

## Research Article



# Dietary life and mukbang- and cookbang-watching status of university students majoring in food and nutrition before and after COVID-19 outbreak

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### Conflict of Interest

There are no financial or other issues that might lead to conflict of interest.

## ABSTRACT

**Purpose:** With increased time spent at home due to prolonged online classes, this study sought to determine how the coronavirus disease 2019 (COVID-19) pandemic has impacted the mukbang- and cookbang-watching patterns and dietary life of college students.

**Methods:** All students majoring in food and nutrition (FN) at a college in Gyeonggi, Korea, participated in the survey in April 2019 (M/F = 36/106) and June 2020 (M/F = 37/130) and data were analyzed using SPSS 26.0.

**Results:** Compared to students responding in 2019, those in 2020 reported more frequently eating alone ( $p < 0.01$ ) and cooking ( $p < 0.01$ ), and evaluated their diets better regarding pleasant mealtimes atmosphere ( $p < 0.05$ ), moderation in drinking ( $p < 0.05$ ), and not consuming excessively delivery foods ( $p < 0.001$ ), processed foods ( $p < 0.01$ ), foods with animal fat ( $p < 0.01$ ), salty foods ( $p < 0.01$ ), and sweets ( $p < 0.01$ ). Although the proportion of respondents who answered that they watched mukbang and cookbang at least occasionally did not change, greater proportions of respondents reported watching both genres frequently ( $p < 0.001$ , respectively) and spending less time/day in watching mukbang ( $p < 0.05$ ) in 2020 vs. 2019. While they evaluated the effect of mukbang- and cookbang-watching on overall diet similarly, the proportion of respondents that reported feeling as though mukbang-watching prompted them to eat more of less-desirable foods decreased from 54.3% to 41.5% ( $p < 0.05$ ). Diet improvement of participants due to COVID-19 resulted in that the association between frequent mukbang-watching and unhealthier dietary habits in 2019 was not shown in 2020.

**Conclusion:** Our results suggest that the prolonged at-home stays due to COVID-19 might have improved many aspects of diet and decreased undesirable effect of frequent mukbang-watching in case of college students majoring in FN.

**Keywords:** universities, students, food, diet, perception

## INTRODUCTION

Since emerging at the end of 2019, the coronavirus disease 2019 (COVID-19) pandemic has brought about profound changes to many aspects of people's lives worldwide. Prolonged at-home confinement has been shown to increase poor diet [1-3], decrease physical activity [2-5], and cause various other problems [2,6-8].

As students have experienced closing and partial reopening of schools, multiple media outlets have reported the increased use of delivery foods and home-meal replacements. There have been accompanying concerns regarding inadequate intake of nutrients, especially for children from low-income families, whose nutrition intake depends heavily on school meals [9]. Concerns regarding the lack of micronutrients and increased intake of empty calories arising due to COVID-19 confinement have been reported from many countries [1,2,7], although specific groups world-wide were shown to have improved their diets [10,11].

Government restrictions on sporting events and gym access, remote work, and online classes all combined to decrease physical inactivity in Polish adults [1], and increase in daily sitting time from 5 to 8 hours per day was reported from an online survey performed in 7 languages [4]. Over the long term, the consumption of empty-calorie foods paired with decreased physical activity [9] may result in a positive energy balance, leading to obesity and related chronic diseases [6].

Increased exposure to screens and electronic devices is another factor that promotes not only sedentariness but also poor dietary habits, with the latter arising in part from exposure to food advertising campaigns and snacking [11,12]. Recent years have seen the rapid growth of concerns regarding food-related content and its influence on the diets of young generations in Korea [13-15]. Food-related contents can usually be divided into mukbang and cookbang; in mukbang, the performers eat delicious-looking and/or excessive amounts of food, while in cookbang, they cook the food before eating it.

College students are often characterized by heavy use of electronic devices [16], newly gained autonomy, and underestimation of the importance of a healthy lifestyle, and thus may experience a poor diet. However, diet can be more easily corrected at this age by education, compared to later in life. Our recent study aiming to identify patterns of mukbang- and/or cookbang-watching and their potential association with the dietary life of college students was performed in April of 2019, about 8 months before the COVID-19 outbreak [15]. This prior study focused on students who were not food and nutrition (FN) majors, in an effort to avoid having the professional background act as a confounding variable. The main results of this study were that frequent-watchers of mukbang, but not cookbang scored their own diets significantly poorer than non-watchers.

Although students majoring in FN may possess with more nutrition knowledge, they still have an inadequate nutrient intake compared to the Dietary Reference Intakes for Koreans [17,18]. Along with many studies from other countries reporting poorer diets and increased sedentariness, this study sought to determine how the COVID-19 pandemic has impacted dietary life and the mukbang- and cookbang-watching patterns of college students, especially majoring in FN, who equipped with a stronger orientation toward health.

## METHODS

### Participants

All students of the FN department of a college in Gyeonggi, Korea, in June 2020 (M/F = 37/130) participated in an online survey. The data were compared to those obtained 14 months earlier, when the same questionnaire was used to survey on all students of the same

department (M/F = 36/106). This study was approved by the Institutional Review Board at the Daejin University (1040656-201907-SB-01-02).

### Data collection

The questionnaire included items on demographic characteristics, mukbang- and cookbang-watching habits, perception of dietary changes attributed to watching, dietary life, and self-diagnosis of dietary habits. The questionnaire began by defining and providing examples of mukbang and cookbang. Participants who answered that they “never” or “maybe” watched mukbang or cookbang were categorized as non-watchers; those who answered “occasionally” were categorized as moderate watchers; and those who answered “often” were categorized as frequent watchers. The self-diagnosis of dietary habits consisted of 21 items [19]. The participants were asked to select the appropriate frequency from among 0–2 days, 3–5 days and 6–7 days per week; these were coded as 1, 3, and 5 points, respectively, for 12 desirable items, and as 5, 3, and 1, respectively, for undesirable items. Thus, a higher score indicated healthier dietary habits.

### Statistical analysis

The survey results were analyzed using SPSS ver. 26.0 (IBM Corp., Armonk, NY, USA). The differences in general characteristics, dietary life, watching habits, and perception of mukbang- and cookbang-watching were analyzed by  $\chi^2$  test and self-evaluated diet score was analyzed by independent 2-sample t-test. The data were compared between 2019 and 2020 to determine the impact of COVID-19. The differences among the 3 groups divided according to the watching frequency for each genre were tested by ANOVA followed by Duncan's multiple-range test. The significance was set at  $p < 0.05$ .

## RESULTS

### Participants

**Table 1** shows descriptive data for participants in 2019 and 2020. There was no significant difference in grade, gender, or smartphone use time between the data sets.

### Dietary life

**Table 2** shows a comparison of the dietary life among participants in 2019 and 2020. Participants in 2020 reported eating alone ( $p < 0.001$ ) and cooking ( $p < 0.01$ ) significantly

**Table 1.** The general characteristics of the study subjects in 2019 and 2020

Variables	2019 (n = 142)	2020 (n = 167)	p-value <sup>1)</sup>
Grade			0.810
Freshmen	37 (26.1)	46 (27.5)	
Sophomore	34 (23.9)	34 (20.4)	
Junior	34 (23.9)	46 (27.5)	
Senior	37 (26.1)	41 (24.6)	
Gender			0.591
Man	36 (25.4)	37 (22.2)	
Woman	106 (74.6)	130 (77.8)	
Duration of smart phone use (hrs/day)			0.481
< 2	6 (4.2)	9 (5.4)	
2–3	48 (33.8)	44 (26.3)	
4–5	48 (33.8)	67 (40.1)	
≥ 6	40 (28.2)	47 (28.1)	

Values are presented as number (%).

<sup>1)</sup>Obtained from the  $\chi^2$  test.

**Table 2.** Dietary life of college students majoring in food and nutrition in 2019 and 2020

Variables	2019 (n = 142)	2020 (n = 167)	p-value <sup>1)</sup>
<b>Eat alone</b>			< 0.001
≥ 1/day	47 (33.1)	94 (56.3)	
3–6/wk	46 (32.4)	44 (26.3)	
≤ 1/mon	49 (34.5)	29 (17.4)	
<b>Cook</b>			< 0.010
≥ 1/day	25 (17.6)	55 (32.9)	
3–6/wk	43 (30.3)	15 (9.0)	
≤ 1/mon	74 (52.1)	58 (34.7)	
<b>Diet score</b>			
Three meals a day	2.11 ± 1.40	1.98 ± 1.31	0.399
Adequate amount of food at each meal	3.11 ± 1.34	3.17 ± 1.40	0.670
≥ 2 Servings/day of meat, egg, bean and tofu	3.27 ± 1.37	3.24 ± 1.28	0.852
Consumption of greenish yellow vegetable	2.44 ± 1.25	2.50 ± 1.37	0.687
Consumption of vegetable oil containing foods	2.93 ± 1.22	2.69 ± 1.20	0.083
Consumption of milk or dairy products	2.47 ± 1.52	2.70 ± 1.48	0.196
Consumption of fruits or sugarless fruit juice	2.42 ± 1.46	2.48 ± 1.44	0.706
Consumption of seaweed	1.92 ± 1.13	1.70 ± 1.03	0.071
Eating in pleasant atmosphere	3.12 ± 1.37	3.44 ± 1.36	< 0.050
Balanced diet at each meal	2.88 ± 1.40	3.01 ± 1.50	0.454
Eating breakfast	2.36 ± 1.67	2.04 ± 1.49	0.072
Regular exercise	1.68 ± 1.21	1.99 ± 1.30	< 0.050
Consumption of processed foods <sup>2)</sup>	3.32 ± 1.27	3.78 ± 1.24	< 0.010
Eating out <sup>2)</sup>	3.83 ± 1.27	4.10 ± 1.18	0.052
Consumption of delivery food <sup>2)</sup>	4.12 ± 1.18	4.54 ± 0.87	< 0.001
Consumption of foods containing animal fat <sup>2)</sup>	3.23 ± 1.15	3.70 ± 1.10	< 0.001
Consumption of salty foods or MSG <sup>2)</sup>	3.69 ± 1.35	4.25 ± 1.09	< 0.001
Consumption of sweet foods <sup>2)</sup>	3.12 ± 1.35	3.58 ± 1.36	< 0.010
Excessive drinking <sup>2)</sup>	4.48 ± 1.00	4.69 ± 0.79	< 0.050
Drinking caffeinated beverage ≥ 3 times/day <sup>2)</sup>	4.28 ± 1.20	4.17 ± 1.34	0.459
Excessive smoking <sup>2)</sup>	4.61 ± 1.12	4.69 ± 1.01	0.569

Values are presented as number (%) or mean ± SD and higher score represents better dietary habit.

<sup>1)</sup>Obtained by  $\chi^2$  test or analysis of variance. <sup>2)</sup>Coded reversely for undesirable dietary habits.

more frequently than those in 2019. Up to 56.3% of participants in 2020 reported eating alone at least 1 meal/day, whereas this percentage was 33.1% in 2019. Also, up to 32.9% of participants in 2020 reported cooking at least 1 meal/day, whereas this percentage was 17.6% in 2019. Participants in 2020 evaluated many of their dietary habits as being significantly better than those in 2019, namely for items regarding experiencing a pleasant atmosphere during mealtimes (3.44 vs. 3.12, respectively,  $p < 0.05$ ), obtaining regular exercise (1.99 vs. 1.68, respectively,  $p < 0.05$ ), not drinking excessively (4.69 vs. 4.48, respectively,  $p < 0.05$ ) and not consuming excessive delivery foods (4.54 vs. 4.12, respectively,  $p < 0.001$ ), processed foods (3.78 vs. 3.32, respectively,  $p < 0.01$ ), high-animal-fat foods (3.70 vs. 3.23, respectively,  $p < 0.001$ ), high-sodium foods (4.25 vs. 3.69, respectively,  $p < 0.001$ ) and sweets (3.58 vs. 3.12, respectively,  $p < 0.01$ )

### Watching patterns

The mukbang- and cookbang-watching patterns were compared between 2019 and 2020 (Table 3). In 2019 and 2020, 45.8% and 42.5% of participants reported watching mukbang occasionally and 35.9% and 35.3% reported doing so frequently, while 43.7% and 45.5% watched cookbang occasionally and 19.0% and 24.6% did so frequently. These proportions were not significantly different.

The watching habits were compared between 2019 and 2020 among the participants who watched mukbang and cookbang at least occasionally in Table 4. For those, the frequencies

**Table 3.** Overall mukbang- and cookbang-watching frequencies of college students majoring in food and nutrition in 2019 and 2020

Variables	2019 (n = 142)	2020 (n = 167)	p-value <sup>1)</sup>
Mukbang			0.615
Never	3 (2.1)	8 (4.8)	
Maybe	23 (16.2)	29 (17.4)	
Occasionally	65 (45.8)	71 (42.5)	
Frequently	51 (35.9)	59 (35.3)	
Cookbang			0.493
Never	10 (7.0)	10 (6.0)	
Maybe	43 (30.3)	40 (24.0)	
Occasionally	62 (43.7)	76 (45.5)	
Frequently	27 (19.0)	41 (24.6)	

Values are presented as number (%).

<sup>1)</sup>Obtained from the  $\chi^2$  test.

of watching mukbang and cookbang increased from 2019 to 2020 ( $p < 0.001$  for both): The proportions of participants who watched 5–7 days/week doubled (28.4% to 53.1%) for mukbang and tripled (16.9% to 50.4%) for cookbang. Although more participants spent less time per day watching mukbang ( $p < 0.05$ ), this was not the case for cookbang. YouTube was the main route of watching cookbang for significantly more participants in 2020 than in 2019 (79.5% and 67.4%,  $p < 0.05$ ), although it was the first choice in both years. Of the participants, 98.3% and 98.9% in 2019 and 95.4% and 99.1% in 2020 were willing to keep watching mukbang and cookbang, respectively. The most often-cited reason for mukbang was vicarious satisfaction (69.3% and 59.7%, respectively in 2019 and 2020) and followed by killing time, entertainment, and pursuit of information, while for cookbang it was pursuit of information (55.7% and 55.2%), followed by vicarious satisfaction. These responses did not significantly differ between 2019 and 2020.

**Table 4.** Mukbang- and cookbang-watching patterns of college students majoring in food and nutrition in 2019 and 2020<sup>1)</sup>

Variables	Mukbang			Cookbang		
	2019 (n = 116)	2020 (n = 130)	p-value <sup>2)</sup>	2019 (n = 89)	2020 (n = 117)	p-value
Frequency			< 0.001			< 0.001
5–7 days/wk	33 (28.4)	69 (53.1)		15 (16.9)	59 (50.4)	
3–4 days/wk	35 (30.2)	40 (30.8)		28 (31.5)	35 (29.9)	
1–2 days/wk	28 (24.1)	0 (0.0)		23 (25.8)	0 (0.0)	
< 1 days/wk	20 (17.2)	21 (16.2)		23 (25.8)	23 (19.7)	
Time			< 0.050			0.380
< 30 min/day	59 (50.9)	88 (67.7)		54 (60.7)	77 (65.8)	
30 min–< 1 hr/day	44 (37.9)	33 (25.4)		26 (29.2)	34 (29.1)	
≥ 1 hr/day	13 (11.2)	9 (6.9)		9 (10.1)	6 (5.1)	
Route			0.362			< 0.050
YouTube	102 (87.9)	122 (93.8)		60 (67.4)	93 (79.5)	
TV	10 (8.6)	6 (4.6)		21 (23.6)	22 (18.8)	
Streaming	1 (0.9)	0 (0.0)		0 (0.0)	0 (0.0)	
SNS	3 (2.6)	2 (1.5)		8 (9.0)	2 (1.7)	
Plan to keep watching			0.287			1.000
Yes	114 (98.3)	124 (95.4)		88 (98.9)	116 (99.1)	
No	2 (1.7)	6 (4.6)		1 (1.1)	1 (0.9)	
Reasons for planning to watch			0.202			0.788
Vicarious satisfaction	79 (69.3)	74 (59.7)		24 (27.3)	25 (21.6)	
Entertainment	11 (9.6)	17 (13.7)		7 (8.0)	12 (10.3)	
Pursuit of information	7 (6.1)	11 (8.9)		49 (55.7)	64 (55.2)	
Killing time	17 (14.9)	18 (14.5)		6 (6.8)	12 (10.3)	
Other	0 (0.0)	4 (3.2)		2 (2.3)	3 (2.6)	

Values are presented as number (%).

<sup>1)</sup>Analyzed only for those answered to watch mukbang and cookbang at least occasionally. <sup>2)</sup>Obtained from the  $\chi^2$  test.

**Table 5.** The perception of college students majoring in food and nutrition of dietary changes attributable to mukbang-watching<sup>1)</sup>

Variables	2019 (n = 116)	2020 (n = 130)	p-value <sup>2)</sup>
Influence on overall diet of mukbang-watching			0.703
Improved	4 (3.4)	6 (4.6)	
No change	91 (78.4)	105 (80.8)	
Worsened	21 (18.1)	19 (14.6)	
Influence on the amount of eating delivery foods and instant foods of mukbang-watching			< 0.050
Eat more	63 (54.3)	54 (41.5)	
No change	49 (42.2)	75 (57.7)	
Eat less	4 (3.4)	1 (0.8)	

Values are presented as number (%).

<sup>1)</sup>Analyzed only for those who reported watching mukbang and cookbang at least occasionally. <sup>2)</sup>Obtained from the  $\chi^2$  test.

**Table 6.** The perception of college students majoring in food and nutrition of dietary changes attributable to cookbang-watching<sup>1)</sup>

Variables	2019 (n = 89)	2020 (n = 117)	p-value <sup>2)</sup>
Influence on overall diet of cookbang-watching			0.392
Improved	24 (27.0)	42 (35.9)	
No change	63 (70.8)	73 (62.4)	
Worsened	2 (2.2)	2 (1.7)	
Increased desire to cook by cookbang-watching			1.000
Yes	82 (92.1)	107 (91.5)	
No	7 (7.9)	10 (8.5)	
Increased cooking by cookbang-watching			0.461
Yes	55 (61.8)	79 (67.5)	
No	34 (38.2)	38 (32.5)	

Values are presented as number (%).

<sup>1)</sup>Analyzed only for those who reported watching cookbang at least occasionally. <sup>2)</sup>Obtained from the  $\chi^2$  test.

### Perception of dietary changes attributable to mukbang- and cookbang-watching

**Tables 5** and **6** compare the participants' perceptions of how their diets were influenced by watching mukbang and cookbang. In 2019 and 2020, 18.1% and 14.6% of participants, respectively, reported that watching mukbang worsened their diet while only 3.4% and 4.6% said that it improved their diet. In contrast, as much as 27.0% and 35.9% of participants, respectively, felt that watching cookbang improved their diet while only 2.2% and 1.7% said that it worsened their diet. We did not observe significant differences between years. When asked about how watching mukbang affected their eating of delivery foods and instant foods, compared to 2019, fewer participants in 2020 said that mukbang-watching caused them to “eat more”, while more participants said there was “no change” ( $p < 0.05$ ). Up to 92.1% and 91.5% answered that watching-cookbang increased their desire to cook and 61.8% and 67.5% said that it actually made them cook more often in 2019 and 2020, respectively. There was no significant difference between years in this parameter.

### Dietary life related to mukbang- and cookbang-watching

**Tables 7** and **8** compare the participants' dietary life according to their frequencies of watching mukbang or cookbang, respectively between 2019 and 2020. The frequencies of eating alone and cooking were not different according to frequency of watching mukbang in both years, while frequent cookbang watchers more often cooked both in 2019 and 2020, yet they more often ate alone in 2020, but not in 2019. Frequent mukbang watchers scored their diets as being significantly worse than non-watchers regarding processed foods ( $p < 0.05$ ), delivery foods ( $p < 0.05$ ), and sweets ( $p < 0.01$ ) in 2019, but these differences disappeared in 2020. In 2019, frequent cookbang watchers scored their diets as being significantly worse



**Table 7.** Dietary life of the college students majoring in food and nutrition according to mukbang-watching status in 2019 and 2020

Variables	2019				2020			
	NW (n = 26)	MW (n = 65)	FW (n = 51)	p-value <sup>1)</sup>	NW (n = 37)	MW (n = 71)	FW (n = 59)	p-value
Eat alone				0.186				0.863
≥ 1/day	6 (23.1)	20 (30.8)	21 (41.2)		23 (62.2)	37 (52.1)	34 (57.6)	
3–6/wk	13 (50.0)	21 (32.3)	12 (23.5)		8 (21.6)	20 (28.2)	16 (27.1)	
≤ 1/wk	7 (26.9)	24 (36.9)	18 (35.3)		6 (16.2)	14 (19.7)	9 (15.3)	
Cook				0.209				0.318
≥ 1/day	3 (11.5)	13 (20.0)	9 (17.6)		8 (21.6)	22 (31.0)	25 (42.4)	
3–6/wk	7 (26.9)	15 (23.1)	21 (41.2)		14 (37.8)	23 (32.4)	17 (28.8)	
≤ 1/wk	16 (61.6)	37 (56.9)	21 (41.2)		15 (40.6)	26 (36.6)	17 (28.8)	
Diet score								
Three meals a day	2.23 ± 1.39	2.11 ± 1.42	2.06 ± 1.41	0.879	2.03 ± 1.30	2.10 ± 1.39	1.81 ± 1.24	0.459
Adequate amount of food at each meal	3.54 ± 1.33	3.00 ± 1.32	3.04 ± 1.36	0.200	3.22 ± 1.62	3.20 ± 1.32	3.14 ± 1.38	0.945
≥ 2 Servings/day of meat, egg, bean and tofu	3.31 ± 1.46	3.25 ± 1.30	3.27 ± 1.44	0.981	3.00 ± 1.41	3.31 ± 1.15	3.31 ± 1.33	0.435
Consumption of greenish yellow vegetable	2.77 ± 1.18	2.20 ± 1.21	2.57 ± 1.28	0.092	2.68 ± 1.29	2.24 ± 1.33	2.69 ± 1.43	0.111
Consumption of vegetable oil containing foods	3.08 ± 1.20	2.78 ± 1.18	3.04 ± 1.30	0.431	2.73 ± 1.17	2.69 ± 1.20	2.66 ± 1.24	0.964
Consumption of milk or dairy products	2.46 ± 1.56	2.32 ± 1.47	2.69 ± 1.57	0.444	2.51 ± 1.45	2.72 ± 1.52	2.80 ± 1.47	0.658
Consumption of fruits or sugarless fruit juice	2.61 ± 1.50	2.20 ± 1.31	2.61 ± 1.60	0.250	2.51 ± 1.52	2.49 ± 1.54	2.46 ± 1.28	0.981
Consumption of seaweed	1.85 ± 1.01	1.83 ± 1.11	2.10 ± 1.22	0.418	1.49 ± 0.87	1.85 ± 1.10	1.68 ± 1.02	0.223
Eating in pleasant atmosphere	2.69 ± 1.46	3.18 ± 1.26	3.27 ± 1.44	0.192	3.38 ± 1.48	3.59 ± 1.33	3.31 ± 1.33	0.466
Balanced diet at each meal	2.85 ± 1.49	2.82 ± 1.45	3.00 ± 1.33	0.773	3.00 ± 1.56	2.98 ± 1.37	3.07 ± 1.62	0.935
Eating breakfast	3.00 ± 1.79	2.32 ± 1.63	2.10 ± 1.62	0.078	2.35 ± 1.77	2.15 ± 1.50	1.71 ± 1.22	0.085
Regular exercise	1.54 ± 1.07	1.65 ± 1.18	1.78 ± 1.33	0.680	2.30 ± 1.65	1.99 ± 1.30	1.81 ± 0.99	0.206
Consumption of processed foods <sup>2)</sup>	3.85 ± 1.16 <sup>a</sup>	3.40 ± 1.28 <sup>ab</sup>	2.96 ± 1.23 <sup>b</sup>	< 0.050	4.14 ± 1.11	3.62 ± 1.25	3.75 ± 1.28	0.118
Eating out <sup>2)</sup>	4.77 ± 1.02	3.92 ± 1.28	3.59 ± 1.34	0.203	4.24 ± 1.09	4.04 ± 1.16	4.08 ± 1.25	0.696
Consumption of delivery food <sup>2)</sup>	4.54 ± 0.86 <sup>a</sup>	4.23 ± 1.04 <sup>ab</sup>	3.78 ± 1.39 <sup>b</sup>	< 0.050	4.73 ± 0.69	4.55 ± 0.91	4.42 ± 0.91	0.245
Consumption of foods containing animal fat <sup>2)</sup>	3.23 ± 1.18	3.34 ± 1.03	3.12 ± 1.29	0.596	3.70 ± 1.08	3.79 ± 1.04	3.61 ± 1.19	0.656
Consumption of salty foods or MSG <sup>2)</sup>	3.85 ± 1.41	3.77 ± 1.26	3.51 ± 1.43	0.479	4.14 ± 1.11	4.41 ± 0.98	4.15 ± 1.19	0.304
Consumption of sweet foods <sup>2)</sup>	3.46 ± 1.42 <sup>a</sup>	3.37 ± 1.27 <sup>ab</sup>	2.65 ± 1.31 <sup>b</sup>	< 0.010	3.70 ± 1.43	3.48 ± 1.37	3.61 ± 1.30	0.698
Excessive drinking <sup>2)</sup>	4.54 ± 1.03	4.51 ± 1.00	4.41 ± 1.00	0.831	4.89 ± 0.46	4.61 ± 0.93	4.66 ± 0.76	0.193
≥ 3 Cups/day of caffeinated beverage <sup>2)</sup>	4.69 ± 0.74	4.29 ± 1.14	4.06 ± 1.41	0.089	4.24 ± 1.28	4.01 ± 1.47	4.32 ± 1.21	0.403
Excessive smoking <sup>2)</sup>	4.85 ± 0.78	4.51 ± 1.23	4.65 ± 1.11	0.418	4.95 ± 0.33	4.63 ± 1.09	4.59 ± 1.16	0.206

NW, not watching; MW, moderate watching; FW, frequent watching.

Values are presented as number (%) or mean ± SD and means with the same superscripts were not significantly different. Higher score represents better dietary habit.

<sup>1)</sup>Obtained by  $\chi^2$  test or analysis of variance. <sup>2)</sup>Coded reversely for undesirable dietary habits.

regarding drinking caffeinated beverages more than 3 cups/day ( $p < 0.01$ ), but did better regarding intake of milk/dairy foods ( $p < 0.05$ ), in both 2019 ( $p < 0.05$ ), and 2020 ( $p < 0.01$ ), than less frequent watchers.

## DISCUSSION

The most notable finding of this study is that the self-evaluated diet scores of college students majoring FN regarding consumption of alcohol, processed foods, delivery foods, high-sodium foods, sweets, and foods containing excessive animal fat, as well as eating in a pleasant atmosphere and regular exercise were significantly higher in 2020 than in 2019, while the score regarding eating out tended to be higher (less eating out) without reaching statistical significance ( $p = 0.052$ ). These changes to healthier dietary habits may be associated with our finding that almost 2 times more participants cooked at least one meal per day in 2020 compared to 2019. This contrasts with the findings of many studies [1-3,6,7,9] reporting that the COVID-19 pandemic experience has adversely affected diet and other health behaviors due to the boredom and stress of prolonged at-home stays. Three reasons may explain the apparent discrepancy between our results and those of the previous studies.

**Table 8.** Dietary life of the college students majoring in food and nutrition according to cookbang-watching status in 2019 and 2020

Variables	2019				2020			
	NW (n = 53)	MW (n = 62)	FW (n = 27)	p-value <sup>1)</sup>	NW (n = 50)	MW (n = 76)	FW (n = 41)	p-value
Eat alone				0.515				0.024
≥ 1/day	15 (28.3)	22 (35.5)	10 (37.0)		32 (64.0)	39 (51.3)	23 (56.1)	
3–6/wk	16 (30.2)	19 (30.6)	11 (40.7)		7 (14.0)	21 (27.6)	16 (39.0)	
≤ 1/mon	22 (41.5)	21 (33.9)	6 (22.2)		11 (22.0)	16 (21.1)	2 (4.9)	
Cook				< 0.001				0.030
≥ 1/day	5 (9.4)	10 (16.1)	10 (37.0)		15 (30.0)	22 (29.0)	18 (43.9)	
3–6/wk	11 (20.8)	19 (30.6)	13 (48.2)		11 (22.0)	27 (35.5)	16 (39.0)	
≤ 1/wk	37 (69.8)	33 (53.3)	4 (14.8)		24 (48.0)	27 (35.5)	7 (17.1)	
Diet Score								
Three meals a day	2.21 ± 1.49	2.03 ± 1.34	2.11 ± 1.40	0.801	2.04 ± 1.29	2.11 ± 1.44	1.68 ± 1.06	0.237
Adequate amount of food at each meal	3.34 ± 1.29	3.06 ± 1.35	2.78 ± 1.40	0.195	2.96 ± 1.48	3.37 ± 1.37	3.10 ± 1.34	0.255
≥ 2 Servings/day of meat, egg, bean and tofu	3.15 ± 1.41	3.32 ± 1.36	3.37 ± 1.36	0.731	3.20 ± 1.41	3.07 ± 1.20	3.59 ± 1.20	0.119
Consumption of greenish yellow vegetable	2.32 ± 1.36	2.48 ± 1.14	2.56 ± 1.28	0.676	2.32 ± 1.43	2.39 ± 1.27	2.90 ± 1.41	0.087
Consumption of vegetable oil containing foods	2.77 ± 1.22	3.00 ± 1.20	3.07 ± 1.30	0.489	2.48 ± 1.20	2.71 ± 1.12	2.90 ± 1.34	0.244
Consumption of milk or dairy products	2.06 ± 1.28 <sup>a</sup>	2.65 ± 1.56 <sup>b</sup>	2.93 ± 1.71 <sup>b</sup>	< 0.050	2.16 ± 1.35 <sup>a</sup>	2.79 ± 1.48 <sup>b</sup>	3.20 ± 1.47 <sup>b</sup>	< 0.010
Consumption of fruits or sugarless fruit juice	2.51 ± 1.41	2.52 ± 1.52	2.04 ± 1.40	0.315	2.20 ± 1.40	2.50 ± 1.43	2.80 ± 1.47	0.136
Consumption of seaweed	1.79 ± 1.13	2.10 ± 1.07	1.81 ± 1.27	0.303	1.48 ± 0.86	1.84 ± 1.14	1.73 ± 0.98	0.154
Eating in pleasant atmosphere	3.04 ± 1.44	3.03 ± 1.28	3.52 ± 1.42	0.259	3.20 ± 1.47	3.42 ± 1.36	3.78 ± 1.17	0.126
Balanced diet at each meal	2.70 ± 1.44	2.97 ± 1.38	3.07 ± 1.41	0.443	2.92 ± 1.45	2.89 ± 1.42	3.34 ± 1.67	0.268
Eating breakfast	2.55 ± 1.78	2.29 ± 1.54	2.19 ± 1.78	0.591	2.08 ± 1.52	2.18 ± 1.54	1.73 ± 1.32	0.286
Regular exercise	1.79 ± 1.38	1.68 ± 1.14	1.44 ± 1.01	0.481	2.16 ± 1.57	1.89 ± 1.15	1.98 ± 1.19	0.532
Consumption of processed foods <sup>2)</sup>	3.42 ± 1.32	3.29 ± 1.30	3.22 ± 1.15	0.787	3.88 ± 1.22	3.61 ± 1.27	3.98 ± 1.19	0.241
Eating out <sup>2)</sup>	3.87 ± 1.27	3.90 ± 1.29	3.59 ± 1.22	0.551	4.04 ± 1.16	4.16 ± 1.14	4.07 ± 1.27	0.847
Consumption of delivery foods <sup>2)</sup>	4.28 ± 1.12	3.94 ± 1.24	4.26 ± 1.13	0.235	4.64 ± 0.78	4.55 ± 0.84	4.41 ± 1.02	0.469
Consumption of foods containing animal fat <sup>2)</sup>	3.26 ± 1.11	3.32 ± 1.21	3.00 ± 1.11	0.474	3.64 ± 1.03	3.74 ± 1.08	3.73 ± 1.25	0.878
Consumption of salty foods or MSG <sup>2)</sup>	3.87 ± 1.33	3.74 ± 1.16	3.22 ± 1.69	0.118	4.36 ± 1.10	4.18 ± 1.09	4.27 ± 1.07	0.675
Consumption of sweet foods <sup>2)</sup>	3.34 ± 1.40	3.10 ± 1.28	2.78 ± 1.40	0.209	3.76 ± 1.33	3.39 ± 1.35	3.68 ± 1.39	0.283
Excessive drinking <sup>2)</sup>	4.32 ± 1.24	4.61 ± 0.80	4.48 ± 0.89	0.299	4.80 ± 0.61	4.68 ± 0.73	4.56 ± 1.05	0.359
≥ 3 Cups/day of caffeinated beverage <sup>2)</sup>	4.51 ± 1.03 <sup>a</sup>	4.35 ± 1.07 <sup>a</sup>	3.67 ± 1.57 <sup>b</sup>	< 0.010	4.12 ± 1.41	4.24 ± 1.35	4.12 ± 1.27	0.858
Excessive smoking <sup>2)</sup>	4.58 ± 1.20	4.71 ± 0.95	4.48 ± 1.31	0.651	4.88 ± 0.63	4.66 ± 1.00	4.51 ± 1.33	0.208

NW, not watching; MW, moderate watching; FW, frequent watching.

Values are presented as number (%) or mean ± SD and means with the same superscripts were not significantly different. Higher score represents better dietary habit.

<sup>1)</sup>Obtained by  $\chi^2$  test or analysis of variance. <sup>2)</sup>Coded reversely for undesirable dietary habits.

Firstly, it is logical that the government's recommendation to avoid crowded and confined places has decreased the opportunities for students to eat out and meet for drinks, which in turn has decreased their consumption of undesirable foods. Secondly, students may have insufficient budgets that do not allow them to keep ordering delivery foods due to difficulties in getting part-time jobs under this social distancing period. Many of our participants had worked at restaurants and cafes before COVID-19 but those workplace have experienced inevitable employee reductions since early 2020. Thirdly, the surveyed students could be expected to already possess cooking skills and understand the importance of a healthy diet. Almost twice as many participants answered that they cooked for themselves in 2020, compared to 14 months earlier, prior to the pandemic outbreak.

Our results are consistent to the previous studies in that COVID-19 pandemic could have improved the diets of certain groups of people [10,11,20]. In fact, the pandemic has made social inequalities visible and magnified, with the poorest families being the most affected [1,21]. Contrary to the studies indicating negative dietary changes [1-3,6,7,9], positive dietary changes related to pandemic confinement have also been reported in other countries. For example, various studies have found a higher adherence to the Mediterranean diet in Spanish adults [10], and more home cooking with increased opportunities to teach nutrition knowledge and behaviors to adolescents in 5 countries [11]. These positive dietary changes



might result from people better appreciating the preciousness of life [8] and understanding that the COVID-19 pandemic might not end soon [20]. Diet improvement of participants in this study resulted in that the association between frequent mukbang-watching and unhealthier dietary habits in 2019 was not shown in 2020, while the reason remains to be studied, especially on other groups of people.

Encouragingly, we observed significantly higher scores regarding regular exercise during this untact period vs. before COVID-19. This is inconsistent with the concerns of the media [9] and a study that observed decreased physical activity among 43% of Polish adults during lockdown [1]. As exercise has been shown to mitigate the effects of the COVID-19 pandemic on mental health [8], new technologies for home-based exercise have become increasingly available this year [5]. However, these developments may not benefit everyone; some may lack the necessary equipment and/or space, or struggle to adapt to new technologies. Young adults like the participants of our study may strongly benefit from these newly popular options and this, along with the increased free time experienced during this untact period, may result in their obtaining more regular exercise. We therefore propose that social support should advocate for the development of TV-based exercise content that a wide range of people can follow at home. This might yield a broader improvement of exercise-related behaviors, just like mukbang-watching can prompt viewers to eat a certain kind of food [22]. Indeed, the Egyptian recommendations [23] for physical exercise during the COVID-19 pandemic included the use of specifically “online” exercise program.

The hypothesis of this study was that prolonged stay-home due to COVID-19 lower diet quality and increase mukbang- and cookbang-watching of college students and they be associated with each other. Although the proportion of participants who answered that they watched both mukbang and cookbang at least occasionally did not change, more of those who did watched such programming at least occasionally reported that they watched those genres more frequently in 2020 than in 2019. This result partly supports the hypothesis that isolation may increase mukbang- and cookbang-watching. On the other hand, it is encouraging that more participants reported spending less time per day in watching mukbang in 2020 than in 2019, especially given that mukbang-watching has been related to an unhealthy diet [13,15].

By comparing to the previous study done in 2019 on non-major college students [15], some characteristics in habits and perception of watching mukbang and cookbang of FN-major students can be found: FN-major students reported watching mukbang and cookbang more often and longer per day; “pursuit of information” was the top answer for watching cookbang among FN-major students, while it was the second most popular answer among non-major students; watching mukbang and cookbang seemed to more profoundly influence FN-major students than their non-major counterparts, since about twice more FN-major students answered that viewing mukbang made them eat more from undesirable foods and much more reported having an increased desire to cook (92.1% vs. 65.1%) and actually cook (61.8% vs. 41.5%) by viewing cookbang from the data obtained in the same year.

It is interesting that our results confirmed the 2019 report that mukbang and cookbang had different influences on the diets of non-major students [15], in that watching cookbang had a desirable effect while watching mukbang had an undesirable effect: much more students perceived that cookbang improved their overall diet rather than worsening it, while even more students felt that mukbang worsened rather than improved it; undesirable diets

were associated with frequently watching mukbang but not with cookbang from the self-evaluation. This problematic nature of mukbang watching, but not cookbang watching, has raised concerns in many other studies and led to the development of a mukbang addiction scale [24].

This study has limitations, such as the difficulty in generalizing the results due to the use of a self-reported questionnaire and a small number of participants from a single college. However, the results of this study are meaningful because at least 3/4 of participants answered the same questionnaire 14 months apart. Moreover, this is the first report that the COVID-19 pandemic could have had positive impacts on the diet and lifestyle behaviors of young adults with a FN background. Our results could help inform the development and implementation of more effective interventions to minimize the negative impact of the COVID-19 pandemic or similar situation in the future on health. Our work further highlights the possibility of improving diet and health behaviors through proper education and the need to define groups that may be at a higher risk of unhealthy behaviors.

## SUMMARY

This study sought to determine how the coronavirus disease 2019 (COVID-19) pandemic has impacted the mukbang- and cookbang-watching patterns and dietary life of college students majoring in food and nutrition (FN) by comparing variables between April 2019 and June 2020. Results showed that students in 2020 reported more frequently eating alone ( $p < 0.01$ ) and cooking ( $p < 0.01$ ), compared to students responding in 2019. The most notable finding of this study is that the self-evaluated diet scores of college students majoring FN regarding consumption of alcohol, processed foods, delivery foods, high-sodium foods, sweets, and foods containing excessive animal fat, as well as eating in a pleasant atmosphere were significantly higher in 2020 than in 2019, while the score regarding eating out tended to be higher (less eating out) without reaching statistical significance ( $p = 0.052$ ). Diet improvement of participants due to COVID-19 resulted in that the association between frequent mukbang-watching and healthier dietary habits in 2019 was not shown in 2020. This contrasts with the findings of many studies reporting that the COVID-19 pandemic experience has adversely affected diet and other health behaviors due to the boredom and stress of prolonged at-home stays. Three reasons are possible to explain this discrepancy: the government's recommendation to avoid crowded or confined places; reduction of budgets due to difficulties to get part-time jobs; cooking skills and the health-orientation that our participants were well equipped with. Also, it is encouraging that significantly higher scores regarding regular exercise during this untact period vs. before COVID-19, while some studies observed decreased physical activity in other age groups. Young adults like the participants of our study may be the population that can benefit from these newly popular options and this, along with the increased free time experienced during this untact period. Despite some limitations, this is the first report that the COVID-19 pandemic could have had positive impacts on the diet and lifestyle behaviors of young adults with a FN background. Furthermore, our work highlights the possibility of improving diet and health behaviors through proper education and the need to define groups that may be at a higher risk of unhealthy behaviors.

## REFERENCES

1. Górnicka M, Drywień ME, Zielinska MA, Hamulka J. Dietary and lifestyle changes during COVID-19 and the subsequent lockdowns among Polish adults: a cross-sectional online survey PLifeCOVID-19 Study. *Nutrients* 2020; 12(8): 2324.  
[PUBMED](#) | [CROSSREF](#)
2. Ghosh A, Arora B, Gupta R, Anoop S, Misra A. Effects of nationwide lockdown during COVID-19 epidemic on lifestyle and other medical issues of patients with type 2 diabetes in north India. *Diabetes Metab Syndr* 2020; 14(5): 917-920.  
[PUBMED](#) | [CROSSREF](#)
3. Mattioli AV, Sciomer S, Cocchi C, Maffei S, Gallina S. Quarantine during COVID-19 outbreak: changes in diet and physical activity increase the risk of cardiovascular disease. *Nutr Metab Cardiovasc Dis* 2020; 30(9): 1409-1417.  
[PUBMED](#) | [CROSSREF](#)
4. Ammar A, Brach M, Trabelsi K, Chtourou H, Boukhris O, Masmoudi L, et al. Effects of COVID-19 home confinement on eating behaviour and physical activity: results of the ECLB-COVID19 international online survey. *Nutrients* 2020; 12(6): 1583.  
[PUBMED](#) | [CROSSREF](#)
5. Ravalli S, Musumeci G. Coronavirus outbreak in Italy: physiological benefits of home-based exercise during pandemic. *J Funct Morphol Kinesiol* 2020; 5(2): 31.  
[PUBMED](#) | [CROSSREF](#)
6. Arora T, Grey I. Health behaviour changes during COVID-19 and the potential consequences: a mini-review. *J Health Psychol* 2020; 25(9): 1155-1163.  
[PUBMED](#) | [CROSSREF](#)
7. Jayawardena R, Misra A. Balanced diet is a major casualty in COVID-19. *Diabetes Metab Syndr* 2020; 14(5): 1085-1086.  
[PUBMED](#) | [CROSSREF](#)
8. Zhang Y, Zhang H, Ma X, Di Q. Mental health problems during the COVID-19 pandemics and the mitigation effects of exercise: a longitudinal study of college students in China. *Int J Environ Res Public Health* 2020; 17(10): 3722.  
[PUBMED](#) | [CROSSREF](#)
9. Jang JH. Prolonged stuck to home, How to deal with kids gaining weight? [Internet]. Seoul: Sport Chosun; 2020 [cited 2020 Sep 6]. Available from: <https://sports.chosun.com/news/utype.htm?id=202012160100119800007200&ServiceDate=20201215>.
10. Rodríguez-Pérez C, Molina-Montes E, Verardo V, Artacho R, García-Villanova B, Guerra-Hernández EJ, et al. Changes in dietary behaviours during the COVID-19 outbreak confinement in the Spanish COVIDiet Study. *Nutrients* 2020; 12(6): 1730-1748.  
[PUBMED](#) | [CROSSREF](#)
11. Ruiz-Roso MB, de Carvalho Padilha P, Mantilla-Escalante DC, Ulloa N, Brun P, Acevedo-Corraea D, et al. Covid-19 confinement and changes of adolescent's dietary trends in Italy, Spain, Chile, Colombia and Brazil. *Nutrients* 2020; 12(6): 1807.  
[PUBMED](#) | [CROSSREF](#)
12. Biddle SJ, García Bengoechea E, Pedisic Z, Bennie J, Vergeer I, Wiesner G. Screen time, other sedentary behaviours, and obesity risk in adults: a review of reviews. *Curr Obes Rep* 2017; 6(2): 134-147.  
[PUBMED](#) | [CROSSREF](#)
13. Kang E, Lee J, Kim KH, Yun YH. The popularity of eating broadcast: Content analysis of “mukbang” YouTube videos, media coverage, and the health impact of “mukbang” on public. *Health Informatics J* 2020; 26(3): 2237-2248.  
[PUBMED](#) | [CROSSREF](#)
14. Oh MH, Hong K, Kim SE. Relationship among the use of food-related content, dietary behaviors, and dietary self-efficacy of high school students in Seoul and Gyeonggi areas. *J Nutr Health* 2019; 52(3): 297-309.  
[CROSSREF](#)
15. Yun S, Kang H, Lee H. Mukbang- and Cookbang-watching status and dietary life of university students who are not food and nutrition majors. *Nutr Res Pract* 2020; 14(3): 276-285.  
[PUBMED](#) | [CROSSREF](#)
16. Korean Statistical Information Service. The survey on smartphone overdependence [Internet]. Daejeon: Korean Statistical Information Service; 2019 [cited 2020 May 7]. Available from: [https://kosis.kr/statisticsList/statisticsListIndex.do?menuId=M\\_01\\_01&vwcd=MT\\_ZTITLE&parmTabId=M\\_01\\_01&entrTy pe=btn#content-group](https://kosis.kr/statisticsList/statisticsListIndex.do?menuId=M_01_01&vwcd=MT_ZTITLE&parmTabId=M_01_01&entrTy pe=btn#content-group).

17. Seo EH. A study on food habits and nutrient intakes according to BMI in Food and nutrition major and non-major female students in Kyungnam University. *Korean J Community Nutr* 2014; 19(4): 297-316.  
**CROSSREF**
18. Shin KO, Chung KH. Comparative study of dietary habits, mini dietary assessment scores, and health interest between female students in the department of food and nutrition and other departments, Sahmyook University. *J East Asian Soc Diet Life* 2010; 20(3): 341-351.
19. Choi HM, Kim JH, Kim CI, Chang KJ, Min HS, Yim KS, et al. *Essentials of nutrition*. 4th ed. Paju: Kyomoonasa; 2016.
20. Hwang HY. Four year' changes occurred just in 3 months by COVID-19 [Internet]. [place unknown]: Mobsinside; 2020 [cited 2020 Aug 10]. Available from: <https://www.mobsinside.co.kr/2020/08/10/opensurvey-corona-1/>.
21. Choi HJ. Prolonged COVID-19 stopped school lunch...children desperately need concerns [Internet]. Gwangju: Gwangju Mael Newspaper; 2020 [cited 2020 Sep 3]. Available from: <http://m.kjdaily.com/article.php?aid=1599123938522987005>.
22. Park J, Park J. Investigating the influence of a food-themed TV program on delivery food order amount using big data with difference-in-differences method. *Inf Syst Rev* 2016; 18(1): 25-39.  
**CROSSREF**
23. Abbas AM, Kamel MM. Dietary habits in adults during quarantine in the context of COVID-19 pandemic. *Obes Med* 2020; 19: 100254.  
**PUBMED | CROSSREF**
24. Kircaburun K, Stavropoulos V, Harris A, Calado F, Emirtekin E, Griffiths MD. Development and validation of the mukbang addiction scale. *Int J Ment Health Addict*. Forthcoming 2020.  
**CROSSREF**