vidualized counseling at the beginning of health promotion program, which was followed by mass-education, might be effective enough to give appropriate suggestions and to give motivation enough for modifying the dietary habits.

At the present time of Japan, most dietary counseling is performed without dietary assessment or with conventional dietary assessments. In the latter case, one-day or three-day dietary record has most often been used for this purpose. But two serious shortcomings have been pointed out : that dietary data of short-days do not represent subject' habitual intakes because of serious day-to-day variation of intakes in most nutrients (Nelson et al. 1989) and that it takes time to handle the data and to calculate nutrient intakes. In order to resolve these problems, brief dietary assessment questionnaires have often been used for this purpose. But validation studies are lacking in the most questionnaires. As a consequence, current dietary counseling is in Japan often held with poor scientific information of subject' dietary intakes.

In order to overcome the above-mentioned problems, some tailored dietary counseling methods have been developed in Western countries, and the usefulness of these methods have been reported (Brug et al. 1999). A tailored dietary counseling consists of two parts : dietary assessment and counseling based on the results obtained from the dietary assessment. For this purpose, we need a dietary assessment method that is highly valid and relatively easy to use. We also need a nutrient-calculation program and computer-assisted feedback system for a quick and systematic counseling.

Based on these backgrounds and needs, we first developed a self-administered diet history questionnaire (DHQ) with validity (Sasaki et al. 1998a ; Sasaki et al. 1998b ; Sasaki et al. 2000). Then, we developed a computer-assisted, tailored counseling system using DHQ. Then the effectiveness of the system was examined using the following three studies.

Subjects and Methods

1. Structure of the system

1) Self-administered diet history questionnaire (DHQ)

The DHQ is a 16-page questionnaire on one-month dietary habits. Questions about eating frequency of main staples, i.e., rice, bread, and noodles, at breakfast were included in DHQ. The DHQ has been validated using three different gold standards as following. Firstly we compared nutrient intakes assessed by DHQ with those assessed by 3-day dietary record among 47 middle-aged women. Pearson correlation coefficient ranged from 0.17 to 0.75 (mean was 0.48) in 17 energy-adjusted nutrients (Sasaki et al. 1998a). Also, the mean intakes assessed by two methods were similar (difference was 1 − 3% in macronutrients and 1 − 25% in micronutrients) (Sasaki et al. 1998a). Secondly we compared sodium and potassium intakes assessed by DHQ with those of 24-hour urinary excretions among 69 female university students. Although Pearson correlation for sodium was not significant ($r = 0.23$, $p = 0.06$), that for potassium was significantly positive ($r = 0.40$, $p < 0.001$) (Sasaki et al. 1998b). Thirdly we compared marine-origin n-3 polyunsaturated fatty acid (PUFA) and carotene intakes assessed by DHQ with those of serum concentrations, which have often been used as reliable biomarkers, among 44 middle-aged women. A significantly positive correlation was observed in both nutrients ($r = 0.60$ and 0.56 respectively, $p < 0.001$ for both) (Sasaki et al. 2000).

2) The tailored dietary counseling system

The tailored dietary counseling system developed and examined in the trials is briefly described as follows. As pre-intervention assessment, the subjects are requested to answer DHQ at home. The completed DHQ is checked by staff. When a missing and/or an illogical answer were found, the subjects are requested to re-answer. The data collected with DHQ are input, approximately 15 minutes per subject, to the attached computer file at a study site or in the staff-office. The data are automatically calculated and the individual nutrient intakes are printed out as feedback sheets. Four types of individualized feedback sheets are available : general nutrition, hypercholesterolemia, hypertension, or osteoporosis. These results are used for counseling with the subjects. The individualized feedback sheets with nutrient intake by food group and by each food item are also available. These sheets are mainly used when a dietitian needs a closer look at the results. In Study 3 (see below), subjects were encouraged to set explicit and proximal subgoals from prelisted 50 items on check sheets. Furthermore, 40 different one-page leaflets were prepared to provide detailed nutrition information and helpful hints regarding cooking. The 4 to 5 leaflets were tailored to individual dietary intake levels and dietary patterns by computer program. Selected leaflets were checked by the trained dietitian and modified slightly when necessary.

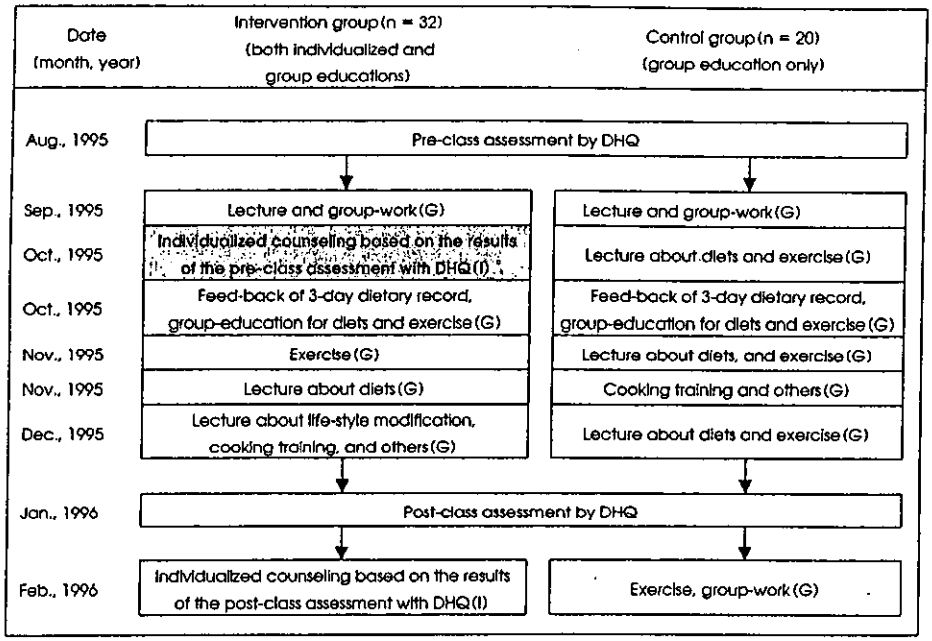

Fig. 1. Education plan in Study 1 (number of participants in parentheses). (I) and (G) indicate individualized and group education, respectively.

Similar tailored counseling systems, but less structures, were used in Studies 1 and 2 (see below).

Details of the questionnaire (DHQ) and the information about the system more in detail are available on request to the author.

2. Effectiveness studies

1) Study 1 (Sasaki et al. 1998c)

A 4-month health promotion class consisting of 7 sessions was conducted in two areas in Hikone, Japan among untreated mildly-hypercholesterolemic men and women, with serum cholesterol = 200 − 239mg/dl for men and women aged 49 years or less and 220 − 259mg/dl for women aged 50 years or over, who were screened at the city annual health checkup. Pre-class and post-class dietary assessments were done using DHQ in both groups. The results were used in a 15-minute individualized counseling about two months after the pre-class assessment in the intervention group. Conventional group education was given in both groups. The education schedule was summarized in Fig. 1. In the individualized counseling, individualized dietary modification suggestions to improve hypercholesterolemia based on the results of the assessment were provided by the staff.

2) Study 2 (Sasaki et al. 1999 ; Sasaki et al. 2000)

We invited men who were at high-risk for coronary heart disease, mainly hypercholesterolemia determined at their annual health-checkup to a 3-month health promotion class in Nagoya, Japan. The study design and the number of subjects are shown in Fig. 2. Among 320 eligible subjects, 80 participated in the class (intervention group). We assessed food and nutrient intakes with DHQ before and after class among the intervention group. We measured serum cholesterol at the post-class point and 1 year after the intervention was completed among both participants and non-participants (control group 1). In addition, at the pre- and post-class dietary assessment points, we asked 169 healthy workers at the jobsite to answer the DHQ (control group 2). In the intervention group, the results of the pre-class assessment were used in the 15- to 20-minute individualized counseling. During the following 3-months, the participants and staff exchanged short letters using a mailing system where the staff checked and counseled the participants' dietary behaviors. In order to examine recidivism, we assessed dietary habits one-year after the post-class assessment.

3) Study 3 (Takahashi et al. 2003)

We examined the effectiveness of the system in a 2-year community-based randomized cross-over trial with 550 healthy volunteers living in Akita, Japan, where the prevalence of stroke and stomach cancer mortality was high. The intervention aim was to decrease sodium, and to increase carotene and vitamin C intakes. In order not to induce carry-over effect, we examined the dietary change on the first half

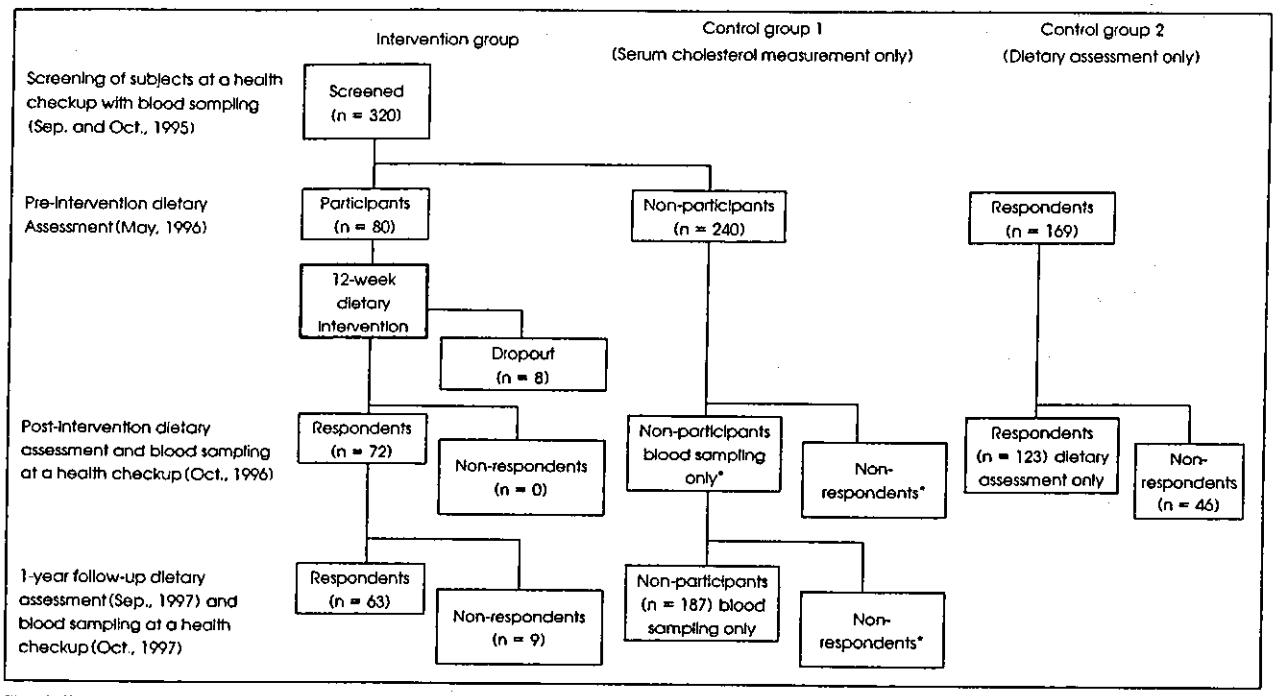

Fig. 2. The number of the male subjects (Study 2). *Number of subjects was not reported.

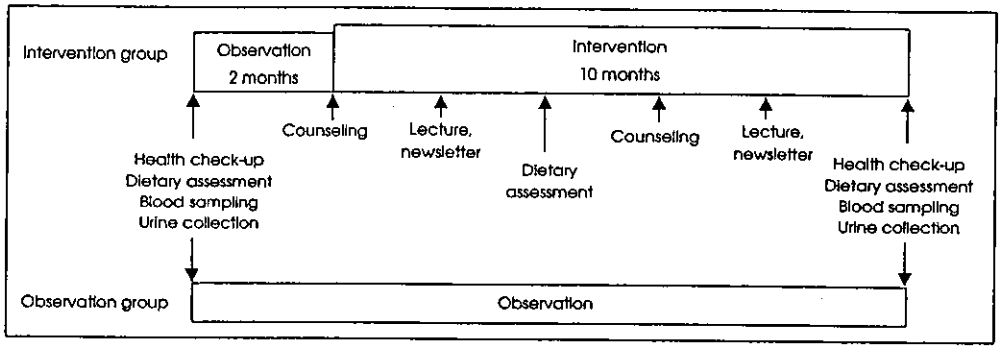

Fig. 3. Design of the first half of the 2 year cross-over trial (Study 3).

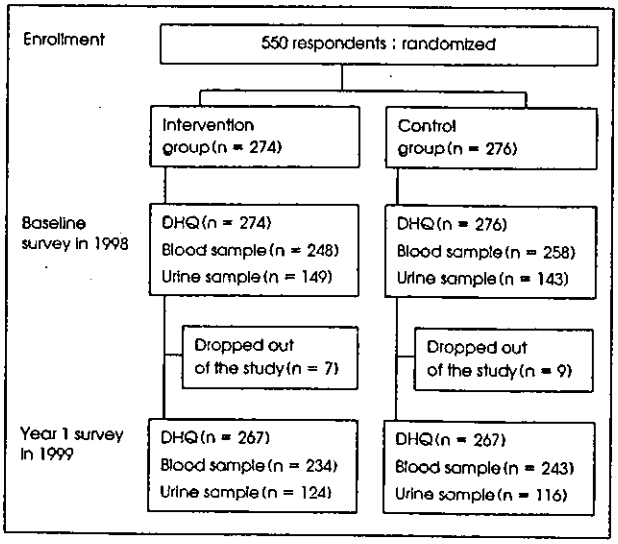

Fig. 4. The number of subjects in the trial (Study 3).

of the trial. The study design and the number of subjects are shown in Fig. 3, 4, respectively. We examined the effectiveness using not only dietary change assessed with DHQ, but also changes in corresponding biomarkers of nutrients of interest, i.e., serum carotene and vitamin C, and 24-hour urinary excretion of sodium. At baseline, dietary habits were assessed and serum and 24-urine were collected from all 550, 506, and 292 subjects, respectively.

Results

1. Study 1

Table 1 shows the change in nutrient intakes between the intervention and the control groups. Intake of saturated fatty acid (SFA), but not of cholesterol, significantly decreased in

Table 1. Mean nutrient intakes at pre- and post-intervention points, and the changes (Study 1)

	Intervention group (n = 32)			Control group (n = 20)		
	Pre-	Post-	Change	Pre-	Post-	Change
Energy (kcal/day)	1888	1865	−22	1725	1834	109
Selected nutrients						
Total fat (%E)	23	22	−1	23	23	0
SFA (%E)	7.0	6.0	−1.0$^{***,\#}$	6.4	6.4	0.0
MUFA (%E)	7.6	7.4	−0.2	7.9	7.8	-0.1
PUFA (%E)	5.2	5.4	0.1	6.0	6.1	0.2
P/S ratio	0.8	0.9	0.1**	1.0	1.0	0.0
Cholesterol (mg/1000kcal)	183	169	−14	186	169	−18
Keys score (unit)	32	28	−4	29	28	−1
Protein (%E)	15	16	1	16	17	1
Carbohydrate (%E)	61	62	1$^{\#}$	61	60	−1
Calcium (mg/1000kcal)	315	306	−9	293	336	43
Iron (mg/1000kcal)	7.1	6.8	−0.3	7.2	7.4	0.2
Salt (g/1000kcal)	5.5	5.0	−0.4	4.3	4.5	0.2
Potassium (mg/1000kcal)	1479	1408	−71	1458	1543	85
Selected food groups (only food groups with significant results)						
Cereals (g/1000kcal)	274	297	23$^{*,\#\#}$	299	271	−27*
Daily products (g/1000kcal)	105	83	−22$^{***,\#}$	82	102	20
Fruits (g/1000kcal)	68	103	35	78	117	39
Cooking oil (g/1000kcal)	2.1	2.1	0.0	2.4	1.8	−0.6*

Significant change within group : *** : $p<0.001$, ** : $p<0.01$, * : $p<0.05$.
Significant difference of change between groups : # : $p<0.05$, ## : $p<0.01$.
%E : percentage of total energy, SFA : saturated fatty acid, MUFA : monounsaturated fatty acid, PUFA : polyunsaturated fatty acid, P/S ratio : PUFA to SFA ratio.

the intervention group when compared to the control group ($p < 0.05$). The differences in the change were marked ($p < 0.05$) for cereals and dairy products among 13 food groups examined. In addition, the participation rate through the 7 sessions was significantly ($p < 0.05$) higher in the intervention group (79%) than in the control group (65%).

2. Study 2

Table 2 shows the change in nutrient and food group intakes of the two groups (the intervention group and the control group 2). A significant difference was observed for the change in intakes of SFA, monounsaturated fatty acids, and cholesterol ($p < 0.05$). Although the data were available only from the intervention group, the favorable decrease in SFA observed at the post-class point was maintained until the 1-year after the counseling was completed. Among foods examined, marked decrease and increase were observed for full-fat and low-fat milk, respectively. This change was maintained for the 1 year after. Neither type of meats nor of fat-spread, such as butter and margarine, intake was significantly changed by the counseling (data not shown).

The change in serum cholesterol from the pre- to post-intervention point was 0.31 ± 0.63 mmol/L (mean ± SD) in the intervention group. Assuming that the change observed in the control group 1 was attributed to regression to the mean (Ederer 1972) and that the same level of regression to the mean occurred in the intervention group, the decrease in serum cholesterol expected from the change in the diets (Keys et al. 1964) and the change in the body weight (Dattilo et al. 1992) was very close to the observed value, i.e., −0.32mg/dl.

3. Study 3

The change in intakes was significantly different between the intervention and control groups for all the targeted nutrients : sodium ($p < 0.001$), carotene ($p < 0.05$), and vitamin C ($p < 0.05$) (Table 3). The changes in serum carotene and vitamin C were modest, and not statistically significant ($p = 0.09$ and 0.07, respectively). When both dietary and urinary sodium were examined between the two groups ($n = 191$), the changes were significantly different ($p < 0.001$). We observed no significant difference in the changes of all other

Table 2. Nutrient and food group intake at each point in Study 2

	Intervention group (n = 63)			Control group 2 (n = 123)		Change from the pre- to post-intervention points	
	Pre-intervention	Post-intervention	1-year follow-up	Pre-intervention	Post-intervention	Intervention group (n = 63)	Control group 2 (n = 123)
Energy (kcal/day)	2107 ± 426	1975 ± 454	1975 ± 412	2148 ± 472	1987 ± 497	−132 ± 489	−161 ± 520
Fats and cholesterol							
SFA (%E)	7.6 ± 1.9	6.0 ± 1.5***	6.3 ± 1.6***	7.7 ± 2.0	6.8 ± 2.0	−1.6 ± 1.8#	−0.9 ± 1.7
MUFA (%E)	8.5 ± 2.4	7.1 ± 1.7***	7.6 ± 2.0*	8.7 ± 2.4	8.2 ± 2.5	−1.4 ± 2.2#	−0.5 ± 2.3
Total fat (%E)	24.3 ± 5.7	21.1 ± 4.2**	22.3 ± 5.0	24.8 ± 5.8	23.6 ± 6.3	−3.2 ± 5.5#	−1.2 ± 5.8
Cholesterol (mg/1000kcal)	136 ± 56	129 ± 38	133 ± 45	126 ± 55	135 ± 57	−7 ± 52#	9 ± 49
Other nutrients							
Dietary fiber (g/1000kcal)	5.7 ± 2.0	6.3 ± 1.5	4.1 ± 1.2	5.7 ± 1.8	5.5 ± 1.6	0.5 ± 2.0##	−0.2 ± 1.3
Potassium (mg/1000kcal)	103 ± 244	1285 ± 320***	1250 ± 287**	1058 ± 241	1151 ± 302	202 ± 265##	93 ± 222
Calcium (mg/1000kcal)	257 ± 84	311 ± 103**	298 ± 98*	242 ± 75	260 ± 109	54 ± 85#	19 ± 89
Iron (mg/1000kcal)	3.6 ± 0.8	4.1 ± 0.9**	5.9 ± 1.6**	3.5 ± 0.8	3.8 ± 0.9	0.6 ± 0.8#	0.3 ± 0.8
Food groups (g/1000kcal)							
Pulses	23.7 ± 11.9	32.7 ± 15.7**	28.5 ± 13.8	23.5 ± 14.0	24.7 ± 16.2	8.9 ± 16.8##	1.0 ± 14.7
Green and yellow vegetables	31.1 ± 18.2	36.1 ± 20.6	35.2 ± 23.9	31.9 ± 22.0	28.5 ± 21.9	5.0 ± 19.4##	−3.4 ± 18.2
Confectioneries	11.7 ± 9.7	7.9 ± 6.3	9.0 ± 8.5	10.1 ± 8.6	11.1 ± 16.6	−3.9 ± 8.8##	0.9 ± 14.5
Other vegetables	71.7 ± 40.8	103.4 ± 45.6***	94.1 ± 42.7*	75.7 ± 44.1	89.2 ± 60.1	31.7 ± 48.1##	13.5 ± 40.9
Fats and oils	9.0 ± 6.3	7.5 ± 5.5	9.5 ± 6.9	9.1 ± 5.1	9.8 ± 6.7	−1.6 ± 6.6#	0.7 ± 6.2
Full-fat milk	34.2 ± 42.8	25.6 ± 44.7	22.4 ± 40.4	33.8 ± 48.4	34.4 ± 46.8	−8.6 ± 61.1	0.6 ± 46.8
Low-fat milk	12.8 ± 30.9	42.2 ± 58.1***	33.8 ± 50.3**	8.4 ± 27.1	11.3 ± 34.6	29.4 ± 63.5##	2.8 ± 37.1

Value is mean ± standard deviation.
See table 1 for abbreviations.
Significance for the change from the pre-intervention point within a group : * : $p<0.05$, ** : $p<0.01$, *** : $p<0.001$.
Significance for the comparison between groups for the change from the pre- to post-intervention point : # : $p<0.05$, ## : $p<0.01$.

nutrients examined including total energy (data not shown), although a modest difference was observed for water-soluble dietary fiber ($p=0.06$).

Discussion

The importance of health counseling aimed at lifestyle modification has long been emphasized for preventing and/or treating lifestyle-related diseases such as cardiovascular diseases. Although a number of dietary intervention studies exist in Japan, most of them have not reported their effectiveness using an appropriate study design. Only one study with DHQ (Sasaki et al, 2000) meets the necessary criteria in a recent systematic review about dietary intervention studies for chronic diseases (Bowen and Beresford 2002). This shortcoming makes it difficult to evaluate the health counseling methods developed in Japan.

Recently, tailored dietary counseling system, mostly attached with a dietary assessment questionnaire, has become popular in Western countries (Brug et al. 1999 ; Brug et al. 2003). Several studies reported the usefulness and the effectiveness of the systems (Brug et al. 1996 ; Kristal et al. 2000). But, to our knowledge, only one trial besides three reports presented in this review examined the effectiveness of a similar system in Japan (Amano et al. 2002).

Another interesting point observed in these effectiveness studies is the relatively low drop-out rates : 10% and 3% in Studies 2 and 3, respectively. In Study 1, a significantly higher participation rate was observed in the intervention group than in the control group. We pointed-out a few, five at maximum, important dietary problems, based on the results of the pre-counseling assessment, for each subject, and recommended them to resolve these individualized and limited dietary problems. We assume that this could give high mo-

Table 3. Changes in dietary intake and the corresponding biomarkers in Study 3

	Intervention group			Control group			Between-group
	Baseline	Year 1	Change[a]	Baseline	Year 1	Change[a]	
	Mean	Mean		Mean	Mean		P^b
All subjects	(n = 231)			(n = 239)			
Dietary Intake							
Sodium (mg/day)	5432	5049	−384	5305	5560	255	<0.001
Carotene (mg/day)[c]	2128	2549	418	1840	2033	220	0.032
Alpha-carotene (mg/day)[c]	203	255	78	156	168	41	0.013
Beta-carotene (mg/day)[c]	1861	2219	340	1624	1798	178	0.048
Vitamin C (mg/day)[c]	105	120	13	97	102	2	0.023
Serum concentration							
Total carotene (mg/L)	560	573	13	549	519	−25	0.092
Alpha-carotene (mg/L)	79	84	10	80	76	−3	0.001
Beta-carotene (mg/L)	475	480	3	462	436	−22	0.196
Vitamin C (mg/L)	14.6	14.8	0.1	14.8	14.4	−0.5	0.070
Subjects with 24-hour urine	(n = 96)			(n = 95)			
Dietary sodium (mg/day)	5551	5146	−406	5253	5836	583	<0.001
Urinary sodium excretion[d]	5625	4622	−1003	5830	5746	−84	<0.001

[a] Difference between baseline and Year 1.
[b] *P*-values for comparison between intervention group and control group by t-test after adjustment for baseline intake.
[c] Values at each point were transformed by the natural logarithm before computation because of the skewed distributions. They were then back-transformed.
[d] Expected intake was considered to be observed urinary excretion divided by 0.86 (Holbrook et al. 1984).

tivation to the subjects and lead it to a low drop-out rate. The potential to motivate subject would be as important as the observed favorable changes in nutrient intakes through counseling.

Tailored dietary counseling systems developed in Western countries have mostly been built upon behavioral change theory such as "stage of change" model (Brug et al. 1999 ; Brug et al. 2003). Some of them reported the difference of effectiveness of a tailored dietary counseling by "stage of change" model (Brug and van Assema 2000). The appropriate use of individual behavioral counseling based on the stage of change model has been reported to be effective (Steptoe et al. 2003). The use of stage of change model to this counseling system may be one of the future research fields. We expect better effectiveness when stage of change model can be introduced appropriately to the system.

The intervention is done according to the results assessed with DHQ meaning that the reliability of the results is the key to the intervention. However, DHQ does not measure dietary intake directly : the assessment is based on memory rather than direct observation of foods eaten. A validation study is necessary to examine the applicability and limitation for the questionnaire. DHQ has been validated against dietary record and serum/urine biomarkers (Sasaki et al. 1998a ; Sasaki et al. 1998b ; Sasaki et al. 2000). Although these validation studies have examined validity at one point, validity to assess change in intakes (called responsiveness) would also be necessary. Responsiveness was examined using Keys score (Keys et al. 1964) against change in serum cholesterol in Study 2 (Sasaki et al. 1999).

The three studies presented in this review bear some limitations. The first two studies were not randomized controlled trial. In Study 1, effectiveness was evaluated using dietary change without observing changes in serum cholesterol. In Study 2, when recidivism was examined after the intervention was completed, no control group was prepared. The Study 3 examined the effectiveness with a randomized controlled trial, including a reasonably large number of subjects. However, significant changes in serum biomarkers could not be detected, although a significant improvement was observed in the dietary intakes assessed with DHQ and in the urinary excretion of sodium.

Despite some shortcomings, there are several findings that are significant to studies. All these studies showed significantly favorable changes in the targeted nutrients. No unfavorable change was observed in other nutrients examined. These results indicated the ability of this system to change the intake of a specific nutrient of interest. When the change

was significant in untargeted nutrients, it was in the favorable directions such as those observed in dietary fiber and calcium in Study 2 (Table 2). This observation also shows one of the characteristics of this system where the intakes of several nutrients besides the targeted ones can be assessed.

The current dietary counseling system with DHQ would be a promising tool for modifying dietary habits at an individual level. The applicability of the assessment tool to other diseases and populations should further be examined.

Conclusion

We developed a computer-assisted dietary counseling system in which nutrient intakes and dietary behaviors are assessed with DHQ. We examined the effectiveness in three studies. We observed significant changes in the intakes of targeted nutrients in all three studies and observed favorable changes in the corresponding biomarkers of two studies. One study maintained a modified dietary habit until one-year after the counseling was completed. No unfavorable change was observed for non-targeted nutrients. The dietary counseling system with DHQ was concluded to be effective at least among motivated high-risk and healthy subjects.

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PAPER

Self-reported rate of eating correlates with body mass index in 18-y-old Japanese women

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OBJECTIVE: To examine associations between rate of eating and macronutrient and dietary fiber intake, and body mass index (BMI).
DESIGN: Cross-sectional study.
SUBJECTS: A total of 1695 18-y-old female Japanese dietetic students.
MEASUREMENTS: Macronutrient intake (protein, carbohydrate, and fat) and dietary fiber intake were assessed over a 1-month period with a validated, self-administered, diet history questionnaire. Body height and weight and rate of eating (according to five categories) were self-reported.
RESULTS: Among the nutrients examined, only dietary fiber intake weakly, but significantly, and negatively correlated with BMI in a multiple regression analysis. The rate of eating showed a significant and positive correlation with BMI. The mean BMI was higher by 2.2, 1.5, 1.0, and 0.5 kg/m^2 in the 'very fast', 'relatively fast', 'medium', and 'relatively slow' groups, respectively, compared with the 'very slow' rate of eating group. This correlation remained evident after adjustment for nutrient intake.
CONCLUSIONS: Rate of eating showed a significant and positive correlation with BMI, whereas only dietary fiber intake showed a weak correlation with BMI.
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Keywords: eating rate; macronutrient intake; dietary fiber intake; Japanese; women; epidemiology

Introduction

Both rate of eating and macronutrient intake balance have long been of interest as factors that may contribute to obesity. Although several previous studies have explored potential associations, the results have been inconsistent.[1–15] Most studies of rate of eating have examined the association using test meals and have compared the rate of eating between obese and nonobese subjects, or have observed weight change by decreasing the rate of eating in obese subjects.[1–3] Few epidemiological studies have examined this topic to date.[4,5] In contrast, several epidemiological studies have examined the role of differing macronutrients in the development of obesity. These results have varied across the studies and populations examined.[6–11] Other studies have reported the importance of dietary fiber.[12,13] As palatability differs between foods with different compositions of fat and dietary fiber,[14,15] rate of eating may correlate with intake of these nutrients. Therefore, when dietary factors associated with obesity are examined, both nutrient intake and rate of eating should be considered. To our knowledge, no studies to date have considered both rate of eating and nutrient intake with respect to obesity. We, therefore, investigated associations between rate of eating and macronutrient and dietary fiber intake, and body mass index (BMI).

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Subjects and methods

Survey method

Subjects were students who entered dietetic courses at 22 colleges and technical schools in Japan in April 1997 (n=2069).[16] The survey was conducted during April 1997. A total of 2063 students (2017 women and 46 men) responded to the survey (response rate = 99.7%). Staff at each school checked the submitted questionnaires according to the survey protocol. When missing values and/or logical

errors were identified, the staff asked the subjects to complete the questions again. The questionnaires were checked at least once by staff at each school and by staff at the survey center. Most surveys were completed by the end of May.

Questionnaires

We used two questionnaires—a self-administered diet history questionnaire (DHQ)[17,18] and a questionnaire on general lifestyle. The DHQ is a validated 16-page questionnaire that recalls dietary habits over a 1-month period. The general lifestyle questionnaire used was a four-page questionnaire designed for this survey. It addressed general lifestyle factors, including participation of sports club activities over the previous month, current dietary counseling, the period of intentional change in dietary habits, experience of dieting, and smoking status. Body height and weight were self-reported as part of the DHQ. The period of intentional change in dietary habits was asked with four categories, from 'none', 'within 1 y', 'within 3 y', to 'more than 3 y ago'. When asking about experience of dieting, dieting was defined as at least 2 kg intentional reduction of body weight within 1 month. Smoking status was asked with three categories, that is, 'nonsmoker', 'past smoker', and 'current smoker'.

Rate of eating was self-reported according to one of five qualitative categories—'very slow', 'relatively slow', 'medium', 'relatively fast', and 'very fast'. We examined the validity of these rating categories in a subpopulation ($n=222$) using the rate of eating reported by a close friend as the standard. We asked subjects to categorize the rate of eating of three close friends and obtained 498 eligible responses. The percentage of exact and adjunct agreement was 46 and 47%, respectively, which indicated high levels of agreement between self- and friend-reported rates of eating.

Statistical analysis

For the purposes of statistical analysis, we selected female subjects aged 18 y ($n=1744$). Subjects considered likely to have severe under- or over-reported energy intake were excluded. This included subjects with a reported energy intake less than half the energy requirement for the lowest physical activity category (6276 kJ/day) according to the recommended dietary allowance for Japanese, sixth revised edition or a reported energy intake more than or equal to 1.5 times the energy requirement of the highest physical activity category (9623 kJ/day), respectively.[19] We also excluded subjects with missing values in nondietary variables. The 1695 women met the criteria and were included in the present analyses.

Intakes of energy, macronutrients, and dietary fiber were computed using an *ad hoc* algorithm for DHQ. As alcohol intake was extremely low, that is, the mean was 0.6 g/day, alcohol was excluded from the present analyses. Validity was higher in energy-adjusted values than in crude values in most of the nutrients in DHQ[17] as was observed in other several dietary assessment questionnaires with similar structures.[20,21] Owing to the lower validity of crude values, energy-adjusted values were recommended to be used in analyses for nutrient–disease association.[22] We therefore used both crude and energy-adjusted values in the present analyses. The energy density model, that is, percentage of energy intake (%E) for macronutrients and grams per 4184 kJ energy intake (g/4184 kJ) for dietary fiber, was used for energy adjustment.

The subjects with participation of sports club activities at least once per week were physically active. BMI (kg/m^2) was computed as body weight (kg) divided by square of body height (m).

Before analyzing correlations between nutrient intake, rate of eating, and BMI, we computed correlation between nondietary variables, and rate of eating and BMI in order to find out confounders.

Then, we computed means and 95% confidence intervals of body height, body weight, BMI, intakes of energy, three macronutrients, and dietary fiber by rate of eating.

Next, we calculated partial regression coefficients and 95% confidence intervals for nutrient intake and rate of eating by multiple regression analysis with BMI as the dependent variable. We tested the association using three different models, that is, nutrient intakes only, rate of eating only, and both nutrient intakes and rate of eating as independent variables, respectively. In this analysis, nondietary variables with significant correlations with BMI were included in the models as covariates. Crude intake values were expressed as 'kJ/day' for macronutrients, and '10 g/day' for dietary fiber. In the model with nutrient intake of energy density model, carbohydrate intake was not included in the model because of very high correlation with fat intake (Pearson's correlation coefficient = −0.94).

All analyses were carried out using SAS statistical software, version 6.12 (SAS Institute Inc., Cary, NC, USA). A P-value of less than 0.05 was considered statistically significant.

Results

Table 1 shows the characteristics of the study population. The distribution of rate of eating differed significantly between two categories on experience of dieting ($P<0.001$). Mean BMI was significantly different both between two physical activity levels ($P<0.01$) and between two categories of experience of dieting ($P<0.001$). Neither did intentional dietary change, current dietary counseling, nor smoking status affect BMI.

Table 2 shows body height, body weight, BMI, and intakes of energy, macronutrients, and dietary fiber by rate of eating. Body weight and BMI increased steadily with the increase in the rate of eating. In contrast, dietary fiber intake adjusted

Table 1 Characteristics of the study population, rate of eating, and BMI ($n=1695$)

		Rate of eating (n)						*BMI (kg/m²)*	
	n (%)	*Very slow*	*Relatively slow*	*Medium*	*Relatively fast*	*Very fast*	*P-value*	*Mean (95% confidence interval)*	*P-value*
Physical activity[a]									
Sedentary	1451 (86)	72	323	520	466	70	0.677	20.7 (20.6, 20.9)	0.009
Active	244 (14)	11	58	92	76	7		21.2 (20.8, 21.5)	
Experiment of dieting[b]									
No	1025 60)	62	265	375	289	34	<0.001	20.4 (20.3, 20.5)	<0.001
Yes	670 (40)	21	116	237	253	43		21.4 (21.2, 21.6)	
Intentional dietary change									
No	1309 (77)	61	276	491	420	61	0.124	20.8 (20.6, 20.9)	0.065
Yes (within 1 y)	198 (12)	8	54	58	69	9		21.0 (20.6, 21.5)	
Yes (within 3 y)	115 (7)	10	32	33	34	6		20.5 (20.1, 20.8)	
Yes (more than 3 y ago)	73 (4)	4	19	30	19	1		20.7 (20.1, 21.4)	
Current dietary counseling									
No	1666 (98)	80	375	605	532	74	0.263	20.8 (20.7, 20.9)	0.526
Yes	29 (2)	3	6	7	10	3		20.5 (19.4, 21.6)	
Smoking status									
Current smoker	44 (3)	2	9	18	12	3	0.914	20.6 (19.7, 21.5)	0.571
Past smoker	56 (3)	2	15	17	18	4		20.7 (20.2, 21.3)	
Nonsmoker	1595 (94)	79	357	577	512	70		20.8 (20.7, 20.9)	

[a]The subjects who took sport club activity at least once per week in the previous month were defined as 'physically active'.
[b]Dieting with more than 2 kg intentional reduction of body weight within 1 month was defined as 'dieting'.

Table 2 Body height and weight, and energy-providing nutrient and dietary fiber intakes (means and 95% confidence intervals) by self-reported rate of eating

Rate of eating	*Very slow (n = 83)*	*Relatively slow (n = 381)*	*Medium (n = 612)*	*Relatively fast (n = 542)*	*Very fast (n = 77)*	*Total (n = 1695)*	*One-way ANOVA P-value*
Body height (cm)	158.9 (157.8, 160.1)	157.7 (157.1, 158.2)	157.5 (157.1, 157.9)	158.4 (158, 158.9)	158.5 (157.3, 159.6)	158.0 (157.7, 158.2)	0.010
Body weight (kg)	49.6 (48.2, 50.9)	50.1 (49.5, 50.7)	51.5 (51.0, 52.1)*	53.4 (52.8, 54.1)***	55.4 (53.2, 57.7)***	51.9 (51.5, 52.2)	<0.001
BMI (kg/m²)	19.6 (19.1, 20.0)	20.2 (19.9, 20.4)	20.8 (20.6, 20.9)***	21.3 (21.0, 21.5)***	22.0 (21.2, 22.9)***	20.8 (20.7, 20.9)	<0.001
Energy intake (kJ/day)	7286 (6922, 7650)	7098 (6905, 7291)	7060 (6907, 7212)	7581 (7403, 7760)	8304 (7651, 8956)**	7303 (7205, 7400)	<0.001
Nutrient intake (crude value)							
Protein (g/day)	65.4 (61.1, 69.7)	62.6 (60.6, 64.7)	61.8 (60.1, 63.5)	65.4 (63.6, 67.2)	72.0 (65.0, 78.9)	63.8 (62.7, 64.8)	<0.001
Carbohydrate (g/day)	231.5 (220.0, 242.9)	231.9 (225.3, 238.4)	230.0 (225.4, 234.5)	242.6 (237.2, 247.9)	263.4 (244.7, 282.1)**	236.0 (233.0, 239.0)	<0.001
Fat (g/day)	60.0 (55.2, 64.8)	55.6 (53.4, 57.8)	55.7 (53.8, 57.5)	62.2 (60.0, 64.4)	68.7 (60.9, 76.5)	58.5 (57.4, 59.7)	<0.001
Dietary fiber (g/day)	12.8 (11.7, 13.9)	12.2 (11.7, 12.8)	11.6 (11.3, 12.0)	12.2 (11.8, 12.6)	12.5 (11.2, 13.8)	12.0 (11.8, 12.3)	0.076
Nutrient intake (energy density value)							
Protein (%E)	15.0 (14.4, 15.6)	14.7 (14.4, 14.9)	14.5 (14.4, 14.7)	14.4 (14.2, 14.6)	14.3 (13.8, 14.9)	14.5 (14.4, 14.7)	0.194
Carbohydrate (%E)	53.7 (52.2, 55.3)	55.2 (54.5, 55.9)	55.4 (54.8, 56.0)	54.3 (53.7, 54.9)	54.4 (52.5, 56.2)	54.9 (54.5, 55.2)	0.039
Fat (%E)	30.5 (29.1, 31.9)	29.0 (28.4, 29.5)	28.9 (28.4, 29.4)	30.1 (29.6, 30.6)	30.1 (28.5, 31.7)	29.4 (29.1, 29.7)	0.002
Dietary fiber (g/4184 kJ)	7.3 (6.9, 7.8)	7.2 (7.0, 7.4)	6.9 (6.8, 7.1)	6.8 (6.6, 6.9)*	6.4 (5.9, 6.8)**	6.9 (6.8, 7.0)	<0.001

%E = percentage of energy intake.
Significance level compared with the 'very slow' group by Dunnett's *t*-test of one-way analysis of variance: *$P<0.05$, **$P<0.01$, ***$P<0.001$.

for energy decreased steadily with the increase in the rate of eating.

Table 3 shows partial regression coefficients by multiple regression analysis with BMI as the dependent variable. As physical activity category and experience of dieting showed a significant association with BMI in Table 1, they were included in the models as covariates. In the model with nutrient intakes as independent variables, only dietary fiber significantly and negatively correlated with BMI ($P<0.05$). In the model with rates of eating as independent variables, the mean BMI steadily increased with the increase in the rate of eating. In the models with both nutrient intakes and rates of eating as independent variables, BMI steadily increased with the increase in the rate of eating, that is, 0.5, 1.0, 1.5, and 2.2 kg increase in 'relatively slow', 'medium', 'relatively fast', and 'very fast' groups compared to the 'very slow' group, respectively. Among the nutrients, only dietary fiber adjusted for energy attained the significance level ($P<0.05$). Additionally, energy intake did not significantly correlate with BMI, that is, Pearson's correlation coefficient was −0.01 and −0.04 without and with adjustment for rate of eating, respectively.

Discussion

Although cross-sectional studies on nutrient intake and obesity have reported inconsistent results, the majority of studies conducted in Western populations have indicated a significant and positive association between fat intake and BMI.[6–8] In contrast, two studies conducted in Korea and China in which fat intake was relatively low (mean was 24.7 and 24.8%E, respectively) did not report a significant association between fat intake and BMI.[9,10] The mean fat intake, 29.4%E, in this study was higher than in those studies, but still lower than those in Western studies. There is no current explanation for the discrepancy in results seen between high and low fat intake populations. In view of the possibility of increased reporting bias for fat intake with greater degrees of obesity,[7,8] the findings observed in Asian countries may be more accurate. However, in this population, energy intake did not significantly correlate with BMI category, and the highest energy intake was observed in the leanest BMI group (data not shown). As this was difficult to understand from physiology, under-reporting of intake in obese subjects apparently existed in this population as was seen in several Western populations.[23–25] Considering this problem, the results of analysis using energy-adjusted values may be more reliable than those using crude values.

Dietary fiber showed a negative correlation with BMI, regardless of adjustment of rate of eating ($P<0.05$) (Table 3). A similar finding with respect to dietary fiber intake and BMI has been reported in previous studies.[12,13] In this study, dietary fiber showed a strongly negative correlation with rate of eating ($P<0.001$) (Table 2). Considering the slight decrease in partial regression coefficient when rate of eating was adjusted for (Table 3), the association between dietary fiber intake and BMI may have two pathways, that is, a direct one and an indirect one through rate of eating. Further studies are needed in this issue.

Some experimental studies have compared rate of eating of test meals by obese and nonobese subjects.[1–3] Results were inconsistent, and the number of subjects were generally small. In the present study, there were few very slow and very fast eaters—only 5% for both groups—and the rate of eating explained only 7% of the observed variation in BMI. This

Table 3 Partial regression coefficients (95% confidence intervals) by multiple regression analysis expressing changes in BMI (kg/m^2) for change in rate of eating and nutrient intakes with adjustment for physical activity category and experience of dieting

	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*
Determination coefficient (R^2)	0.04	0.04	0.07	0.07	0.07
Nutrient intake (crude value)					
Protein (kJ/day)	0.07 (−0.15, 0.28)	—	—	0.06 (−0.15, 0.27)	—
Carbohydrate (kJ/day)	0.02 (−0.02, 0.06)	—	—	0.00 (−0.04, 0.05)	—
Fat (kJ/day)	−0.04 (−0.38, 0.29)	—	—	−0.13 (−0.46, 0.20)	—
Dietary fiber (10 g/day)	−0.50 (−0.92, −0.08)	—	—	−0.34 (−0.75, 0.08)	—
Nutrient intake (energy density value)					
Protein (%E)	—	0.01 (−0.05, 0.07)	—	—	0.02 (−0.04, 0.08)
Fat (%E)	—	−0.01 (−0.04, 0.01)	—	—	−0.02 (−0.04, 0.00)
Dietary fiber (g/4184 kJ)	—	−0.11 (−0.18, −0.03)	—	—	−0.08 (−0.16, −0.01)
Rate of eating					
Very slow (reference)	—	—	0.00—	0.00—	0.00—
Relatively slow	—	—	0.51 (−0.09, 1.11)	0.48 (−0.12, 1.09)	0.47 (−0.13, 1.08)
Medium	—	—	1.04 (0.46, 1.63)	1.00 (0.41, 1.58)	0.98 (0.40, 1.57)
Relatively fast	—	—	1.50 (0.91, 2.09)	1.49 (0.90, 2.08)	1.46 (0.86, 2.05)
Very fast	—	—	2.23 (1.44, 3.02)	2.22 (1.42, 3.02)	2.15 (1.36, 2.94)

%E = percentage of energy intake.

relatively narrow range of distribution for rate of eating and the small contribution to obesity suggests that it would be difficult to design experimental studies to determine an effect. To our knowledge, only two epidemiological studies have previously examined the association between rate of eating and obesity, with both reporting a positive association.[4,5] The current study similarly observed a positive association between self-reported rate of eating and BMI.

If fast eating was recognized as an important risk factor for obesity, obese subjects would tend to eat foods more slowly and reported rate of eating would be confounded by BMI status. However, 'eating slower' was not ranked among 20 major methods of dieting by Japanese female college students.[26] This indicates that reduction in eating rate as a weight-control measure is unlikely to be a serious source of bias in this population. Moreover, we included intentional dietary change into a regression analysis as the covariate in order to avoid this possible confounding.

We used a self-administered semiquantitative dietary assessment questionnaire for data collection.[17,18] Since actual dietary habits were not observed, the results should be interpreted cautiously. In order to minimize data inaccuracy, we used a previously validated questionnaire. The Pearson's correlation coefficients for the 3-day diet records were 0.48–0.55 for the three macronutrients used in the study and 0.48 for energy. As previously mentioned, under-reporting of energy intake assessed with this questionnaire among obese subjects was obvious because of no significant correlation between energy intake and BMI. Therefore, the analysis for correlation between nutrient intake, at least expressed as a crude value, and BMI may be inappropriate.

We observed a high level of concordance between self-reported and friend-reported rate of eating. However, as their friends knew the subject's general body shape, this may have influenced the independence of each rating. The observed agreement might have therefore been higher than the true value.

We used BMI values calculated from self-reported body height and weight. Previous studies have shown that BMI calculated from self-reported body height and weight is highly correlated with measured BMI values, although underestimation is common.[27,28] The studies suggest that BMI calculated from self-reported body height and weight is a reliable measure for use in correlation analysis.

In conclusion, we observed a statistically significant positive association between rate of eating and BMI in 18-y-old Japanese women. This finding was consistent regardless of adjustment for nutrient intake. Conversely, only dietary fiber intake, but not macronutrients, correlated significantly with BMI. Further follow-up of subjects to elucidate the impact of rate of eating on subsequent body mass would be of interest but is beyond the scope of this cross-sectional study.

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特集・食べる力を育む

商店街を巻き込んでの食育の取り組み

世田谷区ぱくぱく健康キッズ&タウンの事例

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抄　録：子どもたちを含む地域住民の望ましい食習慣形成をねらって，東京都世田谷区内にモデル地区を設定し，小学校6年生を対象に，学校を拠点として商店街を巻き込んだ食に関する学習を実施してきた。その学習内容を紹介し，そうした学習から児童や関係者は何を得たかというプロセス評価の結果を報告する。学習プログラムは，教室内での食に関する基本的な学習と，商店街へ出かけてのしらべ学習，及びそうした学習成果を商店街で地域住民に発信する活動からなる。保健所と研究者からなるプロジェクトチームが，学習への支援，地域商店街等との連絡調整を担当した。これらの学習により，児童は社会の食の営みの一端を知り，その学びを再び自分の食生活につなげた気づきを示す者が多かった。児童の学習に参加した保護者も多くの学びを得ていた。また，商店街組合役員，スーパーなど地域の関係者もこうした学習を好意的に受け入れ，次年度以降の継続を希望した。

緒　言

今日，いわゆる「食育」への関心が社会に高まっている。「食育」のとらえ方は，人によってさまざまであり，いまだ社会として一定のコンセンサスを得たものではない。したがって，理論的，概念的な整理は今後の課題として残るが，子どもだけでなく成人も含めて，いま，心身の健康とのかかわり，あるいは真に人間らしい豊かな食を考えるうえで，食生活，食べることが社会の重要な課題になっていることは間違いないだろう。

著者らは，子どもたちを含む地域住民の望ましい食習慣形成をねらって，東京都世田谷区内にモデル地区を設定し，学校を拠点として商店街を巻き込んだ食に関する学習と，子どもたちの学習成果を活用した地域の食環境づくりに取り組んできた1)。本報では，そうした学習の実現のためにどのような連携や調整が行われたか，また，そうした学習から児童や関係者は何を得たかというプロセス評価の結果を報告する。

方　法

本研究は，地域住民の望ましい食習慣形成をねらって，行動科学にもとづく栄養教育と食環境づくりを統合した地域介入プログラムを開発，実施し，その有効性を検討することを目的として平成14年から3年間にわたり実施している研究[1)]の一部である。介入地域は，東京都世田谷区内の2小学校とそれぞれの学区である。世田谷区では，平成13年に，健康日本21の地方計画である「健康せたがやプラン」を区民参画の手法を取り入れて策定した。その中で4点の重点的取り組みが示された。そのうちの2点，「子どもの頃からの生涯を通じた生活習慣の形成」と「食を通じた健康づくりの推進」を組み合わせた具体的な事業として本研究は実施されている。

事業の実施にあたり，世田谷保健所のスタッフと研究者からなるプロジェクトチームを立ち上げ

推進してきた。具体的には，研究全体の概念枠組みの作成とデザインの設計[1]，それを実現するためのフィールドの確保，ベースライン調査の実施，その結果をふまえ学校の教員らと共同で学習プログラムを作成・実施，地域の商店街と学校関係者からなる協議会の設置，それらのプロセス評価，などである。

1．食に関する学習プログラム

学校を拠点として商店街を巻き込んだ学習に関する概念枠組みを図1に示した。まず，教員，学校栄養職員らと協議を重ね，児童への学習プログラムを開発した。学習者は6年生児童とした。児童は，教室内での食に関する基本的な学習と，商店街へ出かけてしらべ学習を行い，そうした学習成果を，今度は商店街で地域住民に発信していく。商店街関係者には児童の学習を支援し，児童の学習成果発信の場を提供してもらう。同時に保護者にも，可能な限り児童の学習に関与してもらい，基本的な情報を共有してもらうことをねらった。このようにして，児童の学習を中心にしながら，結果として，地域全体に食に関する適切な情報と健康づくりに役立つ食物（商品）が増えることで，地域住民全体の食生活の向上をねらったプロジェクトである。いい換えれば，学校を拠点として商店街を巻き込んだ「健康なまちづくり」プロジェクトである。児童が覚えやすく親しみがもてるように，プロジェクトの通称を「ばくばく健康キッズ＆タウン」と名付けた。

モデル地区は2地区あり，それぞれの小学校の教育目標や地域特性にあわせて，学習プログラムの展開は若干異なる。表1に，S小学校での食に関する学習の流れを示した。

S小学校の6年生は2クラス65人である。将来の「なりたい自分」に向かって，現在の食生活の課題をみいだし，その解決のために，食に関する基本学習とグループワークによる課題解決学習を行った。食に関する基本学習としては，食生活指針でも推奨されている主食・主菜・副菜の組み合わせによるバランスのよい食事と，針谷・足立らによる「弁当箱ダイエット法」[3,4]を応用した自分の適量把握の学習を行った。

また，平成14年度に実施したベースライン調査結果[5,6]で，子どもたちに野菜摂取不足や野菜嫌いがみられたため，野菜に親しむことをねらって，毎月「旬」ポスターの作成を行った。子どもたちが実際にとりあげた食物は，野菜だけでなく，果

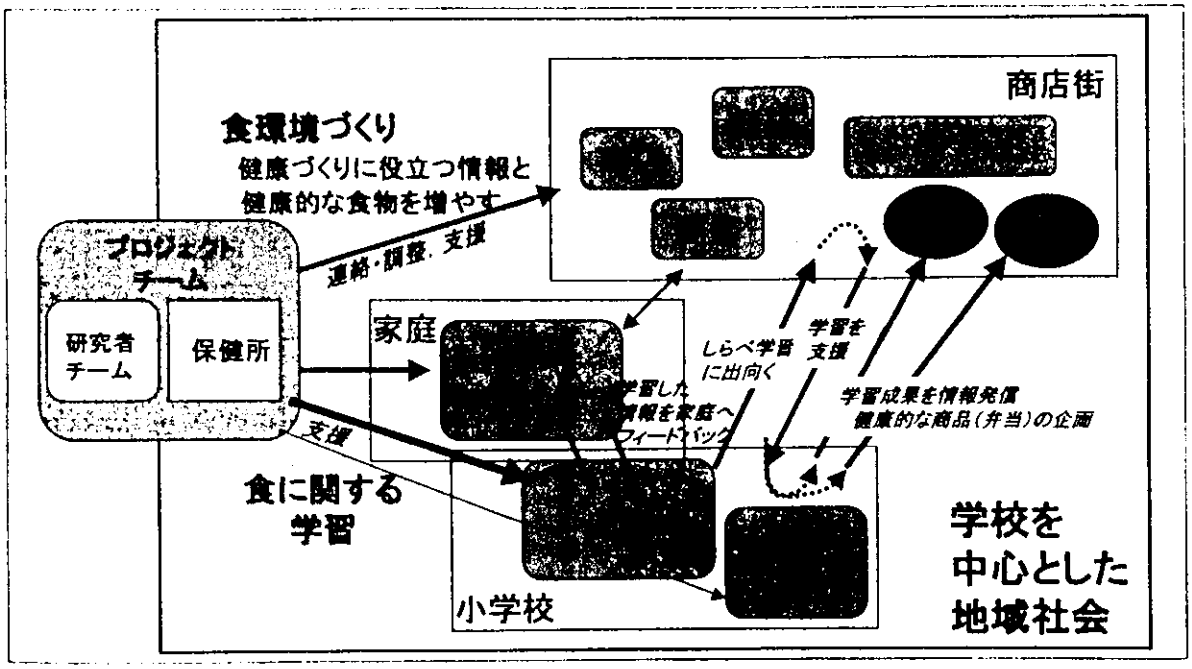

図1　学校と地域が連携した食に関する学習の枠組み
世田谷区「ばくばく健康キッズ＆タウン」の事例

表1　S小学校における食に関する学習　全体の流れ

月	食に関する学習	教科	学習内容	関わった人（商店街関係者以外）	商店街とのつながり
5	旬の食材ポスターづくり（毎月・商店街・スーパーに展示）	総合	食べ物の旬とその意義の理解をねらいとして，毎月旬ポスターを作成し，地域の商店会やスーパー貼る。地域の人々と交流し，情報交換する	クラス担任 保健所スタッフ，研究者	旬ポスターの掲示を依頼に行く（毎月）
	「なりたい私」	総合	将来の「なりたい自分」に向かって，現在の自分の食に関する課題を見つけ，それを友人と共通する課題へ発展させ，課題解決に向けてグループで，調べ学習をする	クラス担任　研究者	
	「我が家の簡単おすすめおかず」	家庭科			
	ぱくぱく弁当				
	ぱくぱく弁当パートⅠ	家庭科・総合	児童の調理した料理を含めた約30品の料理を使って，食べたい弁当の設計図を構想し，バイキング形式で弁当箱に詰める。学校給食の器に移しかえ，いつもの給食の量との違いを考え，自分の食事の課題に気付くことをねらう	クラス担任　家庭科教諭　保健所スタッフ　保護者　研究者	
6		家庭科			
7					
	パートⅡにむけての学習				
9	主食・主菜・副菜の学習		1 主食・主菜・副菜とは何かを知る 2 実物大料理カードを用いて，主食・主菜・副菜・その他の一品を組み合わせて献立を考える 3 ぱくぱくパートⅠで作った料理を主食・主菜・副菜別，調理法別に分類する	家庭科教諭　研究者 クラス担任	協議会で旬ポスターへの地域の人の反応が話題となる ⇒ 担任が児童に伝える
	1食分の適量把握の学習		1 パートⅠの弁当には，料理や食品バランスの問題があったことを理解する。 2 弁当箱ダイエット法の5つのルールを知る 3 5つのルールに従って，自分にあった容量の弁当箱に給食のおかずをしっかり詰める		
	ぱくぱく弁当パートⅡ料理の決定		家族と考えた，我が家のおすすめ簡単弁当おかずのレシピを作成，グループ毎に検討し，ぱくぱくパートⅡに向けて，買い物など準備のための役割分担を決める		
10	「なりたい私」調べ学習グループ発表				
11	ぱくぱく弁当パートⅡ	家庭科・総合	今までの学習内容を生かして，自分の心身の状態に合った弁当を構想し，実際に弁当箱に詰めて，食事として実現するランチバイキングを実施。	クラス担任　家庭科教諭　保健所スタッフ　保護者　研究者	
12					
1	ぱくぱく弁当パートⅢ	家庭科・総合	今までの学習内容を生かして，グループで地域の人に食べてもらいたい弁当の企画し，発表する	クラス担任　家庭科教諭　保健所スタッフ　保護者　研究者	スーパーの店長が，公開授業日にゲストティーチャーとして参加。弁当企画へのコメントを行う ↓ 児童の企画が，実際に商品としてスーパーで販売される
2					
3					

担任の考え方により，クラスによって各学習の時期や内容に，多少に違いが生じている

物，魚類におよび，食物についてさまざまな角度から深く学ぶ機会になった。これらの旬ポスターを，毎月，学校周辺の3商店街の商店とスーパーに児童自身が届け，S小学校児童の作品として掲示してもらった。

さらに，前述の基本学習をふまえ，グループごとに，地域の人々に食べてもらいたい「健康ぱくぱく弁当」企画案作成の学習を行った。公開授業日に小学校に隣接するスーパー店長をゲストティーチャーとして招待し，企画案の発表を行ったところ，店長から「実際に売りましょう」と提案があり，児童が企画した「健康ぱくぱく弁当」の販売が12種類，12週間にわたって実施された。弁当には「S小学校6年生考案 ヘルシーバラエティ弁当」「1日元気弁当」といったように児童が考えた名前と，「野菜たっぷり130g」「脂肪は控えめ」といった栄養的な特徴を示したPOPが付けられて販売された。弁当の1日平均販売個数は15個で，売れ残りはなかった。

もう1校のY小学校でも，S小学校と同様の食に関する基本学習を行ったが，地域とのつながりでは異なる展開がされた。「Myストア大作戦」と銘打った学習プログラムで，野菜を共通のテーマとし，商店街の食料品店や飲食店，地域の病院，保育所，老人福祉施設，市場などへ出向き，野菜をどう扱っているか，野菜についてどのような考え方をしているかなどを聞き取り調査した。6年生3クラス120人を，各クラス9グループに分け「Myストア」を決めて実施した。地域でのしらべ学習には，教員，保護者，プロジェクトチームのメンバー（保健所職員や研究協力者ら）が引率した。そして，しらべ学習の成果をポスターや料理レシピに表現して，再びそれぞれの「Myストア」に届け掲示してもらった。また，こうした「Myストア大作戦」の学習と食の基本学習の総括として，12月の1日を使って，「ぱくぱく新鮮発表会」を体育館で大々的に実施した。発表会には，保護者，地域の関係者らが訪れた。また，他学年の児童も授業時間を利用して6年生の学習成果を見学した。

2．以上の学習のプロセス評価

商店街を巻き込んだ学習のプロセス評価として，プロジェクトチームによる支援内容の検討と，児童，保護者，商店街関係者らの受けとめ方に関する検討を行った。

プロジェクトチームによる支援内容の検討は，実際に実施した支援内容を，学校への支援，商店街との連携調整及び支援，地域への普及啓発の3つに分けて整理した。

児童の受けとめ方は，各授業時のワークシートの記述，および16年2月に実施した事後調査で「ぱくぱく健康キッズ＆タウンで学習したことの中で楽しかったこと，心に残っていることがありますか」という質問への自由回答の中から，商店街とつながった学習に関する記述を拾い出し整理した。保護者の受けとめ方も，同様に，児童の学習の参観・参加時に記入してもらった調査票から関連の記述を拾った。商店街関係者，スーパーについては，15年度末にプロジェクトチームのメンバーが聞き取り調査を実施し，児童の学習への支援に関する意見を整理した。

結　果

1．プロジェクトチームによる支援

図2に示すように，学校への支援としては，新しい教材の紹介や学習プログラムの開発といった技術的支援，プロジェクトチームメンバーが教員と組んで授業を実施したり，地域への引率を分担するなどの人的支援，ポートフォリオ評価用ファイルの提供やポスターのカラーコピー代など経済的支援を行った。また，食に関する学習では家庭をいかに巻き込むか，保護者にいかに気付いてもらうかが重要なポイントであり，そのための支援をしてほしいという教員の要望に応え，児童の基本学習と同様の情報を保護者にも提供，保護者から要望のあったヘルシー料理教室の開催など，プロジェクトチームが家庭の巻き込みを積極的に行った。

商店街との連携調整，支援では，商店会組合役員会と交渉を重ね，児童の学習の場，ならびに情報発信の場を確保した。これにより，学校だけで地域に出向いた学習を行う場合，連絡不足で地域から苦情が寄せられたりする，という問題を回避した。また，S小学校の児童が企画した「健康ぱ

くばく弁当」の販売に当たり，保健所とプロジェクトチームの管理栄養士が，食品構成や栄養素構成のバランスを確認し，調整が必要な場合には調整を行って児童とスーパーの了解を得，スーパーの惣菜部門に弁当作成の指示を出した。これにより，味や栄養面からみて「健康ばくばく弁当」の名に違わぬ商品の販売を実現できた。

また，保健所から積極的に，自治体の意思決定者である区長や議会，或いは自治体の他部署にこうした活動の広報を行った。また，マスコミへの情報提供を行うことで，学校や商店街関係者のやる気を鼓舞するよう支援した。

さらに，こうした学習をより充実させ，地域全体の健康づくりにつなげることをねらって，学校関係者（教員，PTA 役員など）と商店街の商店会代表，スーパー代表から構成される推進協議会を両地区に設置し，保健所が事務局として調整，運営を担った。協議会があることで，子どもの情報発信に対する地域側の反応を，学校関係者が直接に知ることができ，次の学習に生かすことができるようになった。

2．児童の気付き

商店街や地域とつながった学習を通じて，社会の食の営みの一端を知り，その学びを再び自分の

表2　児童の感想や気づきの例

（Y小学校で，学習全体の総仕上げに当る「ばくばく新鮮発表会」を終えた時のワークシートから，商店街との関わりに関する記述の例）

- 総合の学習で（外にしらべ学習に行って）いろいろなことを教えてもらったので，これからも食事のことを気にしていきたいです。
- （インタビューに行った店について）お店に行ったら，もっとバランスよいメニューを食べようと思います。もっと身近なお店の食品も考えて選ぼうと思います。
- お店の人に教えてもらって，今は，栄養のあるものが人気があるんだとわかりました。
- D店（店の名前）は，四季によって食べ物の材料が違うということが初めてわかったので，来ていないおじいちゃんやお父さんにも，教えてあげたいです。
- F荘（老人ホーム）が，お年よりのためにかなりカロリーのことを考えていたなんて，全然知らなかった。僕も食事のとき，健康に気をつけたいです。
- K病院で，こんなに食事のことを考えているなんて知らなかった。次から食事のときには，健康な食事を食べたいです。
- Y農園に行くまでは，野菜があまり好きじゃなかったけれど，Y農園のおじさんが栄養について教えてくれて，野菜を食べると後に良いことがおきるということを知った。これから，野菜をたくさん食べて健康でいたい。

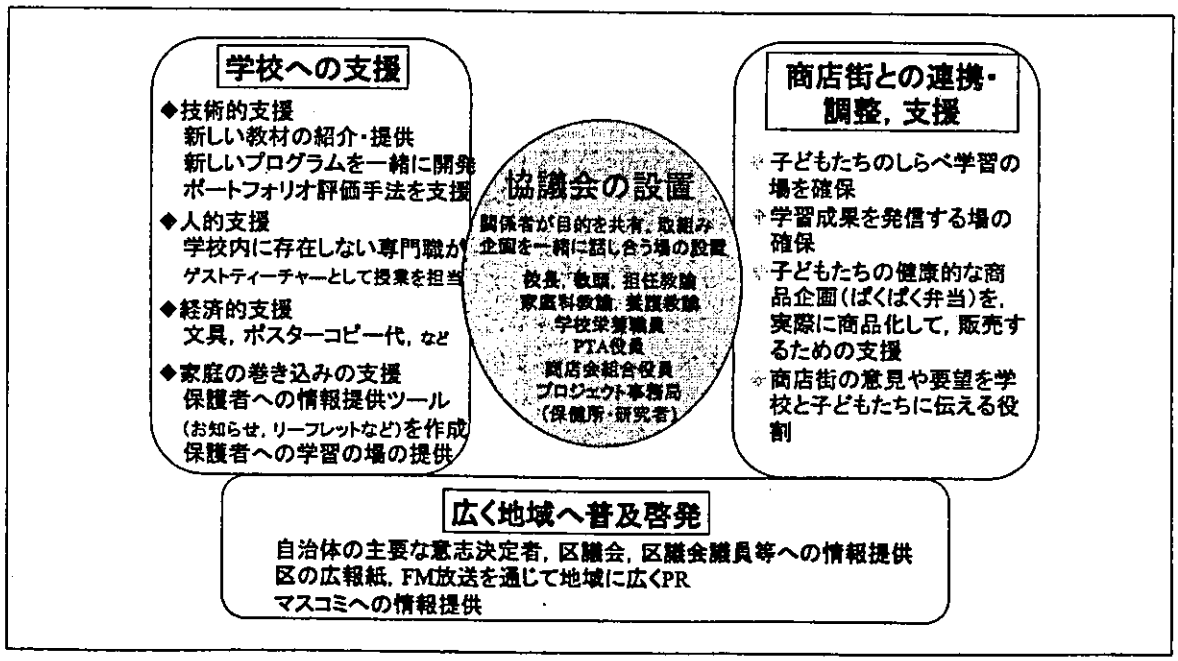

図2　プロジェクトチーム（保健所・研究者）の支援内容

表3　商店街側の反応

インタビューの対象		S地区	Y地区
商店会組合の役員	プログラムで良かった点	児童が自分のポスターを見て楽しそうに話していたので，良かった 児童のポスターやPOPは関心度が高く，客とのコミュニケーションが増えた。年配の客から「良い取組み」だと言われた *食レンジャーの缶バッチは子どもに人気があった* 取り組み自体は，業務に差し障りはない	子どもたちが制作したレシピはよかった。客が欲しがった （My ストア大作戦について）食と健康がブームの折から，大変良い企画だと思う。子どもたちの視点から店に意見を言ってもらうのも良いと思う *食レンジャーのPOP，缶バッチは人気があった* 小学校のぱくぱく新鮮発表会は素晴らしかった
	プログラムで悪かった点	児童のポスターの内容が，食物，旬に限定されるとやりにくい（関係ない業種があるので） 旬の時期がずれていた（ポスターに月が記載されており，実際には1ヶ月遅れで配布された） *リーフレットは，店先に置いてもあまり持っていかない*	すべての店が関心があって，参加するというわけにはいかない *リーフレットの内容が少し難しい。インパクト弱い*
	今後の企画への要望	小学校の学習とつながった取組みは，ぜひ継続したい ポスター，リーフレット，POPの設置は、これまでどおり可能 *商店街の中で，ぱくぱくブース（体脂肪測定やアルコールテスト）をやってほしい。* *事前の宣伝や場所の確保は商店街でやる* *献立の情報提供は重要。健康的な献立を提示し，その材料をそろえるのに，商店街ではどこで何が買えるという情報提供もやってみたい*	小学校の学習とつながった取組みは，できる範囲で継続したい 店によってニーズが違うので，個別対応をして欲しい 商店街の広報誌に取組みPRを掲載することは可能 Y商店街のホームページ並びに商店街の有線放送をPRに活用することは可能
スーパー店長	プログラムで良かった点	児童の手書きのポスターはインパクトがあり，店の取り組みを印象付けた *客がPOPによって，売り場に興味をもってくれた* *食レンジャーのPOPは評判が良く，売り場で指先しながら買い物をしている親子がよくいた* *リーフレットは内容が難しいと思ったが，意外に，持って帰る人が多かったので驚いた* *各売り場の担当者にPOPのセリフを書かせたことで，商品知識を学ぶ機会になり，よかった* 冬から春にかけて，青果の売り上げが伸びたのは，この取組みのせいだと思っている（他の店舗では売上が下落した）	客にとって，健康や食の情報は，プラスになると認識している
	プログラムで悪かった点	特になし	*リーフレットは内容が少し難しい，インパクトが弱い*
	今後の企画への要望	小学校の学習とつながった取組みは，ぜひ継続したい *社員が健康や食事について学習する機会（客とのコミュニケーションのための商品知識を高めるため）*	*この店舗だけでなく，全店で保健所と共同でプロジェクトを進めるのが理想* *献立と健康情報を提供することが今後特に重要（調理する人が減っている）で，スーパーとしても，始めようという考えはある。しかし，やる人がいない，知識がないため，実施にふみきれない*

斜体字は，児童が直接的に関わった活動でないものへの反応。例えば，プロジェクトチームで制作した健康リーフレットの設置，食レンジャーのPOPの設置など。

食生活につなげている児童が多かった。表2は，Y小学校児童の「ばくばく新鮮発表会」終了時のワークシートから拾った記述の例である。地域内のさまざまな施設に自分たちの知らなかった食事や食への配慮をあることを知り，その結果を自分のものとして受けとめている様子がわかる。また，事後調査の中で，楽しかったこと，心に残ったこととして「Myストア大作戦」のことを記述した児童が多かった。

一方，S小学校でも，事後調査で楽しかったこと，心に残っていることが「ある」と回答した児童のほとんどが，毎月の旬ポスターと「健康ばくばく弁当」の販売をあげていた。

以上のように，多くの児童が，学校内での食に関する基本学習よりも，地域や商店街とつながった学習を楽しい，心に残ったとポジティブにとらえていることがわかった。

3．保護者の受けとめ

商店街や地域とつながった学習への意見は，「Myストア大作戦」に引率したY小学校保護者21人の感想の中に多くみられた。例えば，「子どもたちにとって，とても良い企画である」，「日常よく利用する場所（コンビニ）の食についての考え方を聞く機会が持ててよかった」，「ふだんはスーパーでしか買物しない。子どもにとっては八百屋に入ることも数回目。良い体験だったと思う」，「店の人に接する様子を見て子どもたちの成長が感じられた」，「子どもたちがどうまとめるか，楽しみだ」，「子どもだけでなく引率した自分にとって多くの学びがあった」などである。特に，児童だけでなく自分にとっての学びがあった，と記述している保護者が多かった。また，こうした学習が実現できたのは，商店街の関係者や保健所の協力があったからこそで，感謝するといった意見も複数みられた。

4．商店街関係者とスーパーの受けとめ

両地区の商店会組合役員会での聞き取り，スーパー店長への聞き取りの結果を表3に示した。

児童の学習は，おおむね良好に受け入れられていた。商店街では，児童のポスターやレシピは人気があり，客とのコミュニケーションが増えたという意見が多かった。ただ，食の取り組みなので，飲食店と食物販売以外の業種が参加しにくいことが難点としてあげられた。スーパーでも，「児童の手描きポスターはインパクトがありよかった」などとよい受けとめがされていた。商店街，スーパーともに，児童の学習とつながった取り組みを今後も継続してほしいという意見であった。

また，商店街とスーパーでは，学校での食に関する基本学習の内容，例えば主食・主菜・副菜の組み合せや，野菜の旬といった内容と合致したリーフレットやPOPをプロジェクトチームで開発し，それらの店内での掲示と客への配布を行ってもらった。これらの取り組みに対しても，「POPにより客が売場に興味を持ってくれた」，「店員が商品知識を学ぶ機会になった」，「系列全店で実施してはどうか」といった肯定的な意見が多く得られた。

考　察

1．商店街を巻き込んだ食育の意義

生活習慣病が増加し，医療費の高騰が続く現在，子どもの頃からの望ましい食習慣の形成は社会的に極めて重要な課題とされる。したがって，学校における食に関する指導の充実が一層重要視され，栄養教諭制度も創設された。2004年に中央教育審議会から出された「食に関する指導体制の整備について」の答申では，食に関する指導の充実のための総合的な方策として，大きく3点が示された。1つは学校における一体的取り組みの重視，2つめは栄養教諭の効果的な活用，そして3つめが学校・家庭・地域社会の連携による総合的取り組み，である。この学校・家庭・地域社会の連携におけるコーディネーターの役割も，栄養教諭に期待されるところである。

学校での栄養教育に家庭や保護者を巻き込んだ取り組みは国内外に多くみられ，子どもだけを対象とするよりも家庭を巻き込んだ取り組みの方が循環器病のリスク低下には効果的であるとの報告もみられる[7]。近年は，家庭や学校の食環境，すなわち，子どもたちに健康的な食物提供がされているか，健康的な食物が入手しやすい状況になっているか，適切な情報提供がされているか，といった視点を取り込んだ研究も多くなってきた[8-10]。学校・家庭・地域の3者の連携による子どもへの