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Using Soybean Products in School Lunch for Health Education may improve Children's Attitude and Guardians' Knowledge in Kindergarten

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Abstract

Soybean products are healthy and an important source of vegetable protein in Japan. This study examines the effects of using soybean products at home and decreasing children's dislike of soybean products. A quasi-experimental pre-post-test design was utilised to examine the effect of using school lunch programs to assess the consumption of soybean products. The study's participants included 309 children (mean 4.2 ± 0.8 ages) attending kindergarten and nursery facilities. We compared the score among the 3 groups (Intervention, Comparison A and Comparison B) before and after the intervention. Children thinking about 'respect for food' was significantly higher in the intervention groups than the comparison group ($p<0.01$, p=N.S, p=N.S, by Fisher's exact test). The improvement in knowledge about nutrition education in the intervention group and Comparison A was significantly higher than comparison B ($p<0.01$, $p<0.01$, p=N.S). Health education involving the soybeans program may lead to an increase in thinking about 'respect for food' among kindergarten children and an increase giving knowledge in their guardians.

Keywords: Soybeans products; Children; School lunch

Introduction

Soybean products are a necessary source of vegetable protein in Japan and are important for maintaining good health. Studies demonstrate that soybean product intake can prevent Non-Communicable Disease (NCD) including cancers and arterial sclerosis [1-3]. In addition, the consumption of soy protein rather than animal protein significantly decreases serum concentrations of total cholesterol, LDL cholesterol, and triglycerides [4,5]. This is true of diseases to which women are susceptible, for example, soy intake during childhood is associated with lower incidence of breast cancer [6]. Therefore, the intake of soybean products from childhood may lead to positive effects in adults' health. The frequency of serving soybean products is mostly decided by mothers. Our previous study suggested that mother's food habits affect their children's preferences [7,8]. It is certain that soybean products supply vegetable protein, but consumption of soybean products is low as children generally do not prefer them. Therefore, we hypothesized that a mother's attitude towards children acquiring healthy food habits has an influence on children's consumption of soybean products. To test the hypothesis, first of all, we investigated the relationship between their children's consumption and the mother's attitude. In addition, Children are likely to eat in emotionally positive atmospheres. Siblings, peers and parents can act as role models to encourage children to taste novel foods. Repeated exposures to initially disliked foods can make children more agreeable to them [9]. We considered that testing our hypothesis with school lunch would prove useful for this research because it could encourage peer support and could be provided to children regardless of food preferences. We examined the effects of the frequency of using soybean products on children's preference for soybean products.

Methods

Participants

The questionnaires were distributed to the guardians of 359 children aged 3-5 who attended two kindergartens and a nursery school. A total of 313 children (mean 4.2 ± 0.8 ages) attending kindergarten and nursery facilities participated in the study (Table 1).

Study design

The first part is a cross sectional study. Half of the remaining is a quasi-experimental pre-post-test that was based on the result of the pre-test in cross-sectional study. A quasi-experimental pre-post-test design was used to examine the effect of using the school lunch program to assess soybean products. In the Intervention group, teachers and nutritionists provided information about soybeans to children during the school meal. Information included details about the nutritional composition of soybeans and other food types divided into three food groups. This information was given to guardians using a school lunch menu distributed once a month. In the group, Comparison A, the board of Education provided information about lifestyle to guardians using a menu distributed twice a month. In the group, Comparison B, nutritionists provided information to guardians using a menu distributed once a month.

We also divided the children into three groups as follows: 1) The Intervention group which offers school lunch to kindergarteners 4 days per week (186 children); 2) Comparison A which offers a lunch box to kindergarteners 4 days per week (97 children) and 3) Comparison B which offers school lunch in the nursery facilities 5days per week (30 children).

Description of the questionnaire: In addition, we asked 26 questions about the children's lifestyles, eating habits and the mother's attitude and concern for intake of soybean products. We enquired about

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the frequency of a child's usual consumption of soybean products. The frequency of using soybeans and tofu was classified into three categories as follows: less than three times/week, three or more times/week and every day (Figure 1). The mothers' attitude was defined as the mothers' ability to tell their children about Japanese foods and the mothers' recognition that soybean products are good for their children's health. Questions about 'respect for food', utilized a 5-point rating scale. Moreover, we asked the following two questions to examine the mothers' knowledge about products made from soybeans and about dividing each food into three groups according to food function. Mothers chose from the following list: Tofu, Kinako, Abura-age, Kori-tofu, Ganmodoki, Soymilk, Yuba, Miso, Soy sauces and Okara.

The mothers were asked about their children's food behaviours and attitudes, as well as the foods that the children disliked, which were chosen from a list of 55 foods [10].

The mothers were adequately informed about the objectives and methods of this investigation, and they answered the questionnaire voluntarily, with the right to withdraw at any time during the study. Individual privacy was strictly protected throughout the investigation. Under these conditions, the mothers agreed to cooperate with the scientific investigation that also included their children. The study was performed after receiving approval from the principals of the kindergarten and nursery facilities. The study was also approved by the president of the kindergarten and the Kobe Women's University people's ethics committee.

Theory, prior research, rationale: Children are more likely to eat in emotionally positive atmospheres. Siblings, peers and parents can act as role models to encourage the tasting of novel foods. Repeated exposures to initially disliked foods can break resistance [9,11]. We considered that school lunch would be useful in conducting this study because it can encourage peer support and can unintentionally provide children's preferences. For guardians, based on Prochaska and DiClemente's Stages of change model [12] and Schneider's Knowledge, Attitude, and Behaviour (KAB) Model [13], we gave the guardians information about soybeans. KAB also found in literature as Knowledge-Attitude-Practice (KAP), is an important theoretical model of health education, which asserts that behaviour change is affected by knowledge and attitude [13].

Statistical analysis: The program SPSS (version 23.0, SPSS, IBM Inc.) was used for statistical analysis of the data. Ninety-five percent confidence intervals of odds ratios for relationship consumption of soybean products and mothers' attitude were calculated by using Multiple Logistic Regression Analyses (MLRA). Using Fisher's exact probability test, we compared the score among the 3 groups before and after the intervention.

Results

MLRA showed that daily consumption of soybean products was related to whether or not family members had conversations about food at meals (ORs 2.1 [95% CI, 0.98-4.55]), whether or not mothers told their children about Japanese foods (ORs 3.0 [95%CI, 4.41-6.60]) and whether or not mothers recognize that intake of soybean products is good for their child's health (ORs 2.8 [95% CI, 1.09-7.22]). Multivariate-adjusted OR of the high, middle and low frequency of serving of soybean products were 1.00, 2.32 (1.05-5.11) and 3.36 (1.55-7.26) [ORs (95%CI)] across telling their children about Japanese foods, respectively, and 1.00, 1.78 (0.73-4.35) and 2.64 (1.11-6.29) across recognizing that intake of soybean products is good for children's health, respectively (Table 2).

The percentage of correct answers to question the mothers' knowledge about products made from soybeans was 91% (Figure 2). As for other products, 99% mothers answered correctly about tofu and 85% about gunmodoki, 82.4% of the children reported foods they disliked with 6.6 ± 6.3 items on average (Figure 3).

The mothers also answered the foods that the children disliked, which were chosen from a list of 55 foods.

Children eligible for first analysis	Overall (n=313)	School A (n=186)	School B (n=30)	School C (n=97)	P value
Sex ratio (% female)[a]	54.9	57.6	50.8	50.8	ns
Age, y (mean ± SD)[b]	4.2 ± 0.8	4.1 ± 0.8	3.9 ± 0.9	4.5 ± 0.5	0.000
Kaup score[b]	15.4 ± 1.5	15.4 ± 1.6	15.3 ± 1.2	15.5 ± 1.5	ns
Working style (% housework)[a]	68.1	75.3	3.5	72.8	0.000

ns indicates not significant.
[a]Fisher's exact test was used for matched qualitative variables.
[b]ANOVA was used for matched qualitative variables.

Table 1: Study population and school characteristics

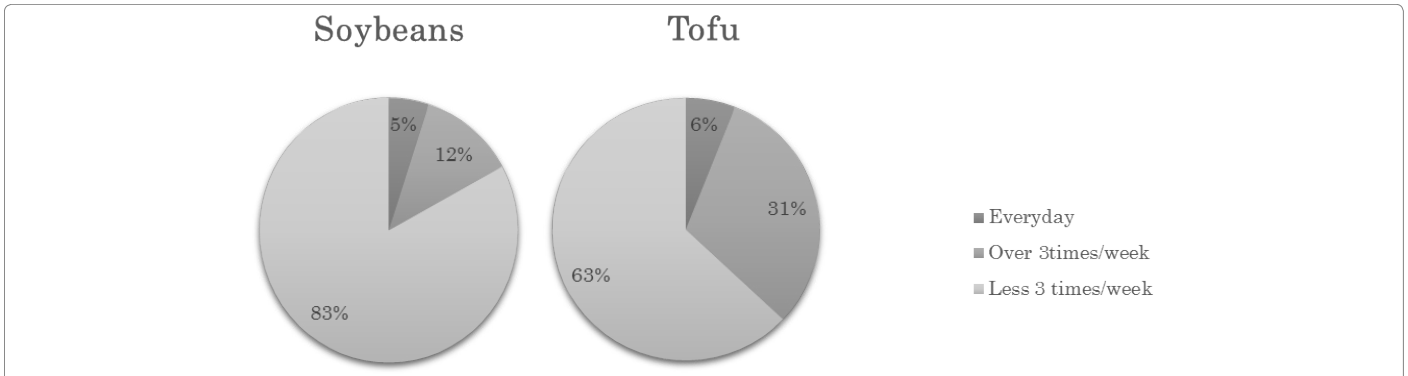

Figure 1: Percentage of consumption of soybean products. The frequency of using soybeans and tofu was classified into three categories as follows: less than three times/week, three or more times/week and every day.

	Less 3times/week	Over 3times/week	Every day
Talking with their family during meals	1.00	0.85 [0.51-1.42]	1.76 [0.82-3.78]
Mothers telling their children about Japanese food	1.00	1.45 [0.83-2.53]	3.35 [1.55-7.26]
Mothers thinking that soybean products are good for their children's health	1.00	1.49 [0.91-2.44]	2.64 [1.11-6.29]

Odds Ratio [95% confidence intervals]
Multiple regression analysis by setting a stepwise method and afterwards a force entry method.
eg, 1. 'Talking with their family during meals' went up if many families engage in conversation.

Table 2: Relationship between children's consumption of soybean products and mother's attitude for food habits.

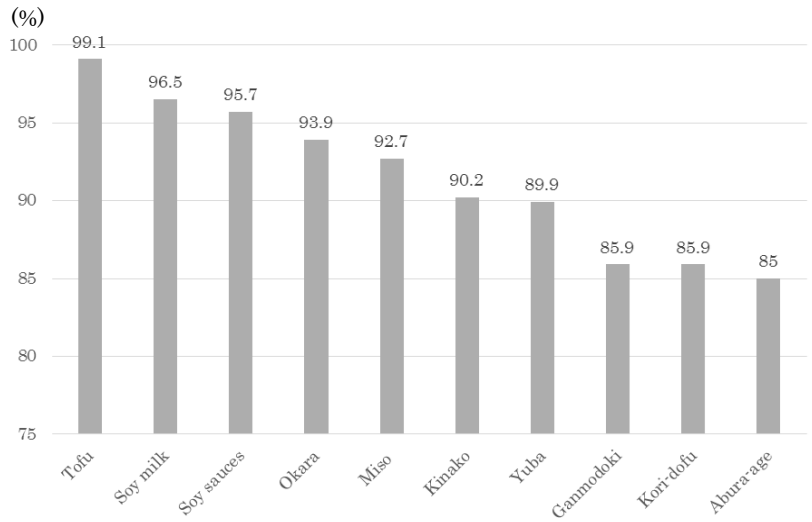

Figure 2: Mother's knowledge of soybean products made from aoybeans. Values are the rate of correct answer.

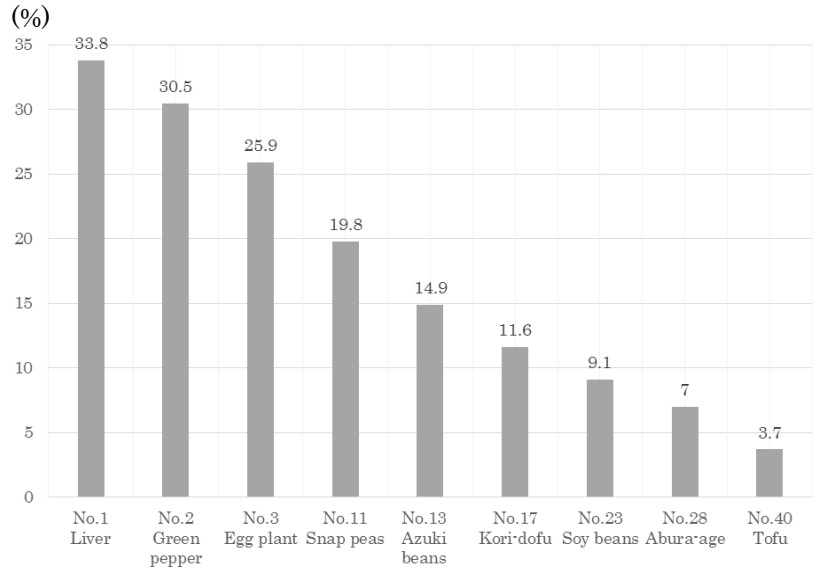

Figure 3: Percentage of children who disliked soybean products. The mothers also answered the foods that the children disliked, which were chosen from a list of 55 foods.

Children thinking about 'respect for food' was significantly more in the intervention groups compared with the comparison group ($p<0.01$, p=N.S, p=N.S, by Fisher's exact test, Table 3). Nutrition education involving the soybeans program showed increase in thinking about 'respect for food' in kindergarten children and showed an increase in guardians being more informed. The improvement in knowledge about nutrition education in the intervention group and comparison A was significantly higher than in comparison B ($p<0.01$, $p<0.01$, p=N.S, Table 4).

Discussion

This study suggested that a mothers' concern and positive attitude toward healthy habits during childhood correlates with high consumption of soybean products. A mother's positive attitude toward

	Overall (n = 313)			School A (n = 186)			School B (n = 30)			School C (n = 97)		
	Baseline	End of Study	P value	Baseline	End of Study	P value	Baseline	End of Study	P value	Baseline	End of Study	P value
High respect	19.3	22.0		16.8	22.0		16.1	19.2		25.5	22.7	
Considerable respect	45.4	51.1		45.2	51.6		51.6	50.0		43.9	50.5	
I'm not sure	27.3	23.0	0.04	27.9	23.7	0.01	29.0	30.8	ns	25.5	19.6	ns
Little respect	8.0	3.6		10.2	2.7		3.2	0		5.1	6.2	
No respect	0	0.3		0	0		0	0		0	1.0	

ns indicates not significant.
Fisher's exact test was used for matched qualitative variables.
Pre School A vs School B vs School C by Fisher's exact test; ns
Post School A vs School B vs School C by Fisher's exact test; ns

Table 3: Relationship between kinds of schools and children's respect for food habits.

		Overall (n=313)			School A (n=186)			School B (n=30)			School C (n=97)		
		Baseline	End of Study	P value	Baseline	End of Study	P value	Baseline	End of Study	P value	Baseline	End of Study	P value
Japanese Food Guide	% I know.	31.6	49.4	0.000	31.1	50.5	0.001	37.5	44.4	ns	30.6	48.5	0.017
Three colour group	% I know.	41.5	59.9	0.000	43.1	60.3	0.006	50.0	59.3	ns	35.7	59.2	0.000

ns indicates not significant.
Fisher's exact test was used for matched qualitative variables.
Pre School A vs School B vs School C by Fisher's exact test; ns
Post School A vs School B vs School C by Fisher's exact test; ns

Table 4: Relationship between kinds of schools and mother's knowledge for nutrition education tool.

a child's healthy eating habits can increase soybean intake. It has also been shown that childhood social and educational factors are strongly associated with adult mental and physical health, and with adult health-related behavior [14]. Attention to these habits may continue to prevent NCDs during childhood and adulthood. Our hypothesis was that a mother's attitude toward her child's acquisition of healthy food habits has an effective influence on children's consumption of soybean products and that a mother's positive attitude toward soybean products can influence her children's consumption of soybean products. Another study showed that there was a positive relationship between children's dietary food intake scores with the mothers' nutritional knowledge and attitude scores [15]. The result of one multi logistic regression analysis showed that both factors were important. For this research, we defined mothers' attitude as, 'talking with their family' and, 'telling their children about Japanese food'. According to one research study conducted by Coon, the dietary patterns of children from families in which television viewing is a normal part of meal routines may include fewer fruits and vegetables and more pizzas, snack foods and sodas than the dietary patterns of children from families in which television viewing and eating are separate activities [16]. Our results countered Coon's findings and confirm that family conversation is very important for children's healthy eating.

Our result showed that they usually eat tofu was only 6%. In 2008, the Ministry of Agriculture, Forestry and Fisheries (MAFF) published a study regarding concerns about the use of soybean products [17]. These studies cannot be discussed on the same page. But our participants may be consuming less tofu than this study.

Nutrition education involving the soybean program is suggested to increase 'respect for food' in kindergarten children. Teachers and nutritionists provided information about soybeans to children utilizing daily school meals. Also, this information was given to guardians using a school lunch menu distributed once a month. Behavior changes need to some process [18]. One research found that consumers understanding of the level of soy intake among women at increased risk for breast cancer and highlight potential factors that may influence women's decision regarding soy food consumption [19]. In future research, we will try to discuss the soybeans program. Our previous study suggested that 'enjoying school lunch' and 'respect for food' are also key factors that may help manage children's preferences [8,20]. This result and previous results showed the same tendency among children's preferences. These are important factors that help create better food habits in early childhood.

This study finds that increasing a guardian's nutrition education about the soybean program is positive action that will lead to an increase in a child's soy consumption. Based on the Stage of change Model and the Knowledge, Attitude and Behaviour (KAB) Models, we gave the children's guardians detailed knowledge about soybeans. Furthermore, nutritionists provided information to mothers about the nutrition composition of soybeans as well as other foods divided into three food groups. This information was given using a school lunch menu distributed once a month. Our proposed program can increase a mother's nutrition education knowledge. As confirmed by another study, there is a positive relationship between children's dietary food intake scores with the mothers' nutritional knowledge and attitude scores [15]. Fang et al reported that the primary reason for consumption of soy foods was eating a healthful diet, whereas in sufficient knowledge about soy food preparation was the primary reason stated for no consumption [19]. Our results suggested that the KAB model showed that knowledge is associated with attitude and, behavior; in addition, mothers' food attitude may be connected with children's intake of soybean products.

Conclusions

Above all, this study suggested that high daily intake of soybean products by children may be influenced by mothers' concern and positive attitudes towards children's food habits.

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Declaration of Conflicting Interests

The study was carried out by research funds provided by the Fuji Foundation for Protein Research. The authors declare that there is no conflict of interest regarding the publication of this paper.

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