

## ■ ORIGINAL ARTICLES

# Survey on physical or mental health status of university students in Japan and Thailand

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**ABSTRACT:**

**[Background]** In Japan and Thailand, problems of physical or mental health conditions, underweight, and overweight have increased, and more people are unable to estimate the appropriate body shape. Maintaining an appropriate weight is important, and personal goal-setting, motivation, and lifestyle are particularly essential to achieve it. This study examined the relationship between physical health status, such as fatigue or stress, and BMI or mental health condition among Japanese and Thai students.

**[Methods]** A total of 189 (108 male and 81 female) and 179 (38 male and 141 female) Japanese and Thai pharmacy students, respectively, were included as participants. A survey questionnaire was used to gather data on the participants' age, gender, weight, height, physical and mental health status, ideal body image (weight and height), health consciousness, and degree of sleep satisfaction.

**[Results]** The desire to lose weight was higher in female than in male students in Japan. However, no significant difference was found between BMI and degree of fatigue or stress among Japanese and Thai students. Meanwhile, a significant difference between sleep satisfaction and mental health status was found among these populations.

**[Conclusion]** Positivity factors were thought to be associated with good physical status, sleep satisfaction, and reduced fatigue or stress. Young people need to be educated on health consciousness so that they can maintain an ideal body image and a good mental health status.

**Key words:** Ideal Body Image, Fatigue or Stress, Mental Health Status

## INTRODUCTION

Since the enforcement of the Health Promotion Law in 2003, various political measures have been implemented in Japan. The Healthy Japan 21, a 10-year health-promotion plan based on the Ottawa Charter for Health Promotion by the World Health Organization (WHO), was started in 2000 and aimed to realize a vigorous society with people who have good health. However, some of the goals of this plan were not sufficiently accomplished. For example, the development of lifestyle-related diseases was not successfully prevented. As a result, the second term of Healthy Japan 21 was established in 2013. This plan mainly promotes prolongation of healthy life expectancy and prevention of lifestyle-related diseases and complications. One of the key factors in the prolongation of healthy life expectancy is the prevention of obesity and lifestyle-related diseases. Primary obesity prevention should be enforced during adolescence because appropriate exercise and desirable dietary habits in this period are important for obesity prevention later in life<sup>1,2)</sup>.

According to the 2015 National Health and Nutrition Survey by the Ministry of Health, Labour and Welfare, the percentage of people with low BMI (<18.5 kg/m<sup>2</sup> BMI) aged 20–29 years was 22.3%, higher than in any other age group<sup>3)</sup>. This value exceeded the 20% goal proposed in the Healthy Japan 21, and this trend is likely to continue in the future. A possible reason behind the weight-loss consciousness among young adults is the increased prevalence of the cult of weight-loss, which is disseminated through social networking services and mass media. Pirke *et al.*<sup>4)</sup> and Genazzani *et al.*<sup>5)</sup> reported that weight loss causes hormone secretion abnormality. Furthermore, Rierdan and Koff<sup>6)</sup> reported that distorted body image is related to the progress of depression. Therefore, it is necessary to cultivate appropriate body evaluation as misconceptions of the ideal body cause health risks.

In Thailand, people's lives are improving because of industrial development. However, the projected increase in the incidence rate of lifestyle-related diseases in the future has been a source of concern. According to the WHO<sup>7)</sup>, 26% and 33% of male and

female individuals in Thailand, respectively, had BMI of >25 kg/m<sup>2</sup> in 2014. The number of obese children in Thailand has been markedly increasing as well. Thus, interventions focused on lifestyle improvement, such as nutrition education<sup>8)</sup> and behavior modification<sup>9)</sup>, are necessary to combat these health issues. Additionally, these findings indicate the urgency of obtaining new findings that can serve as health guidelines in the prevention of increased incidence of obesity.

Personal goal-setting and motivation are important in the achievement of individual lifestyle and behavior modification. Nagasawa *et al.*<sup>10)</sup> reported that a significant proportion of individuals who were obese were interested in pursuing a healthy lifestyle, but the proportion of those who actually took steps to be healthier was <10%–25%. Regular, healthy diet at home and moderate exercise are also important in the maintenance of an appropriate weight<sup>11)</sup>. Personal goal-setting and motivation are particularly essential to maintain appropriate weight, and the latter is dependent on fatigue or stress.

We performed a survey to obtain the data necessary for the development of health-promotion plans through identifying an association between fatigue or stress and BMI or mental health status.

## SUBJECTS AND METHOD

### 1. Population

A total of 189 (108 male and 81 female) third- to fifth-year university students in Japan and 179 (38 male and 141 female) third-year university students in Thailand were included as participants in 2015. The collection rate was 100%, and the number of valid responses was 88.7% overall.

### 2. Questionnaire for university students

Table 1 shows the questionnaire used in the survey and data on the participants' age, gender, weight, height, physical and mental health status, ideal body image (weight and height), health consciousness, and degree of sleep satisfaction.

Table 1 Questionnaire entitled survey on lifestyle habits

<b>Physical characteristics</b>												
1 . Age	_____ year											
2 . Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female											
3 . Height	_____ cm											
4 . Weight	_____ kg											
<b>Ideal body height and weight</b>												
5 . Height	<input type="checkbox"/> Decreasing	<input type="checkbox"/> Keeping										<input type="checkbox"/> Increasing
6 . Weight	<input type="checkbox"/> Decreasing	<input type="checkbox"/> Keeping										<input type="checkbox"/> Increasing
<b>Physical health status</b>												
7 . Fatigue in the past month												
<input type="checkbox"/> No <input type="checkbox"/> Yes, 1 - 2 times <input type="checkbox"/> Yes, 3 - 4 times <input type="checkbox"/> Yes, more than 5 times												
8 . Stress in the past month												
<input type="checkbox"/> No <input type="checkbox"/> Yes, 1 - 2 times <input type="checkbox"/> Yes, 3 - 4 times <input type="checkbox"/> Yes, more than 5 times												
<b>Mental health status</b>												
Select 5 or 6 normally												
9 . Level of success in achieving goals	Weak	1	2	3	4	5	6	7	8	9	10	Strong
10 . Sense of purpose	Weak	1	2	3	4	5	6	7	8	9	10	Strong
11 . Mental strength	Weak	1	2	3	4	5	6	7	8	9	10	Strong
12 . Worrisome	Little	1	2	3	4	5	6	7	8	9	10	Many
13 . Stress	Little	1	2	3	4	5	6	7	8	9	10	Many
14 . Troubled	Little	1	2	3	4	5	6	7	8	9	10	Many
15 . Health consciousness	Weak	1	2	3	4	5	6	7	8	9	10	Strong
<b>Sleep habits</b>												
Select 5 or 6 normally												
16 . Duration of sleep	Unsatisfactory	1	2	3	4	5	6	7	8	9	10	Satisfactory
17 . Depth of sleep	Unsatisfactory	1	2	3	4	5	6	7	8	9	10	Satisfactory
18 . Degree of sleep	Unsatisfactory	1	2	3	4	5	6	7	8	9	10	Satisfactory

### 3. Statistical analysis

The statistical analyses and significance tests were conducted using Windows JMP, version 12.0.1 (SAS Institute Inc., Cary, NC, USA). The significance level was set to 0.05. BMI was calculated based on the height and weight data of the participants and classified as follows: <math> < 18.5 \text{ kg/m}^2 </math>, underweight; <math> 18.5 \text{ to } < 25.0 \text{ kg/m}^2 </math>, normal; and <math> \geq 25.0 \text{ kg/m}^2 </math>, overweight. To determine the participants' ideal body images, we asked them whether they wanted to be thinner, fatter, shorter, or taller. Meanwhile, participants who had experienced fatigue and stress 1–2, 3–4, or >4 times in the last month were classified into the positive status group whereas those who had never experienced stress were classified into the negative status group. A scale from 1: weak to 10: strong was adopted for “level of success in achieving goals,” “sense of purpose,” “mental strength,” and “health consciousness” concerning the perception of achieving goals; a scale from 1: little to 10: many was adopted for “worrisome,” “stress,” and “troubled” concerning nervousness; and a scale from 1: unsatisfactory to 10: satisfactory was adopted for “duration of sleep,” “depth of sleep,” and “degree of sleep” concerning the

perception of sleep. Wilcoxon and chi-square tests and factor analysis were carried out for the statistical analysis. Factor analysis was conducted to find out the relationship between fatigue or stress and mental health status. The statistical analysis software HAD<sup>12)</sup>, using the squared multiple correlation parallel analytical insertion method<sup>13)</sup>, was used to determine the number of factors. For the factor analysis, we determined the factor loading of three factors using the promax rotation, an oblique rotation that permits correlation between factors.

### 4. Ethical consideration

The study protocol was approved by the Research Ethics Committee of Ohu University. The questionnaires were completed anonymously. The participants were informed that the obtained data would be used only for the research on antiaging and lifestyle-related disease prevention, that participation in the survey was voluntary, and that their privacy would be guaranteed.

## RESULTS

### 1. Ideal body image of university students

Table 2 shows the mean ages, heights, weights, and BMI of the students. The mean ages of the Japanese and Thai male students were 22.2 and 22.3 years, respectively, whereas those of the Japanese and Thai female students were 21.4 and 21.9 years, respectively. The mean height, weight, and BMI of the Japanese male students were 171.4 cm, 66.1 kg, and 22.5 kg/m<sup>2</sup>, respectively, whereas those of the Thai male students were 171.3 cm, 67.0 kg, and 22.8 kg/m<sup>2</sup>, respectively. Meanwhile, the mean height, weight, and BMI of the Japanese female students were 157.1 cm, 50.1 kg, and 20.3 kg/m<sup>2</sup>, respectively, whereas those of the Thai female students were 160.7 cm, 52.1 kg, and 20.2 kg/m<sup>2</sup>, respectively. No significant differences in mean weight and BMI were observed between the Japanese and Thai students. However, Thai female students were significantly taller than Japanese female students ( $p < 0.001$ ). Based on the BMI distribution, 12.3% and 19.7% of male and female Japanese students, respectively, and 7.9% and 29.1% of male and female Thai students, respectively, were underweight. Meanwhile, 20.7% and 6.2% of male and female Japanese students, respectively, and 18.4% and 7.8% of male and female Thai students, respectively, were overweight. These results indicate that the percentage of obese students is similar in both countries, although Thailand has a higher percentage of underweight female students than Japan.

Table 3 shows the results of the survey on ideal body images among Japanese and Thai students. As shown in Table 3, 42.5% and 75.3% of male and female Japanese students, respectively, and 63.2% and 68.1% of male and female Thai students, respectively, wanted to lose weight. Particularly in Japan, the percentage of female students who wanted to be thinner was significantly higher than that of male students ( $p < 0.001$ ). In terms of height, approximately 45% of students wanted to become taller. No significant differences in ideal weight and height were observed between the students from Japan and Thailand.

Table 4 shows the students' ideal weight and BMI. The percentages of male and female obese students

who wanted to lose weight were 15.1% and 6.2% in Japan and 18.4% and 7.1% in Thailand, respectively. On the other hand, the percentages of male and female students who had weight within the normal BMI range but wanted to be thinner were 27.4% and 61.7% in Japan and 42.1% and 53.2% in Thailand, respectively. In this survey, the percentage of female students who wanted to lose weight was higher than that of male students.

### 2. Relationship between physical health status and BMI

Table 5 shows the results of the survey on the students' degree of fatigue and stress in the past month, which was conducted a month prior to the present survey. A total of 90.6% and 96.3% of male and female students, respectively, in Japan and 71.1% and 87.9% of male and female students, respectively, in Thailand experienced fatigue. This finding suggests that more female than male students experienced fatigue in both countries. Regarding the difference between these countries, the percentage of Japanese students who experienced fatigue was significantly higher than that of Thai students. In contrast, no significant difference in the degree of stress was observed between the students from Japan and Thailand. Specifically, 84.0% and 95.1% of male and female Japanese students, respectively, and 89.5% and 90.8% of male and female Thai students, respectively, experienced stress.

Table 6 shows the correlations between physical health status, such as fatigue or stress, and BMI. Studies on such correlations remain to be conducted so far. In the present study, physical status was found to not be significantly correlated with BMI.

### 3. Relationship between physical and mental health status

Table 7 shows the mean scores of the students' mental health status, sleep satisfaction, and health consciousness. Japanese male students obtained lower scores than Thai male students in the number of goals, sense of purpose, mental strength, degree and depth of sleep, and health consciousness ( $p < 0.01$  to  $0.001$ ).

Table 2 Physical characteristics of university students in different gender and country

Physical characteristics	Male		<i>p</i> value	Female		<i>p</i> value
	in Japan	in Thailand		in Japan	in Thailand	
Age(year)	22.2 ± 2.5	22.3 ± 1.1	0.007 **	21.4 ± 2.1	21.9 ± 1.0	<0.001 ***
Height(cm)	171.4 ± 5.6	171.3 ± 5.8	0.960	157.1 ± 5.4	160.7 ± 5.6	<0.001 ***
Weight(kg)	66.1 ± 12.1	67.0 ± 11.7	0.780	50.1 ± 6.0	52.1 ± 8.0	0.163
BMI(kg/m <sup>2</sup> )	22.5 ± 3.9	22.8 ± 3.4	0.566	20.3 ± 2.4	20.2 ± 2.9	0.212

mean±S.D., \*\**p*<0.01, \*\*\**p*<0.001, *p*-statistical significance obtained using the Wilcoxon test.

Table 3 Ideal body height and weight of university students in Japan and Thailand

Questions	in Japan			in Thailand			<i>p</i> value
	Decreasing	Keeping	Increasing	Decreasing	Keeping	Increasing	
<b>Male</b>							
Height	0.0	54.7	45.3	2.6	52.6	44.7	0.261
Weight	42.5	40.6	17.0	63.2	28.9	7.9	0.074
<b>Female</b>							
Height	3.7	51.9	44.4	0.7	54.6	44.7	0.282
Weight	75.3	19.8	4.9	68.1	24.8	7.1	0.507

(%), *p*-statistical significance obtained using the likelihood ratio test.

Table 4 Relationship between BMI and ideal body weight of university students in Japan and Thailand

BMI(kg/m <sup>2</sup> )	in Japan			in Thailand		
	Decreasing	Keeping	Increasing	Decreasing	Keeping	Increasing
<b>Male</b>						
<18.5	0.0	4.7	7.6	2.6	0.0	5.3
18.5~24.9	27.4	33.0	6.6	42.1	29.0	2.6
25.0≤	15.1	2.8	2.8	18.4	0.0	0.0
<b>Female</b>						
<18.5	7.4	7.4	4.9	7.8	14.2	7.1
18.5~24.9	61.7	12.4	0.0	53.2	9.9	0.0
25.0≤	6.2	0.0	0.0	7.1	0.7	0.0

(%)

Table 5 Physical health status of university students in Japan and Thailand

Questions	Male		<i>p</i> value	Female		<i>p</i> value
	in Japan	in Thailand		in Japan	in Thailand	
<b>Fatigue</b>						
No	9.4	28.9	0.006 **	3.7	12.1	0.026 *
Yes	90.6	71.1		96.3	87.9	
<b>Stress</b>						
No	16.0	10.5	0.395	4.9	9.2	0.234
Yes	84.0	89.5		95.1	90.8	

(%), \*\**p*<0.01, \**p*<0.05, *p*-statistical significance obtained using the Likelihood ratio test.

Table 6 Relationship between BMI and fatigue or stress of university students in Japan and Thailand

	<i>p</i> value			
	Male		Female	
	in Japan	in Thailand	in Japan	in Thailand
Fatigue	0.387	0.489	0.288	0.362
Stress	0.371	0.905	0.948	0.222

*p*-statistical significance obtained using the Wilcoxon test.

Table 7 Mental health status and sleep habits of university students in Japanese and Thailand

Questions	Male			Female		
	in Japan	in Thailand	<i>p</i> value	in Japan	in Thailand	<i>p</i> value
<b>Mental health status</b>						
Level of success in achieving goals	5.2 ± 2.1	8.2 ± 1.9	<0.001 ***	5.1 ± 2.3	8.0 ± 1.5	<0.001 ***
Sense of purpose	4.6 ± 2.2	6.9 ± 2.5	<0.001 ***	4.4 ± 2.1	6.7 ± 2.2	<0.001 ***
Mental strength	5.0 ± 2.3	7.2 ± 1.7	<0.001 ***	4.0 ± 2.0	7.4 ± 1.7	<0.001 ***
Worrisome	6.1 ± 2.7	6.3 ± 2.1	0.880	6.5 ± 2.5	5.7 ± 2.2	0.009 **
Stress	5.7 ± 2.6	5.8 ± 2.2	0.857	6.4 ± 2.4	5.8 ± 2.3	0.071
Troubled	5.5 ± 2.5	4.8 ± 2.2	0.142	6.0 ± 2.3	4.8 ± 2.4	<0.001 ***
<b>Sleep habits</b>						
Duration of sleep	5.0 ± 2.5	5.8 ± 2.0	0.051	4.7 ± 2.4	5.5 ± 2.0	0.001 **
Depth of sleep	5.2 ± 2.5	7.4 ± 1.8	<0.001 ***	5.4 ± 2.6	7.1 ± 2.1	<0.001 ***
Degree of sleep	4.9 ± 2.4	6.3 ± 2.7	0.003 **	5.0 ± 2.3	6.2 ± 2.3	<0.001 ***
Health consciousness	4.8 ± 2.1	8.1 ± 1.7	<0.001 ***	5.4 ± 2.1	7.8 ± 1.6	<0.001 ***

mean±S.D., \*\*\**p*<0.001, \*\**p*<0.01, *p*-statistical significance obtained using the Wilcoxon test.

On the other hand, Japanese female students obtained higher worrisome and troubled scores than Thai female students. These results indicate that Thai students have more goals, stronger minds, and higher degree of sleep satisfaction and are more health conscious than Japanese students.

Table 8 shows the results of the factor analysis on mental health condition and sleep satisfaction among the students in both countries. We defined the factor

loadings of worrisome, stress, and troubled as “negativity factors” for factor 1. Meanwhile, we defined the factor loadings of length, depth, and degree of sleep as “sleep factors” for factor 2. For factor 3, the factor loadings of goal-consciousness, number of goals, and mental strength were high. We refer to these variables as “positivity factors.” The cumulative contribution percentages of these three factors were 35.3%, 57.6%, and 73.4%, respectively.

Table 8 Results of principal factor method and promax rotation on university students in Japan and Thailand

	Factor 1	Factor 2	Factor 3
Worrisome	0.630	0.058	-0.003
Stress	0.827	-0.065	0.074
Troubled	0.859	-0.015	-0.025
Duration of sleep	-0.059	0.666	-0.033
Depth of sleep	0.009	0.654	0.132
Degree of sleep	0.035	0.995	-0.031
Level of success in achieving goals	0.107	0.012	0.835
Sense of purpose	0.077	0.028	0.735
Mental strength	-0.359	-0.005	0.606
Cumulative contribution percentages(%)	35.3	57.6	73.4

Table 9 Relationship between factor and fatigue or stress of university students in Japan and Thailand

	in Japan			in Thailand		
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
<b>Male</b>						
Fatigue	0.003 **	0.230	0.762	0.031 *	0.234	0.797
Stress	<0.001 ***	0.054	0.406	0.016 *	0.330	0.721
<b>Female</b>						
Fatigue	0.165	0.812	0.039 *	0.012 *	0.013 *	0.103
Stress	0.004 **	0.079	0.578	0.003 **	0.155	0.118

\*\*\**p*<0.001, \*\**p*<0.01, \**p*<0.05, *p*-statistical significance obtained using the Wilcoxon test.

Table 9 shows the correlations of the three extracted factors with fatigue and stress. A significant correlation was observed between negativity factors and fatigue or stress among the male students in both countries. Concurrently, significant correlations between negativity factors and stress as well as positivity factors and fatigue were found among Japanese female students. Furthermore, correlations between negativity factors and fatigue or stress as well as sleep factors and fatigue were noted among Thai female students. Therefore, the higher the factor loading of the negativity factor was, the greater the degree of fatigue and stress was among the students.

## DISCUSSION

### 1. Ideal body image of university students

The mean weight and height of the students in our study who responded to the survey were approximately the same as those of the 22-year-old participants of the 2015 National Health and Nutrition Survey in Japan<sup>3</sup>). The fact that approximately 45% of all the students wanted to be taller and  $\geq 63.2\%$  of all the students, except for Japanese male students, desired to lose weight suggests the presence of a large gap between the current and ideal body images among these students. The mean BMI of all the students in our study was within the normal range with female participants having lower BMI than male participants in both countries. Particularly, the obesity rate in Thailand has been increasing, and 26% and 33% of male and female individuals, respectively, were reported to be obese in Thailand<sup>7</sup>). However, the percentage of participants with obesity in our study was lower than those values presumably because our participants belong to the younger generation.

A large number of students in our study with normal BMI wanted to lose weight. In particular, approximately half of the female students had a false perception of an ideal body image. Kaneda et al.<sup>14</sup>) reported that 15% of thin female adolescents at puberty considered themselves to be too fat in Japan. Additionally, the desire for a slender body or misconceptions of the ideal body may have negative effects on psychological and physical developments in

Japan<sup>14,15</sup>). These findings suggest the need to educate young students on the appropriate BMI and health hazards caused by weight-loss so that the misconceptions of the ideal body can be addressed.

In our study, the percentages of thin students who wanted to gain weight, students with normal BMI who wanted to keep their current weight, and obese students who wanted to lose weight ranged from 23.5% to 55.7% among Japanese female and male students, respectively. Therefore, education on the appropriate weight seems to be necessary. Female students with hidden obesity tend to consume food with too much fat and not enough vegetables, which puts them at risk for lifestyle-related diseases in Japan<sup>16</sup>). Additionally, individuals with hidden obesity are also inclined to do irregular exercises in Japan<sup>17</sup>). Therefore, interventions focused on improving food and exercise habits are necessary.

### 2. Relationship between physical health status and BMI

In our study, the proportions of Japanese students who experienced fatigue  $>4$  times a month was remarkably higher than that of Thai students. In Thailand, the proportions of students who experienced stress 1–2, 3–4, or  $>4$  times a month were almost even. However, in Japan, 37.7% and 48.1% of male and female students, respectively, experienced stress  $>4$  times a month. These findings suggest differences in the degree of fatigue and stress among the students in these two countries. University students may spend their college lives with anxiety caused by various factors, such as job hunting and relationships. Osako *et al.*<sup>18</sup>) reported the absence of a correlation between fatigue and BMI, although fatigue was observed to be correlated with self-rated body image in Japan. However, a correlation between fatigue or stress and obesity was noted only among individuals aged  $\geq 50$  years in Japan<sup>19</sup>). Additionally, people aged between 35 and 55 years have high risk of obesity associated with mental disorder, fatigue, or stress<sup>20</sup>). Meanwhile, in our study, no significant difference between fatigue or stress and BMI was found among students in both Japan and Thailand.

### 3. Relationship between physical and mental health status

The findings of this survey indicated that Thai students had better mental health status, sleep satisfaction, and health consciousness than Japanese students. These results may be attributed to the cultural differences between the two countries. To conduct a more detailed analysis of the survey results, we carried out a factor analysis, which is often used in psychological studies. Except for Japanese female students, those who experienced fatigue and stress had significantly high negativity factor values. Moreover, Japanese female students who experienced fatigue had significantly low positivity factor values. Wardle and Haase<sup>21)</sup> reported that Japanese women had the highest prevalence of perceived overweight (63%) with Thailand second in Asian countries. In addition, Japanese young women were more likely to feel that they were overweight compared to “other people,” which is higher than the average for all female respondents in Japan<sup>22)</sup>, and they tend to have negative thinking. As above, Japanese young women could not be confident of themselves, and this prevented positive thinking. In particular, positive factors and fatigue in Japanese young women were correlated. A study conducted in Japan showed that individuals aged between 40 and 69 years who felt less happiness in life had a higher risk of cardiovascular diseases than those who felt happier<sup>23)</sup>. Furthermore, those who were more satisfied with life or optimistic were more likely to live longer than those who were not<sup>24)</sup>. In other words, negativity factors have an unfavorable influence on health. Thus, the finding that participants with fatigue and stress exhibited high negativity factor values is reasonable. Incidentally, a study reported that Japanese students do not tend to cope with problems in a positive manner, for example, by solving them or using social support, but are likely to depend on negative coping mechanisms, such as reproaching themselves or evading the problems<sup>25)</sup>. Regular exercise may help maintain psychological wellness in Japan<sup>26)</sup>. Therefore, active interventions to improve students' exercise habits are necessary. Previous studies in Japan revealed that fatigue is correlated with physical condition or awakening<sup>27)</sup> and that female

students with reduced hours of sleep are more likely to experience fatigue<sup>28)</sup>. Similarly, in our study, female Thai students who experienced fatigue during the past month exhibited low sleep-factor values. Considering that men and women experienced different degrees of fatigue<sup>27)</sup>, the relationship between fatigue or stress and the aforementioned extracted factors differed between genders. Most students who experienced fatigue or stress had anxious temperament and troubles. Hence, educating them on the importance of goal-setting and positive thinking is crucial.

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