

The Survey of Parent's Food Literacy
and Children's OYATSU

Kei Hosaka

St.Lukes International University

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Abstract

Background : Children's food habits are particularly important and should consist of healthy and nutritionally balanced food to achieve a "life-long" healthy diet. This study aims to validate a food literacy measurement and investigates the association between parent's food literacy with undesirable ultra-processed OYATSU given to their children.

Methods : A total of 210 parents were recruited from M kindergarten and online and they participated to the survey about OYATSU given to their children. The survey results were analyzed, through regression analysis, to understand the most factors that were associated with ultra-processed OYATSU habits.

Results : The sub-scales of food literacy were validated by factor analysis and showed reliable internal consistency. High food literacy was associated with reduced use of ultra-processed OYATSU, and lower food literacy was significantly inversely proportional to the numbers of ultra-processed OYATSU. The most influential factor among the sub-scale of food literacy was "Food Label" that is a representation of proactive action to obtain food information. It had a significant association with less giving of ultra-processed OYATSU.

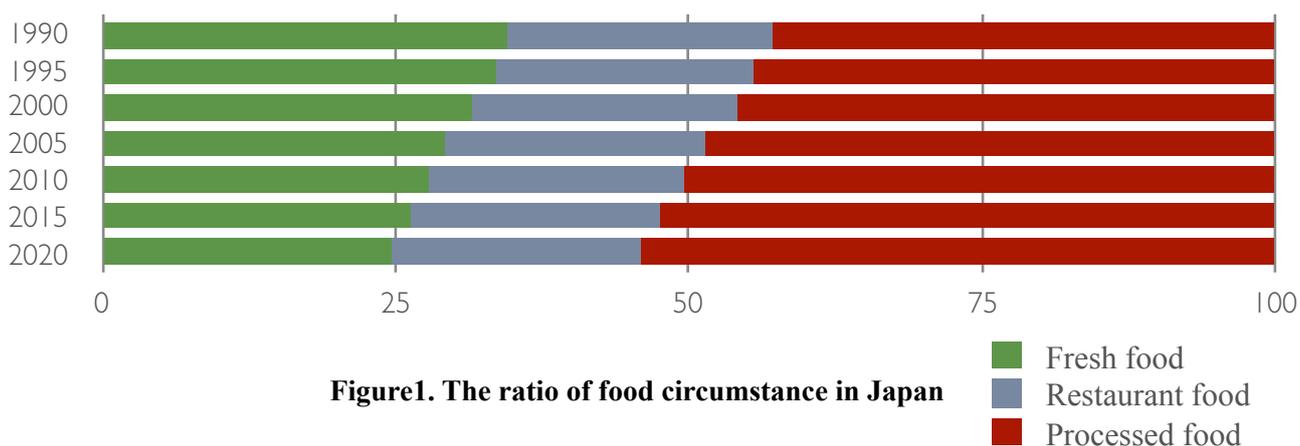
Conclusion : This study validated a food literacy measurement scale with reliable internal consistency. It should be meaningful for parents to recognize their current circumstance and hopefully gain motivation to improve their literacy that may support their children's life-long dietary habits. Consequently, the interpretation of food labels and the utilization of the knowledge to change dietary habits is rather important. In order to enhance the food literacy, further studies are needed to include some new components of food literacy, such as cooking skill and resistance of undesirable processed food. Also, consideration should be given to finding more determinants, such as the influence of using convenience stores.

Keywords: food literacy, OYATSU, child health, processed food, Japan

Background

As food choice and food information have become numerous and diverse in modern society, it is important to be able to choose the food that will promote good health. Ministry of Health and Labour and Welfare¹ (MHLW) states that we all need to be able to understand the right food information among various kinds of food in order to have a healthy diet. In addition, MHLW² specifically stated that children’s food habits are particularly important and should consist of healthy and nutrition-balanced food to achieve a “life-long” healthy diet. It is also stated that increasing the health and nutrition literacy of women, families and communities, particularly with respect to maternal and infant/child nutritional needs, is a key action. (World Health Organization³, 2016)

However, according to Ministry of Agriculture and Fisheries⁴ (MAFF), processed foods have dominated more than 50% of our daily diet as of 2015 and the ratio of fresh foods is predicted to be less than 25% in 2020 (Figure1). The data represents the environmental difficulty of keeping a well



balanced diet in modern society. Processed food is inappropriate for a healthy diet as it contains various ingredients such as chemically refined sugar, salt, and fructose-glucose syrup that rapidly raise the blood sugar rate. Moreover, typical processed food also contains

artificial additives, preservatives, and stabilizers, of which side effects and combination effects are unknown or not fully tested in the human body over a long-term period. There are several case reports that these ingredients cause various disorders such as cancer (National Health Services⁵, 2018) and obesity (Poti, Braga & Qin⁶, 2017). Agrawal and Gomez-Pinilla⁷ (2012) has stated in his research that high sugar intake has a negative impact on memory and learning. Women's Health⁸ (2016) also mentioned 58% of the food Americans eat is considered as processed and the ingredients in these food boost the blood sugar rate causing sleep disorders. In addition, it is reported, as artificial additives are hard to digest and break down in the human body, they would eventually cause obesity problems as well as other disorders (Women's Health⁸, 2016). The accumulation is worse for young children. MHLW¹ is also alerting about the dependency of processed foods as they cause both physical and mental disorders in the long-term.

As the processed foods are already taking a high ratio in our dietary habits, children's OYATSU are also considered to be influenced by the trend. OYATSU is a cultural behavior in Japan, historically started from the "EDO" period (B.C.1603-1868) (Wikipedia⁹, 2019) . The purpose of having OYATSU was originally to supply the lack of calories and necessary nutrients between breakfast and dinner as people didn't regularly have lunch at the period. MAFF¹⁰ has stated that children's OYATSU is still a supplement when there might be 6 to 7 hours gap between lunch and dinner, yet, Okuda and Kuragano¹¹ (1998) presented in her survey that 91% of parents answered that OYATSU was pleasant and only 16% parents answered as for supplement. Terashima¹² (2009) also conducted a survey at GAKUDO (after school center) and found that more than 90% of after-school centers serve OYATSU as an essential learning for children so that they create interests in eating. Thus, OYATSU can be considered as an important opportunity for children to choose or request what they wish to

eat and also a necessary opportunity for adults to promote children's interest in food and eating. OYATSU, therefore, has the potential to affect children's life-long dietary habits, and it represents parent's perception of children's healthy diets.

In other words, parents should have the ability to understand food information properly and resist from giving unhealthy processed OYATSU to their children frequently. According to Davis¹³ (2007), both parents set the pattern of children's lifestyle by the food which the parents buy and stock in the home. Taguchi, Yasuda, Nakayama and Imai¹⁴ (2014) also conducted a survey of the association of nutrition literacy with the actual diet. And the participants who have a higher literacy were significantly associated with having a better diet. Another study by Tsukahara¹⁵ (2003) stated the parents with low food literacy tend to serve more processed food and the balance of nutrition was relatively ultra-processed. Accordingly, promoting parents' food literacy may empower children's initial and future dietary habits that lead to their life-long health.

Purpose of this study

This study serves two purposes. The first is to validate food literacy measurement. The definition of “food literacy” and its core elements has been vary and widely interpreted (Truman, Lane & Elliott¹⁶, 2017), thus, the consistency among the food literacies that were used previous studies was not found well. Therefore this study aims to develop a new food literary measurement. With good measurement validation, parents will be able to measure and recognize their basic knowledge of food information and the perception will be a first step to motivate themselves to enhance their literacy for their children.

The second purpose is to analyze the association between the factors within the validated food literacy and ultra-processed OYATSU given to children. The score of food literacy will be calculated on the validated food literally and the score will be analyzed with the frequency of giving ultra-processed OYATSU. Finding the most effective factors of food literacy will support future intervention to improve one’s health. According to the survey by Sato et al.¹⁷ (2006), 75% of the OYATSU given to children who are more than 3 years old were bought from the store and only 1.3% were hand-made. The reason for focusing on OYATSU is due to its feasibility as well as its potential as mentioned above. That is, we consider OYATSU assessable as they are parent’s simple food choices, compared with breakfast, lunch or dinner that consist of too many ingredients.

Abstract Construct

This study refers to and combines some food-related items that are validated as comprehensive health literacy in earlier studies. Alberta Education¹⁸ defines literacy as the ability, confidence and willingness to engage with all aspects of daily living and World Health Organization¹⁹ defines health literacy as a critical empowerment of improving people's access to health information and their capacity to use it effectively. Cullen et al.²⁰ (2015) also proposed the definition of “Food Literacy” includes “the positive relationship built through social, cultural, and environmental experiences with food enabling people to make decisions that support better health”. Referring to these definitions, we interpret that food literacy should consist of the 3 components below;

- I. Basic understanding (be able to understand and interpret the right food information)
- II. Communicative (be able to engage with the environment to empower people to have a healthy diet)
- III. Behavior (transferring food knowledge into all aspects of daily living)

Based on the interpretation, we referred 6 questions from HEL (Health Eating Literacy) that Takaizumi et al.²¹ (2012) had developed; 「健康に関連した食の情報を自分自身で探すことができる(1)」 (be able to find health-related food information by yourself), 「新聞、本、テレビ、インターネットなど、いろいろな情報源から食情報を集められる(2)」 (be able to collect required food information from several media such as newspaper, television and internet), 「たくさんある情報の中から、自分の求める食情報を選び出せる(3)」 (be able to select and interpret the right food information from various

information), 「食情報がどの程度信頼できるかを判断できる(4)」 (be able to interpret the validity of any food information), 「食情報を理解し, 人に伝えることができる (5)」 (be able to share your interpretation of food information to others), 「食情報をもとに健康改善のための計画や行動を決めることができる(6)」 (be able to make a plan to promote others health based on obtained food information). Also referring to 4 media literacy measurements from the research by Nakanishi et al.²² (2011); 「カロリーなどの栄養成分表示を見て, よりよい食品を選ぶことができる(7)」 (be able to choose better food by using the nutrition and calories label), 「原材料や期限の表示を見て, よりよい食品を選ぶことができる(8)」 (be able to choose better food by raw material and expiry date) 「食べ物や飲み物を買う時に食品表示を見るよう心がけている(9)」 (proactively check food labels) 「食品の表示を理解できる(10)」 (be able to understand food labels), and additionally, 3 more questions from the determining factor of nutritious balanced food; 「健康に過ごすために, バランスの良い食事になるよう気をつけている(11)」 (be aware of a good balanced diet) 「主食・主菜・副菜のそろった食事を心がけている(12)」 (be aware of staple, main dish and side dish) 「自分の食事のバランスがよいかどうか判断することができる(13)」 (be able to understand if the person's own diet is nutritiously balanced). Then we interpreted and grouped into 3 components, Basic Knowledge, Communicative and Behavior. Figure 2 is showing the grouping of 13 items.

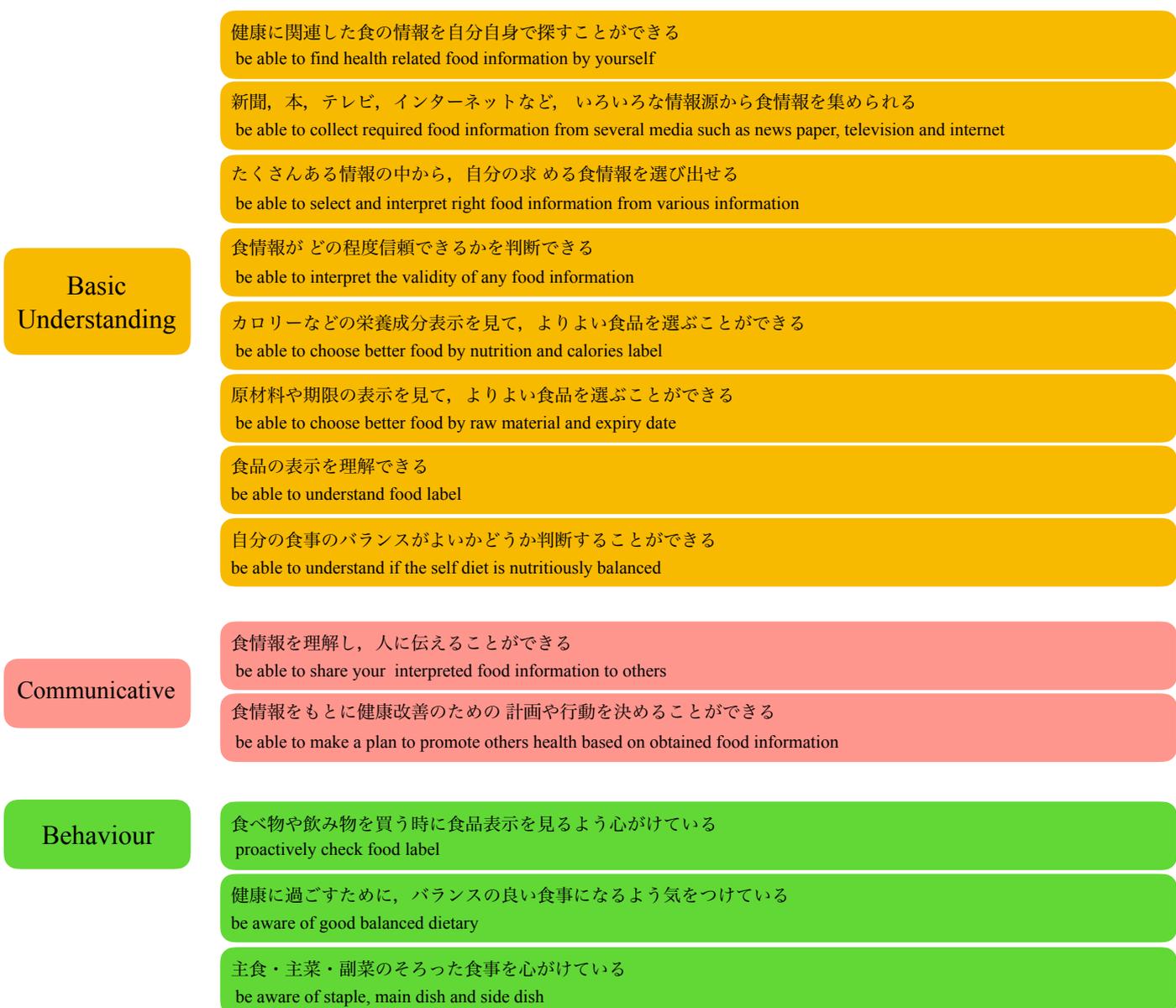


Figure 2. Structure of food literacy components

Method

We conducted a cross-sectional online survey in October 2018. 300 surveys with a QR code that linked to the online survey were distributed in M kindergarten in Tokyo, Koto-ku, to the parents whose children were 3-5 years old. We focused on 3-5 years olds children as pre-school food habits are particularly important and also these ages tend to present the most clearly deviated food habits (Shiraki, Omura & Marui²³, 2008). M kindergarten is a private institution and half of Kindergarten pupils are from the same entity's nursery school that is not private, and another half are came from outside through the examination. Thus, although the survey was physically conducted in one single kindergarten, the characteristic of these children are considered a reasonable mixture of public school and private school. We also asked some acquaintances to distribute the survey sheet in order to add some data from outside the kindergarten. The participants used their own internet devices such as smartphones to access the online survey and accept the consent, then answer the questionnaires. The survey was anonymous and no incentives were paid but the participants could have access to the total result of the survey. As all the questions are mandatory, there was no lack of answers and all the data was used and analyzed. The survey consisted of 3 sections; Sociodemographic of the participants, Food Literacy and OYATSU given to children. This study is approved by the Institutional Review Board in St.Lukes University.

For the classification of the processed OYATSU, we referred to 'NOVA classification²⁴', which was developed in France and classifies all food into 4 groups according to the purpose and level of the process (Table1). As stated in the classification, Group 4, ultra-processed food are likely produced in the factory and many of OYATSU are matched to Group 4. Okuda and Kuragano¹¹ (1998) conducted the survey and 70% of OYATSU given to children were from the selection of ultra-processed food. Also, the

research by Kondo et al.²⁵ (2008) stated that “Snack Kashi” (packaged snack) took up to 82% and ice cream takes up to 53% of total OYATSU given to children. Another research also mentioned ultra-processed OYATSU such as “Snack Kashi” and ice cream, were the most popular OYATSU and 60% of parents wished to improve their children’s food habits (Ishimi et al.²⁶, 2007).

In this research, we state ultra-processed OYATSU as unhealthy and undesirable food for children. Thus, the numbers of ultra-processed OYATSU that the participants have selected will be analyzed to seek the association with food literacy score.

Table1. NOVA Classification

Group 1	Unprocessed or minimally processed foods	Natural foods, altered by processes such as removal of inedible or unwanted parts, drying, crushing, filtering, roasting, boiling, freezing, vacuum packaging.
Group 2	Processed culinary ingredients	Processed directly from group 1 foods or from nature by processes such as pressing, refining and may contain additives used to preserve the product’s
Group 3	Processed foods	Have two or three ingredients and may may contain additives used to resist microbial contamination
Group 4	Ultra-processed food	Industrial formulations typically with five or more ingredients. Often contains refined sugar, salt, sweeteners and uncertain additives; stabilizers and preservatives.

Questionnaire

- Parent's characteristics

Q1. Gender (1.Male, 2.Female)

Q2. Age in years (<29, 30, 31...44, 45<)

Q3. Education (1.Completion of high school or lower, 2.Junior college, 3.University,
4.Postgraduate or higher)

Q4. Location (City [Tokyo, Kanagawa, Saitama, Chiba, Osaka, Nagoya] and suburb)

Q5. Accommodation style (1.Own house, 2.Own mansion, 3.Rent mansion, 4.Rent apartment,
5.Other)

- Children's characteristics

Q6. Have brother/sister (yes or no)

Q7. Do any after-school learning (yes or no)

Q8. Height (1.Higher than the standard, 2.Normal, 3.Shorter, 4.Not known)

Q9. Weight (1.Heavier than the standard, 2.Normal, 3.Lighter, 4.Not known)

- Food Literacy

Score on a 5-point Likert scale (1= 'not at all' to 5= 'very much')

Q10. Being able to find health-related food information by yourself

Q11. Being able to collect required food information from several media such as newspaper,
television and internet

Q12. Being able to select and interpret the right food information from various information

Q13. Being able to interpret the validity of any food information

Q14. Being able to share your interpretation of food information to others

Q15. Being able to make a plan to promote other peoples health based on obtained food
information

- Q16. Being able to choose better food by nutrition and calories labels
- Q17. Being able to choose better food by raw material and expiry date
- Q18. Proactively check food labels
- Q19. Being able to understand food labels
- Q20. Being aware of good a balanced diet
- Q21. Being aware of a staple, main dish and side dish
- Q22. Being able to understand if the person's own diet is nutritiously balanced

- OYATSU

23. Choose 3 most frequent OYATSU given to your child.
24. Choose 3 most preferred OYATSU to your child.
25. Choose 3 most preferred OYATSU to the parent ("you").

Selection : [1.Rice cookie, 2.Japanese sweets, 3.RiceBall, 4.Milk, 5.Fruit, 6.Fried potato,
7.Sweet potato, 8.Candy, 9.Chocolate, 10.Snack, 11.Cookie, 12.Gum, 13.Ice-cream,
14.Yogurt, 15.Potato chips, 16.Other.]

26. Choose 3 concerns about the OYATSU you are giving.

Selection : [1.Nutritious balance, 2.Calories, 3.Fat, 4.Sugar, 5.Tooth decay, 6.Additives,
7.Price, 8.Child's preference, 9.Other]

27. Choose the most frequent place to buy OYATSU

Selection : [1.Convenience store, 2.Supermarket, 3.Hand-made or hand-made shop,
4.Internet, 5.Don't know, 6.Other]

28. How are you satisfied with the current OYATSU status?

Selection : [1.Wish to improve, 2.Wish to improve but no time, 3.Satisfied, 4.Leave it to
kindergarten, 5.Haven't thought about it, 6.Don't know]

Analysis

- Validation of Food Literacy
 - Item analysis: We calculate the data from 13 food literacy questionnaires and obtain the mean and Standard Deviation and validate that there are no floor/ceiling effects (as the score range were from 1 to 5, $Mean + SD$ need to be more than 1 and $Mean - SD$ need to be less than 5).
 - Factor analysis: To data which are validated as having no floor/ceiling effects, factor analysis will be performed by SPSS. As 3 factors (Basic, Communicative, Behavior) are expected to be shown, we carry out the exploratory factor analysis for validation.
 - Internal consistency: Calculate the mean and interpret as sub-scale scores of the factors that are obtained by the factor analysis. To consider internal consistency we calculate Cronbach's coefficient alpha of each sub-scale. We consider $\alpha = 0.80-0.90$ to have certain reliability.
 - Measurement score and correlation: Obtain each sub-scale scores by item average value (as the numbers of questionnaires in each expected factor are different). Then, calculate the correlation coefficient among the sub-scales.

- Consideration of the most influential factors that lead to ultra-processed (ultra-processed) OYATSU habits
 - t-test: Utilizing the sub-scale score of each factor, calculate the t-test in order to find the difference among components that are expected to be relative; sex, education, location, point of sales. P value < 0.05 is considered significant.

- Analysis of Variance: Carry on variance analysis between the sub-scale score of defined food literacy measurement and numbers of ultra-processed OYATSU, that is classified as ultra processed food by NOVA classification, given to children to examine the difference. As the participants have selected 3 most frequent OYATSU from several selections, the range of the numbers of ultra processed OYATSU is from 0 to 3. *P* value < 0.05 is considered significant.
- Multiple Regression Analysis: Carry on regression analysis between each sub-scale and numbers of ultra-processed OYATSU in order to find the most influential factors among food literacy. *P* value < 0.05 is considered significant.

Hypothesis

Regarding food literacy measurement, we hypothesized these 3 sub-scales (Basic, Communicative, Behavior) would be validated with internal consistencies by exploratory factor analysis.

Our second hypothesis was that food literacy would be expected to associate with the numbers of ultra-processed OYATSU. High food literacy would be associated with reduced choose of ultra-processed OYATSU and lower food literacy would be significantly inversely proportional to the numbers of ultra-processed OYATSU.

If those 3 sub-scales that are mentioned above are validated, we hypothesized all 3 factors would be equally associated with the numbers of ultra-processed OYATSU as the 3 sub-scales are equally important components to construct a literacy.

Result

Descriptive Statistics

The composition of a total sample of 210 consists of 141 (67%) mothers and 69 (33%) fathers and the mean ages were 38.27 (range : 28-50, $SD=3.99$). The detail is shown in Table 2. The data from M Kindergarten was 130 and the response rate of the distributed survey sheet was 43%. The 80 (38% of total) data were collected from outside the kindergarten. Among these 80, 53 (66%) are living in a rural area. Children who have brother/sister are 151 (72%) and who have no brother/sister are 59 (28%). The parents who use convenience store to buy OYATSU are 150 (71%) and fathers have a slightly higher ratio (75.4%) compared with mothers (69.5%). 148 (71%) are not satisfied with current OYATSU circumstance.

Table2. Sociodemographic of the participants

		Total <i>n</i> =210		Mother <i>n</i> =141 (67.1%)		Father <i>n</i> =69 (32.9%)	
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Age	-29	3	1.4%	2	1.4%	1	1.4%
	30-34	35	16.7%	22	15.6%	13	18.8%
	35-39	95	45.2%	67	47.5%	28	40.6%
	40-44	64	30.5%	43	30.5%	21	30.4%
	45-	13	6.2%	7	5.0%	6	8.7%
Education	High School or lower	14	6.7%	9	6.4%	5	7.2%
	Junior College	44	21.0%	38	27.0%	6	8.7%
	University	119	56.7%	79	56.0%	40	58.0%
	Postgraduate and higher	33	15.7%	15	10.6%	18	26.1%
Location	Urban (Tokyo, Osaka, Kanagawa, Nagoya, Saitama, Chiba)	157	74.8%	101	71.6%	56	81.2%
	Other	53	25.2%	40	28.4%	13	18.8%
Accommodation Style	Own House	80	38.1%	60	42.6%	20	29.0%
	Own Mansion	74	35.2%	47	33.3%	27	39.1%
	Rent Monsion	44	21.0%	26	18.4%	18	26.1%
	Rent Apartment	10	4.8%	6	4.3%	4	5.8%
	Other	2	1.0%	2	1.4%	0	0.0%
Child has Brother/Sister	Yes	151	71.9%	101	71.6%	50	72.5%
	No	59	28.1%	40	28.4%	19	27.5%
Child does any after school learnings	Yes	140	66.7%	90	63.8%	50	72.5%
	No	70	33.3%	51	36.2%	19	27.5%
Child's weight	Heavier	8	3.8%	7	5.0%	1	1.4%
	Normal	158	75.2%	108	76.6%	50	72.5%
	Lighter	42	20.0%	24	17.0%	18	26.1%
	Unknown	2	1.0%	2	1.4%	0	0.0%
The most frequent place to buy OYATSU	Convenience Store	150	71.4%	98	69.5%	52	75.4%
	Natural Food Store	96	45.7%	20	14.2%	10	14.5%
	Hand Made	31	14.8%	12	8.5%	1	1.4%
	Others	1	0.5%	11	7.8%	6	8.7%
Satisfied with current OYATSU circumstance	Yes	54	25.7%	38	27.0%	16	23.2%
	No	148	70.5%	102	72.3%	46	66.7%
	Unknown	21	10.0%	14	9.9%	7	10.1%

OYATSU

As the result of the survey of OYATSU, each participants had chosen the 3 most frequent OYATSU given to their children. According to NOVA Classification : Candy, Chocolate, Snack, Cookie, Gum, Ice-cream, Yogurt, Potato chips are Class 4 - ultra-processed food (ultra-processed OYATSU). The percentage of ultra-processed OYATSU was 52%, although the top and second most frequently giving OYATSU are fruits (15%) and rice cracker (12%), that are not ultra-processed food. (Figure3) The mean of the numbers of ultra-processed OYATSU was 1.66 (minimum 0 and maximum 3).

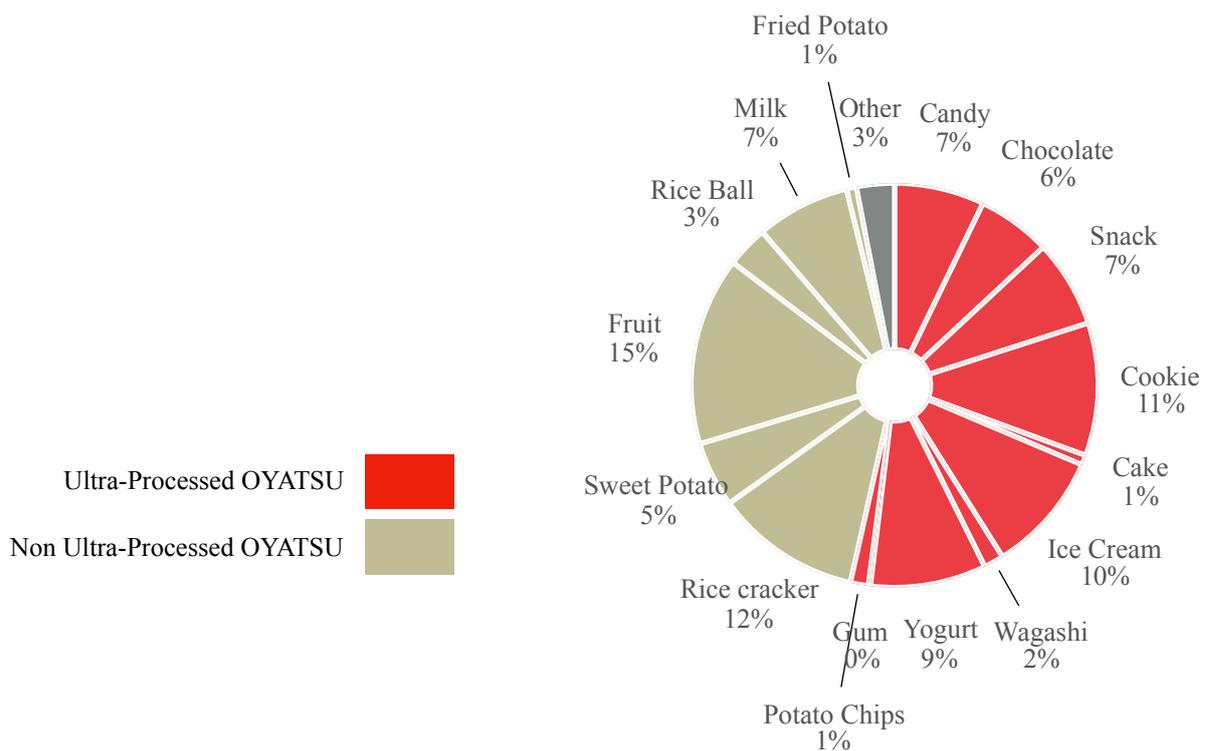


Figure 3. The most frequent OYATSU given to children

Item Analysis

Table 3 is presenting the mean and *SD* of the 13 questionnaires of food literacy. Also, the result of floor and ceiling effects. As the scores range from 1 to 5, *Mean±SD* need to be neither less than 1 nor more than 5. All 13 questions except question 9, shows no floor and ceiling effects. Although question 9 is shown as 5.02 which is a little ceiling effect, we interpreted the effects is small enough thus decided to proceed all results of 13 questions to the following analysis.

Table 3. Descriptive Statistics for Food Literacy Questionnaire (n=210)

			Mean	SD	Mean + SD	Mean - SD
1	Basic Understanding	健康に関連した食の情報を自分自身で探すことができる be able to find health related food information by yourself	4.06	± 0.86	4.92	3.20
2	Basic Understanding	新聞、本、テレビ、インターネットなど、いろいろな情報源から食情報を集められる be able to collect required food information from several media such as news paper, television and internet	3.90	± 0.88	4.77	3.02
3	Basic Understanding	たくさんある情報の中から、自分の求める食情報を選び出せる be able to select and interpret right food information from various information	3.80	± 0.98	4.78	2.82
4	Basic Understanding	食情報がどの程度信頼できるかを判断できる be able to interpret the validity of any food information	3.46	± 1.02	4.48	2.44
5	Basic Understanding	カロリーなどの栄養成分表示を見て、よりよい食品を選ぶことができる be able to choose better food by nutrition and calories label	3.41	± 1.04	4.45	2.37
6	Basic Understanding	原材料や期限の表示を見て、よりよい食品を選ぶことができる be able to choose better food by raw material and expiry date	3.38	± 1.1	4.48	2.28
7	Basic Understanding	食品の表示を理解できる be able to understand food label	3.46	± 1.14	4.59	2.32
8	Basic Understanding	自分の食事のバランスがよいかどうか判断することができる be able to understand if the person's own diet is nutritiously balanced	3.78	± 1.05	4.83	2.73
9	Communicative	食情報を理解し、人に伝えることができる be able to share your interpreted food information to others	3.81	± 1.2	5.02	2.61
10	Communicative	食情報をもとに健康のための計画や行動を決めることができる be able to make a plan to promote others health based on obtained food information	3.57	± 1.08	4.66	2.49
11	Behaviour	食べ物や飲み物を買う時に食品表示を見るよう心がけている proactively check food label	3.88	± 1.01	4.89	2.87
12	Behaviour	健康に過ごすために、バランスの良い食事になるよう気をつけている be aware of good balanced dietary	3.79	± 1.08	4.87	2.71
13	Behaviour	主食・主菜・副菜のそろった食事を心がけている be aware of staple, main dish and side dish	3.81	± 0.97	4.78	2.84

Factor Analysis

We next performed confirmatory factor analysis on 13 questions of food literacy and the cluster analysis divided them into 3 factors. Extraction method by SPSS was the maximum likelihood method with holding the numbers of the factor as “3”, and the rotation method was Promax with Kaiser normalization. Table 4 is presenting the result of the analysis. Although question 6 (be able to choose better food by raw material and expiry date), 7 (be able to understand food label) and 8 (be able to understand if the person’s own diet is nutritiously balanced) were grouped in different factors, the overall structure is kept in original hypothesis. As factor II that was originally named as “Communicative” has actually grouped all questions relating to the food label, we renamed it to “Food Label” and kept factors I and III as they were; “Basic understanding” and “Behavior”.

Internal Consistency

We calculated the mean of each sub-scales; “Basic Understanding” (*Mean*=3.72, *SD*=0.80), “Food Label” (*Mean*=3.66, *SD*=0.93) and “Behavior” (*Mean*=3.72, *SD*=0.86). Then, calculated Cronbach’s coefficient alpha of each sub-scales to validate internal consistency and overall scale considered good reliability as “Basic Understanding” represents $\alpha=.894$, “Food Label” represents $\alpha=.848$ and “Behavior” represents $\alpha=.845$. Also, all 3 sub-scales showed a positive correlation with significances. The result is shown in Table 5.

Table 4. Factor Analysis

		I	II	III
2	新聞, 本, テレビ, インターネットなど, いろいろな情報源から食情報を集められる be able to collect required food information from several media such as news paper, television and internet	.950	-.086	-.104
3	たくさんある情報の中から, 自分の求める食情報を選び出せる be able to select and interpret right food information from various information	.925	.011	-.078
1	健康に関連した食の情報を自分自身で探すことができる be able to find health related food information by yourself	.705	-.055	.086
4	食情報がどの程度信頼できるかを判断できる be able to interpret the validity of any food information	.702	.095	.063
5	食情報を理解し, 人に伝えることができる be able to share your interpreted food information to others	.586	.200	.044
8	原材料や期限の表示を見て, よりよい食品を選ぶことができる be able to choose better food by raw material and expiry date	-.012	.907	-.053
7	カロリーなどの栄養成分表示を見て, よりよい食品を選ぶことができる be able to choose better food by nutrition and calories label	.078	.791	-.062
10	食品の表示を理解できる be able to understand food label	.178	.680	-.131
9	食べ物や飲み物を買う時に食品表示を見るよう心がけている proactively check food label	-.146	.640	.203
11	健康に過ごすために, バランスの良い食事になるよう気をつけている be aware of good balanced dietary	.011	-.064	.967
12	主食・主菜・副菜のそろった食事を心がけている be aware of staple, main dish and side dish	-.080	-.037	.938
13	自分の食事のバランスがよいかどうか判断することができる be able to understand if the self diet is nutritiously balanced	.197	.312	.385
6	食情報をもとに健康改善のための計画や行動を決めることができる be able to make a plan to promote others health based on obtained food information	.302	.214	.349

I...Basic understanding

II...Food Label

III...Behavioural

Table 5. The correlation of sub-scale of Food Literacy and mean, SD and coefficient

	Basic	Food label	Behaviour	Mean	SD	α
Basic Understanding	-	.681*	.533*	3.72	.80	.894
Food label	-	-	.587*	3.66	.93	.848
Behaviour	-	-	-	3.72	.86	.845

* $p < .001$

t-test

To consider the difference between mother and father, we performed t-test on each 3 sub-scale score. As shown in Table 6, mother has significantly higher literacies in “Food label” (Mother’s *Mean*=3.76, *SD*=0.82, Father’s *Mean*=3.44, *SD*=1.09) and “Behavior” (Mother’s *Mean*=3.85, *SD*=0.82, Father’s *Mean*=3.45, *SD*=0.88). “Basic Understanding”, on the other hands, shows a slightly higher mean score by father, but there was no significance.

Table 6. The mean with the sexes separated and the result of t-test

	Mother (n=141)		Father (n=69)		t value
	Mean	SD	Mean	SD	
Basic Understanding	3.70	0.78	3.76	0.85	-0.47
Food Label	3.76	0.82	3.44	1.09	2.35*
Behavior	3.85	0.82	3.45	0.88	3.20*

* $p < .05$

We attempted to find new elements that influence the choice of ultra-processed OYATSU. The status of having brother/sister showed a significant difference in the numbers of ultra-processed OYATSU. As shown in Table 7, the mean of the numbers of ultra-processed OYATSU is 1.76 among children who have a brother or sister whereas 1.42 among those with no brother or sister. Also, we have carried out t-test on the numbers of ultra-processed OYATSU based on the status of where people buy the OYATSU. 150 people, that is 71% of total participants buy OYATSU in convenience stores and the mean of the numbers of ultra-processed OYATSU is 1.83 and for people who buy OYATSU other than at convenience stores, the mean is 1.23 and the difference showed is significant. The result is shown in Table 8. We lastly carried out another t-test on 3 sub-scales of food literacy based on the status of where people buy the OYATSU. People who buy OYATSU at convenience

stores marked lower mean in “Food Label” sub-scale with significant. The result is shown in Table 9. Accordingly, convenience stores are influencing the frequency of ultra-processed OYATSU given to children and parent’s food literacy. We did not obtain other significant difference from other items such as children’s weight, parent’s education status and the presence of children’s after school learning.

Table 7. t-test Have Brother or Sister : The numbers of ultra-processed OYATSU

	Have Brother / Sister (<i>n</i> =151)		No Brother / Sister (<i>n</i> =59)		<i>t</i> value
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
The numbers of ultra-processed OYATSU	1.76	088	1.42	0.81	2.51*
* <i>p</i> < .05					

Table 8. t-test Buy OYATSU in convenience store / others : The numbers of ultra-processed OYATSU

	Convenience Store (<i>n</i> =150)		Other (<i>n</i> =60)		<i>t</i> value
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
The numbers of ultra-processed OYATSU	1.83	0.81	1.23	0.87	4.73*
* <i>p</i> < .05					

Table 9. t-test buy OYATSU in convenience store / buy in others : 3 sub-scales of food literacy

	Convenience Store (<i>n</i> =150)		Other (<i>n</i> =60)		<i>t</i> value
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
Basic Understanding	3.71	0.80	3.76	0.81	0.40
Food Label	3.54	0.94	3.94	0.86	2.82*
Behavior	3.66	0.87	3.85	0.82	1.48
* <i>p</i> < .05					

One-Way Analysis of Variance

We performed one-way analysis of variance by setting each 3 sub-scales of food literacy, “Basic”, “Food Label” and “Behavior” as the independent variable and “the numbers of ultra-processed OYATSU” as the dependent variable. We found the significant between-group difference in “Food Label” and “Behavior”. (“Food Label” : $F(3, 206) = 4.06, p < 0.01$, “Behavior” : $F(3, 206) = 4.19, p < 0.01$) All 3 sub-scale showed the consistency that parent’s higher food literacy lead to less ultra-processed OYATSU given to children despite “Basic Understanding” didn’t show the significant (“Basic Understanding” : $F(3, 206) = 1.18, n.s.$) Figure 4 is the chart presenting the result.

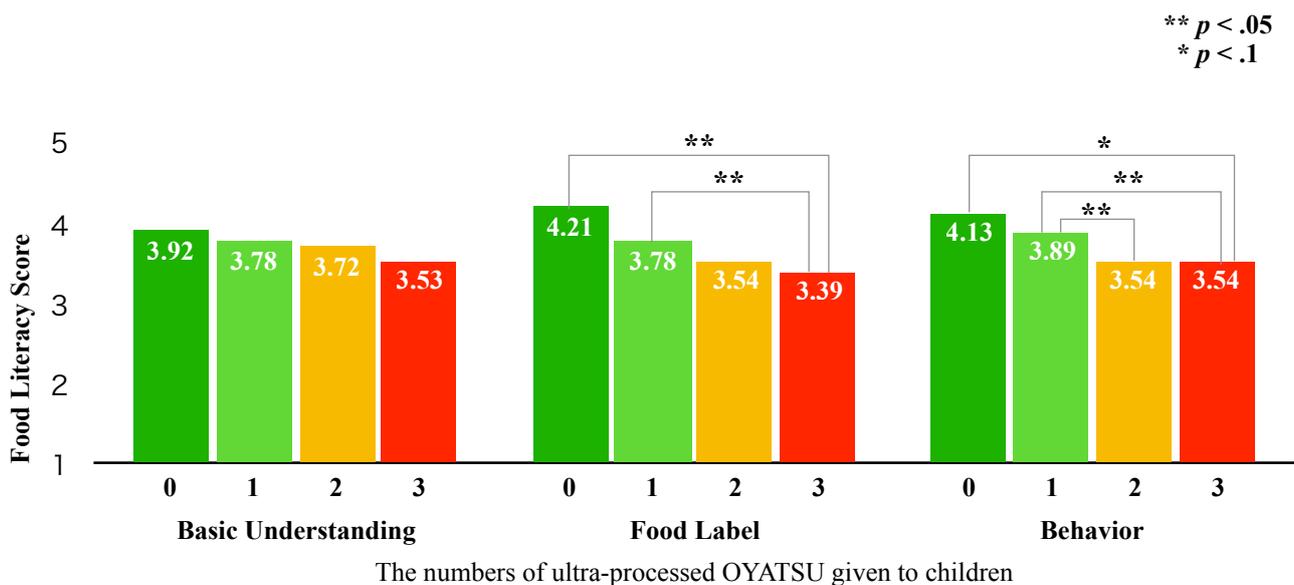


Figure 4. One-Way Analysis of Variance

Multiple Regression Analysis

Finally, we carried out regression analysis in order to predict the most influential factors among Food Literacy, that would resist parents from giving ultra-processed OYATSU. A multiple regression analysis was performed to predict. The explanatory valuable were "Basic Understanding", "Food Label" and "Behavior" and dependent valuable was "the numbers of ultra-processed OYATSU". The model yield lower R^2 of .068. β of "Basic Understanding" was .096, "Food Label" was -.207 and "Behavior" was -.148. "Food Label" was negatively significant predictors of "the numbers of ultra-processed OYATSU". The result is shown in Figure 5.

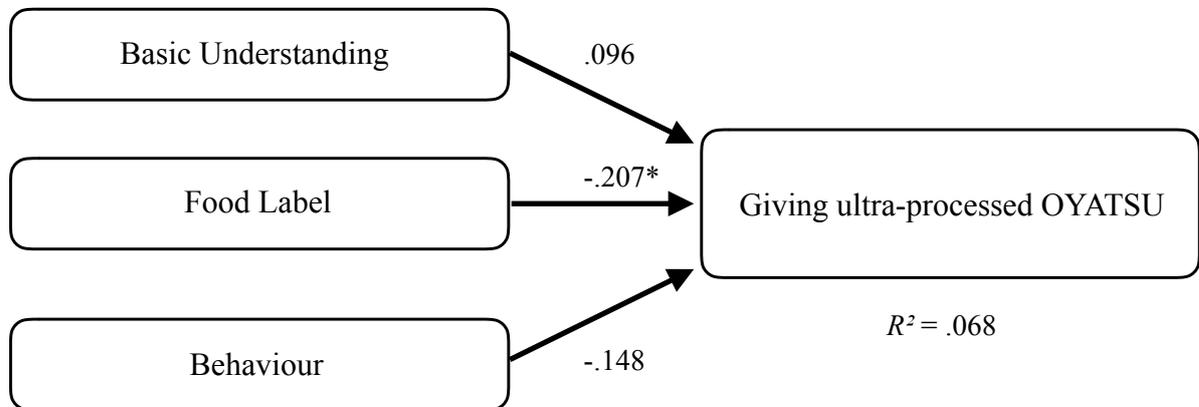


Figure 5. Multiple Regression Analysis

Conclusion

We have validated the 13 questions and developed a reliable food literacy measurement with the internal consistencies. In terms of the components of food literacy, “Food Label” is newly found in the analysis processes. In the survey, 148 participants (71%) are not satisfied with their current OYATSU and food circumstance. Developing food literacy measurement is, therefore meaningful for parents to recognize the current circumstance and hopefully gain the motivation to improve their literacy that will support their children’s life-long dietary habits.

As the results have shown, the population who have a higher food literacy are giving less ultra-processed OYATSU to their children. The difference of the mean of the numbers of ultra-processed OYATSU between low food literacy and high food literacy were significant.

By the regression analysis, the higher score of “Food Label” has a significant association with less ultra-processed OYATSU given. We could assume that the ability to understand and interpret food labels is actually supporting people to actually look at the label and influence the choice of foods. In Japan, however, reading and interpreting food labels are not mandatory learning items in school. Moreover, compared with other OECD countries, the food label and its regulation are visually less recognizable. As Nakayama et al.²⁷ (2015) mentioned Japanese comprehensive health literacy is lower than that of Europeans and there is no national reliable online platform. Therefore, the future intervention of implementing the education of reading and interpreting of food label should influence people and their families. Tanaka and Ikeda²⁸ (1999) suggested that the use of food labels resulted in better dietary habits and also it states that there was a significant gap between being able to understand the food label and actual dietary habits. Consequently, the ability to interpret food labels and

proactive action is important and should include not only the basic skill of being able to understand and interpret but also the utilization of the knowledge to change dietary habits.

Lastly, we could consider a few more potential determinants leading to low food literacy and ultra-processed OYATSU habits. The optional t-test found convenience stores have a significant influence on the mean of food literacy. As more than 70% of participants are buying OYATSU in convenience stores and their food literacy are significantly low. Regardless of food literacy, almost all items in the convenience store are processed food, thus, the result was as a logical consequence. Finding a better place to buy OYATSU should lead to resisting buying OYATSU at convenience stores, which should be the immediate key action to promote the quality of dietary habits. Also, father use convenience store more than mother and both “Food Label” and “Behavior” were scored a lower mean by fathers in the descriptive analysis. The target of future intervention, therefore can be the plan to guide fathers to take actual action for their own and their children’s health. Another significant result was based on participants whose children have a brother or sister. This population marked more ultra-processed OYATSU given to the children. Their OYATSU circumstance is predicted to be influenced by older brother or sister whose diets are less controlled and parents would be less aware of food for the second and the subsequent children.

Limitation

The limitation of this study is that the survey was done by self-reporting. “Basic Understanding” was the only sub-scale that didn’t show a significance and an association with ultra-processed OYATSU habits. It might be because the accuracy was not reliable. The style of question needs to be improved to obtain accurate feedback.

Another limitation is the selection bias in sociodemographic of the participants. More than 70% of participants have finished university degree or higher degree and 75% of people are living in a city area and it is probably leading to higher education status. Thus, the result might represent the specific character. We need to obtain more data form rural area in future research.

Future Research

One new research study in Netherland by Poelman et al.²⁹ (2018) has shown a newly developed food literacy measurement. Their food literacy consisted of 8 factors and they were all statistically validated, for example, food preparation skills, resilience and resistance, and healthy food stockpiling. These new factors that are matching to modern society, can also be effectively used for the local research in Japan.

Also, we have chosen OYATSU as a representation of parent’s food literacy, however we need to validate that three meals a day will present a consequent result. OYATSU is considered as optional compensation, so there is a little chance that parents who give ultra-processed OYATSU but serve good three good meals a day.

Future Intervention

I believe the study of Public Health needs to involve general public in order to have them consider and think up new ideas to improve children's health as well as themselves. However, the access to academic paper and study is normally limited and the styles are generally too technical for most of people to understand.

Therefore, regarding a future intervention, I am considering to make another approach for more parents who wish to know the importance of food literacy. One intervention will be creating a digital picture book that is based on this study and describes the parent's food literacy and its association with children's OYATSU. Uploading the book to online platform, such as Kindle Store by Amazon.inc and iBooks Store by Apple inc, might be a useful approach for modern society and media exposure.

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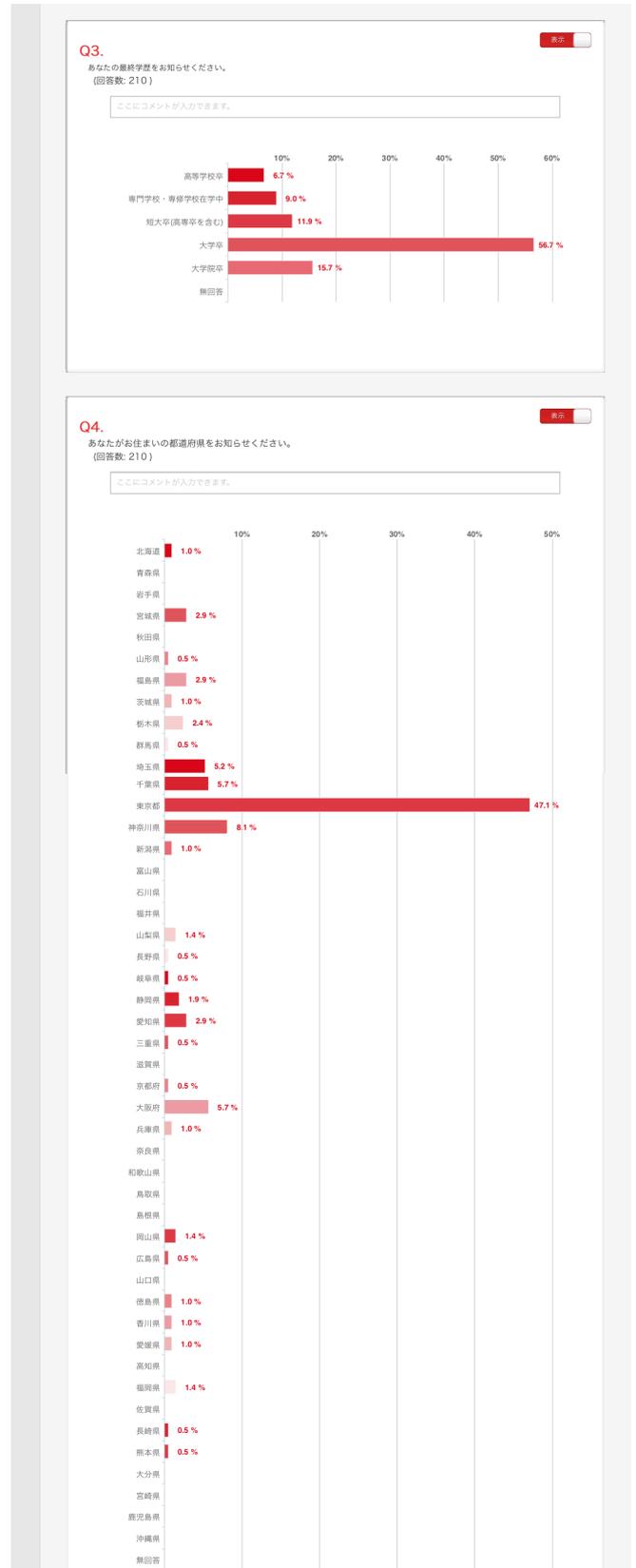
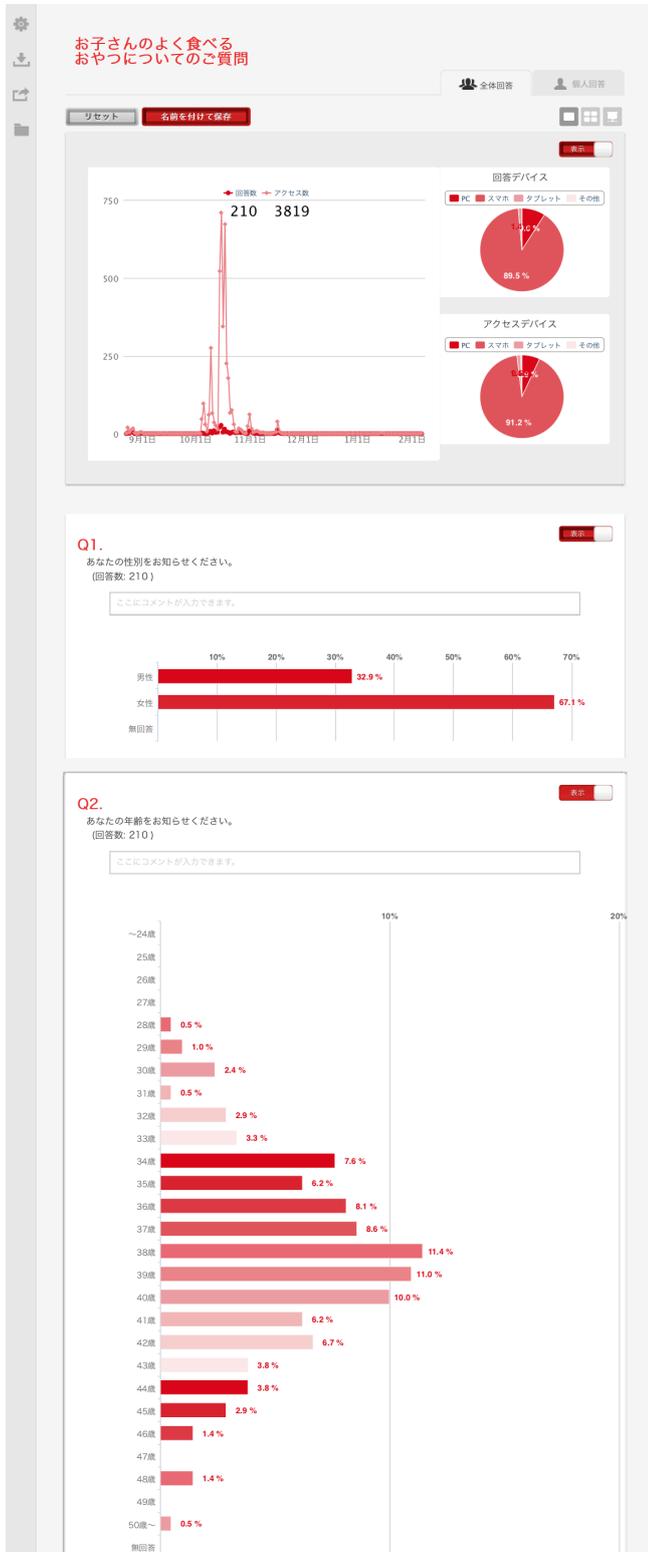
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Appendix

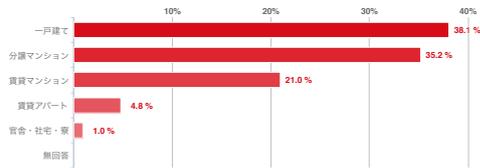
1. Online Survey.



Q5.

あなたの現在の住居形態をお知らせください。
(回答数: 210)

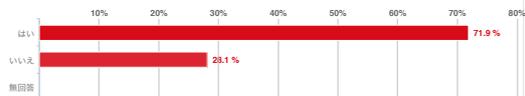
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Q6.

お子さんに兄妹はいますか？
(回答数: 210)

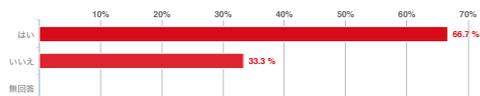
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Q7.

お父さんは習い事をされていますか？
(回答数: 210)

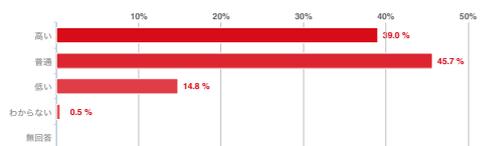
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Q8.

お子さんの身長は同年代の子どもと比べてどうでしょうか？
(回答数: 210)

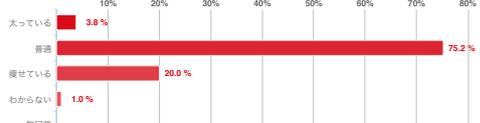
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Q9.

お子さんの体重は同年代の子どもと比べてどうでしょうか？
(回答数: 210)

ここにコメントが入力できます。



Q10.

食生活リテラシー調査
親御さん自身の食生活についてお聞かせします。
下記の5段階のうち最も当てはまる点数をつけてください。

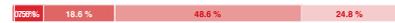
「全くそう思わない(0点)」「あまりそう思わない(1点)」「どちらでもない(2点)」「まあそう思う(3点)」「強くそう思う(4点)」

ここにコメントが入力できます。

健康に関連した食の情報を自分自身で探することができる (回答数: 210)



新聞、本、テレビ、インターネットなど、いろいろな情報源から正しい食の情報を集められる (回答数: 210)



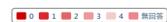
たくさんある情報の中から、自分の知りた正しい食の情報を選び出せる (回答数: 210)



目にした食情報がどの程度信頼できるかを判断できる (回答数: 210)



調べた食の情報を理解し、人に伝えることができる (回答数: 210)



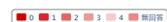
調べた食の情報をもとに、健康改善の計画や行動を起こすことができる (回答数: 210)



カロリーや栄養成分表示を見て、より良い食品を選ぶことができる (回答数: 210)



目にした食情報がどの程度信頼できるかを判断できる (回答数: 210)



調べた食の情報を理解し、人に伝えることができる (回答数: 210)



調べた食の情報をもとに、健康改善の計画や行動を起こすことができる (回答数: 210)

0 1 2 3 4 無回答



カロリーや栄養成分表示を見て、より良い食品を選ぶことができる (回答数: 210)

0 1 2 3 4 無回答



原材料や期限の表示を見てより良い食品を選ぶことができる (回答数: 210)

0 1 2 3 4 無回答



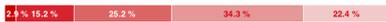
食べ物や飲み物を買う時に食品表示を見るよう心がけている (回答数: 210)

0 1 2 3 4 無回答



食品の表示を理解できる (回答数: 210)

0 1 2 3 4 無回答



健康に過ごすために、バランスの良い食事になるよう気をつけている (回答数: 210)

0 1 2 3 4 無回答



主食・主菜・副菜のそろった食事を心がけている (回答数: 210)

0 1 2 3 4 無回答



自分の食事のバランスがよいかどうか判断することができる (回答数: 210)

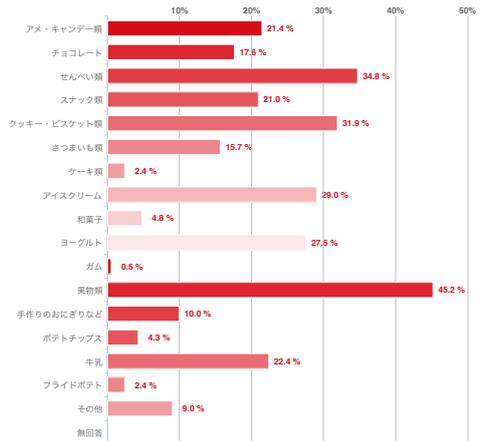
0 1 2 3 4 無回答



Q11.

お子さんによくあげのおやつはなんですか？最も当てはまるものを3つ選んでください。(回答数: 210)

ここにコメントが入力できます。

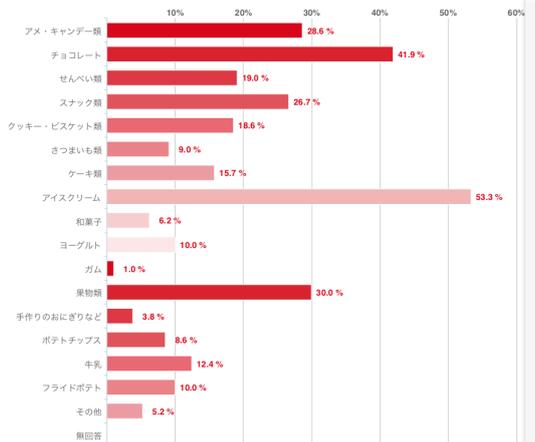


その他 (回答数: 19 無回答: 0)
▼ テキストボックスの回答を表示

Q12.

お父さんが好きなおやつはなんですか？最も当てはまるものを3つ選んでください。(回答数: 210)

ここにコメントが入力できます。

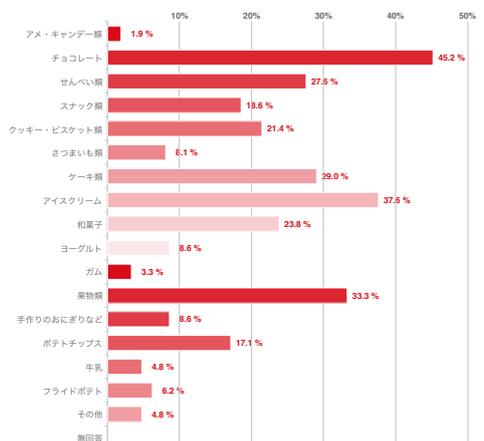


その他 (回答数: 11 無回答: 0)
▼ テキストボックスの回答を表示

Q13.

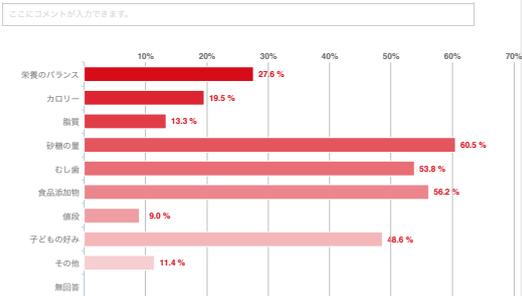
娘 (あなた) の好きなおやつはなんですか？最も当てはまるものを3つ選んでください。(回答数: 210)

ここにコメントが入力できます。



Q14.

お子さんにおやつをあげるときに気にしていることを3つ選択して下さい。
(回答数: 210)



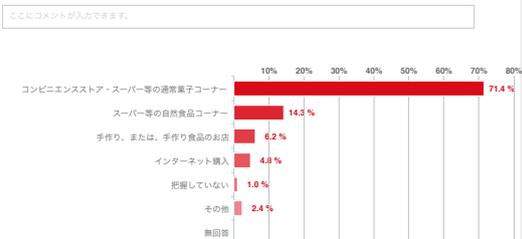
その他 (回答数: 24 無回答: 0)

▼ テキストボックスの回答を表示

Q15.

お子さんにあげるおやつは、主にどのように調達されますか？最も当てはまるものを1つ選択してください。

(回答数: 210)



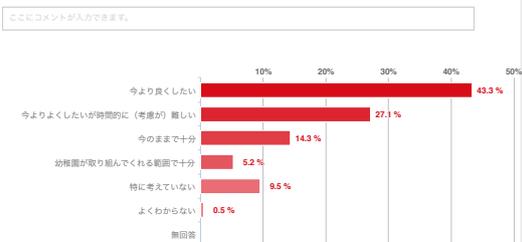
その他 (回答数: 5 無回答: 0)

▼ テキストボックスの回答を表示

Q16.

お子さんのおやつについて当てはまるものを答えてください。

(回答数: 210)



2. IRB Approval



様式4 (所属機関長→申請者)

整理番号	18-R090
区分	<input type="checkbox"/> 介入研究 <input checked="" type="checkbox"/> 観察研究

西暦2018年10月04日

研究審査結果通知書

研究責任者 保坂 景 殿

研究機関の長

聖路加国際大学 学長



依頼のあった研究に関する審査事項について下記のとおり決定しましたので通知いたします。

記

研究課題名	親の食生活リテラシーと子どもに与える超加工おやつに関連調査	
研究責任者	氏名：保坂 景 職種/職位/学年：修士課程	施設名称：聖路加国際病院 所属：公衆衛生大学院
審査事項	<input checked="" type="checkbox"/> 研究の実施の適否 <input type="checkbox"/> 研究の継続の適否 <input type="checkbox"/> 重篤な有害事象等 <input type="checkbox"/> 安全性情報等 <input type="checkbox"/> 研究に関する変更 <input type="checkbox"/> 緊急の危険を回避するための研究実施計画書からの逸脱 <input type="checkbox"/> 継続審査 <input type="checkbox"/> その他 ()	
審査区分	<input type="checkbox"/> 委員会審査 (審査日：西暦 年 月 日) <input checked="" type="checkbox"/> 迅速審査 (審査終了日：西暦2018年10月03日) <input type="checkbox"/> 迅速書類審査 (審査終了日：西暦 年 月 日)	
審査結果	<input checked="" type="checkbox"/> 承認 <input type="checkbox"/> 修正の上で承認 <input type="checkbox"/> 条件付き承認 <input type="checkbox"/> 不承認 <input type="checkbox"/> 保留 <input type="checkbox"/> 停止 <input type="checkbox"/> 中止	
「承認」以外の 場合の理由等		
コメント		

3. Digital Book (will be uploaded to Apple iBook Store)



子どものおやつはその先の長い人生に影響するので
気をつけなくてはなりません。

食リテラシー（食をどのくらい気にしているか）の
3要素を調査しました。

食リテラシーが低いほど
悪いおやつ（加工おやつ）を多くあげています

Figure 4. One Way Analysis of Variance

パパもママも高得点！
(スコアは5点満点)

食情報	3.76	食情報	3.70
食品ラベル	3.44	食品ラベル	3.76
食習慣	3.45	食習慣	3.85