

Relationship between motivation for food and the physique in female
university students

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Abstract

Relationship between motivation for food and the physique in female university students

Aim The purpose of the present study is to investigate relationship between motivation for food and the physique in female university students. **Methods** Thirty female university students (21.6 ± 0.8 years) answered survey on interest in food and dietary behavior and performed body composition. In this study, motivation for food is considered the height of the interest in food. The visual analogue scale (VAS) method used as a measurement for survey about the height of the interest in food and meal amount of dietary behavior. The amount of physical activity per week was evaluated using International Physical Activity Questionnaire Short Version. Body composition was measured using a body composition analyzer (InBody). This study calculated the correlation coefficient among food interest, eating behavior, physical activity, Body composition. **Results** Significant positive correlations were found between food interest and eating behavior, between food interest and physical activity. **Conclusion** These results suggested that the relationship between motivation for food and body composition, physique is not recognized.

女子大学生の食に対するモチベーションと体型との関連性

本研究の目的は、女子大学生の食に対するモチベーションと体型との関連性を調査することであった。30人の女子大学生(21.6 ± 0.8 歳)が食に対する興味と食事行動のアンケートに答え、体組成測定を行いました。本研究では、食に対するモチベーションを食への関心の高さと考えた。食への関心の高さ、食行動の食事量のアンケートの計測に、Visual analogue scale (VAS) を用いた。一週間あたりの身体活動量は国際標準身体活動質問票簡易版 (IPAQ) を使い、評価した。体組成の測定は、体成分分析装置 (InBody) を用いた。食への関心の高さと食行動の食事量、1週間当たりの身体活動量、体組成の間の相関関係を計算した。解析の結果、食への関心と食事行動、食への関心と身体活動の間に有意な正の相関関係がみられた。これらの結果から、女子学生において、食のモチベーションと体組成・体型の関係性は、認められないことが示唆された。

Relación entre la motivación por la comida y el físico de las estudiantes universitarias

El objetivo del presente estudio es investigar la relación entre la motivación por la comida y el físico en estudiantes universitarias. Treinta estudiantes universitarias ($21,6 \pm 0,8$ años) respondieron la encuesta sobre el interés en el comportamiento alimentario y dietético y realizaron la composición corporal. En este estudio, la motivación por la comida se considera la altura del interés en la comida. El método de escala analógica visual (VAS) utilizado como método de medición para la encuesta sobre la altura del interés en los alimentos y la cantidad de comida del comportamiento dietético. La cantidad de actividad física por semana se evaluó utilizando la versión corta del Cuestionario internacional de actividad física. La composición corporal se midió usando un analizador de composición corporal (InBody). Este estudio calculó el coeficiente de correlación entre interés alimentario, comportamiento alimentario, actividad física, composición corporal. Se encontraron correlaciones positivas significativas entre el interés alimentario y el comportamiento alimentario, entre el interés alimentario y la actividad física. Estos resultados sugieren que no se reconoce la relación entre la motivación para la alimentación y la composición corporal, físico.

Introduction

There are various dishes all over the world, and they report that represent the food culture of each country.

Japanese food draws many people's attention. For example, the first place that foreign tourists expect at the date and time of their visit is meals, the first foreign food that foreigners like is Japanese food (National Health and Nutrition Survey, 2013). In addition, the number of overseas Japanese restaurants increased significantly (National Health and Nutrition Survey, 2013). Furthermore, Japanese food recognized by UNESCO as an intangible cultural heritage in 2013.

While Japanese food is attracting worldwide attention, recently young people have many problems about food. For example, a diet that is too nutritionally unbalanced, irregular meals, habits of skipping breakfast, increasing tendency of solitary meals (eating alone) and individual meals (family eating different dishes) (Healthy Japan 21, 2013). Moreover, The Ministry of Health, Labor and Welfare points out any problems such as insufficient intake of vegetables and fruits, excessive intake of salt, overweight and lack of nutrition (Healthy Japan 21, 2013). For example, for young people in 20s and 30s, 26.9% of people does not take breakfast (Ishihara and Hotta, 2014). They report that skip breakfast due to lack of time or lack of appetite (Ishihara and Hotta, 2014). There is a strong relationship between food intake and academic performance (Hamaguchi et al. 2010). Accordingly, students who often skip their breakfast feel apathy and lazy during their class and their problem solving capacity is very low (Hamaguchi et al. 2010). Besides, the restaurant industry and the home-meal replacement industry developed in Japan, young people said that they are fulling their belly with a short stuff on an empty stomach (Asakura et al. 2007). People reports that intake high calorie food with careless nutrition called "Empty calorie" (Definition of Empty

Calories, 2018). Fast food, snack food, alcoholic beverages, carbonated beverages, and cakes are categorized as food that contain empty calorie. Taking extremely “Empty calorie” causes gain a weight. National Health and Nutrition Survey (2018) reported that the intake of “Empty calorie” foods is higher in the younger generation (National Health and Nutrition Survey, 2013).

Takahashi et al. (2002) investigated the degree of interest in the physique and food among male and female students aged 18 to 20. As the result, male students take exercise than female students, but male students have no interest about food and skipping meal than female students. As for the physique, the percentage of thin woman $BMI < 18.5 \text{ kg/m}^2$ aged 20 to 50 exceed 10% in any age, especially it is 21.7% in the 20s (National Health and Nutrition Survey, 2018). The proportion of females in their 20s who are trying to lose weight is high at 28.1% of those categorized as “skinny” (based on their BMI) and 62.8% of those in the “normal” group (Citizen Health and Nutrition Study, 2008). In addition, despite the standard weight, they are many females who think that they are fat. They report that unconsciously recognize the female body type that appears in the media on a daily basis as fashionable (Mori et al. 2012). Their tendency is speculated that this is one factor that increases the health risk of young women who do not need to lose weight in the first place. Moreover, a decreasing trend in their physical activity reported because it decreased by 4.1% in 10 years (Healthy Japan 21, 2013).

Kato (2004) reported students understand the importance of dietary behavior and knowledge of food, but they do not practice. Japan Broadcasting Corporation (2016) showed female focus on the emphasizing taste (preference) and price and neglecting the effort and quantity (satisfaction) to prepare (make) (Japan Broadcasting Corporation, 2016). Female need for understand individual healthy weight and appropriate dietary intake.

Healthy Japan 21 showed the importance of dietary eating, because lifestyles such as inappropriate eating and lack of exercise affect the shortness of life expectancy.

Today, people in twenties are called convenience store generations and are considered to be generations with a high degree of externalization of food (Kajiwara, 2006). Tanabe et al. (2001) announced that university students report to eat delicious and easy food while watching TV alone. The changes in the food environment have increased obesity in male by about 1.5 times and leanness in female in twenties by two times compared to 20 years ago (Ministry of Health, Labor and Welfare, 2006). Therefore, it can be said that changes in dietary habits have affected physique.

Thus, these were a lack of the necessary knowledge and skills to properly intake food and exercise, resulting from changes in female lifestyles. Therefore, this study elucidate the relationship between motivation for food and the physique of female university students. In this study, “motivation for food” is considered as “interest in food”. “Interest in food” was judged to be related to the following items: the fun of eating and like to eat, watching and interest in cooking programs and videos, purchase of cookbooks, food records, interest in local and special food, Knowledge of seasonal ingredients. Regarding the watching and interest of cooking programs and videos, and the purchase of cookbooks, Omori (2011) surveyed about university students' food consciousness, about 70% of respondents answered that they would like to learn knowledge and skills. Therefore, it was considered that watching and interest in cooking programs and videos, and purchasing cookbooks are methods to increase interest in food. Shiota (1998) reported that making special food helps to understand the characteristics of special food, experience the joy of cannibalism, raise interest in special food, and raise awareness of traditions. Murakami et al. (2010)

reported that dietary records not only lead to awareness of the amount and pattern of meals, but also raise interest and understanding of the significance of eating habits. A variety of ingredients is available regardless of the season, and the sense of seasonal food has disappeared (Ministry of Education, Culture, Sports, Science and Technology, 2009). However, it is assumed that those who are interested in food know the seasonal ingredients.

This study hypothesized that female students with higher motivation for food has smaller difference between it BMI and standard value. Because 69.9% of people regularly recognize weight and recognize food to prevent and improve lifestyle-related diseases (Ministry of Agriculture, Forestry and Fisheries, 2017). Therefore, we assumed if they have highly motivated for food, they understood the standard value of BMI and their own proper weight. Therefore, we assumed that there is correlation between the score of motivation for food and the difference from BMI standard value.

Materials and Methods

Participants

Thirty female university students (mean age \pm SD: 21.6 ± 0.8 years, range: 20-24 years) participated in this study. The participants who participated written informed consent for the study after receiving a detailed survey of the purposes and ethical considerations.

Experimental design

In this study, we conducted for all participants survey on Eating behavior and Interest in food, Physical activity survey using International Physical Activity Questionnaire Short Version, and a measurement of body

composition.

i. Survey on dietary behavior and interest in food

The survey included a question asking which extent a participant ate per meal in comparison with amount of meal

recommended based on Japanese Food Guide Spinning Top issued by Ministry of Health, Labour and Welfare and

Ministry of Agriculture, Forestry and Fisheries (Japanese Food Guide Spinning Top, 2005). Firstly, using Japanese

Food Guide Spinning Top, the recommended amount of meals per day was divided into three parts: breakfast, lunch,

and dinner. In this study, we express them as the quantity of breakfast, lunch, dinner. An average of the quantity

of breakfast, lunch and the dinner based on the Japanese Food Guide Spinning Top call dietary behavior score, and

indicates he average amount of food that participants are taking per day. If the Dietary behavior score is high, the

recommended quantity of food is satisfied. Secondary, using the illustrations on the Japanese Food Guide Spinning

Top, we considered the recommended amount per meal. We used Visual analogue scale (VAS) as a measurement

method for the questionnaire results. When the recommended amount was satisfied, it was determined as 10 and

when it was not satisfied at all, it was determined as 0. The following questions were answered with a choice of

YES or NO; “Do you always eat three meals a day? “Do you eat a certain time every day?” Therefore, it showed

as a percentage. Interest in food indicates the level of interest in food. The calculation of level of interest in food

uses a 10-line segment for each question that constitutes an interest in meals in this study, and evaluates the subjective

degree of the question item on a straight line. If the number is high, it is judged that the interest in food is high.

This survey about interest in food included searching for and viewing cooking programs and videos, watching

gourmet programs and books, searching for recipes and cooking methods, whether you prefer to eat, whether you

have meal records, knowledge of seasonal ingredients and special events. The questions that participants were asked are shown in Fig.1~5.

ii. International Physical Activity Questionnaire Short Version (IPAQ-SV)

IPAQ is an assessment index that measures physical activity for 18 to 65 years of age, and is highly reliable and valid (Kitamura et al. 2010). IPAQ-SV is an internationally standardized indicator for measuring self-reported average weekly physical activity from the perspective of high-intensity physical activity, moderate-intensity physical activity, and walking. All participants answered total physical activity per a week. Total physical activity Met-minutes/week was calculated from following equations (IPAQ, 2005).

Total physical activity Met-minutes/week=Walking Met-minutes/week+ Moderate Met-minutes/week+ Vigorous Met –minutes/week

Walking Met-minutes/week=3.3*walking minutes*walking days

Moderate Met-minutes/week=4.0*moderate-intensity activity minutes*moderate days

Vigorous Met-minutes/week=8.0*vigorous-intensity activity minutes*vigorous-intensity days.

iii. Body component measurement

A body component analyzer (InBody, InBody430, Japan) was used for measuring the body composition. BMI, amounts of skeletal muscle, and body fat percentage were measured. Before using InBody, participants wiped the palms and soles with an electrolytic tissue to increase conductivity. With bare feet, participants put their heel on the round electrode and got on the scale. Next, participants entered the height and gender of their personal information and started measuring. InBody used the same procedure as performed by Nonaka et al. 2018. BMI is a body mass

«第一部»

Q1.一日三食必ず食べますか？

Do you always eat three meals a day?

(いいえ)

(はい)

(No)

(Yes)

Q2.毎日決まった時間に食べますか？

Do you eat a certain time every day?

(いいえ)

(はい)

(No)

(Yes)

Q3.朝食は以下のようなメニューが推奨されています。

以下の食事の量を十分にとっているまたそれ以上の時を 10、全くとっていない時を 0 として、あなたはどのくらいとっていますか？

Breakfast introduces the following menu. How much do you eat? If you have enough of the following meals and any more, you get 10 points. If you eat not at all, you get 0 points.



牛乳コップ一杯分

A glass of milk



ウインナーのソテー

vienna sausage



サラダ

salad



ごはん 1 杯 A bowl of rice



味噌汁 miso soup

0

10

3

Fig.1 Questionnaire for survey about dietary behavior

Q4. 昼食は以下のようないいメニューが推奨されています。

以下の食事の量を十分にとっているまたそれ以上の時を10、全くとっていない時を0として、あなたはどのくらいとっていますか？

Lunch introduces the following menu.

How much do you eat? If you have enough of the following meals and any more, you get 10 points.

If you eat not at all, you get 0 points.



豚のしょうが焼き

ginger-fried pork



ほうれんそうのお浸し

boiled spinach



おにぎり 2 個

Two rice balls



かぼちゃの煮物

braised pumpkin



ヨーグルト

yoghurt

0

10

4

Fig.2 Questionnaire for survey about dietary behavior

Q5. 夕食は以下のようなメニューが推奨されています。

以下の食事の量を十分にとっているまたそれ以上の時を10、全くとっていない時を0として、あなたはどのくらいとっていますか？

Dinner introduce the following menu.

How much do you eat? If you have enough of the following meals and any more, you get 10 points. If you eat not at all, you get 0 points.



0 10

年齢 (歳)

Age: (years old)

居住形態: 実家 一人暮らし 寄

Type of residence: parent's home, live by oneself, dormitory

アルバイト： 有 無

Part-time job: Yes, No

5

Fig.3 Questionnaire for survey about dietary behavior

«第二部»

Q1. 食べることが好きですか？

Do you like to eat?

(全く好きではない)

(とても好き)

(Not at all)

(like very much)

Q2. 料理番組、動画を見ることに興味がありますか？

Are you interested in watching cooking programs and videos?

(全く興味がない)

(とても興味がある。)

(Not at all)

(be very interested)

Q3. グルメを紹介している番組や本を見ますか？

Do you watch programs which introduce food?

(全く見ない)

(よく見る)

(Not at all)

(frequently watch)

Q4. 料理本を購入しますか？

Do you buy cooking books?

(全く購入しない)

(よく購入する)

(Not at all)

(frequently buy)

Q5. ネットで料理（レシピや方法）を検索することがありますか？

Do you search for food (recipes and methods) online?

(全く検索しない)

(よく検索する)

(Not at all)

(frequently search)

Fig.4 Questionnaire for survey about interest in food

Q6. 自分自身の料理を記録したことがありますか？

Do you record dishes yourself?

(全く記録しない)

(Not at all)

(よく記録する)

(frequently record)

Q7. 食事をすることが楽しいと感じますか？

Do you think fun to eat?

(全く楽しくない)

(Not at all)

(とても楽しい)

(very fun)

Q8. 行事食（おせち、お雑煮、七草がゆ）などは食べますか？

Do you eat special food (Japanese New Year's cuisine, Ozouni, rice porridge with the seven herbs)?

(全く食べない)

(Not at all)

(よく食べる)

(frequently eat)

Q9. 出身地の郷土料理を知っていますか？

Do you know traditional food your state?

(全く知らない)

(Not at all)

(十分に知っている)

(frequently know)

Q10. 出身地の郷土料理を頻繁に食べますか？

Do you often eat traditional food?

(全く食べない)

(Not at all)

(頻繁に食べる)

(frequently eat)

Fig.5 Questionnaire for survey about interest in food

Q11. 地場産物を購入し、食べますか？

Do you buy food with local production and eat?

(全く食べない)

(Not at all)

(よく買い、食べる)

(frequently buy and eat)

Q12. 人と雑談するときに、「食」の話をしますか？

Do you talk about "food" with friends?

(全くしない)

(Not at all)

(よくする)

(frequently talk)

Q13. 旬の食材を知っていますか？

Do you know seasonal ingredients?

(全く知らない)

(Not at all)

(よく知っている)

(frequently know)

Q14. 旬の食材がいつおいしか知っていますか？

Do you know that seasonal ingredients is good?

(全く知らない)

(Not at all)

(よく知っている)

(frequently know)

Fig.6 Questionnaire for survey about interest in food

index, which is an internationally used physique index as an indicator of obesity. BMI is calculated by [weight (kg)] ÷ [height (m)²]. JASSO announced a BMI value of 22 as the appropriate weight (standard weight), statistically the least likely to get sick. BMI standard value was calculated from following equations. BMI standard value= |22- participant's BMI|

Statistics

The following questions were answered with a choice of YES or NO; “Do you always eat three meals a day?” and “Do you eat a certain time every day?”. Therefore, it showed as a percentage without applying the statistics. Other date is provided as mean. Before the analysis, the normal distribution of the date was confirmed using Shapiro-Wilk test. Since the data of this study were not normally distributed, the non-parametric analysis was used in this study as a result. Firstly, relationship among interest for food, eating behavior score, the total physical activity Met, BMI, the difference from BMI standard value were analyzed using Spearman’s rank Correlation Coefficient. Secondly, relationship among the amount of breakfast, the amount of lunch, the amount of dinner, interest for food, were analyzed using Spearman’s rank Correlation Coefficient. Observing the amount of meals per day, if there is a bias for meals in the morning, noon and night, it cannot be accurately evaluated. Therefore, considering the preamble, we extracted and analyzed relationship among the quantity of breakfast, lunch, dinner and food interests. The level of statistical significance was set at p < 0.05. Statistical analyses were performed using SPSS software (version 25.0; SPSS, Tokyo, Japan).

Results

In response to the question, “Do you always eat three meals every day?” 50% of the participants answered Yes and 50% answered No. In response to the question “Do you eat a certain time every day?” 13% of the participants answered Yes and 50% answered No.

There is a strong correlation between interest in food and dietary behavior score ($r=0.413, p<0.05$) (Fig.7). There is a correlation between interest in food and the physical activity per week ($r=0.375, p<0.05$) (Fig.8). There is no correlation between BMI and interest in food ($r=-0.133, p>0.05$) (Fig.9). There is no correlation between interest in food and the difference with BMI standard value ($r=0.047, p>0.05$) (Fig.10). There is no correlation between interest in food and amounts of skeletal muscle ($r=0.069, p>0.05$) (Fig.11). There is no correlation between interest in food and Body Fat percentage ($r=-0.195, p>0.05$) (Fig.12). The correlation between the items that make up the interest in food in this study and the physique and body composition is shown in Table.1, 2.

Discussion

Participants with higher eating behavior scores interest in food more ($r=0.413, p<0.05$) (Fig.7). We considered that those who are more interested in food take the amount of meal that recommended per day based on Japanese Food Guide Spinning Top. It suggested that participants are aware of the amount of meal on a daily basis. The participants with more interest in food has greater physical activity per week ($r=0.375, p<0.05$) (Fig.8). We considered that those who are interest in food reports that they perform physical activities such as walking, exercise, and sports. We thought that having an interest in food would be effective in increasing the amount of total physical

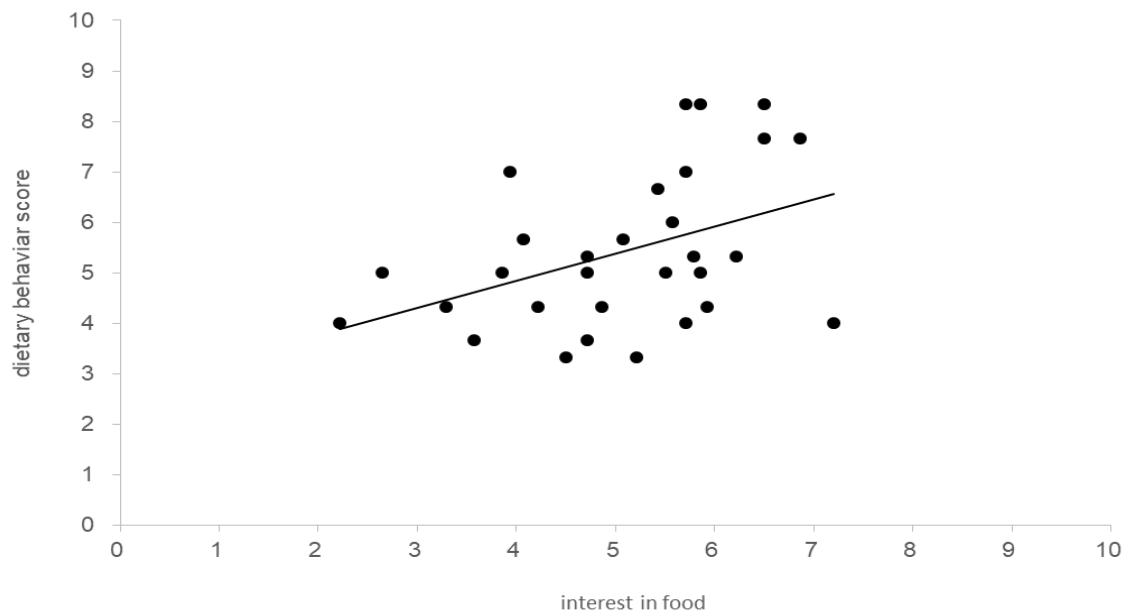


Fig.7 This is a correlation between interest in food and dietary behavior score ($r=0.413$, $p<0.05$)

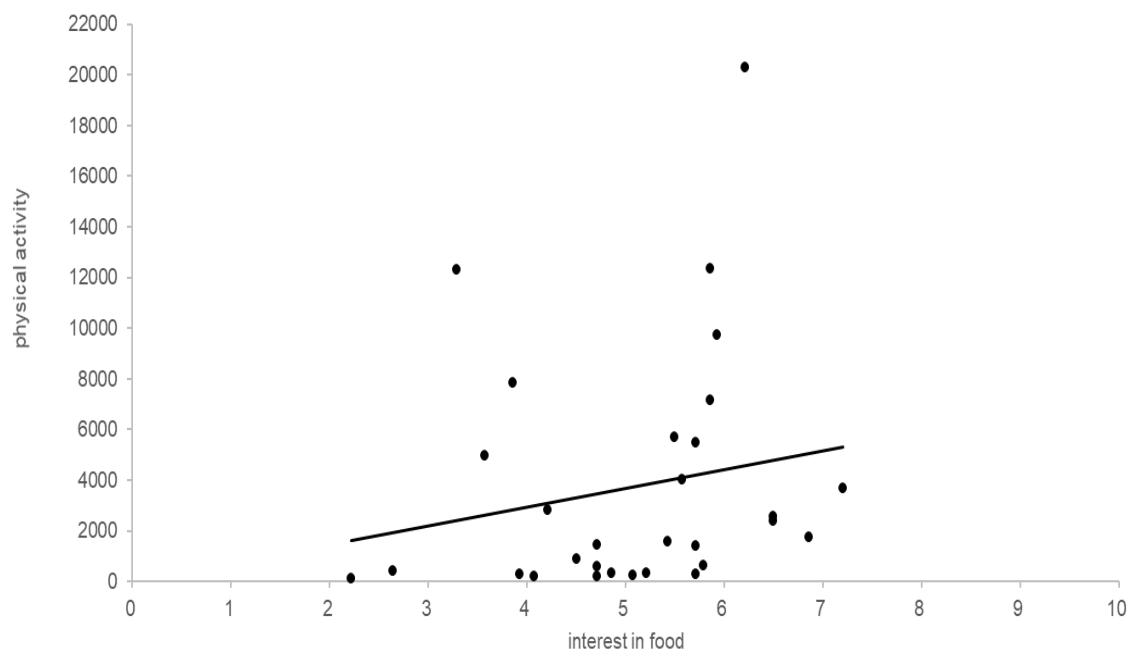


Fig.8 This is a correlation between interest in food and the physical activity ($r=0.375$, $p<0.05$)

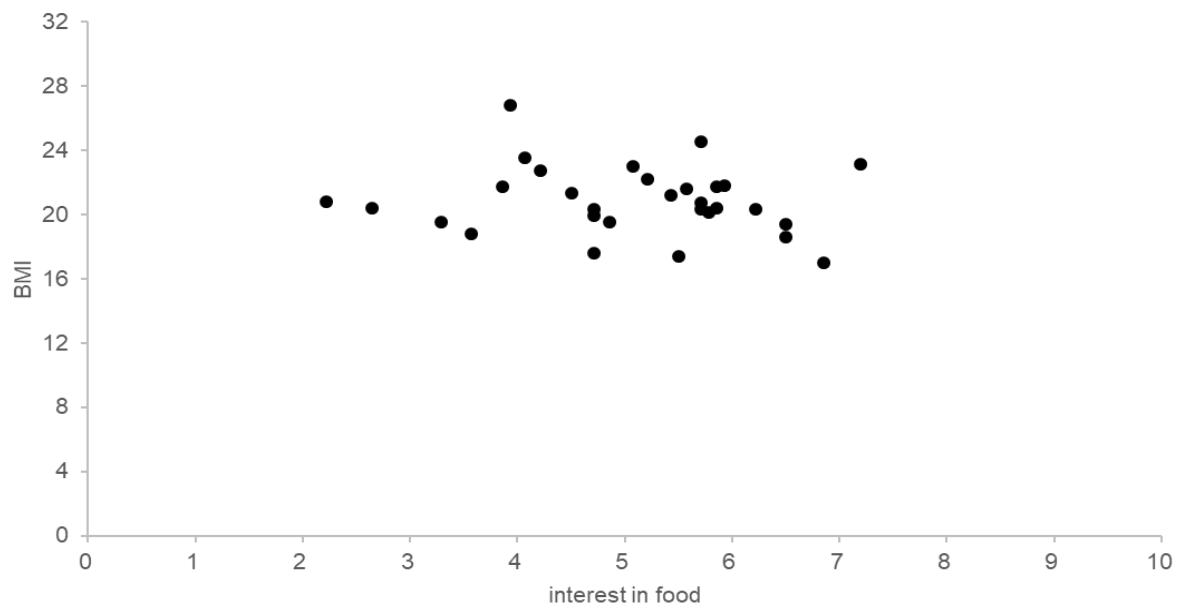


Fig.9 There is no correlation between BMI and interest in food ($r=-0.133$, $p>0.05$).

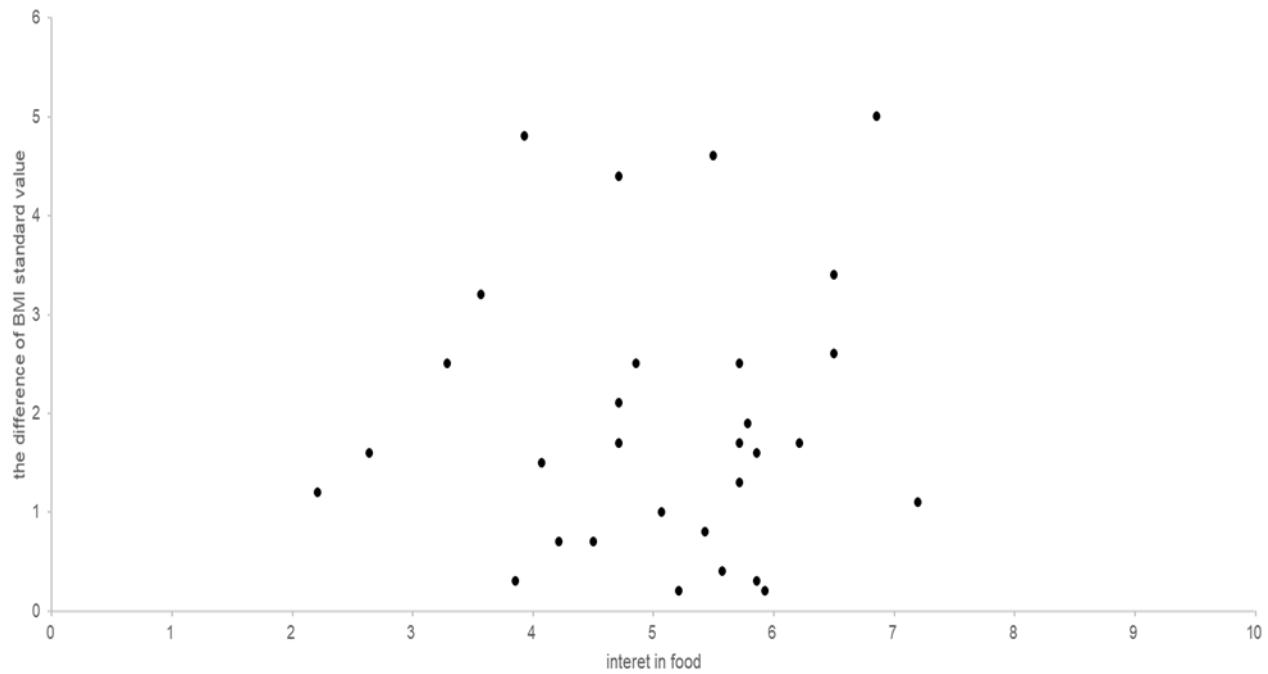


Fig.10 There is no correlation between interest in food and the difference with BMI standard value ($r=0.047$, $p>0.05$).

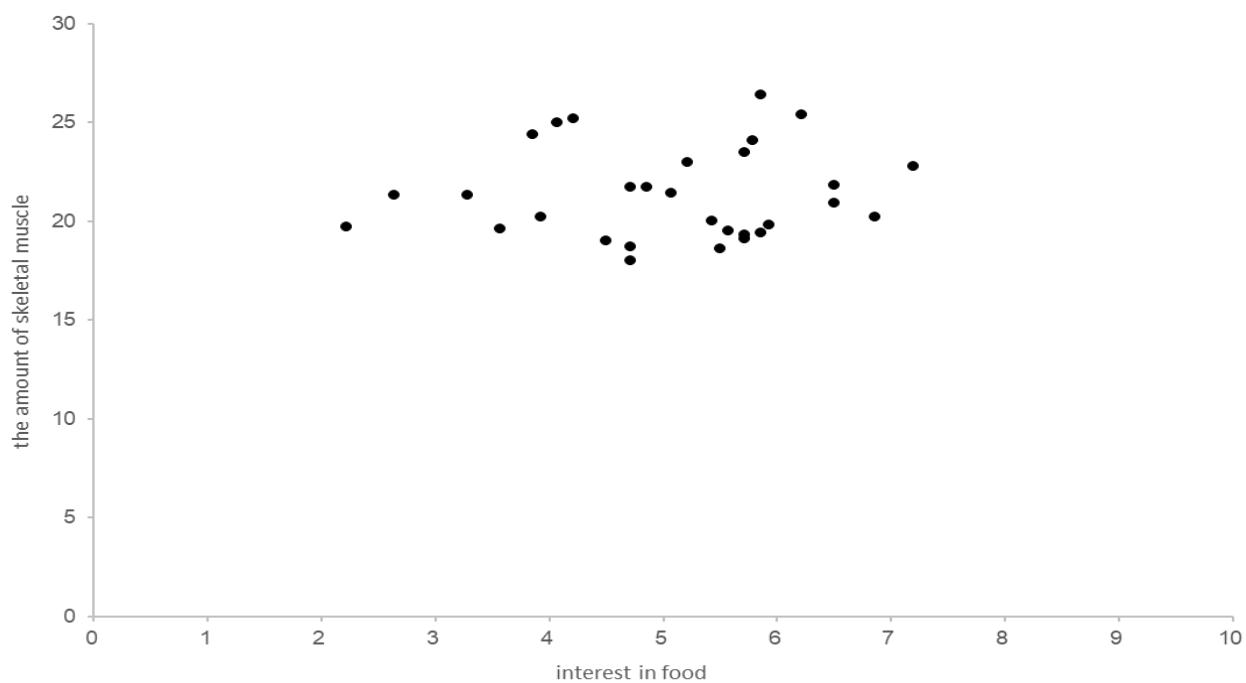


Fig.11 There is no correlation between interest in food and amounts of skeletal muscle ($r=0.069$, $p>0.05$).

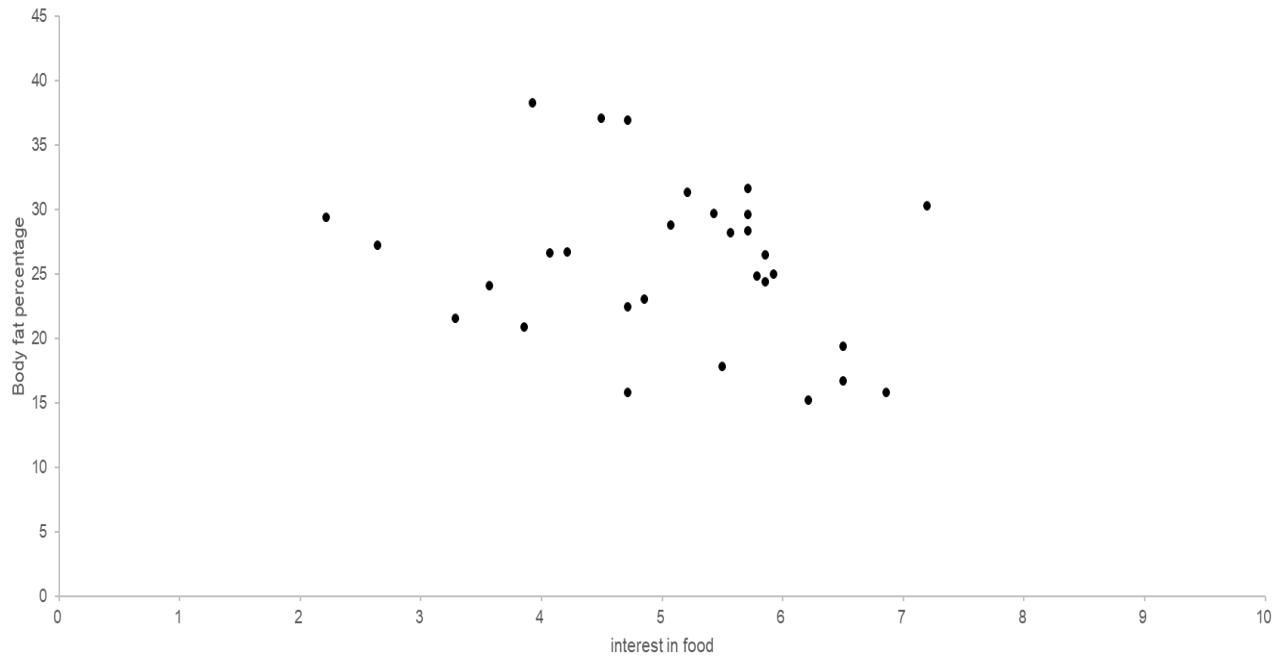


Fig.12 There is no correlation between interest in food and Body Fat percentage ($r=-0.195$, $p>0.05$).

Table.1 The correlation between the items that make up the interest in food in this study and the physique and body composition

	BMI	difference with BMI standard value	Amount of skeletal muscle	Body Fat percentage
the fun of eating and like to eat	r=-0.044 p>0.05	r=-0.091 p>0.05	r=-0.137 p>0.05	r=-0.030 p>0.05
Watching in cooking programs and videos	r=0.051 p>0.05	r=-0.047 p>0.05	r=-0.203 p>0.05	r=0.052 p>0.05
purchase of cookbooks	r=0.092 p>0.05	r=0.163 p>0.05	r=0.137 p>0.05	r=0.212 p>0.05
Food records	r=-0.342 p>0.05	r=0.225 p>0.05	r=-0.234 p>0.05	r=-0.078 p>0.05

Table2. This is the correlation between the items that make up the interest in food in this study and the physique and body composition.

	BMI	difference with BMI standard value	Amount of skeletal muscle	Body Fat percentage
knowledge of seasonal ingredients	r=-0.212 p>0.05	r=0.180 p>0.05	r=0.108 p>0.05	r=-0.297 p>0.05
interest in traditional food	r=-0.031 p>0.05	r=0.023 p>0.05	r=0.221 p>0.05	r=-0.128 p>0.05
interest in special food	r=-0.077 p>0.05	r=0.012 p>0.05	r=0.246 p>0.05	r=-0.267 p>0.05

activity per week. There is no significant positive correlations among BMI and interest in food ($r=-0.133$, $p>0.05$) (Fig.9). If participants had more interest in food, we judged that there was no relationship with BMI. Therefore, we considered that there is no relationship among interest in food and the physique. There is no significant positive correlation among interest in food and the difference with BMI standard value ($r=0.047$, $p>0.05$) (Fig.10). Even if participants are more interested in food, BMI of participants cannot be said to be close to the BMI standard value. There is no significant correlation among interest in food and amounts of skeletal muscle ($r=0.069$, $p>0.05$) (Fig.11). Even if participants have more interest in food, it shows to be unrelated to skeletal muscle. There is no significant correlation among interest in food and Body Fat percentage ($r=-0.195$, $p>0.05$) (Fig.12). Even if participants have more interest in food, it shows to be unrelated to Body Fat percentage. Thus, there is no significant correlation among interest in food and body composition and physique. In short, the relationship between motivation for food and body composition, physique is not recognized in this study.

The hypothesis of this study was that female students were more motivated to eat, the smaller the difference from the BMI reference value. Nevertheless, from the results of the survey, only the dietary behavior score of motivation for food have relation to the physique, indicating that the hypothesis was not supported. I assumed that the reasons of this results are that the age range of participants was small in this study, and because there were no differences in physique due to focusing on female university students. There is a previous study that Japanese BMI is gathered around the average compared to Americans (Fujise, 2003). Furthermore, in both university students, BMI of Japanese university students is 20.9 ± 1.3 , and that of American university students is 23.3 ± 3.3 (Fujise, 2003). Therefore, it can be said that the dispersion from the average value is small.

In order to detect correlation, this study requires a small number of people. Therefore, it can be said that the examination power is insufficient due to the small number of samples. There were many data with a significance level exceeding 5% ($p > 0.05$)

From the above results, we propose to introduce home economics classes to universities. Although there was no relationship between food interest and physique and body composition, the participants of this study are low in search rates for recipes, knowledge on seasonal ingredients and traditional food. Many of the questionnaire items for food included in this survey related to voluntary attitudes. In order to acquire a voluntary approach, we think it is necessary to provide support from around. Therefore, we considered that by incorporating home economics as part of the class, students could cook dishes in class and gain knowledge of seasonal ingredients and traditional food. Currently, practical dietary education is being conducted for elementary and junior high school students. On the other hand, only students who specialize in food and nutrition in university get practical dietary education. Students who are not conscious of their own eating habits have no dissatisfaction with their eating habits, and they have no attitude to change their eating habits (Hamaguchi et al, 2010). Therefore, educational guidance may make improvements on food thinking and attitudes. In addition, cooking class has the effect of improving the development of decision-making abilities regarding eating habits (Hamaguchi et al, 2007). There is a positive connection between the quality of the meal and the academic (Zainab and Ayesha, 2017). Thus, the introduction of home economics classes may improve

We explored relationship between motivation for food and the physique of female university students using questionnaire surveys that referred to motivation for food, the physical activity and BMI measurement. As a result,

there is no relationship between motivation for food and body composition, physique. From these results, the hypothesis of this study was not supported. However, having highly motivation for food can reevaluate people's life style and lead to a better and healthier life.

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