567		−0.924		0.340		0.202		−0.807	
	Club activity	1 Athletic club	−0.150	0.037	−0.073	0.027	−0.359	0.094	−0.145	0.073	0.232	0.085	−0.223	0.088
		2 Non athletic club	−0.003		0.404		1.053		−0.676		−1.036		1.254	
		3 No participation	0.280		−0.001		0.304		0.493		−0.071		−0.003	
	Multiple correlation		0.259		0.383		0.280		0.380		0.439		0.320	
		Rating categories	CS	PC	CS	PC	CS	PC	CS	PC	CS	PC	CS	PC
MA group	Have breakfast	1 Everyday	2.063	0.170*	3.062	0.219**	2.170	0.165*	0.826	0.108	0.499	0.105	2.808	0.197**
		2 Sometimes	−0.950		−1.054		−0.301		−1.280		−1.217		−1.136	
		3 Not at all	−0.255		−0.458		−0.429		0.104		0.155		−0.390	
	Hours of sleep	1 5 hours or less	0.499	0.056	0.927	0.087	1.631	0.161*	0.038	0.027	0.164	0.040	0.941	0.100
		2 6 to 7 hours	0.218		0.280		0.339		0.213		0.261		−0.635	
		3 8 hours or more	−0.466		−0.765		−1.213		−0.222		−0.331		0.115	
	Bedtime	1 Before 12 midnight	−0.526	0.105	0.060	0.030	−0.189	0.042	−1.009	0.155*	−0.270	0.089	0.272	0.165*
		2 Between 12 midnight and 1 a.m.	0.652		−0.176		−0.014		0.187		−0.197		0.632	
		3 After 1 a.m.	−0.231		0.370		0.767		3.229		1.696		−3.184	
	Waking time	1 Before 7 a.m.	1.326	0.131	1.189	0.107	0.185	0.067	0.815	0.087	2.025	0.194*	0.856	0.092
		2 Between 7 and 8 a.m.	−0.408		−0.397		0.088		−0.218		−0.770		−0.349	
		3 After 8 a.m.	−1.634		−1.185		−1.439		−1.337		−1.463		−0.307	
	Care about sleeping well	1 Very much	−2.051	0.251**	−2.280	0.222**	−1.837	0.198**	−1.141	0.153*	−1.117	0.135	−1.637	0.180*
		2 Somewhat	0.453		0.007		−0.041		−0.287		0.376		0.099	
		3 No attention	−0.704		0.251		0.343		0.173		−0.345		−0.247	
		4 Not at all	2.522		2.543		1.966		1.965		1.006		2.175	
	Eat snacks between meals	1 Habitually	1.804	0.173*	0.186	0.058	−0.002	0.041	0.866	0.084	0.534	0.077	0.248	0.019
		2 Sometimes	−0.001		0.229		0.178		0.053		0.150		−0.032	
		3 A little	−0.974		−0.489		−0.302		−0.572		−0.560		−0.077	
	Care about body weight	1 Very much	−1.694	0.260**	−1.310	0.166*	−1.114	0.100	−2.814	0.235**	−1.486	0.124	0.063	0.098
		2 Somewhat	−1.570		−1.030		−0.389		−1.104		−0.386		−0.805	
		3 No attention	1.164		0.790		0.397		1.080		0.465		0.438	
	Dwelling	1 Own house	0.188	0.060	0.094	0.023	0.241	0.061	0.206	0.051	0.250	0.082	−0.046	0.013
		2 A lodging or dormitory	−0.789		−0.395		−1.010		−0.897		−1.081		0.192	
	The method of going to school	1 Walking	−0.368	0.047	−1.480	0.097	−1.333	0.103	−2.070	0.128	−0.522	0.060	1.053	0.095
		2 Bicycle	0.592		1.032		1.095		−0.070		−0.424		0.685	
		3 Train	−0.021		0.255		0.190		0.713		0.283		−0.537	
	Club activity	1 Athletic club	0.243	0.041	0.441	0.074	−0.148	0.036	−0.307	0.051	−0.234	0.096	0.072	0.012
		2 Non athletic club	−0.083		0.165		−0.232		−0.097		1.172		0.047	
		3 No participation	−0.220		−0.503		0.224		0.344		−0.170		−0.087	
	Multiple correlation		0.487		0.419		0.385		0.428		0.385		0.357	

Note. CS: Category score, PC: Partial correlation,
** $p<0.01$, * $p<0.05$.

above, it is suggested that the content of SSF closely relating to lifestyles differs between the MA and LC groups, and there are regional differences in the relations between SSF and lifestyles in the youth.

The results for sleeping habits in the LC group were similar to those from an investigation into the actual condition of sleeping habits for the same National College of Technology students (19). In addition, since the survey in this study was conducted anonymously, it is not likely that there was any bias caused by the class setting survey, such as social desirability, and affecting the results for sleeping habits. Monden (6) suggested, in 1978, that the bedtime of Japanese high school students in the Tokyo metropolitan area tended to be later because of cram school, wandering about until after midnight and playing video games, and that these behaviors were the main cause of their symptoms of fatigue. Recently, however, activities such as attending to cram school and playing video games are not always distinctive activities of the Tokyo metropolitan area.

Taking a rest is a fundamental and important coping behavior in health and stress management and it is closely related to sleeping habits (20). From the findings of this study, regardless of regional characteristics, sleeping habit is considered to be an important factor influencing SSF in youths.

From the above-stated results, the relation between SSF and lifestyle, "care for sleeping well" significantly related to many SSF subscales in the MA group having shorter sleeping hours compared with the LC group, while in the LC group sleeping habits of "waking time," "hours of sleep" and "care about sleeping well" significantly related to many SSF subscales. Significant relations of SSF with "hours of sleeping" and "waking time" were found only in the LC group. Therefore, there may be a regional difference in the relation between SSF and sleeping habit. In addition, "care about sleeping well" was significantly related to many SSF subscales in both groups. This suggests that male students paying attention to having good sleeping habits may be an important countermeasure to reduce SSF. However, the distribution of the response for "care about sleeping well" differed between the LC and MA groups. While many LC students responded with "somewhat," the responses in the MA students were varied, and their responses of "very much" and "not at all" tended to be greater than those of the LC group. Therefore, further investigations with a larger sample size will be needed to verify the results of this study.

3. Orientation for future studies and limitations of this study

As mentioned above, we examined the relations between SSF and lifestyles in male students, and compared these characteristics between the MA and LC groups. Since Kobayashi et al. (21) reported that there were gender differences in SSF, further studies have been needed to determine the characteristics of the above relation in female students. There is a possibility that there was bias in the responses for smoking and drinking, and accurate information regarding these habits cannot be obtained because the survey was performed during classes. These habits are suggested to greatly influence youths' health. Therefore, further studies are necessary to examine the relations between subjective symptoms of fatigue and lifestyle, adjusting for the effects of drinking and smoking habits.

4. Conclusions

A significant difference was found only in "feeling of physical disintegration," being higher in the MA group than the LC group. The MA students showed shorter sleeping hours and earlier waking time compared with LC students. The relations between SSF and lifestyles differed between the two groups. Sleeping habit was an important factor significantly relating to SSF in both groups. Paying attention to good sleeping habits is an important countermeasure for preventing SSF in the male students.

References

(1) Ministry and Welfare. Consideration about the survey of the chronic fatigue in a woman junior college student. Welfare science research cost subsidy health science general research enterprise in 1991 "Research on substance investigation and the cause of a disease of chronic fatigue syndrome, and disease condition" report, 1991. (in Japanese)

(2) Hashimoto S, Uchiyama S, Tajima Y, Cho A. Consideration about the survey of the chronic fatigue in a woman junior college student. Welfare science research cost subsidy health science general research enterprise in 1999 "Research on the recovery-from-fatigue technique for the survey of fatigue, and the production of health" (Chief researcher: Kitani T.) report 2,1999; 1–3. (in Japanese)

(3) Minowa M, Tanihata T, Matsumoto M, Hashimoto S, Simizu A, Akaeda T, Kuratsune M, Kitani T. The actual condition and the risk-factor of fatigue in an area. Welfare science research cost subsidy health science general research enterprise in 1999 "Research on the recovery-from-fatigue technique for the survey of fatigue, and the production of health" (Chief researcher: Kitani T.) report 1, 1999; 1–3. (in Japanese)

(4) Muto T, Fukuwatari Y. Measurement and evaluation in health education and health promotion. Shinohara Shuppan Shinsha. 1995; pp. 1–12. (in Japanese)

(5) Piper BF, Dibble SL, Dodd MJ, Weiss MC, Slaughter RE, Paul SM. The revised Piper Fatigue Scale: psychometric evaluation in women with breast cancer. Oncol Nurs Forum. 1998; 25(4): 677–684.

(6) Monden S. Relationship between subjective symptoms of fatigue and living behavior in senior high school students: A study by quantification method II. Japanese journal of school health 1990; 32: 239–247. (in Japanese)

(7) Kobayashi H, Demura S, Goshi F, Sato S, Noda M. Construction of a subjective fatigue scale for adolescent students. Japanese Journal of Public Health 2000; 47(8): 638–646. (in Japanese)

(8) Kobayashi H, Demura S, Goshi F, Minami M, Sato S, Tada N. Examination of subjective symptoms of fatigue in young men. From the viewpoint of age, subjective fatigue feeling and daily activity condition. Japanese Journal of Public Health

1999; 46 (11): 953–964. (in Japanese)
(9) Kuratsune H. The actual condition and the risk-factor of fatigue in an area—The 2 city 4 town survey in the Aichi Toyokawa health center pipe—. Welfare science research cost subsidy health science general research enterprise—Research on the recovery-from-fatigue technique for the survey of fatigue, and the production of health. Research report in the Heisei 11 fiscal year. Bando Insatsu 2000; 19–44. (in Japanese)
(10) Toyo Keizai, Inc. City data pack 2002 edition. Toyo Keizai, Inc 2001; CD-ROM. (in Japanese)
(11) Ministry of Education, Culture, Sports, Science and Technology. 1998 Japanese government policy, education, Education, Science, Sports and Culture. Ministry of Finance printing department pp. 30–38. (in Japanese)
(12) Demura S, Kobayashi H, Sato S, Nagasawa Y. Examination of validity of the subjective fatigue scale for young adults. Japanese Journal of Public Health 2001; 48(2): 76–84. (in Japanese)
(13) Kobayashi H, Demura S, Goshi F, Minami M, Nagasawa Y, Sato S, Noda M. The relationship among subjective symptoms of fatigue, subjective fatigue feeling, and life habits of high school and college students. Japanese Journal of Hygiene 1999; 54(3): 552–562. (in Japanese)
(14) Udo M. Matsuda I, Kagaya H, Kaneko K, Saeki S, Sugihara T, Takahashi T, Ochiai M, Takaishi M, Inamura H, Suzuki S, Wakara M, Hoshi T, Ozawa H, Kondo M. Health and physical education text. Taishukan Shoten 2001; pp. 82–85. (in Japanese)
(15) Hoshi T. City healthy level. Tokyo Metropolitan University Press, 2000; pp. 1–2. (in Japanese)
(16) Saijo O, Watanabe M. The connection between fatigue and lifestyle in junior high school students. Hiro to Kyuyo no Kagaku 1998; 13: 119–128. (in Japanese)
(17) Inoue M, Kuratsune H, Watanabe Y. Science of fatigue. Kodansha 2001; p. 60–118. (in Japanese)
(18) Gibbons KL, Wertheim EH, Paxton SJ, Petrovich J, Szmukler GI. Nutrient intake of adolescents and its relationship to desire for thinness, weight loss behaviors, and bulimic tendencies. Australian Journal of Nutrition and Diet 1995; 52: 69–74.
(19) Shimada S, Demura S, Yamaji S, Kobayashi H, Goshi F, Ikemoto Y, Matsuzawa J, Tada N. The conditions of daily life in technical college male students. Journal of Education and Health Science 2000; 45: 847–857. (in Japanese)
(20) Inoue M, Kuratsune H, Watanabe Y. Science of fatigue. Kodansha 2001; p. 11–17. (in Japanese)
(21) Kobayashi H, Demura S, Goshi F, Sato S, Matsuzawa J. Sex Difference in Symptoms of Fatigue in Young Men and Women with Reference to Experience of Awareness and Cognitive Appraisal. Japanese Journal of Physical Fitness and Sports Medicine 1998; 47: 581–592. (in Japanese)