

Attitude towards Food Associated with Food Preferences in Japanese Elementary and Junior High School Students

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Abstract

Food-related preferences and practices are formed in early childhood. Our prior study suggested that children's food preferences were related to their attitude towards food, especially "concern about food" and "respect for food." In this study, we investigated the association of the high and low level of "attitude towards food" to food preferences of 6–16-year-old students. In 2017, a questionnaire was given to 1,658 students and guardians who attended public school and junior high school in the Hyogo prefecture of Japan. A total of 497 (29.9%) completed questionnaires were returned. The Kruskal–Wallis, Mann–Whitney U, and Jonckheere–Terpstra tests were employed to assess any associations between the independent variables and three levels of "concern about food" and "respect for food" with significance being at $p < 0.05$. The number of foods disliked by the students significantly decreased with increasing levels of "attitude towards food". The present study suggests that the students' "attitude towards food" was associated with their food preferences.

Keywords: food preference, attitude towards food, elementary school children, junior high school students

1. Introduction

Food preferences are very complicated. Taste preferences are created in early childhood when children are predisposed to prefer high-energy, sugary, and salty foods, and also tend to reject new foods (Schwartz et al., 2011; Cosmi, Scaglioni & Agostoni, 2017). As noted above, these appear to be intimately related to children's behavior and development. Food neophobia is generally regarded as the reluctance to eat, or the avoidance of new foods. In contrast, picky or fussy eaters are usually defined as children who consume an inadequate variety of foods through rejection of foods that are familiar, as well as unfamiliar, to them (Dovey, Staples, Gibson & Halford, 2008). Picky eating among children is a common concern, yet little is known about how these behaviors develop in early childhood. Picky eaters consume fewer total fats, less energy, and less protein than children without picky eating behaviors (Dubois, Farmer, Girard & Peterson, 2007). Picky eating can affect children's nutritional intake and dietary quality, and negatively impact their growth and development (Dubois et al., 2007; Cano et al., 2016). It is important to improve children's food neophobia and/or picky or fussy eating habits. In this study, all of these behaviors are defined as food preferences, as teachers and parents were unable to distinguish among these behaviors. Eating habits learned in early childhood often continue throughout adulthood (Ventura & Worobey, 2013). Some researchers found that limited food preferences relate to children's human environment, with preferences resembling those of their mother, father, and siblings (Birch, 2013; Pliner & Pelchat, 1986). Parental food habits and feeding strategies are the most important determinants of a child's eating behavior and food choices (Scaglioni et al., 2018). A preference for fat taste in mothers correlates with overweight and obesity in their children (Sobek et al., 2020). Parents of picky eaters were more likely to report that their children consumed a limited variety of food (Mascola, Bryson & Agras, 2010; Osera, Tsutie, Kobayashi & Kurihara, 2016). It is important to increase a child's eating experience. Cosmi suggested that while genetically determined individual differences exist, repeated offerings of food can modify innate preferences

(Cosmi, Scaglioni & Agostoni, 2017). Early-life experiences with various tastes and flavors have a role in promoting future healthy eating (Scaglioni et al., 2018). So, the role of parents for children during childhood is important.

While the role of parents in the development of their children's food preferences is important, the specific method is not known. Our previous study suggested that 3–5-year-old children's "concern about food" and "respect for food" were associated with a decrease in the number of foods they disliked (Osera, Tsutie, Kobayashi & Kurihara, 2016). These concepts are reported in Japan to be important in the development of mind and body during childhood in "*shokuiku*" (a type of nutritional education) during kindergarten (MEXT, 2018). "Concern about food" and "Respect for food" are classified as attitude. In the KAB model, attitude is regarded as a leading factor of behavior.

In addition "Respect for food" important for not only food preferences but also Sustainable Development Goals (SDGs), there are connected with good health and well-being and quality education (United Nations, 2015). Our previous study suggested that the relationship between food preferences and their attitude especially "Respect for food" during childhood (Osera, Tsutie, Kobayashi & Kurihara, 2014). In the present study, we aimed to determine whether the same concepts could be found in children of 6–16 years of age in elementary and junior high school.

2. Method

This was a cross-sectional study. From May to September 2017, a questionnaire was given to 1,658 mothers and their children, 6–16 years of age, who lived in Hyogo prefecture. In addition, we suggested that the 6–9 year old students answer the questionnaire with their guardians.

2.1 Questionnaire

Anthropometric measurements (weight and height) were self-reported. Body mass index (BMI) was used to indirectly assess adiposity and was calculated as weight/height^2 (kg/m^2). BMI cutoffs for the children were generated from pooled international data for BMI and were linked to BMI cutoff points used in adults (Kazmarzyk, Janssen, Morrison & Tremblay, 2007). The Japan Obesity Society's BMI cutoff points for adults were used in the current analyses to classify weight status in Table 1 (Miyazaki, 2018).

Student's food habits and lifestyle, including behaviors and attitudes, are shown in Tables 2 and 3. The questionnaire contained nine questions on food habits and attitudes toward food which referred to our previous study's questionnaire (Osera, Taniguchi, Hashimoto & Kurihara, 2018; Osera et al., 2017a). The questionnaire comprised one questionnaire on "concern about food", "respect for food", self-rated health (SRH), "talk about food", "talk about taste", "help set the table", "help cooking", "liking school lunch", "liking home meals". Both 5 point rating scales were used, with higher scores indicating more positive food habits. For example, questions regarding 'concern about food' utilized a 5-point rating scale (5 = high concern, 4 = middle concern, 3 = concern, 2 = little concern, 1 = no concern). In addition, we analyzed student's preferences at each of the three levels of "respect for food (respect)" and "concern about food (concern)". We grouped scores of the "concern" and "respect" variable into three categories: the 'high' included the responses 'higher', 'middle' included the responses 'high' whereas 'low' includes the responses 'medium', 'low', and 'none' according to the result of Table 2 and our previous study (Osera, Tsutie, Kobayashi & Kurihara, 2016).

In addition, questions about SRH measures were included with five response categories (Joffer, Jerden, Ohman & Flacking, 2016; Warnoff et al., 2016). In this study, we grouped scores of the SRH variable into two categories: the 'excellent' included the responses 'excellent' whereas 'other' includes the responses 'very good', 'good', 'fair' and 'poor' in Table 3.

Student's likes and dislikes were included in the questionnaire with the response to each being either "yes" or "no." If students answered "yes", students also chose the foods they disliked by themselves from a list of the following 55 foods: noodles, rice, bread, konjac, sweet potatoes, potatoes, azuki beans, soybeans, freeze-dried tofu, deep-fried tofu, sesame, pumpkin, peas, string beans, carrots, leeks, green peppers, broccoli, spinach, Japanese mustard spinach, cabbage, cucumber, burdock, Japanese radish, onions, corn, eggplant, Chinese cabbage, tomatoes, cherry tomatoes, bananas, tangerines, apples, pineapple, Enoki mushrooms, Shimeji mushrooms, dried shitake, toasted laver, Hijiki, seaweed, squid, shrimp, fish paste cake, Spanish mackerel, salmon, liver, beef, chicken, pork, cheese, yogurt, milk, eggs, and quail eggs. The foods on the list were selected from what is available at regular school lunches and often disliked by children as noted in our previous study (Osera, Tsutie, Kobayashi & Kurihara, 2016).

2.2 Statistical Analysis

We compared the student's food behaviors, including preferences, likes and dislikes, based on the three levels of respect and concern. In addition, we noted the top 10 disliked foods listed by the guardians or themselves. We compared the ratio of children who disliked each of the top 10 foods by the three levels of "respect" and "concern." The Kruskal–Wallis, Mann–Whitney U, and Jonckheer–Terpstra tests were used to compare the results using SPSS version 25.0 J (IBM, New York, NY, USA).

2.3 Ethics Statement

The students and their guardians were fully informed about the objectives and methods of this study. They voluntarily answered the questionnaire without any compulsion and with the understanding that they could withdraw from the study at any time. Individual privacy was strictly protected throughout the investigation. Signed consent was obtained from the guardians of each child. This study was approved by the Kobe Women's University Ethics Committee regarding Human Subjects (approval number H29-1).

3. Results

3.1 Characteristics of the Answers for the Questions related to Food Habits

Responses for questionnaire items related to food habits and lifestyle are shown in Tables 1 to 3. A total of 497 questionnaires were analyzed, which included 233 children of 6–12 years of age and 153 children of 13–16 years of age. There was no significant relationship among age, sex, and BMI (Table 1). Table 2 showed that there was a significant relationship between food preferences and "concern" or "respect."

Table 1. Baseline characteristics classified by food preferences

Items	Food preferences Category	Presence		Absence		P value*
		N	%	N	%	
Age (y.o.)	6–12	233	(58.0)	58	(58.0)	N.S.
	13–16	153	(39.6)	42	(42.0)	
Sex	Boy	166	(43.1)	54	(54.5)	N.S.
	Girl	219	(56.9)	45	(45.5)	
BMI (kg/m ²)	<18.5	290	(76.3)	66	(67.3)	N.S.
	18.5–24.9	85	(22.4)	32	(32.7)	
	≥25.0	5	(1.3)	0	(0.0)	

* Fisher's exact test.

Table 2. Association between food preferences and "Concern about food"/ "Respect for food"

Items	Food preferences Category	Presence		Absence		P value*
		N	%	N	%	
Concern about food	None	16	(4.1)	0	0.0	0.000
	Low	37	(9.6)	2	2.0	
	Medium	73	(18.9)	9	9.0	
	High	150	(38.9)	39	39.0	
	Higher	110	(28.5)	50	50.0	
Respect for food	None	2	(0.5)	0	0.0	0.000
	Low	17	(4.4)	2	2.0	
	Medium	43	(11.2)	4	4.0	
	High	155	(40.4)	23	23.0	
	Higher	167	(43.5)	71	71.0	

* Fisher's exact test.

3.2 Disliked Foods Stratified by "Concern about Food" and "Respect for Food" Levels

Of all the children, 79.4% had some food disliked. The average number of disliked foods, of the 55 items listed, was 5.3 ± 5.0 . The quartiles are shown in Table 3.

Children in the low "Concern" level group had significantly more disliked foods compared with the middle and high "Concern" level groups (6.0 ± 5.2 , 5.1 ± 5.6 , and 4.6 ± 3.8 items, respectively, $p < 0.05$). Children in the low "Respect" level group had significantly more disliked foods compared with the middle and high groups as

noted in Tables 4 and 5 (7.0 ± 6.7 , 4.9 ± 4.4 , and 4.9 ± 4.7 items respectively, $p < 0.05$). The number of foods that children disliked decreased significantly as the level of “Concern about food” and/or “Respect for food” increased.

Children chose the foods their children disliked from a list of 55 foods. The ratio of children who disliked each of the top 10 foods was investigated. Figure 1 showed that when children who disliked each of some of the top 10 disliked foods significantly or tendency reduced. This was similar to the number of foods children disliked relative to “Respect” and “Concern” shown below in Tables 4 and 5.

Table 3. Number of disliked food

Count	N	%
1 to 2	116	(32.8)
3 to 4	93	(26.3)
5 to 7	68	(19.2)
8 to 42	77	(21.8)

Table 4. Average number of disliked foods among three levels of “Concern about food”

	N	Mean	SD	
Low Concern	116	6.0	± 5.2	
Middle Concern	138	5.1	± 5.6	
High Concern	100	4.6	± 3.8	

* $p < 0.05$ by Kruskal-Wallis test.

$p < 0.05$ by Mann-Whitney U test.

SD: standard deviation N.S.: not significant

Table 5. Average number of disliked foods among three levels of “Respect for food”

	N	Mean	SD	
Low Respect	62	7.0	± 6.7	
Middle Respect	149	4.9	± 4.4	
High Respect	142	4.9	± 4.7	

* $p < 0.05$ by Kruskal-Wallis test.

$p < 0.05$, ## $p < 0.01$ by Mann-Whitney U test.

SD: standard deviation N.S.: not significant

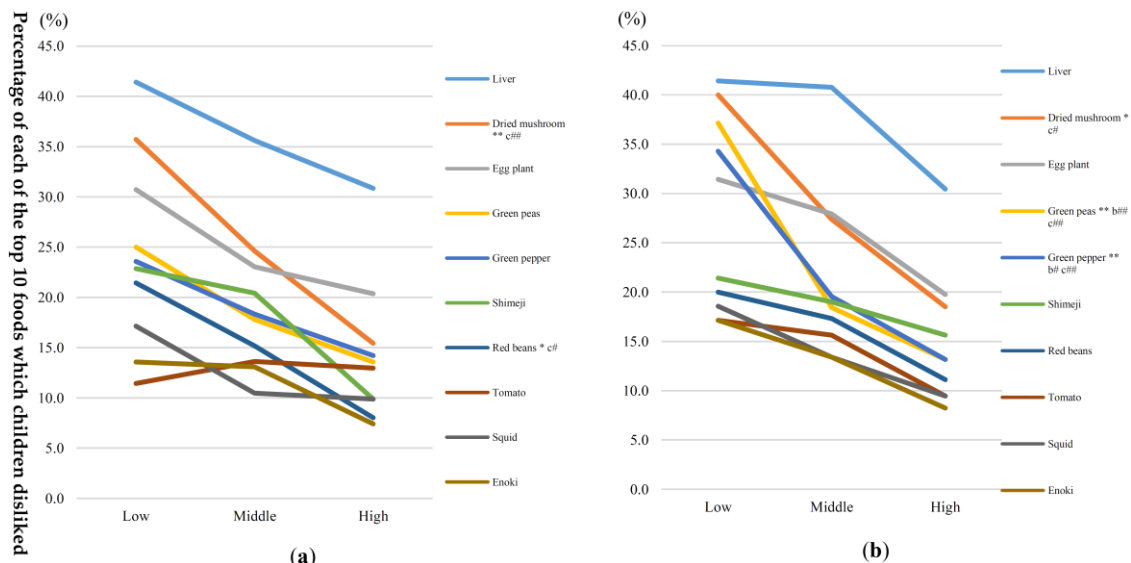


Figure 1. Percentage of children who disliked each of the top 10 disliked foods in the high, middle, and low groups stratified by (a) concern about food and (b) respect for food

* $p < 0.05$, ** $p < 0.01$ by Jonckheere–Terpstra test; # $p < 0.05$, ## $p < 0.01$ by Mann–Whitney U test; a, High vs. Middle; b, Middle vs. Low; c, High vs. Low.

3.3 Relationship between Presence or Absence of Food Preferences and Attitudes toward Food based on high to low “Concern about food” and “Respect for food”

As shown in Table 2, we classified concern and respect into the following five levels: none, low, medium, high, and higher. The individual questions from the low and middle groups were subsequently stratified by “other” and “higher.” We combined three groups to determine the relationship between the presence or absence of food preferences and concern/respect for food (data not shown). There was a significant relationship between food preferences and “Concern”/ “Respect” ($p < 0.001$).

There was a significant relationship between food preferences and children’s attitudes toward food without “help set the table” in “Concern.” In the low and high groups, there was no significant relationship between food preferences and attitude toward food. In the middle group, there was no significant relationship between food preferences and attitude toward food except for talk about taste noted in Table 6 and Appendix Table A1.

In “Respect for food,” there was a significant relationship between food preferences and attitude toward food except for “talk about food” and “help set the table.” In the high and middle groups, there was no significant relationship between food preferences and attitude toward food. In the high group, there was a significant relationship between food preferences and attitude toward food except for “SRH,” “talk about food,” and “help set the table.” In “respect for food,” there was a significant relationship with “liking school lunch” and food preferences noted in Table 6.

Table 6. Association between food preferences and food habits based on high to low “Respect for food”

Respect for food Food preferences		Low				P value*	Middle				P value*
		Presence		Absence			Presence		Absence		
Items	Category	N	%	N	%		N	%	N	%	
SRH	Other	7	29.2	0	0	N.S.	13	36.1	1	8.3	N.S.
	Very good	17	70.8	2	100		23	63.9	11	91.7	
Talk about food	Other	54	87.1	6	100	N.S.	131	85.6	19	82.6	N.S.
	Higher	8	12.9	0	0		22	14.4	4	17.4	
Talk about taste	Other	50	80.6	5	83.3	N.S.	122	78.7	17	73.9	N.S.
	Higher	12	19.4	1	16.7		33	21.3	6	26.1	
Help set the table	Other	39	88.6	4	80	N.S.	81	81	13	86.7	N.S.
	Higher	5	11.4	1	20		19	19	2	13.2	
Help Cooking	Other	42	95.5	5	100	N.S.	92	92	14	93.3	N.S.
	Higher	2	4.5	0	0		8	8	1	6.7	
Liking School Lunch	Other	28	65.1	2	40	N.S.	62	62	9	60	N.S.
	Higher	15	34.9	3	60		38	38	6	40	
Liking Home meals	Other	40	64.5	4	66.7	N.S.	63	40.9	11	47.8	N.S.
	Higher	22	35.5	2	33.3		91	59.1	12	52.2	

* Fisher’s exact test.

Respect for food		High					
Food preferences		Presence		Absence		P value*	P value*
Items	Category	N	%	N	%		
SRH	Other	9	27.3	2	14.3	N.S.	0.048
	Very good	24	72.7	12	85.7		
Talk about food	Other	121	72.5	44	62	N.S.	N.S.
	Higher	46	27.5	27	38		
Talk about taste	Other	106	63.9	34	47.9	0.03	0.002
	Higher	60	36.1	37	52.1		
Help set the table	Other	61	69.3	24	63.2	N.S.	N.S.
	Higher	27	30.7	14	36.8		
Help Cooking	Other	80	90.9	29	76.3	0.044	0.044
	Higher	8	9.1	9	23.7		
Liking School Lunch	Other	46	52.3	8	21.1	0.002	0.000
	Higher	42	47.7	30	78.9		
Liking Home meals	Other	50	29.9	11	15.5	0.023	0.011
	Higher	117	70.1	60	84.5		

4. Discussion

In this study, we found that Japanese elementary and junior high school students' food preferences were associated with their "Attitude towards food." This is evidence for continuing to teach "Concern about food" and "Respect for food" during childhood and school age (Osera, Tsutie, Kobayashi & Kurihara, 2016).

Picky children displayed more problem behaviors, both internalizing and externalizing, than non-picky eaters (Jacobi, Schmitz & Agras, 2008). On the other hand, early childhood eating problems were not associated with later eating problems at 16 years of age (Hafstad, Soest & Torgersen, 2013). Dovey et al. found that food neophobia peaked at the ages of 2 to 6 years (Dovey, Staples, Gibson & Halford, 2008). A previous study of ours found that neophobia disappeared in 10% of children aged 4 to 6 years (Osera, Tsutie, Kobayashi & Kurihara, 2014). Additionally, another previous study of ours suggested that although children may dislike some types of food, these dislikes may disappear as they become adolescents (Osera et al., 2017 b). In addition, our previous study had a cross-sectional design, so we could not establish a clear causal relationship. However, the KAB model has shown that knowledge is a key factor in behavior (Ren et al., 2020).

The three levels of "concern about food" and "respect for food" are not significantly different among the levels as noted in Tables 6, and A-1. "Respect for food" was significantly related to "liking school lunch." The aim of Japanese public kindergarten guidelines is attention to "concern about food" (MEXT, 2018). As well, the aim of Japanese public primary school is attention to feelings for food (MEXT Course of home economics, 2018), which is similar to "respect for food" in this study. Additionally, our previous study suggested that changes in food preferences among 4 to 6-year-old children were related to their food habits. Enjoying school lunches and respect for food had a significant relationship with changes in food preferences among 4 to 6-year-olds within four groups (Osera, Tsutie, Kobayashi & Kurihara, 2014). "Respect for food" in the high group had a significant relationship between food preferences and enjoying school lunch. This result supports the aim of the Japanese public primary schools of teaching attention to feelings for food (MEXT Course of home economics, 2018). In addition, Akamatsu & Iuchi (2009) have performed research related to "Gratitude for food". Their research revealed that children scoring higher in "Gratitude for food" ate vegetables every day compared with other children in grades 5 and 6 who hardly ate any vegetables. Based on these results, the presence or absence of food preference is likely to differ according to children's attitude toward food.

This study's top five disliked foods were liver, dried mushrooms, eggplant, green peas, and green peppers. These were the same as the most disliked foods as in our previous study (Osera, Tsutie, Kobayashi & Kurihara, 2016). We found the same most disliked foods among high school students in this study as in our previous study (Osera et al., 2017). The same five foods were the most disliked in three different stages of life, but this is not representative of all Japanese, and we would like to repeat the study in different aged populations. In part, the results of this study may have been due to the presence of supertasters, those able to detect 6-n-propylthiouracil (PROP) (Fox, 1932; Cohen & Ogdon, 1949; Harris & Kalmus, 1949). Kosugi & Horio (2005) found that 28% of the population were supertasters, and this taste sensitivity to PROP may be related to food preferences. As such, children's food preferences may be determined not only psychologically but also by physiology of taste.

Rahill et al. (2018) found that age affects the level of food fussiness in children, with younger children (5–8 years old) having higher levels of food fussiness than older children (9–12 years old). This finding is similar to those observed in earlier studies (Powell, Farrow & Meyer, 2011; Hursti & Sjoden, 1997; Ashcroft et al., 2008). Older children are more likely to have had greater exposure to various foods, and they will become less neophobic as fewer foods are novel to them (Cooke & Wardle, 2005). In a future study, we will assess subjects of different ages. In a previous study, 74.6% of the mothers noted that their children disliked one or more foods (Osera, Tsutie, Kobayashi & Kurihara, 2016). In this study, 79.4% of the students answered that they disliked one or more foods. Additionally, the average number of disliked foods was the same as that of our previous study (Osera, Tsutie, Kobayashi & Kurihara, 2016).

In addition “Respect for food” important for not only food preferences but also SDGs, there are connected with good health and well-being and quality education (United Nations, 2015). We think that the “Respect for food” is linked to sustainability.

Limitation of this study is that it cannot make clear the causal relationship. In the near future, we would test the hypotheses by interventional studies on the basis of the result of this study and our previous study (Osera, Tsutie, Kobayashi & Kurihara, 2016). Based on behavior science, “attitude” is the leading factor of behavior. In addition, our previous children’s retrospective cohort study suggested the same factors shown as this study’s result; “Enjoying school lunch” and “Respect for food” (Osera, Tsutie, Kobayashi & Kurihara, 2014). On the other hand, there study was small number and groups of different ages. It is necessary to continue the same survey in the future and confirm whether the same results can be obtained. Larger number of the study population with varied age distribution will be needed. However, it is an advance that similar trends in attitudes about food preferences were made clear in early childhood and elementary school and junior high school students. In addition, self-reported anthropometric measurements in young adults used to calculate BMI has its limitations. However, this will have potential impact on the results especially with the presence of the sample PROP. To future understand this phenomenon, we will do an interventional study on the basis of the result of this study in the near.

In this study, we found that student’s food preferences were associated with their “Attitude towards food”. These findings may provide important information for improving food preferences not only in young children but also in elementary school and junior high school students. In addition, this is the evidence for the importance of teaching “Respect for food” in schools.

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Appendix A

Table A-1. Association between food preferences and food habits based on high to low "Concern about food"

Concern about food		Low				Middle				
		Presence		Absence		Presence		Absence		P value*
Food preferences	Category	N	%	N	%	N	%	N	%	
SRH	Other	14	36.8	0	0	10	29.4	2	22.2	N.S
	Very good	24	63.2	5	100	24	70.6	7	77.8	
Talk about food	Other	113	90.4	11	100	128	85.3	29	74.4	N.S
	Higher	12	9.6	0	0	22	14.7	10	25.6	
Talk about taste	Other	106	85.5	11	100	112	74.7	21	53.8	0.017
	Higher	18	14.5	0	0	38	25.3	18	46.2	
Help set the table	Other	68	86.1	5	83.3	70	72.2	16	64	N.S
	Higher	11	13.9	1	16.5	27	27.8	9	36	
Help cooking	Other	76	96.2	6	100	85	87.6	20	80	N.S
	Higher	3	3.8	0	0	12	12.4	5	20	
Liking school lunch	Other	54	68.4	2	33.3	60	62.5	10	40	N.S
	Higher	25	31.6	4	66.7	36	37.5	15	60	
Liking home meals	Other	60	47.6	4	36.4	67	45.0	15	38.5	N.S
	Higher	66	52.4	7	63.6	82	55.0	24	61.5	

* Fisher's exact test.

Concern about food		High				P value*	P value*
Food preferences		Presence		Absence			
Items	Category	N	%	N	%		
SRH	Other	5	22.7	1	7.1	N.S	0.048
	Very good	17	77.3	13	92.9		
Talk about food	Other	67	61.5	29	58	N.S	0.021
	Higher	42	38.5	21	42		
Talk about taste	Other	61	55.5	24	48	N.S	0.002
	Higher	49	44.5	26	52		
Help set the table	Other	44	77.2	20	74.1	N.S	N.S
	Higher	13	22.8	7	25.9		
Help cooking	Other	54	94.7	22	81.5	N.S	0.043
	Higher	3	5.3	5	18.5		
Liking school lunch	Other	23	40.4	7	25.9	N.S	0.000
	Higher	34	59.6	20	74.1		
Liking home meals	Other	27	24.5	7	14.0	N.S	0.011
	Higher	83	75.5	43	86.0		

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