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Paper

Gender-based Differences in Healthy Eating Practices and Association with Childhood Dietary Behaviors in Young Adults

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This study examined the association between healthy eating practices and childhood dietary habits in young adults, and the presence of gender-based differences in this association. In this cross-sectional study, 500 Japanese young adults aged 18–29 years completed an online questionnaire comprising items that assessed healthy eating practices and childhood eating habits. Content analysis was used to examine open-ended data. Logistic analysis was performed to examine the association between the prevalence of healthy eating practices and childhood eating habits. In this study, 56.2% of the participants practiced healthy eating. In the content analysis, gender-based differences in the primary eating practices and primary reasons for not adhering were identified. The logistic regression analysis identified gender-based differences to be associated with childhood eating habits and healthy dietary practice, such as "receiving nutrition education" for men and "maintaining a healthy diet" for women. In conclusion, gender-based differences were found in factors related to healthy eating practices among young adults.

Key words：healthy eating, preventive practice, young adult, qualitative, childhood eating habit

INTRODUCTION

Healthy eating during early adulthood plays a significant role in maintaining good health throughout one's life[1)~3)]. However, researchers have warned that during this life stage, marked by various environmental and social changes, individuals often adopt unhealthy eating habits more readily[4)5)]. In Japan, dietary patterns among young adults often involve a higher incidence of skipping breakfast, a less balanced diet, and lower consumption of fruits and vegetables compared to older generations[6)7)]. Furthermore, health concerns among young adults have been noted, such as an increasing obesity rate among men in their 30s, and a high prevalence of low body mass index (BMI) among young women, predisposing them to future osteoporosis risks[6)]. Therefore, in 2016, the Basic Plan for the Promotion of Shokuiku aimed to increase the proportion of individuals practicing healthy eating habits to prevent or manage lifestyle diseases[8)]. Despite this initiative, findings from the Nutrition Education Awareness Survey indicated that the proportion of young adults adhering to healthy eating practices was lower compared to other age groups[9)]. However, owing to the limited number of young adult respondents in this survey, the prevalence of healthy eating habits specifically targeted at preventing lifestyle diseases in this demographic is less reliable.

Eating patterns established during childhood and adolescence play a crucial role in shaping dietary behaviors in young adults and adults[10)~16)]. Consumption of fruits and vegetables during young adulthood has been linked to factors such as taste preferences, availability of nutritious foods, and family meal routines during early stages of life[10)11)14)]. Young adults who maintain well-balanced diets often have a history of enjoying meals and discussing nutrition during their childhood[13)16)]. Regular

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eating habits during childhood have also been associated with low rates of skipping breakfast among young adult men[12]. Furthermore, adolescents who are more mindful of sustainable eating tend to develop healthy eating habits as young adults[15]. However, it should be noted that the association between eating habits in childhood and those in early adulthood may have limitations. For instance, Ainuki et al. found no direct link between enjoying mealtime as a child and skipping breakfast in adulthood[13]. Similarly, weight control efforts during adolescence do not necessarily correlate with fruit and vegetable intake in young adulthood[10], and awareness of sustainable eating habits during adolescence may not influence sodium and calcium intake in young adults[15]. Thus, although certain childhood eating habits may impact whether young adults adopt healthy dietary practices aimed at preventing lifestyle diseases, this relationship remains to be fully clarified.

Understanding how childhood eating habits impact the adoption of healthy eating habits during young adulthood to prevent lifestyle diseases is valuable for developing educational campaigns and health initiatives aimed at increasing the adoption rate of such practices. Given that gender is known to influence dietary habits, investigating gender-based variations in the adoption of healthy eating practices for disease prevention is crucial[4]. Therefore, this study aimed to determine the prevalence of healthy eating practices adopted to prevent lifestyle diseases among young adults and to explore potential gender-based differences in such practices. Additionally, the study qualitatively explored the specific practices and reasons for not adhering to healthy eating to better understand young adults' perceptions regarding healthy eating. Furthermore, the study examined the relationship between adopting healthy eating practices for disease prevention and childhood dietary habits among young adults as well as any gender-based differences in this relationship.

METHODS

Study design and participants

This study employed a cross-sectional online survey conducted via Yahoo! Crowdsourcing Services (Yahoo Japan Corporation, Japan). The survey targeted individuals aged 18–29 years who were registered users of online services. Prior to participating, all respondents provided informed consent after receiving detailed information about the study's objectives and the intended use of collected data, as outlined on the recruitment page. Subsequently, participants completed questionnaires written in Japanese. To ensure the reliability of responses, three screening questions were included in the questionnaire to identify and exclude unsatisfactory submissions[17]. Completing the questionnaire in its entirety earned participants 50 PayPay points as a reward. The sample size for this study was determined based on an expected proportion, with a confidence interval (CI) of 0.1 and a confidence level of 95%. The expected proportion was estimated from a prior survey conducted by the Ministry of Agriculture, Forestry and Fisheries of Japan, which evaluated the prevalence of healthy eating habits among individuals in their 20s (Ministry of Agriculture, Forestry and Fisheries)[9]. Subsequently, this study collected anonymous responses from a total of 500 participants, evenly split between 250 men and 250 women. Each registrant was restricted to providing only one response. The survey was conducted online on November 18–19, 2022. Throughout the duration of the survey, 531 registrants submitted responses. After eliminating 31 participants who incorrectly answered the screening questions, the final dataset comprised 500 valid responses. This study adhered to the principles outlined in the Declaration of Helsinki, and all procedures involving the participants were approved by the Institutional Ethics Committee (approval number: 22–84).

Assessment of healthy eating practices specifically adopted to prevent lifestyle diseases

To assess the prevalence of healthy eating practices aimed at preventing lifestyle diseases, participants were asked the following question: "To prevent or improve lifestyle diseases, do you usually practice dietary habits aimed at maintaining an appropriate body weight and reducing salt intake?" This question was adapted from the Nutrition Education Awareness Survey[9]. Responses included options such as "I always do," "I sometimes do," "I seldom do," and "I never do." Participants responding "I always do" or "I sometimes do" were assigned to the practice group, whereas those responding "I seldom do" or "I never do" were assigned to the nonpractice group. Both groups were also asked open-ended questions regarding their healthy eating practices and reasons for not adhering to such practices. No restrictions were placed on the response length, allowing answers to vary from single words to entire paragraphs.

Assessment of childhood eating habits

Herein, the childhood period was defined as the number of years spent in elementary school. Childhood dietary factors were assessed through 33 items that encompassed various elements of childhood eating habits based on previous studies, including involvement in meal preparation, meal content, dietary regularity, learning eating habits, food likes and dislikes, familial and adult guidance in these matters, and nutrition education opportunities[12)16)]. Additionally, in line with the implementation of the Basic Act on Shokuiku (Food and Nutrition Education) in Japan since 2005, which promotes the placement of nutrition educators in elementary and junior high schools as well as nutrition education within communities, two further items were introduced in the questionnaire. These items queried participants about whether they had received food and nutrition education beyond home economics classes and whether they had received such education within the community, such as at community centers and children's groups. Response options included "very applicable," "applicable," "neither," "not very applicable," and "not applicable." The validity of these items was deliberated by two authors who are certified dietitians and two authors who are certified school teachers.

Other variables

Age was determined based on the following categories: " < 20," "20–24," and "25–29" years. Information regarding living arrangements was collected with options including "living with family, etc.," "living alone," and "other." Respondents who selected "other" were prompted to specify their living situations. Employment status was categorized as "regular worker," "contract worker," "part-time worker," "public employee," "educator," "medical worker," "specialist personnel," "self-employed professional," "student," or "other". Subjective economic status was assessed using a 5-point scale ranging from very secure to very insecure. BMI was evaluated with options " < 18.5," "18.5–24.9," and " ≥ 25." Smoking status was determined by selecting from "never smoked before," "used to smoke but have stopped," and "still smoke." The prevalence of alcohol consumption was determined by querying respondents about their drinking frequency, with choices including "I do not drink at all," "I occasionally drink," and "I drink every day."

Qualitative analysis

Textual data regarding healthy eating practices and explanations for not adhering to healthy eating were qualitatively analyzed using a conventional qualitative content analysis approach to organize the data into distinct categories[18)]. Initially, the primary researcher and a trained research assistant thoroughly reviewed all textual data, identifying 214 responses related to healthy eating practices and 115 responses regarding reasons for not adhering to healthy eating. Subsequently, the data were meticulously examined word by word, and descriptive codes were developed. Given that participants often provided multiple responses, multiple codes were assigned accordingly. The codes were then categorized based on their thematic relevance. The coding and categorization processes were performed independently by the two researchers. Discrepancies were resolved through discussion, leading to the creation of comprehensive category lists, which were subsequently reviewed and slightly modified by the co-authors. This process resulted in the identification of 20 categories pertaining to healthy eating practices and 9 categories regarding reasons for not adhering to healthy eating. Furthermore, both researchers independently applied the established categories to code the data. Krippendorff's alpha values, which were determined to be 0.955 for healthy eating practices and 0.966 for reasons for not adhering to healthy eating, indicated excellent agreement between coders[19)]. Any discrepancies were resolved through consensus, resulting in the finalization of the category lists. Table1 illustrates some examples of these categories. Finally, frequency analyses were conducted for both overall and gender-specific data.

Statistical analysis

The study participants were categorized into two groups: those who practiced healthy eating habits (practice group) and those who did not (nonpractice group). Descriptive statistics for participant characteristics, presented as percentages, were employed for categorical variables. A chi-squared test was used to compare participant data between these groups. Respondents who answered "living with family, etc.," or "other" for their living arrangements were categorized as "living with someone." Employment status was divided into four categories: employed full-time, employed part-time, unemployed/homemaker/other, and student. Subjective economic status was delineated into

Table1 Categories, descriptions, and examples of the contents of healthy eating practices and reasons for non-adherence

Category	Description	Examples
Contents of healthy eating practices		
Salt reduction	Responses related to salt reduction and practices aimed at reducing salt	"Keeping the seasoning light." "Eating lightly seasoned meals." "I do not eat *ramen* broth."
Vegetable intake		
	Answers regarding the number of vegetables and how to eat them	"I prepare lunches with more vegetables." "I eat various colored vegetables." "I eat vegetables first."
Balanced diets		
	Responses related to nutritional and dietary balance	"I eat a balanced diet." "I shop for a balance of carbohydrates, fats, and proteins in my food." "I try to eat a well-balanced diet."
Limit sweet consumption and snacking		
	Responses related to the number of sweets, sweetened beverages, and other sweet foods (including sugar), snacking, and junk food	"Sugar-free as much as possible." "I am careful not to consume too many sweets and juices." "Snacking is limited to one meal per day."
Energy restriction		
	Responses regarding energy restriction or practices aimed at energy restriction	"I try eating until I am 80% full." "I avoid overeating." "I am reducing the amount of food consumed to avoid weight gain."
Use of health-conscious food products		
	Responses regarding the use of "Food for Specified Health Uses (FOSHU)," low-sodium seasonings, low-sugar foods, oil containing medium-chain triglycerides, etc.	"I use low-sodium seasonings." "I buy FOSHU and low-sodium products." "I supplement missing nutrition with supplements."
Reasons for not adhering to healthy eating habits		
Lack of motivation for healthy eating	Responses stating discomfort with complications and hassles in practicing healthy eating	"Tiresome." "It is a hassle to worry about prices and cooking." "I am too lazy to practice."
Perception as unnecessary		
	Responses such as no need or no effect	"I don't feel I need it." "I am not fat or sick." "I tried practicing it before and didn't get much benefit from it."
Appetite for unhealthy foods		
	Responses related to difficulties in self-control and preference for unhealthy food.	"I don't want to not be able to eat what I want to eat." "My appetite gets the better of me." "I like junk food."
Lack of knowledge and skills		
	Responses related to difficulties due to lack of knowledge and skills for healthy eating	"I don't know how to do it." "It is not so easy to put it into practice on my own." "I do not have any nutritional knowledge."
Not cooking oneself	Responses such as not cooking or unwillingness to cook	"I don't cook." "I don't want to cook." "I eat out a lot."
Lack of interest or concern	Responses such as lack of interest or concern	"I don't care much about nutrition." "I am uninterested."

three levels: secure, neither, and insecure. Participants were further classified based on their smoking status into current smokers and nonsmokers. Exploratory factor analysis was conducted using unweighted least-squares methods with Promax rotation to identify childhood eating habits. The number of factors retained was determined using a scree test in conjunction with eigenvalues (≥ 1). Items with factor loadings of < 0.4 and those with loadings of ≥ 0.4 on more than one factor were excluded from the analysis, which was iteratively repeated until such items were no longer present. Following the exclusion of 5 out of the initial 33 childhood eating habit items, a seven-factor solution was derived (Kaiser–Meyer–Olkin Measures of Sampling Adequacy score, 0.87; Bartlett test score, < 0.001)[20]. The reliability of each factor was examined using Cronbach's alpha coefficients. Each item was scored based on its perceived applicability, with ratings of "extremely applicable" receiving 5 points, "applicable" receiving 4 points, "neither" receiving 3 points, "not very applicable" receiving 2 points, and "not applicable" receiving 1 point. The total score for each factor was calculated by summing the scores and dividing by the number of items, resulting in scores ranging from one to five for childhood eating habits. Variations in factor scores between the practice and nonpractice groups were assessed using the Mann–Whitney U test. Logistic regression analysis was employed to investigate the relationship between the prevalence of healthy eating practices and childhood eating habits, with odds ratios (ORs) and 95% CIs calculated accordingly. Covariates included age, gender, living arrangement, subjective economic status, and current smoking and alcohol consumption statuses, all considered fundamental participant attributes and thus included as covariates in the analysis. Subgroup analyses were conducted to explore gender-based differences in the associations between healthy eating practices and childhood eating habits. IBM SPSS Statistics 26.0 software (IBM Corp., Armonk, NY, USA) was used to perform all statistical analyses. A two-tailed p-value of < 0.05 was considered statistically significant.

RESULTS

Participant characteristics

Table2 presents the characteristics of the study participants, categorized according to their adherence to healthy eating habits. The study comprised 500 young adults aged 18–29 years, with an equal gender distribution (1:1 ratio). Overall, 66% of participants had a BMI within the normal range (18.5–24.9 kg/m^2). Among the participants, 56.2% (n = 281) reported practicing healthy eating to prevent lifestyle diseases. Significant differences were observed between the practice and nonpractice groups based on their subjective economic status (p = 0.002) and current smoking status (p = 0.028). Specifically, the percentage of participants reporting subjective economic security was higher in the practice group (42.0%) than in the nonpractice group (28.3%). Additionally, the prevalence of current smokers in the nonpractice group (11.0%) was twice as high as that in the practice group (5.3%). However, there were no significant differences in age, gender, BMI, living arrangement, employment status, or alcohol consumption status between the two groups.

Healthy eating practices and reasons for not adhering to healthy eating

Figure1A illustrates the distribution of participants' adherence to various eating patterns within the practice group. Data from free responses were collected from 214 participants in this group (76.2%). Among these participants, 73.2% reported practicing multiple healthy eating measures. The most prevalent practice was reducing dietary salt intake, reported by 35.5% of participants, with examples including "keeping the seasoning light," "eating lightly seasoned meals," and "I don't eat *ramen* broth". The second most prevalent practice was vegetable intake, reported by 22.4% of participants, with responses such as "I prepare lunches with more vegetables," "I eat various colored vegetables," and "I eat vegetables first." Other common healthy eating practices included maintaining a balanced diet (14.5%), adjusting energy intake (14.0%), opting for healthier food choices (12.1%), and limiting the consumption of sweets and snacks (9.8%).

Figure1B illustrates the distribution of participants' reported reasons for not adhering to healthy eating within the nonpractice group. In the nonpractice group, 152 participants (69.4%) provided reasons for their lack of adherence to healthy eating. Most respondents (95.4%, n = 145) reported a single reason. The most commonly cited reason was lack of motivation, reported by 28.3% of participants, with responses including "I'm too lazy to think and eat," "It is a hassle," and "If I had to worry about the amount of salt in every meal, it would be too much work to cook". The second most commonly cited reason was a perception of healthy eating being unnecessary, reported

Table2　Characteristics of the study participants and of those categorized based on healthy eating practices (n = 500)

	Overall (n = 500)	Nonpractice group (n = 219)	Practice group (n = 281)	$p^{1)}$
	N (%)	N (%)	N (%)	
Age, years				
< 20	51 (10.2)	25 (11.4)	26 (9.3)	0.669
20–24	194 (38.8)	86 (39.3)	108 (38.4)	
25–29	255 (51.0)	108 (49.3)	147 (52.3)	
Gender				
Men	250 (50.0)	115 (52.5)	135 (48.0)	0.367
Women	250 (50.0)	104 (47.5)	146 (52.0)	
Body mass index, kg/m^2				
< 18.5	125 (25.0)	49 (22.4)	76 (27.0)	0.072
18.5–24.9	331 (66.2)	144 (65.8)	187 (66.5)	
≥ 25	44 (8.8)	26 (11.9)	18 (6.4)	
Living arrangements				
Living with someone	362 (72.4)	160 (73.1)	202 (71.9)	0.840
Living alone	138 (27.6)	59 (26.9)	79 (28.1)	
Employment status				0.689
Employed full-time	231 (46.2)	95 (43.4)	136 (48.4)	
Employed part-time	53 (10.6)	25 (11.4)	28 (10.0)	
Unemployed/homemaker/other	58 (11.6)	28 (12.8)	30 (10.7)	
Student	158 (31.6)	71 (32.4)	87 (31.0)	
Subjective economic status				0.002
Secure	180 (36.0)	62 (28.3)	118 (42.0)	
Neither	220 (44.0)	102 (46.6)	118 (42.0)	
Insecure	100 (20.0)	55 (25.1)	45 (16.0)	
Current smoking status				
Nonsmoking	461 (92.2)	195 (89.0)	266 (94.7)	0.028
Smoking	39 (7.8)	24 (11.0)	15 (5.3)	
Current alcohol consumption status				0.334
None	239 (47.8)	104 (47.5)	135 (48.0)	
Occasionally	233 (46.6)	99 (45.2)	134 (47.7)	
Every day	28 (5.6)	16 (7.3)	12 (4.3)	

1) Statistical significance was determined using the chi-square test.

by 21.1% of participants, with responses such as “no sense of urgency,” “my weight hasn’t changed,” and “I feel I don’t have to worry about it yet because of my age.” Additionally, an appetite for unhealthy foods (21.1%) and a lack of knowledge or skills were frequently cited as reasons for not adhering to healthy eating habits.

Table3 presents the top four healthy eating practices and reasons for not adhering to healthy eating according to gender. Regarding healthy eating practices, reducing salt intake emerged as the most common response

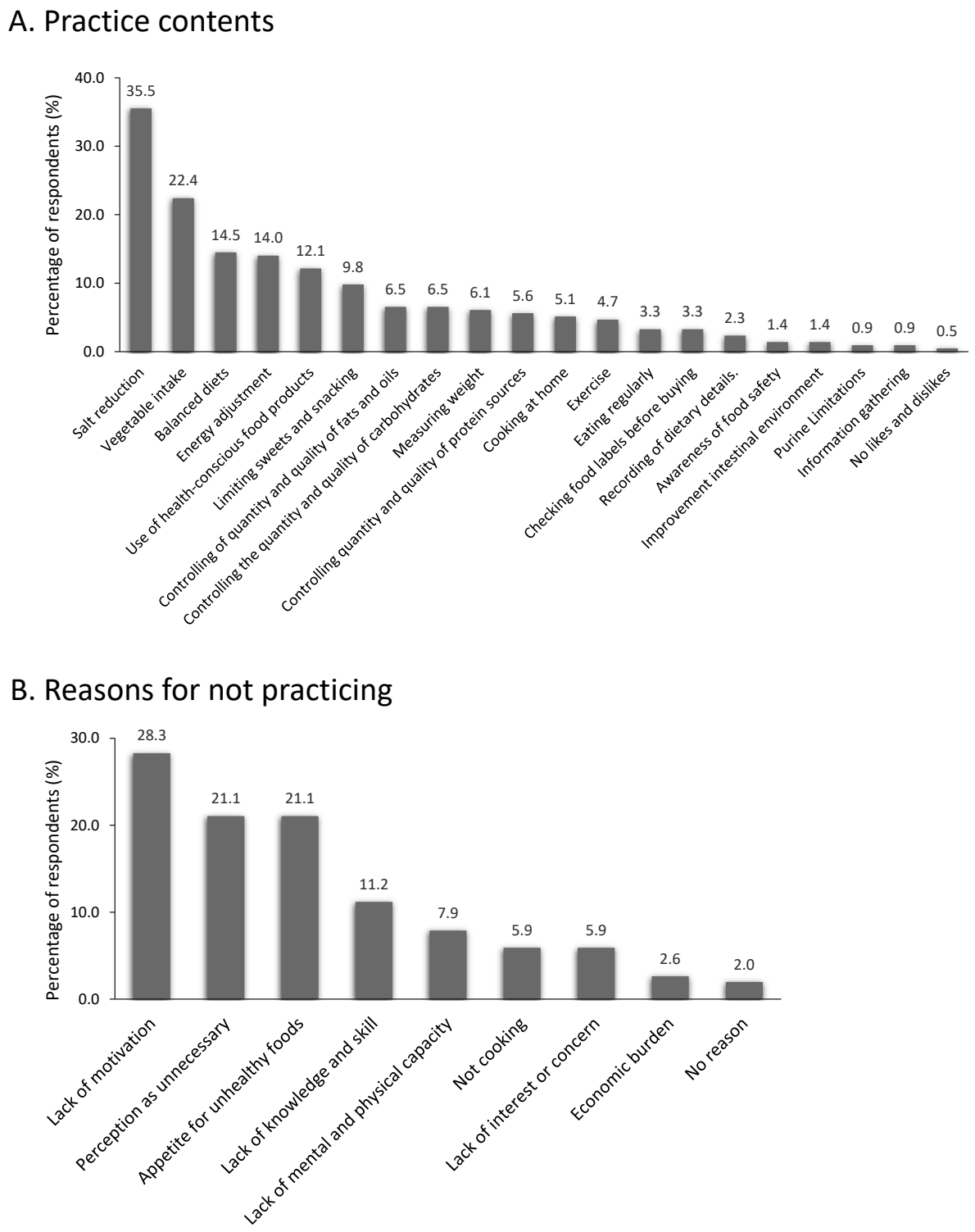

Fig.1 Percentages of participants reporting each category of healthy eating practices and the reasons for not adhering to healthy eating

(A) Twenty categories of healthy eating practices (B) Nine categories of reasons for not adhering to healthy eating

among both men and women. Among men, the ranking of practices was similar to the overall rankings. Conversely, among women, the rate of reported use of health-conscious food products (15.7%) exceeded the rate of following a balanced diet (13.0%). Regarding reasons for not adhering to healthy eating, both men and women commonly cited lack of motivation and the perception that healthy eating is unnecessary. Notably among men, not cooking for

Table3 Rankings of healthy eating practices and reasons for not adhering to healthy eating

	Top 4 healthy eating practices				Top 4 reasons for not adhering to healthy eating			
	N				*N*			
Men	106	1	Salt reduction	26.4%	82	1	Lack of motivation for healthy eating	34.1%
		2	Vegetable intake	23.6%		2	Perception as unnecessary	24.4%
		3	Balanced diets	16.0%		3	Appetite for unhealthy food	13.4%
		3	Energy restriction	16.0%		4	Not cooking for oneself	8.5%
						4	Lack of knowledge and skills	8.5%
Women	108	1	Salt reduction	44.4%	70	1	Appetite for unhealthy foods	30.0%
		2	Vegetable intake	20.4%		2	Lack of motivation for healthy eating	21.4%
		3	Use of health-conscious food products	15.7%		3	Perception as unnecessary	17.1%
		4	Balanced diets	13.0%		4	Lack of knowledge and skills	14.3%

oneself (8.5%) and a lack of knowledge and skills (8.5%) were ranked fourth. Among women, an appetite for unhealthy foods (30.0%) emerged as the most frequent response, exceeding both lack of motivation (21.4%) and the perception that healthy eating is unnecessary (17.1%).

Differences in factors influencing childhood eating habits between the groups

Table4 displays the factor structure of childhood dietary habits, identifying seven distinct patterns: eating healthy diets (factor 1, Cronbach's alpha = 0.854), receiving nutrition education (factor 2, Cronbach's alpha = 0.848), meal preparation experiences (factor 3, Cronbach's alpha = 0.791), eating convenience meals (Cronbach's alpha = 0.773), regular eating habits (Cronbach's alpha = 0.782), food likes and dislikes (Cronbach's alpha = 0.718), and sharing experiences of eating habits with close ones (Cronbach's alpha = 0.627). The cumulative contribution rate was 53.5%. Table5 presents the differences in childhood dietary habit factor scores. Notably, scores of the practice group were significantly higher than those of the nonpractice group regarding eating healthy diets, receiving nutrition education, meal preparation experiences, regular eating habits, and sharing experiences of eating habits with close ones (4.3 vs. 3.8, $p < 0.001$; 3.2 vs. 2.5, $p < 0.001$; 2.8 vs. 2.4, $p < 0.001$; 5.0 vs. 4.5, $p < 0.001$; 4.5 vs. 4.0, $p = 0.001$, respectively). However, no significant differences were observed in scores related to eating convenience meals and food likes and dislikes between the two groups.

Associations between the prevalence of adopting healthy eating practices to prevent lifestyle diseases and childhood dietary habit factors among young adults

Binary logistic analysis was conducted to examine the relationship between the prevalence of practicing healthy eating habits to prevent lifestyle diseases and childhood dietary habit factors (Table6). Overall, healthy eating habits were positively associated with eating healthy diets, receiving nutrition education, meal preparation experiences, regular eating habits, and sharing experiences of eating habits with close ones in both the non-adjusted model (model 1) and the model adjusted for basic attributes (model 2). In model 3, which was additionally adjusted for each childhood dietary habit factor, the practice of healthy eating habits was significantly associated with eating healthy diets (adjusted OR 1.44; 95% CI, 1.05–1.97) and receiving nutrition education (adjusted OR, 1.45; 95% CI, 1.14–1.85). Furthermore, subgroup analysis based on gender was conducted. Among men, the prevalence of adopting healthy eating practices to prevent lifestyle diseases was only associated with receiving nutrition education in model 3 (adjusted OR, 1.70; 95% CI, 1.20–2.42). Among women, the prevalence of adopting healthy eating practices to prevent lifestyle diseases was only associated with eating healthy diets in model 3 (adjusted OR, 2.03; 95% CI, 1.22–3.38).

DISCUSSION

In this study, approximately 50% of the participants aged 18–29 years adhered to healthy eating habits

Table4 Factor structure of childhood dietary habits and Cronbach's alpha coefficient

	Factor loading						
	1	2	3	4	5	6	7
Eating healthy diets (α = 0.854)							
There were at least three items in the meal.	0.852	−0.06	−0.036	−0.037	0.087	0.071	−0.063
Meals were combined with staples, main dishes, and sides.	0.840	−0.016	−0.048	0.015	0.09	−0.009	−0.093
Foods were well presented and visually appealing.	0.697	0.000	0.023	−0.021	−0.127	−0.099	0.116
Foods were seasonal and appropriate for the season.	0.689	0.008	0.03	−0.019	−0.047	0.026	0.045
Fruits were often served.	0.64	0.048	0.082	0.136	−0.003	−0.01	−0.069
Many dishes were homemade.	0.467	−0.014	0.005	−0.216	0.056	0.093	0.125
Receiving nutrition education (α = 0.848)							
Talked about dietary balance, such as the "three color food groups," with family members or close ones.	−0.065	0.880	−0.003	−0.036	0.005	0.035	−0.086
Talked about nutrients with family members or close ones.	−0.005	0.844	−0.025	0.008	0.033	0.058	−0.063
Discussed the importance of breakfast with family members or close ones.	−0.044	0.800	−0.095	−0.064	0.098	0.006	0.119
Received nutrition education outside in home economics class.	0.05	0.56	0.078	0.016	−0.002	−0.032	0.043
Talked about food with family members or close ones during meals.	0.194	0.495	−0.047	0.068	−0.179	−0.124	0.307
Received nutrition education in the community, such as at community centers and children's groups.	0.025	0.419	0.308	0.085	−0.014	−0.03	−0.148
Meal preparation experiences (α = 0.791)							
I used to cook for my family and close friends.	−0.034	−0.009	0.773	−0.022	−0.041	0.043	0.058
I could cook a meal by myself that included a staple, main dish, and side dishes rather than a single dish.	0.06	0.047	0.699	0.042	0.059	−0.078	−0.141
I used to cook with family members or close ones.	−0.083	−0.077	0.68	−0.033	0.029	0.001	0.351
I often helped clean up after meals, such as washing dishes	0.066	−0.048	0.614	−0.006	0.046	−0.037	0.072
I often made sweets.	0.004	0.035	0.513	−0.048	−0.003	0.053	−0.036
Eating convenience meals (α = 0.773)							
I often ate takeout or retort foods	−0.025	−0.118	−0.108	0.832	0.053	−0.045	0.091
Carry-out foods were sometimes served in trays or packets.	−0.012	−0.026	−0.049	0.812	−0.021	−0.006	0.101
Meals were always the same.	−0.099	0.072	0.011	0.581	0.125	0.074	−0.057
I sometimes ate sweets instead of meals.	0.017	0.034	0.146	0.514	−0.112	0.037	−0.203
I often ate out.	0.124	0.066	0.058	0.451	−0.035	0.061	0.074
Regular eating habits (α = 0.782)							
Had three meals a day at a set time	−0.02	0.08	0.03	0.039	0.807	−0.037	0.104
I ate breakfast every day.	0.065	−0.013	0.031	0.009	0.738	−0.017	−0.029
Food likes and dislikes (α = 0.718)							
I used to be warned about my food likes and dislikes by my family or close ones.	0.082	0.066	0.058	−0.007	0.016	0.834	0.014
I had food likes and dislikes.	−0.063	−0.044	−0.08	0.081	−0.082	0.68	0.081
Sharing experiences of eating habits with close ones (α = 0.627)							
I used to grocery shop with my family or close ones.	−0.068	0.021	0.197	0.03	−0.036	0.069	0.686
I used to have a meal with my family or close ones.	0.113	−0.034	−0.092	0.062	0.143	0.01	0.646
Contribution rate (%)	22.0	13.8	5.0	4.4	3.6	2.6	2.1

IQR, interquartile range.

Table5　Differences in childhood dietary factor scores between the nonpractice and practice groups

	Overall	Nonpractice group	Practice group	*p*
	Median (IQR)	Median (IQR)	Median (IQR)	
Eating healthy diets	4.0 (1.4)	3.8 (1.1)	4.3 (1.0)	< 0.001
Receiving nutrition education	2.9 (1.3)	2.5 (1.4)	3.2 (1.5)	< 0.001
Meal preparation experiences	2.8 (1.4)	2.4 (1.4)	2.8 (1.7)	< 0.001
Eating convenience meals	2.4 (1.2)	2.4 (1.2)	2.2 (1.2)	0.146
Regular eating habits	4.5 (1.0)	4.5 (1.5)	5.0 (1.0)	< 0.001
Food likes and dislikes	3.0 (2.0)	3.0 (2.0)	3.0 (2.0)	0.301
Sharing experiences of eating habits with close ones	4.5 (1.5)	4.0 (1.0)	4.5 (1.0)	0.001

IQR, interquartile range
Statistical significance was determined using the Mann–Whitney U test.

Table6　Associations between the practice of healthy eating and childhood dietary factor scores among young adults

	Model 1 Odds ratio (95% CI; lower, upper)	Model 2 Odds ratio (95% CI; lower, upper)	Model 3 Odds ratio (95% CI; lower, upper)
Overall (n = 500)			
Eating healthy diets	1.87 (1.49, 2.35)***	1.82 (1.44, 2.32)***	1.44 (1.05, 1.97)*
Receiving nutrition education	1.76 (1.45, 2.13)***	1.73 (1.42, 2.11)***	1.45 (1.14, 1.85)**
Meal preparation experiences	1.49 (1.24, 1.79)***	1.42 (1.18, 1.72)***	1.12 (0.89, 1.41)
Eating convenience meals	0.92 (0.75, 1.13)	0.94 (0.76, 1.15)	1.08 (0.82, 1.42)
Regular eating habits	1.41 (1.17, 1.69)***	1.35 (1.12, 1.63)**	1.13 (0.91, 1.40)
Food likes and dislikes	0.92 (0.80, 1.06)	0.93 (0.8, 1.08)	0.93 (0.79, 1.09)
Sharing experiences of eating habits with close ones	1.39 (1.15, 1.67)**	1.36 (1.12, 1.66)**	1.09 (0.87, 1.36)
Men (n = 250)			
Eating healthy diets	1.65 (1.20, 2.26)**	1.56 (1.12, 2.19)**	1.13 (0.74, 1.72)
Receiving nutrition education	1.89 (1.44, 2.47)***	1.86 (1.39, 2.50)***	1.70 (1.20, 2.42)**
Meal preparation experiences	1.58 (1.23, 2.03)***	1.50 (1.16, 1.95)**	1.23 (0.89, 1.71)
Eating convenience meals	0.99 (0.75, 1.31)	0.95 (0.71, 1.27)	0.79 (0.53, 1.18)
Regular eating habits	1.23 (0.97, 1.57)	1.18 (0.92, 1.52)	1.02 (0.76, 1.38)
Food likes and dislikes	0.99 (0.82, 1.21)	0.99 (0.81, 1.21)	0.98 (0.78, 1.24)
Sharing experiences of eating habits with close ones	1.34 (1.03, 1.74)*	1.35 (1.02, 1.78)*	1.17 (0.85, 1.60)
Women (n = 250)			
Eating healthy diets	2.14 (1.53, 3.00)***	2.13 (1.50, 3.01)***	2.03 (1.22, 3.38)**
Receiving nutrition education	1.65 (1.26, 2.16)***	1.64 (1.24, 2.17)**	1.21 (0.86, 1.73)
Meal preparation experiences	1.36 (1.03, 1.79)*	1.36 (1.03, 1.81)*	1.06 (0.75, 1.49)
Eating convenience meals	0.86 (0.64, 1.16)	0.92 (0.68, 1.25)	1.44 (0.95, 2.21)
Regular eating habits	1.64 (1.25, 2.17)***	1.59 (1.19, 2.13)**	1.20 (0.86, 1.66)
Food likes and dislikes	0.84 (0.68, 1.05)	0.86 (0.69, 1.07)	0.87 (0.68, 1.11)
Sharing experiences of eating habits with close ones	1.42 (1.08, 1.86)*	1.41 (1.06, 1.86)*	1.04 (0.74, 1.47)

CI: confidence interval
*: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$
Model 1: Non-adjusted
Model 2: Adjusted for age, gender, body mass index, living arrangements, subjective economic status, smoking status, and alcohol consumption status
Model 3: Model 2 + factors of childhood dietary habits

aimed at preventing lifestyle diseases, whereas > 40% did not. Although there were no differences in the rates of practicing healthy eating between genders, gender-based differences were observed regarding healthy eating practices and reasons for not adhering to them. Overall, the current state of healthy eating practices was found to be significantly associated with the following childhood eating habits: eating healthy diets and receiving nutrition education. Notably, gender-based differences were apparent in this association, with significant relationships found only with receiving nutrition education among men and eating healthy diets among women.

Key healthy eating practices included reducing dietary salt intake, increasing vegetable intake, following balanced diets, and adjusting energy intake, indicating the recognized importance of these habits for young adults' health. Aspects regarding the quality of fats, proteins, and carbohydrates—including reducing saturated fats, incorporating plant and seafood proteins, and consuming whole grains—comprise essential elements of a healthy diet[21]. However, our study revealed relatively low proportions regarding the quantities and qualities of these macronutrients. Notably, responses pertaining to the quality aspects were limited among these categories. Furthermore, although the fruit intake among the Japanese population did not meet the targeted amount outlined in Health Japan 21 (the second term), the free-text data from our study did not address fruit intake[22]. The reasons behind the limited responses regarding these practices remain uncertain, raising questions about whether this is due to a lack of awareness or challenges in implementation. Further quantitative investigation is necessary to elucidate the factors contributing to the low adoption rates of certain healthy eating behaviors. Regarding gender-based differences, although the study found no differences in the prevalence of healthy eating practices between genders, discrepancies were evident in the specific practices themselves. Men predominantly adhered to similar primary eating practices as the overall population, whereas women tended to prioritize the utilization of healthy food products. In Japan, despite encouragement for men to actively engage in household chores and childcare, women continue to shoulder a disproportionately significant role, especially in meal preparation. A prior study on fathers' involvement in household tasks and child rearing revealed that 35.7% of fathers reported daily cleanup after meals, but only 8.6% reported daily cooking[23]. This difference in cooking frequency between genders may contribute to the elevated preference for healthy food alternatives among women.

The primary reasons cited for not adhering to healthy eating habits among both men and women were identified as a lack of motivation and the perception of healthy eating as unnecessary. However, among women, the prevalence of citing an appetite for unhealthy foods was more than double that among men. Reportedly, women's appetite is partially influenced by the menstrual cycle as sex hormones modulate food intake and food cravings[24][25]. Although this study did not explore the specific factors contributing to gender-based differences in responses regarding appetite, one potential factor could be the influence of sex hormones. Furthermore, healthy eating habits extend beyond cooking, with opportunities for healthy food choices in restaurants; however, not cooking for oneself ranked fourth among men. Moreover, a lack of knowledge and cooking skills emerged as primary reasons for not adhering to healthy eating among both men and women. These findings underscore the potential benefits of enhanced nutrition education in promoting healthy eating practices among young adults. Although quantitative analysis indicated that economic insecurity was significantly higher in the nonpractice group than in the practice group, qualitative analysis revealed a low overall response rate (2.6%) regarding economic burden as a reason for not adhering to healthy eating practices. Despite the well-established association between socioeconomic factors and healthy eating, it appears that the influence of economic factors on healthy practices may be underestimated among young adults[26].

The factor structure of childhood dietary habits observed in this study closely resembles that documented in previous studies[12][16]. Herein, the scores for eating healthy diets, receiving nutrition education, meal preparation experiences, regular eating habits, and sharing experiences of eating habits with close ones were significantly higher in the practice group than in the nonpractice group. These findings align with those of previous studies exploring factors linked to healthy eating behaviors among adolescents or young adults[10]~[13][15][16]. Specifically, the scores for eating healthy diets and receiving nutrition education were associated with healthy eating practices in young adults in the multivariate logistic analysis conducted in this study. A previous study indicated that a high consumption of vegetables and fruits during

childhood was reportedly associated with continued high intake into adolescence[27]. Furthermore, increased availability of healthy food at home during adolescence has been linked to enhanced vegetable and fruit intake in early adulthood[10)11)]. Consuming healthy diets during childhood may influence food preferences toward healthier options in young adulthood. Our qualitative data revealed that among women, an appetite for unhealthy foods was the predominant reason for not adhering to healthy eating practices. Consequently, the current state of healthy eating practices might be highly correlated with the consumption of healthy diets during childhood, particularly among women, as observed in this study. Regarding nutrition education, discussions about diets and guidance on healthy eating during childhood were associated with the adoption of well-balanced diets among university students[16]. Nutrition education is deemed pertinent to fostering healthy eating habits in young adulthood because it instills positive dietary habits during childhood[28]. In particular, the association between healthy eating practices and nutrition education in childhood was significant among men in this study. It is plausible that nutrition education exerts a more profound influence on men compared to women, possibly due to men generally possessing lower food preparation skills than women during both childhood and adulthood[29)30)]. Indeed, our study revealed a higher proportion of men selecting the response "not cooking for myself" as a reason for not adhering to healthy eating practices compared to women. However, research indicates a positive impact of cooking classes on attitudes, self-efficacy, and the adoption of healthier dietary habits in adults[31]. Therefore, providing nutrition education, especially targeted at adult men, may help encourage the adoption of healthy eating habits aimed at preventing lifestyle diseases.

Strengths and limitations

The strengths of our study include employing a mixed-methods approach, providing a comprehensive understanding of healthy eating behaviors, reasons for not adhering to healthy eating habits, and gender-based differences in young adults. Conducting an online survey allowed for a nationwide reach, assessing the broader status of healthy eating habits without confining it to specific behaviors due to their complexity. However, our study also has several limitations. First, the online survey may have introduced biases, given the skewed attributes of the population, such as upscale living and high internet literacy. The proportion of participants in their 20s practicing healthy eating in our study (56.2%) was higher than that in the national survey conducted in 2021 (46.0%, n = 204) by the Ministry of Agriculture, Forestry, and Fisheries of Japan. Participants might have been more health-conscious, as evidenced by the lower ratio of current smokers in our study (7.8%) compared to the National Health and Nutrition Survey (16.4%)[6]. Second, concerns about satisficing leading to unreliable responses are inherent in online surveys[17]. To mitigate this, three screening questions were included to ensure participants read and understood the questions related to general food-related matters and dietary manners. Third, participants' childhood dietary habits were assessed based on their recollections, introducing potential biases such as recall, social-desirability, and implicit biases; therefore, the results must be interpreted with caution. Fourth, all variables relied on self-reported data obtained through the online survey, which may introduce reporting biases. Fifth, we did not quantitatively assess food or nutrient intake, limiting our ability to evaluate actual behaviors such as dietary salt reduction or vegetable intake. Finally, the study lacks information on whether participants provided a comprehensive account of all their practices and associated reasons.

CONCLUSION

This study revealed that approximately 50% of the young adult participants engaged in healthy eating practices aimed at preventing lifestyle diseases, with no discernible gender-based differences in these practices. Key healthy eating practices included reducing dietary salt intake, increasing vegetable intake, maintaining balanced diets, and adjusting energy intake. Primary reasons for not adopting healthy eating habits included "lack of motivation," "perception as unnecessary," and "an appetite for unhealthy foods." Gender-based differences were evident in both healthy eating practices and reasons for not adhering to healthy eating. Although the use of health-conscious food products emerged as a primary practice among women, it was not as prominent among men. Furthermore, the prevalence of "appetite for unhealthy foods" as a reason for not adhering to healthy eating was twice as high among women compared to men. The occurrence of healthy eating practices was significantly associated with childhood dietary habits, particularly

in terms of consuming nutritious diets and receiving nutrition education. Gender-stratified analysis indicated that adherence to healthy diets during childhood among women and receiving nutrition education during childhood among men were associated with the adoption of healthy eating practices in young adulthood. These findings underscore the significance of early-life consumption of nutritious diets and exposure to nutrition education in fostering the capacity of young adult women and men to adopt healthy eating practices aimed at preventing lifestyle diseases. The study also emphasizes the importance of nutrition education addressing gender-based differences in healthy eating practices.

APPENDICES

Authors have no conflict of interest to declare.

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REFERENCES

1) Ludwig, D. S.; Pereira, M. A.; Kroenke, C. H.; Hilner, J. E.; Van Horn, L.; Slattery, M. L.; Jacobs, D. R. Dietary fiber, weight gain, and cardiovascular disease risk factors in young adults. *JAMA*. 1999, Vol. 282, 1539–1546.
2) Steffen, L. M.; Van Horn, L.; Daviglus, M. L.; Zhou, X.; Reis, J. P.; Loria, C. M.; Jacobs, D. R.; Duffey, K. J. A modified Mediterranean diet score is associated with a lower risk of incident metabolic syndrome over 25 years among young adults: the CARDIA (Coronary Artery Risk Development in Young Adults) study. *The British Journal of Nutrition*. 2014, Vol. 112, 1654–1661.
3) Hu, T.; Jacobs, D. R.; Larson, N. I.; Cutler, G. J.; Laska, M. N.; Neumark-Sztainer, D. Higher diet quality in adolescence and dietary improvements are related to less weight gain during the transition from adolescence to adulthood. *The Journal of Pediatrics*. 2016, Vol. 178, 188–193.e3.
4) Munt, A. E.; Partridge, S. R.; Allman-Farinelli, M. The barriers and enablers of healthy eating among young adults: a missing piece of the obesity puzzle: A scoping review. *Obesity Reviews*. 2017, Vol. 18, 1–17.
5) Winpenny, E. M.; van Sluijs, E. M. F.; White, M.; Klepp, K. I.; Wold, B.; Lien, N. Changes in diet through adolescence and early adulthood: longitudinal trajectories and association with key life transitions. *The International Journal of Behavioral Nutrition and Physical Activity*. 2018, Vol. 15, 86.
6) Ministry of Health, Labour and Welfare of Japan. "The National Health and Nutrition Survey Japan, 2019" (in Japanese). 2020. https://www.mhlw.go.jp/content/001066903.pdf (accessed 2024.4.25).
7) Ministry of Agriculture, Forestry and Fisheries of Japan. "Policies for the Promotion of Shokuiku (White Paper on Shokuiku)". 2019. https://www.maff.go.jp/j/syokuiku/wpaper/attach/pdf/r1_index-7.pdf (accessed 2023.3.11).
8) Ministry of Agriculture, Forestry and Fisheries of Japan. "Policies for the Promotion of Shokuiku (White Paper on Shokuiku)". 2021. https://www.maff.go.jp/j/syokuiku/wpaper/attach/pdf/r3_index-18.pdf (accessed 2023.3.11).
9) Ministry of Agriculture, Forestry and Fisheries of Japan. "Nutrition Education Awareness Survey Report, 2022". 2022. https://www.maff.go.jp/j/syokuiku/ishiki/r04/index.html (accessed 2023.3.22).
10) Larson, N. I.; Neumark-Sztainer, D. R.; Harnack, L. J.; Wall, M. M.; Story, M. T.; Eisenberg, M. E. Fruit and vegetable intake correlates during the transition to young adulthood. *American Journal of Preventive Medicine*. 2008, Vol. 35, 33–37.e3.
11) Cutler, G. J.; Flood, A.; Hannan, P.; Neumark-Sztainer, D. Multiple sociodemographic and socioenvironmental characteristics are correlated with major patterns of dietary intake in adolescents. *Journal of the American Dietetic Association*. 2011, Vol. 111, 230–240.
12) Tanaka, M.; Takemi, Y. Comparison of current frequency of breakfast and recollections of childhood dietary habits among young single males (in Japanese). *Nihon Kenkokyoiku Gakkaishi* (*Japanese Journal of Health Education and Promotion*). 2015, Vol. 23, 182–194.
13) Ainuki, T.; Akamatsu, R.; Hayashi, F.; Takemi, Y. Association of enjoyable childhood mealtimes with adult eating behaviors and subjective diet-related quality of life. *Journal of Nutrition Education and Behavior*. 2013, Vol. 45, 274–278.
14) Fleary, S. A.; Mehl, R.; Nigg, C. Predicting Hawaiian youth's physical activity and fruit and vegetable consumption behaviors: A 10-year cohort study. *Journal of Physical Activity & Health*. 2019, Vol. 16, 644–646.
15) Larson, N.; Laska, M. N.; Neumark-Sztainer, D. Do young adults value sustainable diet practices? Continuity in values from adolescence to adulthood and linkages to dietary behaviour. *Public Health Nutrition*. 2019, Vol. 22, 2598–2608.
16) Nakade, M.; Nakamura, K.; Fukui, R.; Matsushita, M.; Fujishiro, M. Association of a well-balanced diet with diet-related factors in childhood among female university students (in Japanese). *Nihon Kenkokyoiku Gakkaishi*

(*Japanese Journal of Health Education and Promotion*). 2022, Vol. 30, 207–217.

17) Oppenheimer, D. M.; Meyvis, T.; Davidenko, N. Instructional manipulation checks: Detecting satisficing to increase statistical power. *Journal of Experimental Social Psychology*. 2009, Vol. 45, 867–872.

18) Hsieh, H.-F.; Shannon, S. E. Three approaches to qualitative content analysis. *Qualitative Health Research*. 2005, Vol. 15, 1277–1288.

19) Hayes, A. F.; Krippendorff, K. Answering the call for a standard reliability measure for coding data. *Communication Methods and Measures*. 2007, Vol. 1, 77–89.

20) Yong, A. G.; Pearce, S. A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*. 2013, Vol. 9, 79–94.

21) Krebs-Smith, S. M.; Pannucci, T. R. E.; Subar, A. F.; Kirkpatrick, S. I.; Lerman, J. L.; Tooze, J. A.; Wilson, M. M.; Reedy, J. Update of the Healthy Eating Index: HEI-2015. *Journal of the Academy of Nutrition and Dietetics*. 2018, Vol. 118, 1591–1602.

22) National Institute of Health and Nutrition. "Health Japan 21 (the second term) | Health Japan 21". 2013. https://www.nibiohn.go.jp/eiken/kenkounippon21/en/kenkounippon21/mokuhyou.html (accessed 2021.6.19).

23) Takase, H.; Arakida, M. Childcare and housework performed by fathers with infants and related factors (in Japanese). *Nihon Koshu Eisei Zasshi* (*Japanese Journal of Public Health*). 2022, Vol. 69, 814–823.

24) Hirschberg, A. L. Sex hormones, appetite and eating behaviour in women. *Maturitas*. 2012, Vol. 71, 248–256.

25) Krishnan, S.; Tryon, R. R.; Horn, W. F.; Welch, L.; Keim, N. L. Estradiol, SHBG and leptin interplay with food craving and intake across the menstrual cycle. *Physiology & Behavior*. 2016, Vol. 165, 304–312.

26) Maguire, E. R.; Monsivais, P. Socio-economic dietary inequalities in UK adults: an updated picture of key food groups and nutrients from national surveillance data. *The British Journal of Nutrition*. 2015, Vol. 113, 181–189.

27) Nigg, C. R.; Amato, K. The influence of health behaviors during childhood on adolescent health behaviors, health indicators, and academic outcomes among participants from Hawaii. *International Journal of Behavioral Medicine*. 2015, Vol. 22, 452–460.

28) Dudley, D. A.; Cotton, W. G.; Peralta, L. R. Teaching approaches and strategies that promote healthy eating in primary school children: a systematic review and meta-analysis. *The International Journal of Behavioral Nutrition and Physical Activity*. 2015, Vol. 12, 28.

29) Woodruff, S. J.; Kirby, A. R. The associations among family meal frequency, food preparation frequency, self-efficacy for cooking, and food preparation techniques in children and adolescents. *Journal of Nutrition Education and Behavior*. 2013, Vol. 45, 296–303.

30) Smith, K. J.; McNaughton, S. A.; Gall, S. L.; Blizzard, L.; Dwyer, T.; Venn, A. J. Involvement of young Australian adults in meal preparation: Cross-sectional associations with sociodemographic factors and diet quality. *Journal of the American Dietetic Association*. 2010, Vol. 110, 1363–1367.

31) Hasan, B.; Thompson, W. G.; Almasri, J.; Wang, Z.; Lakis, S.; Prokop, L. J.; Hensrud, D. D.; Frie, K. S.; Wirtz, M. J.; Murad, A. L.; Ewoldt, J. S.; Murad, M. H. The effect of culinary interventions (cooking classes) on dietary intake and behavioral change: a systematic review and evidence map. *BMC Nutrition*. 2019, Vol. 5, 29.

若い世代の健康的な食生活の実践と学童期の食習慣との関連における性差

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本研究は，若い世代における健康的な食生活の実践と学童期の食習慣との関連について，男女による違いに着目して検討を行った．健康的な食生活の実践状況や学童期の食習慣についての質問で構成されたオンライン調査に回答した18～29歳の男女500名を解析対象とした．自由記述データは，質的内容分析によりカテゴリを生成した．健康的な食生活の実践と学童期の食習慣との関連は，ロジスティック回帰分析を用いて解析した．健康的な食習慣の実践を行っている者（実践群）の割合は，56.2%であった．内容分析の結果，主要な実践内容や実践しない理由において一部，男女差が認められた．またロジスティック回帰分析の結果，健康的な食習慣の実践と関連する学童期の食習慣は，男性は「食育機会」，女性は「健康的な食事」であり，性別により異なることが示された．以上より，若い世代における健康的な食習慣の実践と関連する学童期の食習慣には性差があることが示唆された．

キーワード：健康的な食生活，若い世代，学童期の食習慣，生活習慣病予防，質的分析

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