

The connection between cumulative fatigue and the use of Social Networking Services among Japanese junior high school students

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Abstract Purpose: This study aimed to obtain suggestions for health education in order to improve the everyday habits and clarify the effects of the use of Social Networking Systems (SNS) by Japanese junior high school students on their sleeping habits and overall fatigue as measured by scores on the Cumulative Fatigue Symptoms Index (CFSI).

Methods: We examined the data from 346 students from nine junior high schools (145 male and 201 female) in the 1st and 2nd year in Niigata City Japan. The study was conducted from December 2013 to January 2014. Data collected included the background of the participants, their everyday habits, their use of communications devices, their use of SNS, and CFSI scores.

Results: There were no significant differences in the overall CFSI scores between the two groups (high and low) of SNS users. However, the use of SNS raised the CFSI subscale of “physical disorders” among female students in comparison to those who did not use SNS. The reason that male students had high CFSI was an odds ratio of 2.8 (95% CI: 1.091-7.086) for “Sleeping time. : After 11pm” and for female students, it was an odds ratio of 2.1 (95% CI: 1.12-4.27) for “Owned their own communications devices. : Yes” In addition, the odds ratio for “What do you do after you get into bed? : Some activity” was 2.5 (95% CI: 1.126-5.643) for male students and 1.9 (95% CI: 1.017-3.895) for female students.

Conclusion: It was clarified that students who owned their own communications devices had developed poor sleeping habits by using SNS, playing games, or sending e-mail after they went to bed but before going to sleep, and they were experiencing fatigue. This suggests the necessity of guidance about the use of electronics devices in order to improve the everyday habits of junior high school students.

Introduction

Background

In recent years, the use of the internet has expanded on a global scale and the use of Social Networking Services (SNS) among adolescents has become increasingly prevalent¹⁾. SNS are online information media that allow the transmission of information by individuals, communication between individuals, and relationships between people.

Examples of SNS include internet sites such as Instagram and Facebook, as well as applications such as Snapchat and Kik. Adolescents mainly use websites that support communication, based on friendly relationships and shared topics^{2) 3)}. These websites and apps promote “real-time” exchanges of information, which often means users are on-line for extended periods, repeatedly checking digital media screens. In addition, many users conduct multiple “conversations” simultaneously, which potentially

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increases arousal and may contribute to education and health problems⁴).

SNS and Education

SNS are spreading rapidly as simple and highly convenient communication tools and this spread has brought a certain energy to our lives. However, at the same time, SNS have become an issue in schools as they can provide a platform for a number of problems, including affecting the sleep habits of young people, in particular junior and senior high school students who are particularly susceptible to poor lifestyle choices due to their growth phase. Some of these sleep disturbances are due to the content of these communications (i.e., cyberbullying), rather than a direct effect of SNS on sleep quality^{4) 5)}. However, SNS use also has direct consequences on health.

SNS and Health

A survey on the use of media and the health of pubescent children reported a connection between the use of media and general malaise such as headaches, stomachaches, and difficulty sleeping⁵⁻⁶⁾. Poor sleep habits and fatigue among junior high school students were also reported to have a strong connection with the use of electronic media⁷⁻⁸⁾. As mentioned above, this could be a direct effect of arousal due to viewing the screen, or a side effect of the content of SNS communications.

Junior high school students are in an important growth period with rapid maturation of both the mind and body. However, it is also a period during which they seek out social connections, which can lead to long hours spent on SNS. Japanese junior high school students tend to be very busy as they participate in school club activities and attend additional private tutoring sessions after school (known as “cram schools”). Thus, the additional use of SNS brings about deterioration in their sleep habits and it is predicted that the scale of chronic fatigue on a daily basis will increase.

Chronic Fatigue Syndrome (CFS) is a health disorder in which psychosocial factors cause problems with the nervous system, for example, low sense of control, low level of physical activity, and depression⁹⁾. The causes of CFS are unknown, but for pubescent children, it is one of the reasons for a reduction in life activities and prolonged or repeated

school absence¹⁰⁾. In Japan, there is also a distinct mental health issue called *Hikikomori* (social withdrawal) in which people shut themselves away at home and avoid social contact¹¹⁾. Fatigue accumulates from poor sleep habits caused by the use of electronic media and causes absence from school. Such fatigue may lead to *Hikikomori*.

For the above reasons, from the perspective of public health in Japan, it is important to clarify the connection between cumulative fatigue and the use of SNS. As an initial step in clarifying this relationship, we examined whether the pre-sleep use of SNS and electronic media among Japanese junior high school students shortened sleep time and was a factor in the increase of CFS symptoms.

Methods

Participants

We implemented a cross-sectional survey using an anonymous self-recording questionnaire in Niigata City in the east of Japan. A total of 1,255 first and second year students, aged 13-14 years, from nine junior high schools participated. The survey period was December 2013 to January 2014. Third year students were not included as the study took place during their high school entrance exam period. The procedure was as follows: Each class teacher at participating schools distributed an envelope to each student to give to their parents or guardians, which contained an explanation of the study. Information was provided regarding the research objectives, details, and method, in addition to the protection of personal information, an explanation for the participant, and a self-addressed, stamped envelope. Students who consented to participate in the study completed the survey at home and posted it back; this process ensured that the survey was voluntary in nature. The ethics board of our institution approved the study.

Materials

The questionnaire included questions on participants' backgrounds, their everyday habits, their use of communications devices, their use of SNS, and 32 items on the Cumulative Fatigue Symptoms Index (CFSI). Multiple choice questions were used to obtain information on participant demographics, including their current age, school year, gender, club activity affiliation type (sports, cultural),

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and whether they attended cram schools or took other extra-curricular activities. We also obtained responses regarding their frequency per week of attendance at cram schools or other extra-curricular activities. There were four choices for this response: every day, 4-6 days a week, 2-3 days a week, or once a week. To determine participants' everyday habits, we obtained information regarding the times at which they get up, return home, and go to bed. The six multiple-choice items for "What do you do after you get into bed?" were: I go to sleep straight away, I send e-mails, I play application games, I read a book, I play games, and I listen to music. Yes/No questions were asked regarding the use of communications devices, whether the participant owned their own communications device, and whether they used SNS. Three questions regarding social media were asked: "When I use social media, I think that problems with my friends occur easily," "My life is enhanced by social media," and "With a communication device, I can find out things that I don't know quickly," along with the general question, "Do you think you live a healthy life?" Each was scored on a 4-point scale ranging from 'I strongly agree' (4 points) to 'I do not agree at all' (1 point).

The CFSI is a scale composed of 32 items excluding items that ask about stressors, developed from a larger 74 item, 8-subscale version by Ishihara (Kaneyoshi & Kazuhiko 2000). All questions used a 4-point Likert scale: "applies very well" (4 points), "applies well" (3 points), "does not apply" (2 points), "does not apply at all" (1 point). The higher the points scored, the higher the level of fatigue is judged to be.

The Cronbach coefficient α was executed for internal consistency of lower CFSI items. The overall coefficient α was 0.79 and the internal consistencies of lower items were confirmed as depressive feelings (0.85), physical disorders (0.71), loss of vigor (0.69), reduced vitality (0.78), chronic fatigue (0.76), and irritability caused by excessive use (0.76).

Analysis

The data obtained were gender segregated and divided into two groups: those who used SNS and those who did not. χ^2 tests (or Fisher's exact test, if necessary) and students' t-tests were used for analysis. Nine pm was determined as the cut-off value for the average time that students arrived

home from cram schools or other extracurricular activities and the two groups were divided according to whether they arrived home before or after this time. In addition, the cut-off time for overall average hours of sleep was set at 7.5 hours, with the groups split on sleep time. In order to investigate the influences that increase CFSI, we created two items with the CFSI median of 55 points as the cut-off value and conducted two-item multiple logistic regression using the forced insertion method with five variables as influential factors. All of these had the risk ratio of 5% as their level of significance. Statistical analysis was conducted using SPSS version 22 for Windows.

Results

Participant Characteristics

Table 1 shows participants' backgrounds and lifestyle habits by gender. We collected 389 questionnaires from subjects (31.7% response rate) and of these a total of 346 (male: 145 (41.9%), female: 201 (58.1%)), which did not have deficient values for the CFSI responses, were valid (valid response rate: 88.9%; Age range: 12-14 years old; mean \pm standard deviation of age; 13.14 \pm .66 years old).

Participants were 198 first year (57.2%) and 148 second year (42.8%) junior high school students. Of these, 94.2% took part in club activities of which 241 (74.4%) were sports clubs and 83 (25.6%) were cultural clubs. Most male students took part in sports club activities ($p=0.001$). In addition, 197 (57.1%) students attended cram schools or other extracurricular activities and most students attended these two-three times a week (105 (53.8%)). More female students took part in cultural club activities than male students ($p=0.036$). The time for returning home from cram schools or other extracurricular activities was after 9pm for 104 (40.6%) students.

Bedtime was after 11pm for 229 (66.4%) students. Of these, 193 (84.2%) went to bed before midnight and 36 (15.7%) after midnight. The overall average number of hours of sleep was 7.5 (SD=0.9) and more female students had less than 7.5 hours sleep than male students ($p=0.021$). In response to what they did once they had gone to bed, 175 (52.1%) students reported going straight to sleep while 161 (47.9%) did not. The activities of students who did not go

Table 1. Participants' backgrounds and lifestyle habits.

Characteristic	Total n (%)	p-value	Male n (%)	Female n (%)	p-value
School year(n=346)					
1	198 (57.2)	.007**	74 (51.0)	124 (61.7)	0.061
2	148 (42.8)		71 (49.0)	77 (38.3)	
School club activity(n=324)					
Sports	241 (74.4)	.000**	115 (87.8)	126 (65.3)	.001**
Culture	83 (25.6)		16 (12.2)	67 (34.7)	
Cram school or other extra-curricular activities(n=345)					
No	148 (42.9)	.008**	72 (49.7)	76 (38.0)	.036*
Yes	197 (57.1)		73 (50.3)	124 (62.0)	
Yes-items					
Everyday	1 (0.5)				
4-6 days/w	22 (11.2)				
2-3 days/w	107 (54.3)				
1 day/w	67 (34.0)				
Arrived home from cram school (n=186)					
Before 9pm	82 (44.1)	0.107	30 (44.1)	52 (44.1)	1
After 9pm	104 (55.9)		38 (55.9)	66 (55.9)	
Sleeping time(n=345)					
Before 11pm	116 (33.6)	.000**	56 (38.9)	60 (29.9)	0.084
After 11pm	229 (66.4)		88 (61.1)	141 (70.1)	
Average hours of sleep(SD) ^a	7.52 (0.9)		7.6 (0.8)	7.4 (0.9)	0.238
Average hours of sleep(n=344)					
Less than 7.5 hours	157 (45.6)	0.106	55 (38.2)	102 (51.0)	.021*
7.5 hours or more	187 (54.4)		89 (61.8)	98 (49.0)	
What do you do after you get into bed?(n=336)					
Nothing (sleep immediately)	175 (52.1)	0.445	81 (57.9)	94 (48.0)	0.326
Some activity	161 (47.9)		59 (42.1)	102 (52.0)	
Item:					
Check e-mails or play application games	102 (63.4)				
Read a book, or listen to music	59 (36.6)				
Owned their own communications devices(n=344)					
No	181 (52.6)	.001**	87 (67.4)	106 (53.1)	.016*
Yes	163 (47.4)		57 (53.0)	94 (47.0)	
Yes-Items: Smartphones	52 (31.9)				
Mobile phones	39 (23.9)				
Personal computers	34 (20.9)				
Games consoles	38 (23.3)				
SNS use (n=346)					
Yes	94 (27.2)	.000**	30 (20.7)	64 (31.8)	.027*
No	252 (72.8)		115 (79.3)	137 (68.2)	

*p<.05; **p<.01; SD: standard deviation

Analysis: χ^2 tests (or Fisher's exact test, if necessary); ^a Student's t-test

No answers are excluded.

straight to sleep were: e-mail or application games (102 (63.4%)) and reading or music (59 (36.6%)). No significant difference was noted between males and females for those who went straight to sleep and those who did not. In total,

163 (47.4%) students owned their own communications devices and more female students owned their own devices than male students (p=.016). With regard to types of communications devices for personal use, 52 (31.9%)

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Table 2. Subjects' characteristics by gender, their use or non-use of SNS, and the connection between these two groups.

	Total		p-value	Male		p-value	Female		p-value
	Use SNS n (%)	Don't use SNS n (%)		Use SNS n (%)	Don't use SNS n (%)		Use SNS n (%)	Don't use SNS n (%)	
School year(n=346)									
1	49 (52.1)	149 (59.1)	0.272	10 (33.3)	64 (55.7)	.040*	39 (60.9)	85 (62.0)	.878
2	45 (47.9)	103 (40.9)		20 (66.7)	51 (44.3)		25 (39.1)	52 (38.0)	
School club activity (n=324)									
Sports	66 (76.7)	175 (73.5)	0.666	24 (92.3)	91 (86.7)	.738	42 (70.0)	84 (63.2)	.415
Culture	20 (23.3)	63 (26.5)		2 (7.7)	14 (13.3)		18 (30.0)	49 (36.8)	
Cram school or other extra-curricular activities (n=345)									
Yes	62 (66.7)	134 (53.2)	.037*	15 (50.0)	57 (49.6)	1	47 (74.6)	77 (56.2)	.018*
No	31 (33.3)	118 (46.8)		15 (50.0)	58 (50.4)		16 (25.4)	60 (43.8)	
Arrived home from cram school (n=186)									
Before 9pm	24 (39.3)	58 (46.4)	0.43	3 (21.4)	27 (50.0)	.073	21 (44.7)	31 (43.7)	1
After 9pm	37 (60.7)	67 (53.6)		11 (78.6)	27 (50.0)		26 (55.3)	40 (56.3)	
Sleeping time(n=345)									
Before 11pm	18 (19.1)	98 (39.0)	.010**	9 (30.0)	47 (41.2)	.298	9 (14.1)	51 (37.2)	.001**
After 11pm	76 (80.9)	153 (61.0)		21 (70.0)	67 (58.8)		55 (85.9)	86 (62.8)	
Average hours of sleep (SD) ^a	7.2 (0.9)	7.6 (0.8)	.010**	7.3 (1.0)	7.7 (0.7)	.022*	7.2 (0.9)	7.6 (0.9)	.007**
What do you do after you get into bed? (n=336)									
Some activity	61 (67.0)	100 (40.8)	.001**	16 (55.2)	43 (38.7)	0.14	45 (72.6)	57 (42.5)	.001**
Nothing (sleep immediately)	30 (33.0)	145 (59.2)		13 (44.8)	68 (61.3)		17 (27.4)	77 (57.5)	
Owned their own communications devices (n=344)									
Yes	85 (90.4)	78 (31.2)	.001**	26 (86.7)	31 (27.2)	.001**	59 (92.2)	47 (34.6)	.001**
No	9 (9.6)	172 (68.8)		4 (13.3)	83 (72.8)		5 (7.8)	89 (65.4)	

*p<.05; **p<.01; SD: Standard deviation

Analysis: χ^2 tests (or Fisher's exact test, if necessary); ^aStudent's t-test

No answers are excluded.

Table 3. SNS use as reported by subjects.

	Total (n=346)			Male (n=145)			Female (n=201)		
	Use SNS (n=94)	Don't use SNS (n=252)	p-value	Use SNS (n=30)	Don't use SNS (n=115)	p-value	Use SNS (n=64)	Don't use SNS (n=137)	p-value
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
My life is enhanced by social media.	3.1 (0.6)	2.3 (0.8)	.01**	2.9 (0.7)	2.3 (0.9)	.01**	3.9 (0.3)	3.4 (0.5)	.01**
With a communications device, I think that problems with my friends occur easily.	2.8 (0.9)	3.1 (0.7)	.01**	2.5 (0.9)	3.0 (0.8)	.01**	2.9 (1.0)	3.2 (0.6)	.05*
With a communications device, I can find out things that I don't know quickly.	3.3 (0.7)	2.7 (0.8)	.01**	3.3 (0.8)	2.7 (0.8)	.01**	3.9 (0.3)	3.7 (0.5)	.01**
Do you think you live a healthy life?	2.9 (0.7)	3.0 (0.6)	0.06	2.8 (0.7)	2.9 (0.6)	0.24	2.9 (0.6)	3.0 (0.5)	0.08

*p<.05; **p<.01; SD: Standard deviation

Items: strongly agree: 4; agree: 3; slightly disagree: 2; disagree: 1.

Mann Whitney-U test

students had smartphones, 39 (23.9%) had mobile phones, 34 (20.9%) had personal computers, and 23.3% had games consoles or other equipment. Ninety-four (27.2%) students used SNS and 252 (72.8%) did not, with more female students using SNS (p=.027).

Connection between Participant Characteristics and their Use of SNS

Subjects' characteristics by gender and use or nonuse of SNS, and the connection between these two groups are shown in Table 2. Overall, the group that used SNS, in comparison with the group that did not, had more students

who attended cram schools or other extracurricular activities (p=.037), more went to bed after 11pm (p=.01), their average sleeping time was shorter (p=.01), and more owned their own communications devices (p=.001). They also engaged in activities after going to bed (p=.001).

If we examine this result by gender, the group that used SNS contained more male students in the second year of junior high school than in the first year (p=.04), male students had shorter sleeping hours (p=.022), and more of them owned their own communications devices (p=.001). The same trends were present overall among female students.

Table 4. Connection between CFSI and the two groups of SNS use.

	Range	Total (n=346)			Male (n=145)			Female (n=201)		
		Use SNS	Don't use SNS	p-value	Use SNS	Don't use SNS	p-value	Use SNS	Don't use SNS	p-value
		(n=94)	(n=252)		(n=30)	(n=115)		(n=64)	(n=137)	
		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
CFSI total score	32-108	58.3 (17.0)	56.4 (15.8)	0.34	54.2 (13.6)	55.1 (15.9)	0.77	60.2 (18.1)	57.5 (15.6)	0.28
Subscale										
Depressive feelings	7-28	13.4 (3.3)	13.3 (3.2)	0.84	13.7 (4.5)	14.2 (5.4)	0.64	15.3 (6.0)	15.1 (5.3)	0.81
Physical disorders	8-29	12.7 (4.4)	11.3 (3.6)	.01**	11.4 (3.8)	11.1 (3.6)	0.61	13.3 (4.6)	11.4 (3.5)	.01**
Loss of vigor	5-20	8.2 (5.2)	8.0 (4.9)	0.58	6.8 (2.7)	6.6 (2.9)	0.86	6.8 (2.7)	6.5 (2.7)	0.55
Reduced vitality	4-16	8.2 (2.7)	8.5 (2.8)	0.43	7.6 (2.4)	8.4 (2.9)	0.2	8.5 (2.8)	8.5 (2.7)	0.86
Chronic fatigue	4-16	8.8 (3.3)	8.4 (15.8)	0.36	8.2 (2.5)	8.3 (3.3)	0.85	9.1 (3.6)	8.6 (3.1)	0.26
Irritability caused by excessive SNS use	4-16	6.9 (3.1)	7.0 (3.2)	0.85	6.5 (2.9)	6.6 (2.8)	0.82	7.1 (3.2)	7.3 (3.2)	0.73

*p<.05; **p<.01; SD: Standard deviation
 CFSI: The Cumulative Fatigue Symptoms Index
 Students t-test

Table 5. Factors contributing to raising the CFSI by binary logistic regression.

Variable (Reference Group)	Male (n=145)			Female (n=201)		
	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
School year (1 year)	1.336	0.606-2.943	0.473	1.095	0.57-2.104	0.786
Sleeping time (before 11pm)	2.8	1.091-7.086	.032*	0.675	0.29-1.572	0.362
Hours of sleep	1.565	0.874-2.802	0.132	0.692	0.447-1.073	0.1
Owned their own communications devices (None)	0.871	0.371-2.043	0.751	2.187	1.12-4.27	.022*
What do you do after you get into bed? (Nothing)	2.521	1.126-5.643	.025*	1.981	1.017-3.859	.044*

*p<.05

Table 3 shows SNS use, as reported by participants. In the items “My life is enhanced by social media” and “With a communications device, I can find out things that I don’t know quickly,” more of the students in the group that used SNS responded that their lives had been enhanced or that they could find things out (p=.01). In the “I think that problems with my friends occur easily” item, more of the group that did not use SNS agreed with this statement (p=.01). In the items “My life is enhanced by social media” and “With a communications device, I can find out things that I don’t know quickly,” more of both genders in the group that used SNS responded that their lives had been enhanced or that they could find things out (p=.01). In the “I think that problems with my friends occur easily” item, more male (p=.05) and female (p=.01) students in the group that did not use SNS agreed. No significant difference was observed in the “Do you think you live a healthy life?” item for self-awareness of health of subjects overall.

Connection between CFSI and the use of SNS

Table 4 shows the connection between CFSI by gender and the two groups of SNS use. In an overall comparison by gender, there was no significant difference in CFSI between the two groups. However, there was a high value for the CFSI’s subscale of “physical disorders” among female

students and students who used SNS overall (p=.01).

In order to investigate the risk factors that raise CFSI, we implemented two-item multiple logistic regression analysis by gender with five subscales that were significantly univariate (Table 5). The use of SNS was excluded, as the possession of their own communications devices is a confounding factor.

High CFSI was connected with male students who responded that they went to bed after 11pm (p=.032, ORs=2.8, 95% CI=1.09-7.09) and that they engaged in an activity after going to bed (p=.025, Odds=2.5, 95% CI=1.12-5.64). High CFSI was connected with female students who responded that they owned their own communications devices (p=.022, OR=2.2, 95% CI=1.12-4.27) and that they engaged in an activity after going to bed (p=.044, OR=2.0, 95% CI=1.02-3.86).

Discussion

We conducted a study to investigate whether everyday habits and the use of SNS affect the CFSI of Japanese junior high school students. According to a survey of the use of social media in young people conducted by the Ministry of

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Internal Affairs and Communications in 2013, 42.6% of junior high school students used social media with a rate of utilization of approximately 40%. The rate of utilization for junior high school students in this study with regard to SNS in particular was 27.2%. If we consider that SNS are popular web tools, we can suppose that the subjects of this study comprise a group with a low utilization trend.

Furthermore, this study compared the characteristics of the everyday habits of 2 groups: the group that used SNS and the group that did not use SNS in order to investigate characteristics and trends in students who used SNS. The result was that the group that used SNS went to bed later at 11pm or later and slept significantly less than the group that did not use SNS.

This study clarified that the use of SNS raised the CFSI subscale of physical disorders among female students in comparison to those who did not use SNS. In addition, risk factors that increase CFSI were present among male students who responded that they went to bed after 11pm and that they engaged in an activity after going to bed and among female students who responded that they owned their own communications devices and that they engaged in an activity after going to bed. Due to the strong connection between owning a communications device and the use of SNS, it was clarified that students who owned their own communications devices formed bad sleeping habits by using SNS, playing games, or sending e-mails after going to bed and before going to sleep, and that they were thus accumulating fatigue.

Previous research reports have identified the negative influence of short sleeping time and everyday habits on junior and senior high school students through the use of mobile phones and the internet⁷⁾¹²⁾¹³⁾. The results of this study corroborate the results of previous research in that the use of SNS, which is one part of internet use among junior high school students, is linked to bad sleeping habits.

Furthermore, this study focused on behavior between the time of going to bed until falling asleep, as an everyday habit related to bedtime and sleeping time. The results showed that, regardless of SNS use, approximately half of students overall did not go to sleep straight after going to bed. This demonstrated the pre-bed behavioral pattern of junior high school students in the cold regions of Japan who do not go to

sleep straight after going to bed. In particular, many students in the group that used SNS responded that they engaged in an activity after going to bed. A trend of replies such as “I play application games” and “I use my smartphone” was observed in the students’ evaluation of their own behavior. The group that used SNS was assumed to sleep for a shorter time due to online activities after going to bed.

There are already reports that the light reception from the screens of personal computers or mobile phones used before going to sleep delay the phases of the biological clock, stimulate the sympathetic nerves, and prevent good quality sleep (Jun 2008). In addition, there are reports that viewing mobile phones, etc., in bed contributes to eyestrain¹⁴⁾. Based on these results, we decided to inform parents and guardians that although their child’s room is dark and their child is in bed, there is a possibility that the child is not sleeping. It was also suggested that health education to improve pre-bed patterns is essential. This education should include the effects of internet use after going to bed on sight, hearing, and quality of sleep among junior high school students.

This study also showed that there were differences between male and female students in that female students had higher CFSI and more female students owned their own communications devices, used SNS, and went to bed later. Previous research also reported that female students complained of sleepiness or sluggishness more than male students¹⁵⁾ and that fatigue and sluggishness amongst female senior high school students is connected to mealtimes and bedtimes¹⁶⁾. It is suggested that the causes, which differ between the sexes, of these feelings of tiredness and general malaise, are due to changes in feelings and sleep patterns caused by female sex hormones¹⁷⁾. However, on the other hand, some reports have found no differences between the sexes so the question has not been satisfactorily resolved. This study was able to assume that the cause of a high CFSI was poor sleeping habits, which is an important everyday habit, as a characteristic of the female junior high school student subjects.

This study recognized the connection between attending cram school or other extracurricular activities and SNS use among female students, 54.8% of whom returned home after 9pm. It is assumed that parents and guardians give

communications devices to their female children for crime prevention or because of the necessity of contact for picking up and dropping off¹⁸⁻¹⁹). However, students using SNS recognized that “My life is enhanced by social media” and “I can find out things that I don’t know quickly” and there were situations in which they were using their communications devices for convenience other than contacting their parents or guardians. Meanwhile, in the group that did not use SNS, more students agreed with the statement, “When I use social media, I think that problems with my friends occur easily.” It is suggested that there is a trend for junior high school students who understand the dangers of SNS not to use them simply for convenience but also to weigh the risks and be cautious about their use.

Limitations

Firstly, this is a cross-sectional study, which cannot prove a causal relationship. Secondly, the participants were confined to a limited area of Japan, which may limit the generalizability of these findings. In addition, as third year junior high school students were excluded from the study, it does not give a true representation of the actual status of all junior high school students. Thirdly, it is likely that there is a bias in responses related to the low questionnaire response rate. In the future, it is necessary to collect data from participants in a wider area and implement a longitudinal study that can clearly prove a causal relationship.

Conclusion

This study was conducted with the aim of clarifying the relationship between the use of SNS and CFSI in junior high school students in Niigata City in Japan. The use of SNS raised the CFSI subscale of “physical disorders” among female students in comparison to those who did not use SNS. For both male and female students, a risk factor associated with increased CFSI was owning a communications device. It was clarified that students who owned their own communications devices had developed poor sleeping habits by using SNS, playing games, or sending e-mails after they went to bed and before going to sleep, and that this led to accumulated fatigue.

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