

BMI, Breakfast Habits, and Fast Food Usage of American and Japanese College Students

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米国人大学生参加者（男子 30 名、女子 102 名）と日本人大学生参加者（男子 86 名、女子 67 名）の BMI（体格指数）、朝食摂取習慣、及びファストフード利用頻度の各因子についての相互関係を調査した。結果として、米国人男子大学生の BMI にのみ、朝食摂取習慣及びファストフード利用頻度が強く関係していた。米国人男子大学生は自分自身の朝食摂取習慣及びファストフード利用頻度に現状より一層の注意を払う必要があると暗示された。

American (30 male & 102 female) and Japanese (86 male & 67 female) college students were surveyed to investigate how Body Mass Index (BMI), breakfast habits, and weekly fast food usage were related to one another. Results indicated that breakfast habits and fast food weekly usage were strongly related to the BMI of American male college students but not to the other groups. Breakfast eating habits and frequent weekly fast food usage somehow might have a synergistic effect upon the BMI of American male college students exclusively.

Obesity is not exactly an infectious disease, but it has already spread all over the U.S. like an epidemic and poses a real danger to the health of American life (U.S. Department of Health and Human Services, 2001). The frequency of obese adults in the U.S. has doubled between 1980 and 2004 and currently 33.3% of men and 35.3% of women in the U.S. are obese (Ogden, Carroll, McDowell, & Flegal, 2007) and thus at least 280,000 annual deaths in the U.S. have been solely attributed to obesity (Allison, Fontaine, Manson, Stevens, & Vanitallie, 1999).

Obesity is also a real threat to the American college population. It is very common to find “super-sized” students on college campus in the U.S. (Sparling, 2007). Data from 94,806 college students throughout the U.S. in the spring 2006 semester found that 9.5% were obese and 21.9% were overweight (American College Health Association, 2007). The obesity and overweight problem in the college population has been attributed to both lack of regular exercise and poor dietary habits (Buckworth & Nigg, 2004; Huang, Harris, Lee, Nazir, Born & Kaur, 2003).

From 1977 to 1996, young adults between the ages of 19 and 29 significantly increased their nutritional energy intake at restaurants and fast food places (Nielsen, Siega-Riz, & Popkin, 2002). In addition, American adults in their 20s are the most frequent fast food users in all the age groups, spending 4.3 times more than adults ages 55 and over (Bowman & Vinyard, 2004). Sneed and Holdt (1991) found that the most frequent meal site for American college students was fast food restaurants. Moreover, U.S. male students eat fast foods more frequently than female students (Hertzler, Webb, & Frary, 1995; Sneed & Holdt, 1991). Hertzler, Webb, and Frary (1995) found that fat consumption drastically increased when both male and female college students increased the frequency of fast food usage. They hypothesized that an increase of fast food consumption actually increased nutrition intake from fat and thus might create a certain type of high fat diet lifestyle.

Some journalists hypothesized that recent dramatic increases of obesity were linked with the birth and an exponential growth of the fast food industry after World War II (Critser, 2003; Schlosser, 2001; Shell, 2002). Messier, Whately, Liang, Du, and Puissant (2007)

conducted a simulation study for fast food diet by using 38 male mice. The mice with high fat and high fructose diet gained weight significantly and also had a significantly higher level of blood glucose than the mice fed with normal food and water over three months. In studies of American adult populations, there were positive correlations between fast food usage frequency and the BMI (Bowman & Vinyard, 2004; Jeffery & French, 1998; Pereira et al., 2005).

Several studies found that skipping breakfast is one of the risk factors for obesity (Berkey, Rockett, Gillman, Field, & Colditz, 2003; Ma et al., 2003; van der Heijden, Hu, Rimm, & van Dam, 2007). Huang, Song, Schemmel, and Hoerr (1994) found that approximately one in five American college students do not eat breakfast regularly. Other studies also found a steady increase of skipping breakfast in children under the age of 18 (Siega-Riz, Popkin, & Carson, 1998) and adults over the age of 18 (Haines, Guilkey, & Popkin, 1996) in the U.S. from 1965 to 1991. Moreover, Niemeier, Raynor, Lloyd-Richardson, Rogers, and Wing (2006) reported that both fast food consumption and skipping breakfast are predictive factors for weight gain in nationally representative adolescent samples.

In contrast, neither being overweight nor obesity is a serious problem in Japanese college students and, especially, very few of them are obese (Kobayashi, 2007; Matsuura, Fujimura, Nozawa, Iida & Hirayama, 1992; Sakamaki, Amamoto, Mochida, Shinfuku & Toyama, 2005; Tanaka, Itoh & Hattori, 2002). Fast food is one of the representations of American lifestyle (Schlosser, 2001) and Japanese gradually have taken on a more American lifestyle after World War II. Indeed, fast food usage among college students has been increasing in Japan. Asano et al. (2003) found that male college students eat fast food more often than female students ($p < .01$) and 58.0% of male students and 36.6% of female students eat fast food once or more on a weekly basis. Several studies found that the frequent fast food users were more likely to skip one of their meals than the infrequent fast food users in a college population (Asano et al., 2003; Egami, Hasegawa, & Itazu, 1995; Egami, Hasegawa, & Ohya, 1993). The Ministry of Health, Labour and Welfare (2007) reported that 28.3% of Japanese aged from 20 to 29 in 2005 skipped their breakfast. Especially, more men (33.1%) skipped their breakfast than women (23.5%) did. In addition, Goto, Oishi, Takenaka, and Furukawa (2003) reported that approximately 60% of 837 college students in rural areas ate their breakfast regularly and about one out of four of them had a tendency of skipping breakfast.

In summary, the obesity problem may be a serious health risk for American college students and could be influenced by both breakfast habits and fast food usage. Fast food usage of Japanese college students is increasing and may be linked with skipping breakfast. However, there are few published studies that investigate how BMI (Body Mass Index), breakfast habit, and fast food usage are related to one another in these two different countries. Thus, this study researches this issue in both American and Japanese college populations simultaneously. It is hypothesized that both breakfast habits and fast food usage would be related to the BMI of American college students but not to that of Japanese college students.

Method

Participants

The Japanese participants were 153 undergraduate college students aged from 18 to 26 (56.2% men and 43.8% women) from a private university in a rural area of Japan. The American participants were 132 undergraduate college students

aged from 18 to 53 (22.7% men and 77.3% women) from a state university in a rural area of the U.S.

Procedure

The study was approved by the institutional review boards of both the state university in the U.S. and the private university in Japan. Then, the author collected the data from the two different universities in rural areas of the U.S. and Japan. After granting their informed consent, the participants answered about their own gender, age, height, weight, breakfast habit, and the frequency of eating fast food per week in their own native languages.

Results

All the statistical analyses were conducted by Statistical Package for the Social Sciences (SPSS) for Windows,TM version 16.0 J (SPSS Inc. Tokyo, Japan) with the level of significance at $p < .05$. Table 1 indicated the comparison data between American and Japanese samples in regard to target variables.

Table 1. Comparison data between American and Japanese samples in regard to target variables

Variable	Japanese			American			p
	Mean	SD	N	Mean	SD	N	
Age (year)	20.4	1.2	153	21.4	5.2	132	.05
Height (m)	1.66	.08	153	1.71	.10	132	.001
Weight (kg)	56.8	9.9	153	71.8	15.9	132	.001
BMI (kg/m ²)	20.5	2.4	153	24.5	4.2	132	.001
Fast Food (times)	.99	.80	153	1.95	1.1	132	.001
Breakfast (%)	73.9	NA	153	47.0	NA	132	.001

Note. Weight means body weight. BMI stands for body mass index. Fast Food (times) indicates the frequency of eating fast food per week. Breakfast (%) means the percentage of students who eat breakfast each day. NA indicates not applicable.

The American students were older ($t(283) = 2.06, p < .05$), taller ($t(283) = 4.30, p < .001$), heavier ($t(283) = 9.41, p < .001$), larger in BMI ($t(283) = 9.79, p < .001$), ate fast food more frequently per week ($t(283) = 8.50, p < .001$), and less likely to eat breakfast each day ($\chi^{2(1)} = 21.6, p < .001$) than their Japanese counterparts.

In order to investigate how BMI, breakfast habits, and weekly fast food usage were related to one another, 2 (Gender: Female or Male) X 2 (Breakfast Habit: Yes or No) X 2 (Fast Food Usage: Infrequent User or Frequent User) between-subjects Analysis of Variance (ANOVA) was conducted to each country's participants. Due to the differences in weekly fast food usage regarding the U.S. and Japan, the author made two definitions of frequent users for their fast food usage.

Regarding the Japanese sample, the author chose .99 usages per week as a maximum cutting point of infrequent user in order to make two comparative groups and also due to the fact that both mode and median scores were 1.0. In this way, 33.3% were classified as infrequent users and 66.7% were classified as frequent users.

Regarding the American sample, the author chose 1.99 usages per week as a maximum cutting point of infrequent user in order to make two comparative groups and also due to the fact that both mode and median scores were 2.0. In this way, 42.4% were classified as infrequent users and 57.6% were classified as frequent users.

When it came to the ANOVA results of the Japanese sample, there was a significant main effect of gender ($F(1, 145) = 17.1, p < .001$). None of the other effects were significant ($F_s < 2, ns$). Figure 1 displayed the mean BMI of male and female Japanese students regarding breakfast habit and fast food usage.

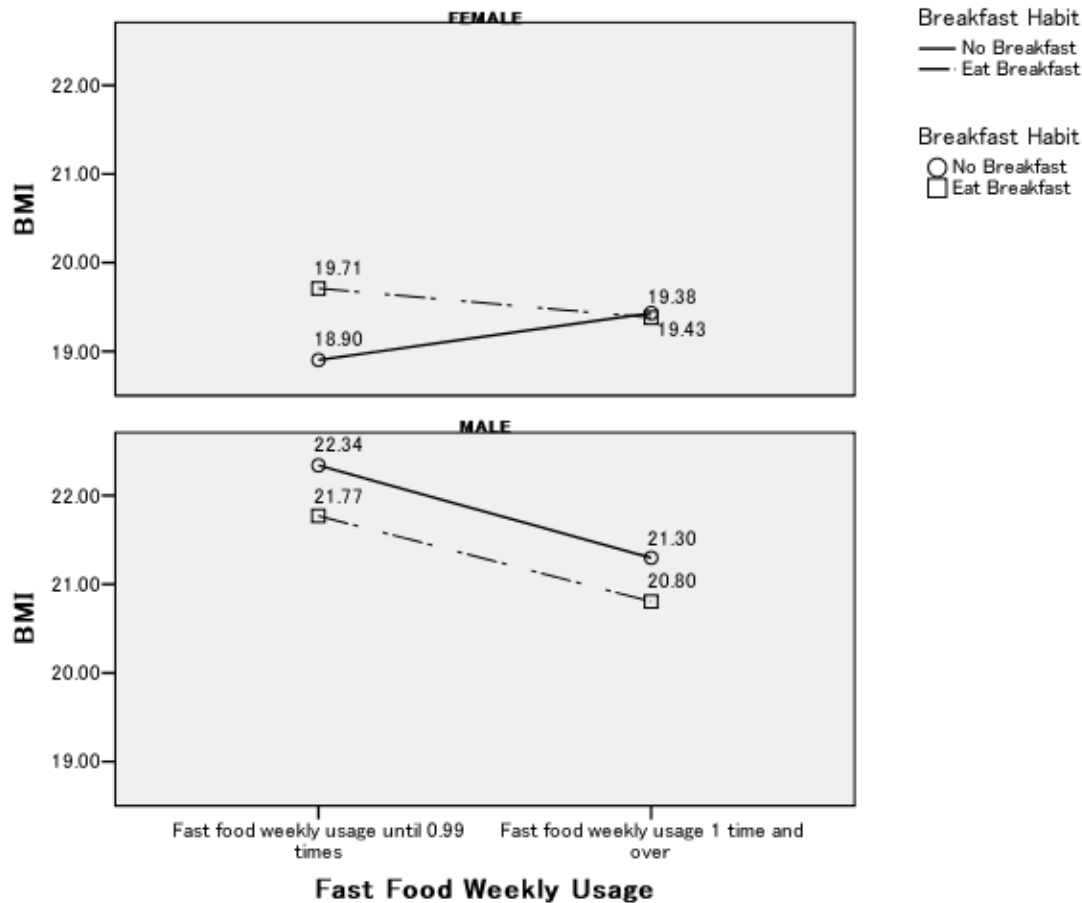


Figure 1. Mean BMI of male and female Japanese students regarding breakfast habit and fast food usage

When it came to the ANOVA results of the American sample, a three-way interaction effect between Gender X Breakfast Habit X Fast Food Usage became significant ($F(1, 124) = 6.72, p < .05$) and also there was a significant main effect of gender ($F(1, 124) = 9.14, p < .01$). None of the other effects were significant ($F_s < 3, ns$).

As a next step, 2 (Breakfast Habit: Yes or No) X 2 (Fast Food Usage: Infrequent User or Frequent User) between-subjects ANOVA was conducted on each gender. The results from the female sample indicated that none of the main and interaction effects were significant ($F_s < 2, ns$). However, the results from the male sample indicated that a two-way interaction effect between breakfast habit and fast food usage became significant ($F(1, 26) = 4.58, p < .05$). None of the other effects were significant ($F_s < 1, ns$). Then, the simple effects were tested for the male students. The simple effect of fast food usage upon male students who had a breakfast habit was marginally significant ($F(1, 26) = 3.08, p < .10$). In addition, the simple effect of breakfast habits upon male students who eat

fast food 2.00 times or more per week was also marginally significant ($F(1, 26) = 3.23, p < .10$). As shown in Figure 2, American male college students who had a breakfast habit increased their BMI in regard to their fast food usage but the BMI of American female college students are related with neither breakfast habits nor fast food usage and stayed within the normal range ($18.5 \text{ kg/m}^2 \leq \text{BMI} < 25 \text{ kg/m}^2$) based on the U.S. clinical guideline (National Institute of Health, US Dept of Health and Human Services, National Heart, Lung, and Blood Institute, and the North American Association for the Study of Obesity, 2000).

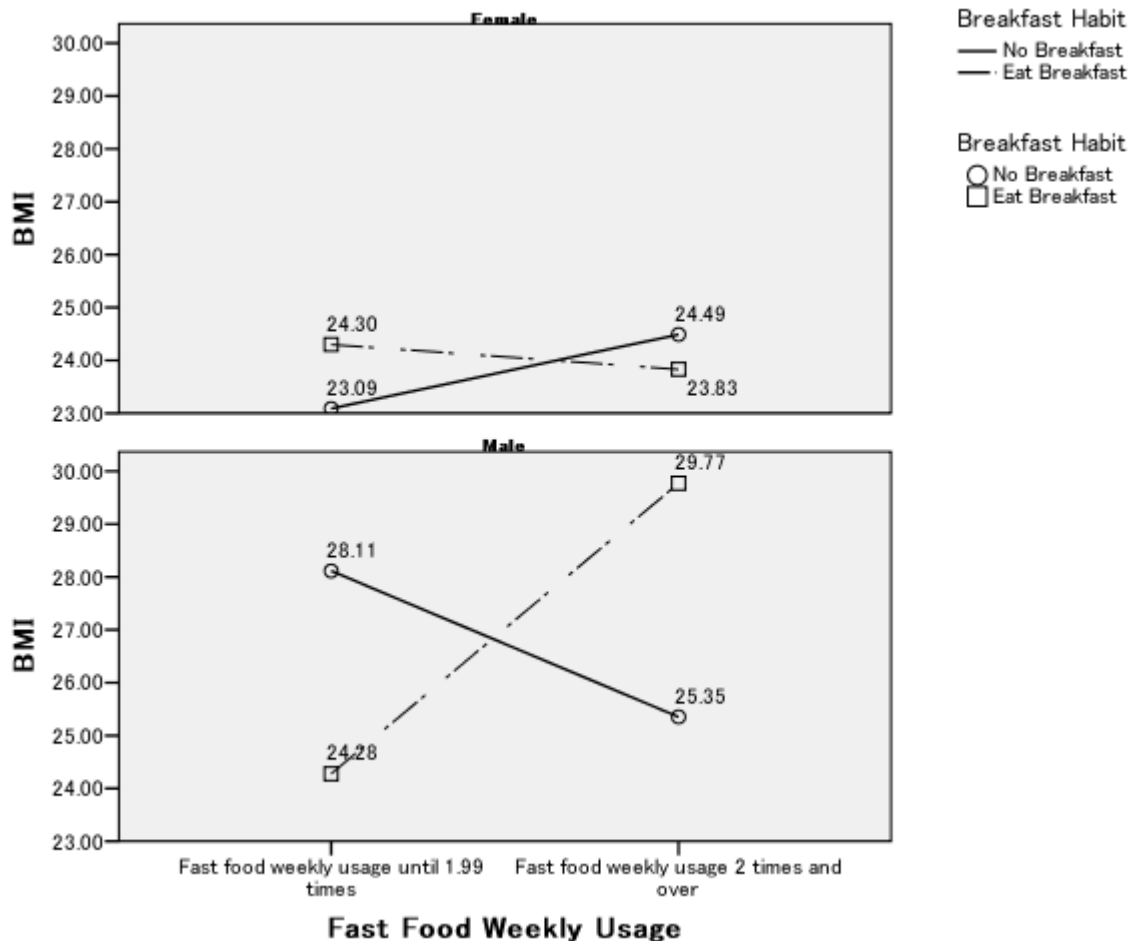


Figure 2. Mean BMI of male and female American students regarding breakfast habit and fast food usage

Discussion

Compared to the previous study (Huang, Song, Schemmel, & Hoerr, 1994), a lower frequency of American students (47.0%) ate their breakfast. Although Japanese were more likely to eat their breakfast (73.9%), this frequency was not in the satisfactory level because it also meant more than one in four of them did not eat their breakfast. Breakfast skipping is one of the risk factors for obesity (Berkey, Rockett, Gillman, Field, & Colditz, 2003; Ma et al., 2003; van der Heijden, Hu, Rimm, & van Dam, 2007), therefore, both American and Japanese students were increasing their risks for becoming overweight or obese.

Regarding the Japanese sample, their BMIs were not related to either breakfast habits or the level of weekly fast food usage. Although the author hypothesized that both the breakfast habit and fast food usage would be related to

the BMI of American students, such a result appeared only in the American male students. Regarding the American female students, neither breakfast habits nor fast food usage was related to their BMI significantly.

However, the BMI of American male students was related with both breakfast habit and the level of weekly fast food usage in a complex way. When American male students who had a breakfast habit ate fast food frequently, their BMI became significantly higher than their infrequent fast food users. It may result from the fact that they ate fast food as their breakfast. When the American male breakfast skippers were compared, the BMI of the infrequent fast food users was higher than that of the frequent fast food users. The infrequent fast food users may eat too much in later meals or snacks to decrease their hunger (Niemeier, Raynor, Lloyd-Richardson, Rogers, & Wing, 2006). On the other hand, the frequent fast food users might not eat anything after skipping meals. For example, researchers had already found that the frequent fast food users were more likely to skip one of their meals than the infrequent fast food users in a Japanese college population (Asano et al., 2003; Egami, Hasegawa, & Itazu, 1995; Egami, Hasegawa, & Ohya, 1993). Past research indicated that frequent fast food usage and skipping breakfast were two contributing factors for increasing obesity among American adolescents (Niemeier, Raynor, Lloyd-Richardson, Rogers, & Wing, 2006). This study did not find a similar result in the American female sample, but both factors were found to be related to the American male sample in a complex way. American male students should pay more attention to their breakfast habit and fast food usage than their female counterparts.

The limitations of this study should be noticed. First, the number in the American male sample was only 30 and it is less than one-third of their female counterparts. A future study should use a greater number of American male participants. Second, this study is non-experimental in design, thus, ANOVAs can indicate only relationships among target variables, but not any causal relationship among them. Although this study had its own limitations, this study warns American male college students to pay more attention to their breakfast habits and fast food usage.

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