

Survey on Meal Habit, Hours of Sleep and Exercise Habit of University Student in Japan and Thailand

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Abstract

Improper meal and exercise habits potentially lead to obesity and lifestyle-related diseases. Since there are signs that the atmospheric temperature in Japan will rise, the climate in this country will become subtropical in the near future. We distributed a questionnaire to university students in Japan and Thailand to survey meal habit, hours of sleep and exercise habit, and examined the correlations among them. A questionnaire entitled, "Questionnaire about Body Stature and Lifestyle of University Students", was distributed and collected from 54 male and 69 female university students in Japan and 83 male and 72 female university students in Thailand. Those who usually do not eat breakfast but eat between-meal snacks was higher in Thailand, whereas the percentage of students who eat breakfast but no between-meal snacks was higher in Japan. Japanese students liked to exercise more than Thai students did. The body mass index (BMI) of the Thai students was nearly equal to that of the Japanese students, while the body fat percentage was higher in the Thai students than in the Japanese students.

Thai students spent longer lengths of time eating meals than Japanese students. Among all students, body fat percentage and BMI were not significantly correlated with the level of exercise. The body fat percentage of the Thai students was higher than that of the Japanese students. We think that deficiency of exercise is a cause of the increased body fat percentage in the Thai students. It was considered that Thai students tend to suffer from visceral obesity. Since insufficient sleep lowers the ability of concentration, Japanese students should ensure that they get sufficient sleep and exercise.

1. Introduction

Obesity occurs when the amount of consumed energy is markedly higher than the amount of energy that is expended. The amount of walking conducted by Japanese people is currently very low, and the amount of consumed energy by Japanese people tends to also

be low. It has been reported that the incidence of visceral obesity, which is a risk factor for "lifestyle-related diseases,"¹⁻³⁾ increases as the length of time that individuals spend eating meals increases. It would be interesting to clarify the relationships among the length of time spent eating meals, the number of meals per day, obesity, and the number of

hours of sleep per day. A study on the meal habit and nutritional status of adolescents in Europe⁴⁾ and an epidemiological study on the relationship between the number of hours of sleep and lifestyle factors in Japanese factory workers⁵⁾ have been conducted. A dose-response relationship between short sleeping hours and childhood obesity⁶⁾ has been reported.

Human sleep has a rhythm which is controlled by an internal clock and sleep substances so that people are normally awake during the daytime and sleep during the night. With the spread of 24-hour opened convenience stores, however, the sleep of people who work at night has been disturbed and they have sleep deficiency. Sleep deficiency not only leads to disturbance of daily life but also increases the risk for traffic accidents because of reduced concentration, memory and thinking ability⁷⁾. According to the "Japanese Use Time" survey made by the NHK Broadcasting Culture Research Institute in 2000, the mean duration of sleep among all people living in Japan was 7 hours and 23 minutes^{8,9)}. In a sleep survey of 14,000 subjects in 28 countries conducted in 2004, the average number of sleeping hours among subjects in Japan was the lowest, and 41% of the Japanese subjects answered that they slept for less than 6 hours per day¹⁰⁾. The mean duration of sleep was the longest among subjects in Australia, and 31% of them answered that they slept for more than 9 hours per day. The sleeping habit of the Japanese subjects markedly differed from that of the Thai subjects. Forty-three percent of the Japanese subjects and 58% of the Thai subjects went to bed by midnight. Sixty-four percent of the former subjects and 61% of the latter subjects woke up by 7 A.M. Eighteen percent of the Japanese subjects and 40% of the Thai subjects sleep for more than 8 hours per day¹⁰⁾.

The environment on the earth has recently been worsening. In particular, global warming is considered to be the most important problem because it induces climate changes. The Global Warming Convention came into effect in February 2005 with much difficulty, and measures are at last being taken against carbon dioxide emissions. However, it is predicted that the climate in Japan will become subtropical in the near

future, because the atmospheric temperature in this country has been increasing every year^{11,12)}. We were consequently interested in Thailand, which is now a subtropical country. We distributed a questionnaire to university students in Japan and Thailand in order to survey meal habit, hours of sleep and exercise habit, and we examined the correlations between them.

2. Methods

2.1 Study subjects

A questionnaire form entitled, "Questionnaire about Body Stature and Life-style of University Students", was distributed to 54 male and 69 female students at a university in Osaka, Japan, and 83 male and 72 female students at a university in Chiang Mai, Thailand. Completed questionnaires were collected from all students. In this study, the age of the male and female university students in Japan was 21.2 ± 1.2 years (mean \pm standard deviation) and 20.8 ± 1.0 years, respectively, and that of the male and female university students in Thailand was 20.8 ± 1.3 years and 20.8 ± 1.5 years, respectively. This study falls in the category of "an epidemiological study only using unlinkable, anonymized data" in "The Ethical Guidelines for Epidemiological Research" implemented by the Japanese Society of Public Health in July 2005¹³⁾. This study was conducted while following the descriptions of obtaining informed consent and protection of confidentiality in the Guidelines. The questionnaire was anonymous to respect the students' privacy according to ethical considerations.

The body fat percentage was measured with the Body Composition Monitor HBF-300 (OMRON, Tokyo, Japan), and grip was measured by a hand dynamometer TANITA6103 (TANITA, Tokyo, Japan). Body mass index (BMI) was calculated by the equation, (body weight in kilograms) / (height in meters)². The subjects were categorized as "underweight" if $BMI < 18.5$, "normal" if $18.5 \leq BMI < 25.0$, "overweight" if $25.0 \leq BMI < 30.0$, and "obese" if $30.0 \leq BMI$, based on the classification of obesity established by the Japan Society for the Study of Obesity¹⁴⁾.

The questionnaire, which was specially developed for this study, was comprised of the following items:

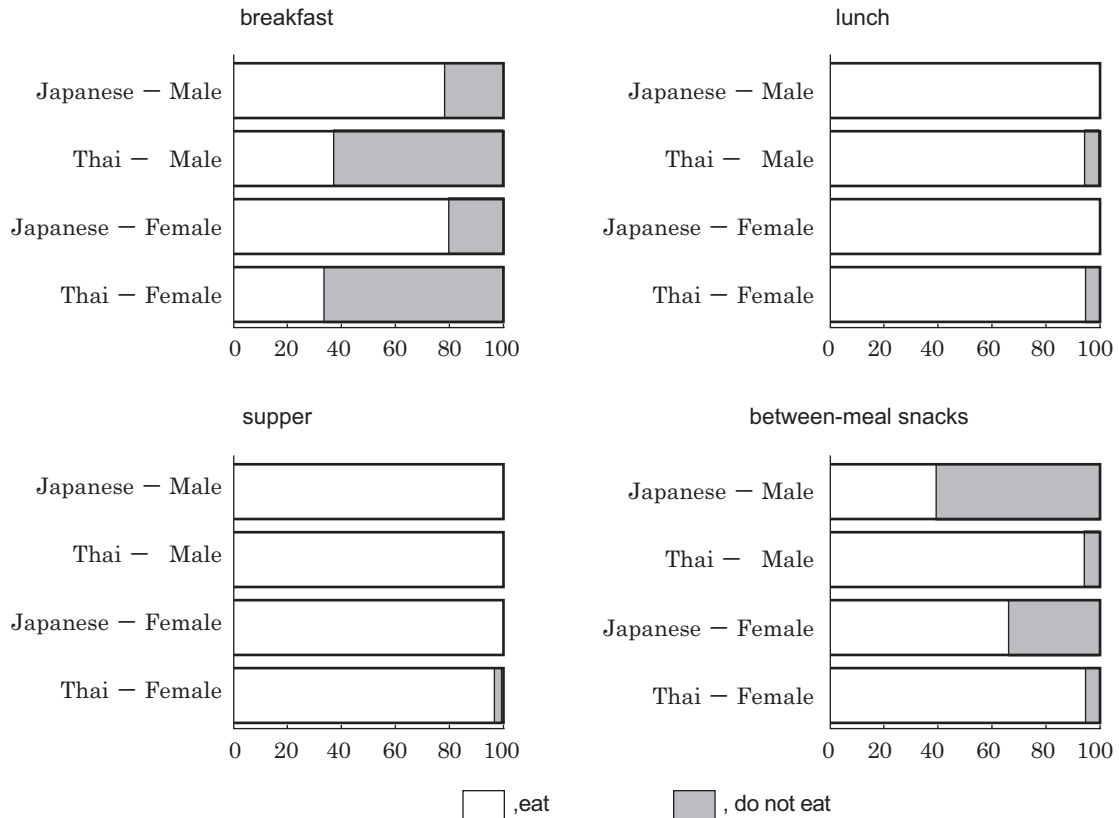


Figure 1 Percentage of Japanese and Thai university students who usually eat breakfast, lunch, supper and between-meal snacks.

gender, age, exercise habit, number of occasions of exercise per week, number of hours spent exercising per week, and number of hours spent eating meals. For each meal, the subject selected one of two possible responses: “1. eat” or “2. do not eat”. As to exercise habit, the subject selected one of three possible responses: “1. like”, “2. neither like nor dislike”, or “3. dislike.”

2.2 Relationships between exercise habit and BMI, body fat percentage or number of hours of sleep

We evaluated the relationships between the exercise habit and BMI, body fat percentage or number of hours of sleep using the Pearson product-moment correlation coefficients. The Pearson product-moment correlation coefficient reflects the strength of the linear relationship between two variables, and is calculated as shown in equation [1], where x and y are response variables.

$$r = \frac{\sum (x - \bar{x}) (y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2} \sqrt{\sum (y - \bar{y})^2}} \dots\dots\dots [1]$$

Statistical analysis and the test for assessing the significance of differences were performed with Windows JMP ver. 5.1 (SAS Institute Inc., Tokyo, Japan). Differences were considered to be significant at p<0.05.

3. Results

3.1 Meal habit of Japanese and Thai students

University students in Japan and Thailand were asked to fill out a questionnaire asking whether they usually eat breakfast, lunch, supper, and between-meal snacks by choosing “1. Eat” or “2. Do not eat”. The results are summarized in **Figure 1**. About 80% of male and female students in Japan answered that they usually eat breakfast, whereas about 35% of male and female students in Thailand answered that they usually eat breakfast. As to lunch, all Japanese male and female students answered that they usually eat lunch, whereas about 95% of the male and female Thai students answered that they usually eat lunch. Nearly all students in Japan and Thailand answered

Table 1 Health, strength and nutrition of Japanese and Thai university students.

	Japan				Thailand			
	Male	n	Female	n	Male	n	Female	n
age (year)	21.2 ± 1.2	54	20.8 ± 1.0	67	20.8 ± 1.3	81	20.8 ± 1.5	72
height (cm)	171.1 ± 5.7	54	157.2 ± 5.3	69	171.9 ± 5.6	83	160.5 ± 5.8	72
weight (kg)	61.5 ± 7.3	54	48.3 ± 4.7	69	62.0 ± 11.3	83	51.2 ± 8.4	72
body fat percentage (%)	16.1 ± 4.0	52	23.0 ± 3.8	66	17.6 ± 5.7	83	24.0 ± 5.3	72
BMI (kg/m ²)	21.0 ± 2.0	54	19.5 ± 1.5	69	21.0 ± 3.4	83	19.9 ± 3.3	72
hours of sleep (h)	6.6 ± 1.3	54	6.4 ± 1.1	67	7.5 ± 1.3	74	7.5 ± 1.4	68
breakfast (min)	12.9 ± 7.6	40	12.1 ± 5.1	54	16.3 ± 8.6	30	15.0 ± 7.8	24
lunch (min)	19.2 ± 9.7	53	23.4 ± 9.2	67	23.4 ± 10.9	80	25.3 ± 10.2	69
supper (min)	27.5 ± 10.5	53	31.4 ± 12.8	67	30.5 ± 15.8	83	33.1 ± 15.8	70
number of exercise (time/week)	1.7 ± 2.2	52	0.97 ± 1.1	57	1.1 ± 0.35	41	1.2 ± 0.6	26
time spent for exercise (min)	92.1 ± 121.5	43	93.3 ± 81.6	40	67.3 ± 38.4	41	41.2 ± 25.3	26
right grip (kg)	43.6 ± 8.2	54	26.0 ± 4.8	69	38.5 ± 4.8	83	24.3 ± 4.7	72
left grip (kg)	40.1 ± 7.7	54	23.9 ± 4.5	69	36.6 ± 5.2	83	22.1 ± 4.1	72

Mean ± S.D.

that they usually eat supper. A larger percentage of Thai students answered that they usually eat between-meal snacks than did Japanese students. A larger percentage of female students answered that they usually eat between-meal snacks than did male students

3.2 Time spent eating meals by Japanese and Thai students

To clarify the relationships among the length of time spent by Japanese and Thai students eating breakfast, lunch, and supper, Pearson’s product-moment correlation coefficients were calculated and are shown in **Table 1**. Significant correlations at

p<0.001 and p<0.01 were found among times spent by Japanese and Thai male students for breakfast, lunch, and supper. On the other hand, there was a significant correlation between the length of time spent eating lunch and the length of time spent eating supper among the female students in Japan and Thailand (p<0.001). The length of time spent eating breakfast was correlated with the length of time spent eating lunch or supper among the female students (p<0.05).

3.3 Exercise habits of Japanese and Thai students

The Japanese and Thai university students were asked whether they like to exercise or not by choosing one from among “1. Like”, “2. Neither like nor dislike”, and “3. Dislike”. The results are summarized in **Figure 2**. A larger percentage of Japanese students answered that they like to exercise than did Thai students. A larger percentage of male students answered that they like to exercise than did female students. The percentage of female students who answered that they neither like nor dislike to exercise was higher than that of male students. These results indicate that male students had a tendency to be distributed in the two extreme groups of either liking or disliking to exercise.

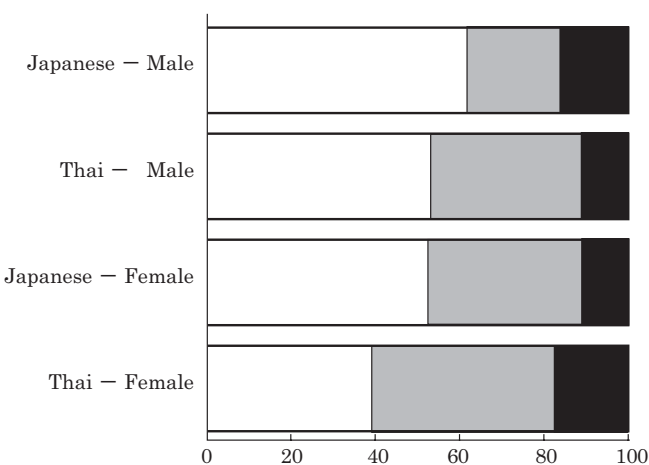


Figure 2 Exercise habit of the Japanese and Thai university students.
 □,like exercising ■,neither like nor dislike exercising ■,dislike exercising

Table 2 Pearson correlation coefficients between exercise and body fat percentage, BMI or hours of sleep among the Japanese and Thai university students.

	Japan		Thailand	
	Male	Female	Male	Female
vs. time spent for exercise per week (min)				
body fat percentage (%)	0.037	0.074	- 0.010	- 0.170
BMI (kg/m ²)	- 0.024	0.358 *	- 0.036	<0.0001
hours of sleep (h)	0.040	- 0.078	0.017	- 0.298
vs. numbers of occasions of exercise per week (times)				
body fat percentage (%)	- 0.008	- 0.080	0.183	- 0.209
BMI (kg/m ²)	0.150	- 0.002	0.077	- 0.008
hours of sleep (h)	0.044	0.050	- 0.033	- 0.564 **

** p < 0.01, * p < 0.05

3.4 Constitution and lifestyle of Japanese and Thai students

Table 2 summarizes the height, weight, body fat percentage, BMI, hours of sleep, time spent eating each meal, number of occasions for exercise per week, number of hours of exercise per week, and grip strength in the Japanese and Thai students. There was no significant difference in height between the Japanese and Thai male students, whereas the mean height of Japanese female students was approximately 3 cm lower than that of Thai female students. The Japanese male students and Thai male students also had similar weight, body fat percentage and BMI. On the other hand, the weight, body fat percentage and BMI were lower in the Japanese female students than in the Thai female students. There was no significant gender difference in the number of hours of sleep. The mean duration of sleep among the Japanese students was one hour shorter than that among the Thai students. The Japanese students tended to spend shorter lengths of time eating breakfast, lunch, and supper than the Thai students. The mean length of time spent eating supper was about 30 min in both the Japanese and Thai students. The number of occasions of performing exercise was one or two per week in all students. The Japanese students performed exercise for a mean of approximately 90 minutes per week, while the male Thai students performed exercise for a mean of 67.3 minutes and female Thai students did so for a mean of 41.2 minutes per week. The grip strength of Japanese students was stronger than that of Thai students.

3.5 Relationship between exercise habit and BMI or body fat percentage in Japanese and Thai students

To clarify the relationships among the number of occasions of exercise per week, the length of time spent performing exercise per week, the body fat percentage, BMI and number of hours of sleep, Pearson's product-moment correlation coefficients were calculated and are shown in Table 3. A significant correlation was found between the BMI and the number of occasions of exercise per week among the Japanese female students. In addition, a significant correlation was found between the number

Table 3 Pearson correlation coefficient between the lengths of time spent eating meals among the Japanese and Thai university students.

	breakfast (min)		lunch (min)	
Japanese-Male				
breakfast (min)	-		-	
lunch (min)	0.419	**	-	
supper (min)	0.473	**	0.433	**
Thai-Male				
breakfast (min)	-		-	
lunch (min)	0.752	***	-	
supper (min)	0.709	***	0.739	***
Japanese-Female				
breakfast (min)	-		-	
lunch (min)	0.287	*	-	
supper (min)	0.166		0.508	***
Thai-Female				
breakfast (min)	-		-	
lunch (min)	0.341		-	
supper (min)	0.500	*	0.621	***

***p < 0.001, **p < 0.01, *p < 0.05

of hours of sleep and the number of hours spent performing exercise per week among the Thai female students.

4. Discussion

In this study in which a questionnaire concerning meal habit was distributed to university students in Japan and Thailand, it was found that the proportion of students who usually eat breakfast was higher in Japan than in Thailand. In addition, some Thai students answered that they did not eat lunch. On the other hand, the percentage of students who answered that they eat between-meal snacks was larger in Thailand than in Japan, and was larger among the female students than among the male students. These results indicate that many Thai students do not eat breakfast but instead eat between-meal snacks. The proportion of Japanese students who answered that they usually do not eat breakfast but eat between-meal snacks was 14.5% among males and 3.7% among females. The corresponding values in Thailand were 42.2% among male students and 63.9% among female students. The percentage of Japanese students who usually eat breakfast but no between-meal snacks was 27.5% among males and 42.6% among females. The corresponding values in Thailand were 10.8% among males and 2.8% among females. These results indicate that Japanese students tend to eat breakfast, whereas Thai students tend not to eat breakfast but instead eat between-meal snacks.

The prospect of global warming may impact on the response of humans to chemical toxicants. Moreover, temperature and exercise are the two most well-studied parameters in the fields of environmental physiology¹⁵⁾. In this study, the Japanese students liked to exercise more than the Thai students did. The mean annual temperature in Osaka, Japan and Chiang Mai, Thailand, is 17.4 °C and 25.7 °C, respectively. The mean annual humidity in Japan and Thailand is 64.0% and 75.3%, respectively. Such high temperature and high humidity in Thailand may have partly contributed to a decrease in the proportion of students who like to exercise.

The Japanese and Thai male students who filled

out the questionnaire had nearly the same mean height. The mean height of the female students in Japan was 3 cm shorter than that of their counterpart in Thailand. Similar trends were found in body weight and BMI. Although the BMI of the Japanese students was nearly equal to that of the Thai students, the body fat percentage of the former group was slightly lower than that of the latter group. This suggests that the Thai students had larger amounts of visceral fat. It seems to be necessary to provide Thai students with information on meal habit in an effort to prevent lifestyle-related diseases.

Since the sleep rhythm throughout the night has been reported to be associated with obesity, it is important to investigate the number of hours of sleep with respect to prevention of diseases¹⁶⁾. The mean duration of sleep of the Japanese students was shorter than that of the Thai students by about one hour, while there was no significant gender difference in the duration of sleep in this study. Eighteen percent of the general population in Japan and 40% of the general population in Thailand were reported to have a duration of sleep exceeding 8 hours³⁾. Our results are in agreement with this report. Insufficient sleep is considered to lower the ability of concentration. Improvements in the lifestyle of both Thai and Japanese students seem to be necessary.

Since the existence of a correlation between meal pattern and obesity has been suggested in previous studies, we investigated the meal habits of Japanese and Thai students. It was also found that the lengths of time spent eating breakfast, lunch and supper were significantly correlated with each other. In view of the previous finding that the risk for visceral obesity increases as the length of time spent eating meals increases, the finding of the present study on the length of time spent eating meals by Thai students seems to be consistent with the finding concerning their body fat percentage.

Japanese students performed exercise for approximately 90 minutes per week, whereas Thai students spent less time performing exercise (67.3 minutes among male students and 41.2 minutes among female students). This is consistent with our finding that a

higher percentage of Japanese students liked to exercise. This indicates that Thai students dislike exercising compared with Japanese students and, accordingly, Thai students spent a fewer number of hours exercising per week than Japanese students. This result suggests that deficient exercise in Thai students led to an increase in body fat percentage, which was higher than that of the Japanese students.

Mutual correlations were examined among the number of occasions of exercise per week, length of time spent performing exercise per week, body fat percentage, BMI and the number of hours of sleep among the Japanese and Thai students. Among the Japanese female students, there was a significant correlation between the BMI and the number of occasions of exercise per week. Among the Thai female students, there was a significant correlation between the number of hours of sleep and the length of time spent performing exercise per week. On the other hand, there were no significant correlations between the parameters enumerated above among the male students. Therefore, it is conceivable that high body fat percentage and high BMI are not associated with the exercise habit.

5. Conclusion

The proportion of students who did not take breakfast but took between-meal snacks was much higher in Thailand than in Japan. The proportion of students who took breakfast but did not take between-meal snacks was higher in Japan than in Thailand. With regard to exercise habit, Japanese students like exercise more than Thai students do. The trend that Thai students dislike exercise is conceived to have partially resulted from the high average annual temperature and the high average annual humidity in Thailand. Although the BMI value in Japanese students was almost equal to that of Thai students, the value of body fat percentage in Japanese students was a little lower than that of Thai students. This suggests that the latter have more visceral fat. The results of this study show that the duration of sleep in Japanese students is about one hour shorter than that in Thai students. Since insufficient sleep lowers

concentration, Japanese students should improve their life style.

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日本およびタイの大学生の食習慣, 睡眠, 運動習慣に関する調査

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ヒトの睡眠は, 体内時計や睡眠物質により調整されており, 睡眠不足は, 集中力, 記憶力, 思考力の低下を招く。また, 食習慣や運動習慣は, 生活習慣病の原因となる肥満に関係していると考えられる。一方, 日本の気温は, 年々上昇していることから, 今後亜熱帯気候になることも予測されるため, 現在, 亜熱帯気候に属するタイに注目し, 日本人大学生およびタイ人大学生の睡眠時間, 食習慣および運動習慣についてアンケート調査を実施し, それらの関連性について検討した。

タイでは朝食を食べずに間食を食べる学生の割合が, また, 日本では朝食を食べ間食を食べない学生の割合が高かった。運動習慣は, 日本の大学生の方がタイの大学生に比べ運動を好み, タイの大学生が運動を好まない原因として年平均気温および年平均湿度が高いことが一要因となるものと考えられる。日本およびタイの大学生の BMI の値が同程度であるにもかかわらず, タイの大学生の体脂肪率は, 日本の大学生の値に比べ低い値となり, タイの大学生は内臓の脂肪が多いものと考えられる。日本の大学生の睡眠時間は, 約 1 時間タイの大学生に比べ短いことから, 日本の大学生に対し, 生活習慣の改善について推進することも必要であると考えられる。タイの大学生の体脂肪率は, 日本の大学生に比べ高い傾向にあり, タイの大学生の食事に要する時間は日本の大学生に比べ長く, 内臓型肥満の傾向が認められた。日本およびタイの大学生の一週間当りの運動回数, 運動時間と体脂肪率, BMI, 睡眠時間との関連性を解析した結果, 体脂肪率および BMI の値が高いことと運動習慣との間には関連性が認められなかったが, 運動不足も体脂肪率の増加の一原因になっていると考えられる。

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