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Evaluation of the relationship between cooking and food preparation skills and dietary intake, body mass index, and body composition in university students

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ABSTRACT

Background and aim: Having cooking and food preparation skills can improve the nutritional and dietary quality of individuals. This study aimed to evaluate the relationship between cooking and food preparation skills and food consumption, body mass index and body composition in university students.

Material & Method: The study was conducted on 242 individuals aged 18 years and over who were studying at Biruni University between March and May 2023. Demographic characteristics, anthropometric measurements, dietary habits, knowledge about cooking and food preparation, frequency of food consumption according to cooking methods, cooking and food preparation skills and 24-hour food consumption were questioned by applying a data collection form with face-to-face interview and measurement analysis with Bioelectrical Impedance Analysis device. The Cooking and Food Preparation Skills (CS and FPS) scale developed by Lavelle et al. was used to question skills. The relationship between cooking and food preparation skills, food consumption and anthropometric measurements was investigated by correlation test.

Results: There was a significant negative correlation between the total cooking and food preparation skills scale score and carbohydrate consumption in women and a significant positive correlation between energy, protein, fat, magnesium and vitamin D consumption in men ($p<0.05$). Although there was a positive correlation between total scale score and BMI in women and men, no significance was found ($p>0.05$). Although there was no significant relationship between total scale score and anthropometric measurements in females, there was a significant positive relationship between total scale score and muscle mass in males ($p<0.05$).

Conclusion: In conclusion, improving cooking and food preparation skills may be an important strategic element to support university students to achieve healthy eating and body composition goals.

KEYWORDS

Cooking skills, body composition, food preparation skills, anthropometric measurements.

INTRODUCTION

Cooking is the process of changing the flavor, appearance and taste of foods by applying heat[1]. In general, in the preparation of home cooking, steaming, frying, boiling, oven and microwave cooking are used[2].

Cooking and food preparation skills provide individuals with the ability to cook for themselves or others, which affects dietary patterns and diet quality of individuals[3]. Studies have shown that those who cook and consume meals at home more frequently generally have a higher intake of fruits, vegetables and whole grains[4]. Similarly, consumption of home-cooked meals allows the consumption of foods such as fruits, vegetables, legumes, cereals and meat, which are healthier choices, as well as less fried foods that contain lower levels of cholesterol, saturated/trans fatty acids and are generally in line with healthy eating standards. Food and beverages prepared at home may contain higher levels of nutrients such as fiber, essential vitamins and minerals[5].

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Recent research on cooking interventions generally shows that more frequent home cooking and improved skills-based meal preparation contribute to better diet quality, health and weight management[6,7]. Improved cooking skills have been reported to be associated with better diet quality and specific components of the diet. This suggests that food preparation behaviors, which are an important determinant of nutrient intake, may affect weight status. Therefore, it is thought that an important step can be taken in the fight against obesity by improving cooking and food preparation skills in the community, increasing the frequency of home cooking and ensuring the consumption of healthier foods[8]. In a study on cooking, it was observed that increased time spent on cooking was associated with lower BMI. In contrast, eating outside the home was associated with increased consumption of ultra-processed foods, convenience foods and calorie-dense foods. Therefore, eating out behaviors are potentially linked to obesity[4]. In this study, it was aimed to evaluate the relationship between cooking and food preparation skills and food consumption, body mass index and body composition in students.

MATERIAL & METHODS

Research Place, Time and Sample Selection

This study was conducted between March and May 2023 with a total of 242 individuals (150 females and 92 males) between the ages of 18-31 studying at Biruni University in Istanbul. Individuals who were associate, undergraduate or graduate students at Biruni University and who volunteered to participate in the study were included in the study. Menstruating, pregnant and breastfeeding women were not included in the study. The reason why menstruating women were not included in the study was to prevent misleading results in the bioelectrical impedance analyzer (BİA). For this study, 'Ethics Committee Approval' dated 21/02/2023 and numbered 2023/78-23 was obtained from Biruni University Non-Interventional Research Ethics Committee.

Data Collection Tools

The data collection form included demographic information, anthropometric measurements, dietary habits, information on cooking and food preparation, frequency of use of preparation and cooking methods, cooking and food preparation skills scale and 24-hour food consumption record.

Cooking and Food Preparation Scale

The "Cooking Skills and Food Skills" scale was developed by Lavelle et al. in 2017 to assess cooking skills and food preparation skills. The scale consists of two subscales in total; cooking skills (CS) and food preparation skills (FPS). The PC subscale consists of 14 items and the FFL subscae consists of 19 items, totaling 33 items[9]. Responses to the items are graded on an 8-point Likert-type scale. A score of (0) is given to skills that are never or rarely used. Scoring of other skills ranges from 1 (very poor) to 7 (very good). The higher the total score, the better the cooking skills and food skills. The scale was translated into Turkish by Keleş et al. and its validity and reliability were tested[10].

Data Collection and Evaluation

Personal information, chronic disease status, use of any vitamin and mineral supplements, dietary habits, information on cooking and food preparation, and frequency of use of cooking and preparation methods of some food groups were questioned. Data on food consumption of the individuals participating in the study were obtained through 24-hour food consumption records. With these food consumption records, energy, protein, fat, carbohydrate, fiber, vitamin A, vitamin D, vitamin E, vitamin B1, vitamin B2, vitamin B6, vitamin C, sodium, potassium, calcium, magnesium, phosphorus, iron and zinc values were calculated. The 24-hour food consumption record and the "Computer Assisted Nutrition Program, Nutrition Information System (BEBIS/8.22 (student version)" were used to evaluate the energy, macro and micronutrients of the daily dietary contents collected. After completing the questionnaires, height measurements, waist and hip circumference measurements and body weight were recorded in the same session with the help of a BIA device. Waist and hip circumference measurements were performed by a clinically experienced researcher who was continuing his/her master's degree education. A non-flexible tape measure was used to measure waist and hip circumference. Individuals stood upright during the measurement. Waist circumference was measured by determining a midpoint between the last rib and the highest point of the crista iliaca. Care was taken not to apply too much pressure while taking the measurement. The data obtained after the measurement were recorded in centimeters on the research form. Hip circumference was measured while the individual was standing and in an upright position, parallel to the ground in front of the torch anterior points of the femur bones. This measurement also passes through the most protruding points of the hip. The measurement was recorded in centimeters. BMI was evaluated according to the classification standardized by the World Health Organization (WHO) for adults; those with <18.5 kg/m2 were classified as underweight, those with 18.5-24.9 kg/m2 as normal weight, those with 25.0-29.9 kg/m2 as slightly obese, and those with ≥30.0 as obese[11]. Reference values determined by the World Health Organization were used in the evaluation of waist circumference measurements. Accordingly, a waist circumference of 80 cm and above in women and 94 cm and above in men was considered risky, and a waist circumference of 88 cm and above in women and 102 cm and above in men was considered obese.

Waist/hip ratio: Using the reference values determined by the World Health Organization, a waist/hip ratio of 0.85 and

above in women and 0.90 and above in men was considered obese[12].

Statistical Evaluation

IBM SPSS Statistics 24 statistical package program was used in the evaluation of the research data. Percentage values, arithmetic mean, standard deviation, median, minimum and maximum values were given as descriptive statistics of the data. Shapiro-Wilk normality test and Q-Q graphs were used to determine whether the data were normally distributed. Since the data were not normally distributed, Mann Whitney U test was used for two independent group comparisons, Kruskal Wallis test and All pairwise multiple comparison test were used for more than two independent group comparisons, and Chi-square significance test was used for the comparison of categorical variables. Spearman correlation analysis was used to determine the correlation between scale scores. Statistical significance level was accepted as $p<0.05$.

RESULTS

The demographic characteristics, general habits and antrophometric measurements of the university students who participated in the study are shown in Table 1. There were statistically significant differences between male and female

Table 1. Comparison of Demographic Characteristics, General Habits and Antrophometric Measurements of University Students by Gender

Demographic Characteristics and General Habits	Female (n=150)		Male (n=92)		Total (n=242)		*Test value*	p
	n	%	n	%	n	%		
Marital status								
Single	148	98,7	91	98,9	239	98,8	0,028	0,677
Married	2	1,3	1	1,1	3	1,2		
Education status								
License/Pre-license	143	95,3	85	92,4	228	94,2	0,906	0,341
Postgraduate	7	4,7	7	7,6	14	5,8		
Socioeconomic level								
8,000 TL and below	66	44,0	45	48,9	111	45,9	3,943	0,268
Between 8,001-10,000 TL	24	16,0	21	22,8	45	18,6		
10.001-15.000 TL	25	16,7	11	12,0	36	14,9		
15.001 TL and above	35	23,3	15	16,3	50	20,7		
Who he/she lives with								
Family	117	78,0[a]	60	65,2[b]	177	73,1	9,576	**0,008**
Dormitory	19	12,7	10	10,9	29	12,0		
Alone	14	9,3[a]	22	23,9[b]	36	14,9		
Number of people living in the household								
One	15	10,0[a]	23	25,0[b]	38	15,7	10,638	**0,014**
Two	11	7,3	5	5,4	16	6,6		
Three	20	13,3	14	15,2	34	14,0		
Four and above	104	69,3[a]	50	54,3[b]	154	63,6		

Chi-square test was used. * More than one answer was given. a,b superscripts indicate the difference in the same row; measurements with the same letters are similar. TL: Turkish liras.

Table 1 continuation. Comparison of Demographic Characteristics, General Habits and Antrophometric Measurements of University Students by Gender

Demographic Characteristics and General Habits	Female (n=150)		Male (n=92)		Total (n=242)		*Test value*	p
	n	%	n	%	n	%		
Smoking status								
No	124	82,7	58	63,0	182	75,2	11,776	**0,001**
Yes	26	17,3	34	37,0	60	24,8		
Alcohol use status								
No	128	85,3	70	76,1	198	81,8	3,277	0,070
Yes	22	14,7	22	23,9	44	18,2		
Presence of chronic disease								
No	133	88,7	88	95,7	221	91,3	3,511	0,061
Yes	17	11,3	4	4,3	21	8,7		
Chronic disease types* (n=21)								
Cardiovascular diseases	2	12,5	1	25,0	3	14,3		
Kidney diseases	-	-	1	25,0	1	4,8		
Diabetes	1	6,25			1	4,8		
Other (asthma,..)	13	81,25	3	50,0	16	76,1		
Use of vitamin or mineral supplements								
Yes	40	26,7	14	15,2	54	22,3	4,312	**0,038**
No	110	73,3	78	84,8	188	77,7		

Chi-square test was used. * More than one answer was given. a,b superscripts indicate the difference in the same row; measurements with the same letters are similar. TL: Turkish liras.

students in terms of who they lived with, number of people they living inthe houseold, smoking status and using vitamin or mineral supplements ($p<0.05$).

When the BMI averages of the individuals were analyzed according to gender, the mean BMI value of female individuals was 22.4±4.1 and the mean BMI value of male individuals was 24.0±4.4. This difference between female and male individuals was statistically significant ($p=0.001$, test value=-3.202).

Some other important anthropometric measurement averages of female students are as follows; waist circumference: 71.6±8.9 cm, waist/hip ratio: 0.7±0.05, fat (%): 29.6±6.7.

The mean anthropometric measurements of male students were as follows; waist circumference: 84,8±11,8 cm, waist/hip ratio: 0,8±0,06, fat (%): 19,2±7,1.

The mean total and subscale scores of the CS and FPS scale according to the demographic characteristics of university students are shown in Table 2. The differences between the mean total and subscale scores of male and female students were found to be statistically significant ($p<0.05$).

The mean total and subscale scores of the CS and FPS scale according to the demographic characteristics of university students were analysed. When the total and subscale scores of the CS and FPS scale were analyzed according to the smoking status of the university students, it was found that the CS subscale score of male smokers was 61.7±22.6 and the CS subscale score of male non-smokers was 54.7±20.6. The differences between the CS subscale scores of male smokers and non-smokers were found to be statistically significant ($p<0.05$).

Table 2. Total and Subscale Scores of the CS and FPS Scale of University Students by Gender

VCS and FPS Scale Total and Subscale Scores	Female (n=150)		Male(n=92)		Total (n=242)		*Test value*	p
	Mean±SD	Med (Min-Max)	Mean±SD	Med (Min-Max)	Mean±SD	Med (Min-Max)		
CS subscale score	64,5±15,8	63 (17-98)	57,3±21,5	58 (0-98)	61,7±18,5	61 (0-98)	-2,595	**0,009**
FPS subscale score	86,1±19,8	87,5 (33-133)	80,2±27,8	81,5 (0-133)	83,9±23,3	85 (0-133)	-1,612	0,107
Total scale score	150,6±32,4	151 (50-231)	137,5±46,9	138,5 (0-231)	145,7±39,0	146,5 (0-231)	-2,373	**0,018**

Since the data were not normally distributed, Mann Whitney U test was used.
CS: Cooking skills.
FPS: Food preperation skills.

When the total and subscale scores of the CS and FPS scale were examined according to the alcohol use status of the university students, it was found that the total scale scores of CS, FPS, CS and FPS of male individuals with and without alcohol use were CS; 66.5±16.5 and 54.4±22.2, FPS; 91.1±13.6 and 76.8±30.3, and CS and FPS; 157.6±27.8 and 131.2±50.0, respectively. The differences of male individuals in terms of CS, FPS and CS and FPS total scores according to alcohol use status were found to be statistically significant ($p<0.05$).

When the alcohol use status of all individuals was analyzed, it was found that the scores of alcohol users and non-users in terms of FPS subscale scores and CS and FPS total scale scores were FPS; 90.6±17.7 and 82.4±24.2, CS and FPS; 157.3±31.1 and 143.1±40.1, respectively. Differences in terms of alcohol use status were found to be statistically significant in terms of both the FPS subscale scores and the CS and FPS total scale scores of the total individuals. ($p<0,05$).

The total and subscale score averages of the CS and FPS scale, which differ significantly according to the eating habits of university students, are given in Table 3.

Eating habits that do not show significant differences between boys and girls separately or in total in the total and sub-scores are number of snacks consumed, skipping meals, eating out regularly, frequency of eating outside, fast food consumption habit, eating speed, status of being a vegetarian, way of consuming fruit, adding sugar to tea, adding salt to food.

The relationship between BMI and other anthropometric measurements of university students and the CS and FPS total scale scores was examined by correlation analysis. When the relationship between the muscle mass (kg) of the university students participating in the study and the total scale score of CS and FPS was examined; it was found that there was a positive correlation between body muscle mass and total scale score average in male individuals ($r=0.206$). This relationship was found to be statistically significant ($p<0.05$).

The relationship between energy and nutrient consumption of university students according to gender and CS and FPS total scale scores was examined by correlation analysis. When the relationship between the amount of energy and nutrients consumed by the students and the total scale scores of CS and FPS was examined, it was found that the amount of carbohydrate consumption of female individuals showed a negative correlation with the total scale score ($r= -0.222$). This relationship was found to be statistically significant ($p<0.05$). Energy, protein, fat, vitamin D and magnesium intake of the male individuals who participated in the study were positively correlated with the mean total scale score of CS and FPS ($r=0.220$, $r=0.276$, $r=0.311$, $r=0.286$ and $r=0.243$, respectively). This relationship was found to be statistically significant ($p<0.05$).

DISCUSSION

With the increasing tendency towards convenience foods and fast food restaurants, it is becoming difficult to maintain a healthy body weight. Studies have shown a positive association between processed food consumption and high BMI, obesity and metabolic syndrome[10].

In a study by Hanson et al. which aimed to examine whether cooking skills and meal planning behaviors were associated with more fruit and vegetable intake and lower BMI in first-year university students at risk of overweight, it was found that 42.9% of university students did not cook, 23.9% preferred to cook meals requiring manual labor, and 33.2% preferred to cook easy and ready meals[13]. In addition, the study concluded that cooking more frequently, acquiring good cooking skills and meal planning habits were associated

Table 3. The Total And Subscale Score Averages of the CS And FPS Scale, which Differ Significantly According to the Eating Habits of University Students

Nutrition Habits	Female (n=150)			Male (n=92)			Total (n=242)		
	CS Subscale Score	FPS Subscale Score	Total Scale Score	CS Subscale Score	FPS Subscale Score	Total Scale Score	CS Subscale Score	FPS Subscale Score	Total Scale Score
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Number of main meals									
One meal	62,6±17,6	77,3±13,9	140,0±26,2	47,6±11,0	60,2±16,1	107,8±26,4	57,9±17,0	72,0±16,3[a]	129,9±29,7[a]
Two meals	65,9±15,1	87,5±20,2	153,4±32,7	57,6±23,3	81,3±29,5	138,9±50,4	63,4±18,3	85,6±23,4[b]	149,1±39,2[b]
Three meals	61,2±17,2	85,2±19,9	146,5±32,8	58,1±20,6	81,5±26,7	139,6±44,8	59,5±19,0	83,2±23,7[b]	142,8±39,6[b]
Test value	5,323	5,378	5,096	1,948	5,092	4,028	5,913	**9,672**	**8,007**
p	0,070	0,068	0,078	0,378	0,078	0,133	0,052	**0,008**	**0,018**
Number of snacks									
No	62,7±17,5	82,2±22,9	145,0±38,3	55,9±24,2	78,9±33,9[a]	134,8±56,1	59,7±20,8	80,7±28,0	140,5±46,8
One meal	65,4±13,4	88,8±16,5	154,2±26,1	55,4±17,8	75,4±22,1[a]	130,9±36,3	61,1±16,1	83,1±20,1	144,2±32,8
Two meals	63,0±14,3	88,7±18,2	151,7±28,4	67,1±16,7	96,8±19,3[b]	164,0±34,2	64,2±15,0	91,0±18,7	155,2±30,3
Three meals	68,3±20,2	83,0±22,7	151,3±40,0	51,8±30,0	74,7±31,2[a]	126,6±59,5	63,5±24,2	80,6±25,2	144,1±46,8
Test value	2,305	3,951	1,867	4,000	**8,689**	7,192	1,954	6,062	3,450
p	0,512	0,267	0,600	0,261	**0,034**	0,066	0,582	0,109	0,327
Pretending to pay attention to nutrition									
Yes	67,2±17,0	91,6±19,5[a]	158,8±32,4	62,5±17,9	89,7±24,1	152,3±39,3	64,6±17,5	90,6±22,0[a]	155,2±36,2
No	62,1±15,8	80,2±20,8[b]	142,4±32,9	56,0±19,7	74,5±27,7	130,6±44,8	59,9±17,4	78,2±23,4[b]	138,1±37,7
Sometimes	64,7±15,5	87,2±18,8[a]	152,0±31,6	55,1±19,8	76,2±23,1	131,3±40,1	62,2±17,2	84,3±20,5[ab]	146,5±35,0
No idea	-	-	-	43,0±43,9	67,8±53,5	110,8±96,1	43,0±43,9	67,8±53,5[c]	110,8±96,1
Test value	2,365	**7,158**	5,245	2,900	6,734	5,438	3,905	**10,314**	7,266
p	0,307	**0,028**	0,073	0,407	0,081	0,142	0,272	**0,016**	0,064

Since the data did not show a normal distribution, the Kruskal Wallis Test was used to compare the means of more than two groups, and the Mann-Whitney U test was used to compare the means of two groups.
Superscripts a, b, c indicate intra-group differences in each group, and measurements with the same letters are similar.

with decreasing BMI by increasing fruit and vegetable consumption in university students. In the university students in our study, the rate of cooking elaborate meals requiring manual labor was the highest, and the rate of cooking easy and short time-consuming meals ranked second and was found to be higher than the other study. The high rate of cooking dishes that require manual labor in our study may be due to the high number of people living with their families. When the results of our study related to BMI were analyzed, no statistical significance was found when the correlation between the total scale score and BMI of all individuals was examined ($p>0.05$).

In a study conducted by Gonzalez et al. to investigate cooking habits in the Spanish adult population, no direct relation-

ship was found between cooking skills, cooking frequency and body weight[4]. In a study conducted by Méjean et al. to investigate the relationship between food preparation behaviors and weight change and obesity risk, Méjean et al. reported that an increase in food preparation behaviors was associated with a decrease in obesity risk in women and that this relationship could be explained by an increase in food preparation behaviors encouraging the consumption of a healthier diet[14].

In a study conducted by Tani et al. to examine the relationship between cooking skills and dietary behaviors and weight status among elderly men and women in Japan, no significant relationship was found between cooking skills and obesity. However, in the same study, it was determined that low cooking skills were associated with unhealthy eating behaviors and low body weight, especially in men[15]. In the individuals who participated in our study, no significance was found between the total scale score and any anthropometric measurement (waist circumference, hip circumference, waist/hip ratio, body fat percentage, body fat mass, muscle mass, lean body mass and BMI) in female individuals, whereas a significant positive correlation was found between the total scale score and muscle mass in male individuals ($r=0.206$, $p<0.05$).

When the relationship between total scale score and total fat consumption of individuals was analyzed, although a negative correlation was observed in female individuals, significance could not be determined ($p>0.05$). On the other hand, it was determined that there was a positive correlation between total fat consumption and total scale score in male individuals and this correlation was statistically significant ($p<0.05$). This may be explained by the following reasons: Men who have good cooking and food preparation skills may have the ability to prepare more varied and tasty foods. This may cause them to gravitate towards foods with richer flavors and higher fat content. Men with well-developed cooking and food preparation skills may tend to prepare foods, especially those containing meat and fat, following traditional recipes and using more fat.

Males may require a higher energy and protein diet to increase muscle mass or to meet energy requirements. Animal sources are known to be a source of high quality protein, but they also contain high levels of invisible fat and therefore provide high energy. Increasing the availability of such foods in men can be achieved through improved cooking and food preparation skills. Highly skilled men may also increase their consumption of fatty foods.

In our study, when the relationship between cooking and food preparation skills of male individuals and vitamin D consumption was analyzed, individuals with high cooking and food preparation skills can prepare and cook various foods better. Animal sources, especially foods such as fish, dairy products and eggs are rich in vitamin D. Therefore, individuals with high cooking and food preparation skills can increase their vitamin D intake by consuming well-cooked meals from animal sources more frequently.

In our study, when the positive correlation between cooking and food preparation skills of male individuals and magnesium consumption was examined; magnesium is a mineral found in many foods and is an important nutrient for the body. Some sources of magnesium include green leafy vegetables, whole grains, nuts, seeds and some seafood. Men who are skilled in cooking and food preparation may tend to have a healthier and more balanced diet. This can help them to consume magnesium-rich foods more often.

CONCLUSION

When the results of the study are analyzed; the findings obtained show that cooking and food preparation skills can affect individuals' food consumption habits and body composition. As cooking and food preparation skills increased, carbohydrate consumption decreased significantly in female individuals and energy, protein, fat, vitamin D and magnesium consumption increased significantly in male individuals ($p<0.05$). When the relationship between cooking and food preparation skills and BMI was examined, although there was a positive correlation between them, no significance was found ($p>0.05$). Although there was no significant relationship between the increase in cooking and food preparation skills and any anthropometric measurement in women, there was a significant increase in muscle mass with the increase in skills in men ($p<0.005$). These results point to the interaction of cooking and food preparation skills with individual factors and a complex network of relationships. In conclusion, improving cooking and food preparation skills may be an important strategic element to support university students to achieve healthy eating and body composition goals. However, it should be kept in mind that this strategy may be effective in different ways for each individual and it is important to consider individual differences.

It is thought that more studies to be conducted in this field will help to further improve cooking and food preparation skills by understanding the importance of these skills and will contribute to obtaining results compatible with the health of food consumption and body composition.

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LIMITATIONS

One of the limitations of this study is that women generally have more culinary skills than men, making it difficult to explain differences other than gender. Another limitation is that although recorded by a nutritionist, the food consumption record and answers to other questions about dietary habits may have been underreported due to embarrassment and shyness.

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