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STUDIES ON MODIFICATION OF HEALTH HABITS AND RELATED REPORTS TO WHO—2

A Study on Life Habits for Preventing Cardiovascular Diseases

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I INTRODUCTION

Mass health survey of citizen of the community and its follow-up care have been often conducted in order to improve people's general health conduction so as to prevent cardiovascular diseases such as hypertension and ischemic heart disease. However, it is quite difficult to prevent these diseases at an early stage solely with these means. In recent years, necessary conditions have been pointed out for preventing cardiovascular diseases. It becomes very important, therefore, to find out how the factors which may cause the diseases lie hidden in daily life of people. So far, studies have been made in the relations between life habits and occurrence of disease, especially heart disease,¹⁾ C.V.A.,²⁾ hypertension,³⁾ and woman's anemia.⁴⁾⁵⁾ It should be noted, however, that most of these studies see the life habits only in view of medical aspect. If we define the analysis of life habits in terms of the patterns of human behavior in daily life, then the life habits must reflect not only the habits in food, clothing and shelter, but also man's personality and value system from psychological point of view.

From this perspective, this study was designed with a purpose to collect basic data which may contribute to preserving the good health of the people by means of a many-faceted survey of life habits of the people of a community in Japan. Items of the survey include not only those related to the life habits of food, clothing and shelter, but also items related to personality, mental and physical

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Table 1. List of 30 scales

A1	amusement	B1	multicomplaint
A2	highly salted food	B2	depressiveness
A3	regularity of meal	B3	extrovert-introvert
A4	favorite food (rich in sugar)	B4	negative view of health
A5	motivation to cooking	B5	empathy
A6	wife-husband type	B6	motivation to exercise
A7	meat and fish	B7	frequency of diseases
A8	fat and oil	B8	adaptability
A9	education	B9	emotional instability
A10	care of food	B10	spontaneity
A11	care of health		
C1	theoretical type	D	degree of culture
C2	duty type (social restraint type)		
C3	economic type		
C4	traditionalism		
C5	conservative type		
C6	ethic type		
C7	self-indulgence type		
C8	social type		

health and value system.

II METHODOLOGY

(a) Questionnaire

We revised the former questionnaires of the "Life Habits Survey"⁶⁾ conducted in Nakai-machi in 1979. Adding to them a numbers of new questions relating to personality, mental and physical health and value system, we conducted a preliminary survey to a sample of 72 housewives living in Tokyo, Chiba and Kanagawa prefectures. Based on the outcomes of this preliminary survey, we compiled a questionnaire of thirty scales consisting of 255 items. The scales are:

(A) 11 scales consisting of items on the life habits: (A1–A11) (B) 10 scales consisting of 82 items on personality, mental and physical health: (B1–B10) (C) 8 scales consisting of 64 items on value system: (C1–C8) (D) a scale on the level of culture. (For the title of each scale, see Table 1) These items for (A) are chosen with reference to the survey items of the previous year: for (B) Y.G. Test, T.H.I. (Tokyo Univ. Health Index⁷⁾) and J.M.I.⁸⁾ Items for (C) were based on Spranger's six types of values.⁹⁾ Furthermore, information on education, occupation, age and residential area of the respondent was gathered on the face-sheet.

(b) Sample and time of the survey

The samples of this survey are 1,101 women (average age: 43.4 years) living in three districts (Nakamura, Sakai, Inokuchi) of Nakai-machi, Ashigarakami-gun, Kanagawa Prefecture. The preliminary survey was done in September – November 1980, and the main survey was carried out on

Table 2. Backgrounds of subjects

a) Region							
Nakamura	Sakai	Inokuchi					
523 (47.5)	97 (8.8)	481 (43.7)					
b) Age							
20-29	30-39	40-49	50-59	60-	Total		
78 (7.1)	425 (38.6)	315 (28.6)	205 (18.6)	78 (7.1)	1101		
c) Occupation							
farmer	farmer with a side job	manager	clerical	out-door service	independent enterprise	others	house-wife
149 (4.5)	106 (9.6)	10 (0.1)	56 (5.1)	129 (11.7)	80 (7.2)	74 (6.7)	435 (39.5)
d) Academic carrier							
primary school	junior high school	senior high school	junior college	university or graduate school			
34 (3.3)	402 (38.8)	461 (44.5)	116 (11.2)	24 (2.3)			
e) Academic carrier and age crossed							
age group	primary school or junior high school	senior high school	junior college or university	omission	total		
20-29	12 (16.4)	44 (60.3)	17 (23.3)	5	78		
30-39	101 (24.9)	253 (62.3)	52 (12.9)	19	425		
40-49	140 (47.9)	119 (40.8)	33 (11.3)	23	315		
50-59	123 (64.4)	38 (19.9)	30 (15.7)	14	205		
60-	60 (80.0)	7 (9.3)	8 (10.6)	3	78		

January 31 - February 1, 1981 with the following method: that is, a questionnaire was distributed by our survey staff to the respondent who was asked to fill in the questionnaire, which was collected a few days later by the staff.

Back ground factors of the subjects according to age, occupation, education and residential area are shown in Tables .2 (a)-(d). As for the residential area, Nakai-machi was divided into three districts, i.e., Sakai district where a large number of full-time farm families are found: Inokuchi District where a new residential area is developing: and Nakamura district which might be described as a mixture of these two types. A cross tabulation of occupation and age is shown in Table 2 (e)-(f).

(c) Method of Analysis

In order to estimate a reliability coefficient relating to internal consistency of each scale, we have

Table 3. Alpha reliability coefficients
of the 30 scales

A1 .658	B1 .791	C1 .744
A2 .646	B2 .773	C2 .676
A3 .657	B3 .840	C3 .645
A4 .696	B4 .576	C4 .696
A5 .717	B5 .627	C5 .624
A6 .550	B6 .866	C6 .764
A7 .607	B7 .716	C7 .653
A8 .598	B8 .589	C8 .765
A9 .703	B9 .761	
A10 .569	B10 .717	D .538
A11 .650		

(For the names of scales, refer to Table 1.)

conducted principal component analysis to each of the thirty scales selected from the preliminary survey, and calculated the alpha reliability coefficient¹⁰⁾ defined as:

$$\alpha = \frac{\text{number of items}}{\text{number of items} - 1} \left(1 - \frac{1}{\text{maximum eigenvalue}} \right) \dots \dots (1)$$

Next, we calculated the mean values of each item separately according to the levels of age, education, and occupation, and then conducted F test. For each of the thirty scales, total aggregated scores of all the items included in each scale was sought (when the content of an item has a negative implication, a minus score was given), and, with the mean value and standard deviation of the entire scales, the scale score thus obtained was transformed to a standard score (mean = 0, variance = 1).

Further, for each scale score, F test was executed by age, education, occupation, and age and education crossed. Next, correlation coefficients between any two of the 30 scales were calculated for each of its following age categories: (1) 30–39 years of age; (2) 40–49 years of age; and (3) 50 years of age and over. Then principal factor analysis followed by varimax relation¹¹⁾.

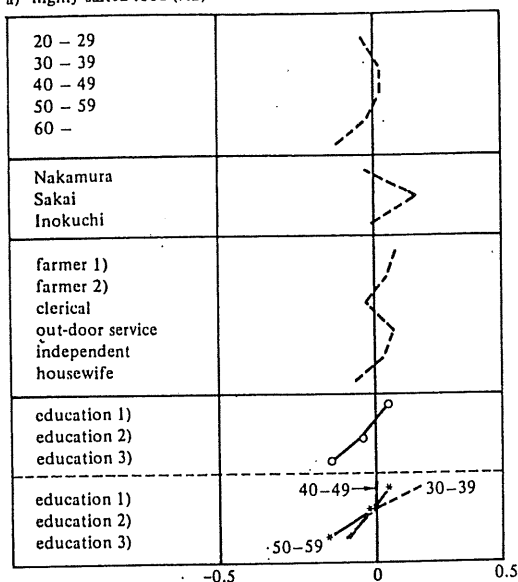
(i.e., a squared multiple correlation (S.M.C.) as the approximate of the communality, and then repeating calculation until the convergence reached.) was carried out. As a part of accumulating basic data for analyzing relationships between the life habits and diseases, we next investigated the previous record of 10 illnesses. Of these the most frequently suffered three diseases, i.e., hypertension, anemia, and peptic/duodenal ulcer, were analyzed basing on the normalized scores of the thirty scales.

III FINDINGS

(a) Reliability of the Scale

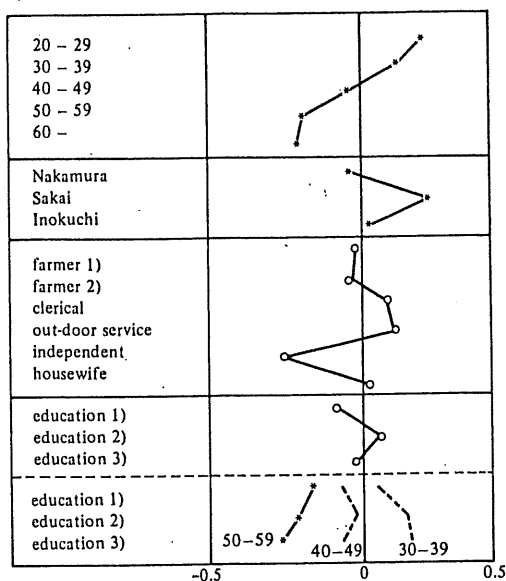
Values of alpha reliability coefficient calculated by the formula (1) are shown in Table 3. The scale with the highest is the "motivation to exercise" scale ($\alpha = 0.866$) and the scale with the lowest is the "wife-husband type" scale ($\alpha = 0.550$). The mean value of reliability coefficients of all the scales was relative high (0.680). The contents of the items of 11-scales relating to the life habits and

a) highly salted food (A2)

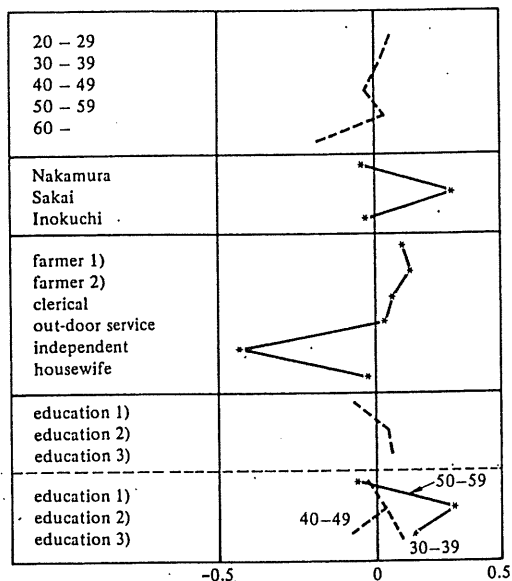


----- : no significant
 ○—○—○ : significant in the 5% level
 ——* : significant in the 1% level

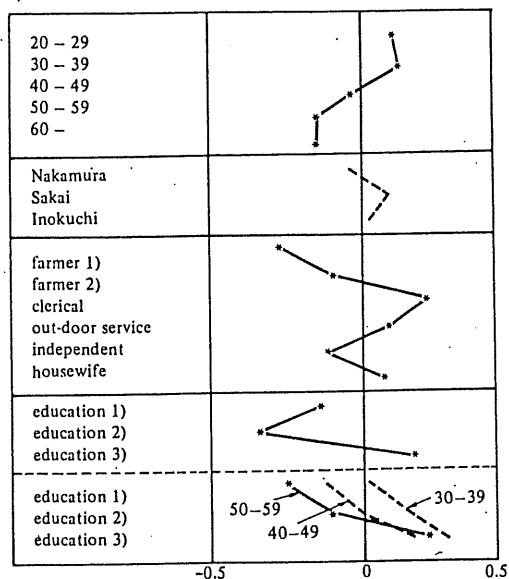
b) favorite food (rich in sugar) (A4)



c) meat and fish (A7)



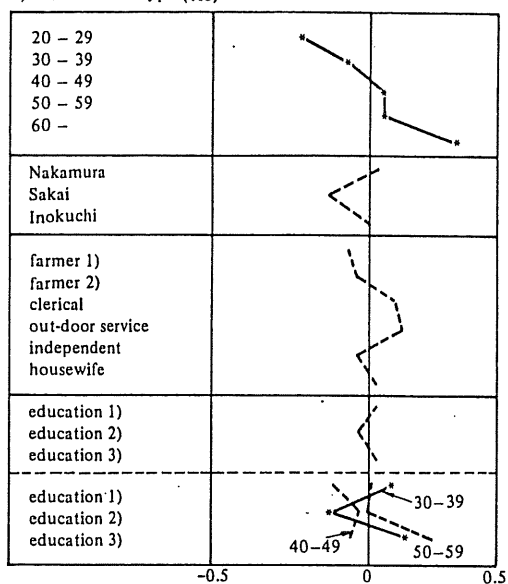
d) fat and oil (A8)



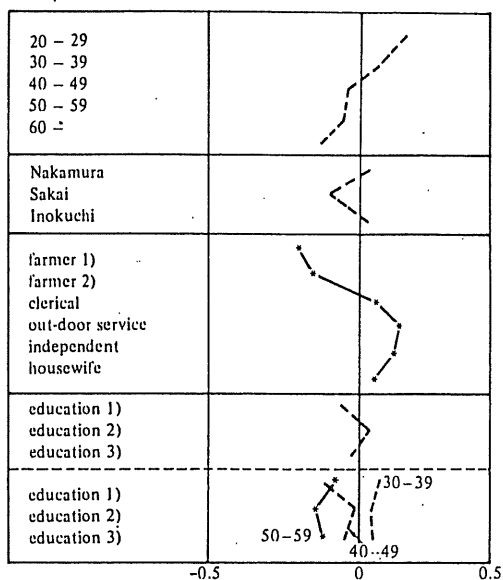
*farmer 1): farmer
 farmer 2): farmer with a side job
 education 1): primary school or junior high school
 education 2): senior high school
 education 3): junior college or university or graduate school

Figure 1. Profiles of mean values of scores classified with respect backgrounds of subjects

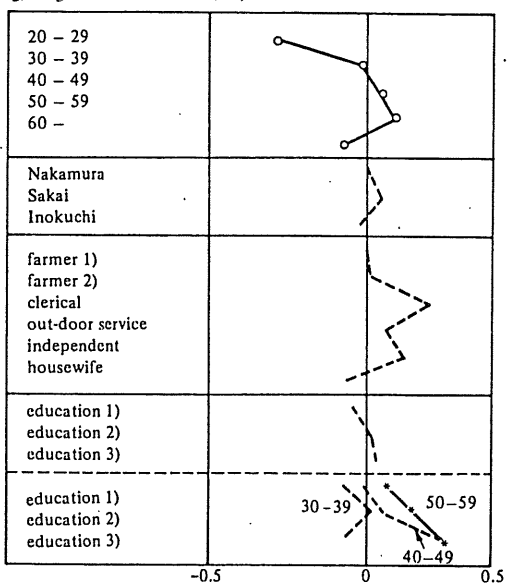
e) wife-husband type (A6)



f) depressiveness (B2)



g) negative view of health (B4)



h) motivation to exercise (B6)

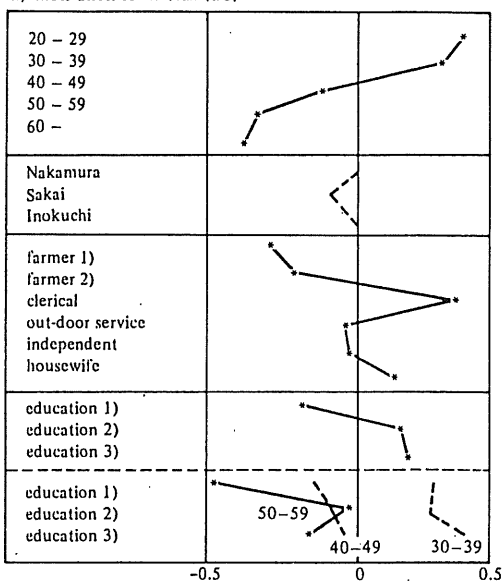


Figure 1. Profiles of mean values of scores classified with respect backgrounds of subjects

scales of "view on health" (B4), "motivation to exercise" (B6) and "culture level" (D), together with the primary factor loadings obtained by principal factor analysis of each scale are shown in the Appendix.

(b) Analysis of Scale Scores according to Age, District, Occupation and Education

The mean value and the standard deviation of the total scores of items of each scale were calculated, and the score of each scale was transformed to the standard score. The mean value of the standard scores thus obtained was calculated for age categories (20–29) and for the districts (Nakamura, Sakai, Inokuchi). The standard scores are shown in Figures 1 (a)–(h) according to age, district, occupation, education, and education and age crossed, for "highly salted food" (A2), "food rich in sugar" (A4), "meat and fish" (A7), "fat and oil" (A8), "wife-husband type" (A6) among 11 life habits scales and "depression" (B2), "motivation to exercise" (B6) and "negative view on health" (B4) scales.

We shall now briefly summarize the findings of each scale returning to Fig. 1.

For the "highly salted food" scale, related to the habitual intake of salt, the difference by educational level is statistically significant at the 5% level, but no significant difference is seen by age or occupation. Among the age categories, however, a statistically significant difference by education is seen in the 40–49 age category and the 50–59 age category thus indicating that habitual intake of highly salted food decreases as the level of education becomes high.

As for habitual intake of food rich in sugar, i.e., habitual intake of sugariness and carbohydrate (Fig. 1 (b)), there was a significant difference at the 1% level by age and by district, and at the 5% level by occupation and by education. That is to say, habitual intake of food rich in sugar decreases as the age advances. By district, tendency of habitual intake of sugar is strong in the least urbanized area of Sakai district.

The "meat and fish" scale (Fig. 1 (c)) shows no statistically significant difference by age or by education, but shows a significant difference at the 1% level by district as well as by occupation.

The "fat and oil" scale (Fig. 1 (d)) shows significant difference by age, occupation and education. That is, habitual intake of fat and oil decreases as the age advances. As for the occupation categories, it is the highest among the clericals (white-collar) and the second highest among those engaged in out-door services (blue-collar), and then among those without occupation. Among the 50–59 age category, the habit to take fat and oil grows as the level of education becomes higher.

The score of the "wife-husband type" scale (Fig. 1 (e)), which reflects the degree of wife's leadership in family decisions, becomes higher with age (with 1% level of significance). Furthermore, it is to be noted that degree of depressiveness decreases with age (Fig. 1 (f)).

Now let's take a look at the scales of the value system. A tendency is observed to attach little value to theoretical thinking or aesthetic views as the age advances, but on the other hand, there is a tendency to put importance to old customs, traditions or traditional values. On older age groups, the rate of respondents with spontaneous or empathetic character increases as the level of educational goes up. "Motivation to exercise" (Fig. 1 (h)) shows a negative correlation with age, and a positive

Table 4. Correlation coefficients among the 11 scales on life habits

a)		(upper right: all age lower left: 20–39)										
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
A1	amusement		.232	-.054	.281	.259	.000	.266	.257	.361	-.009	.172
A2	highly salted food	.267		-.078	.383	.029	-.043	.218	.316	-.031	-.350	-.151
A3	regularity of meal	-.108	-.062		-.090	.037	-.050	.102	-.095	-.016	.210	.077
A4	favorite food (rich in sugar)	.305	.355	-.052		.119	-.042	.328	.396	.111	-.309	-.087
A5	motivation to cooking	.217	.019	.133	.139		.037	.287	.347	.481	.066	.415
A6	wife-husband type	.026	-.021	-.107	-.029	.051		-.030	.021	.018	-.045	.058
A7	meat and fish	.246	.223	.150	.328	.303	.001		.450	.230	-.070	.156
A8	fat and oil	.193	.335	-.039	.346	.314	.118	.429		.319	-.211	.092
A9	education	.322	-.045	-.010	.095	.372	.070	.194	.237		.093	.392
A10	care of food	.005	-.330	.184	-.248	.095	-.072	-.051	-.220	.100		.278
A11	care of health	.095	-.095	.079	-.076	.347	.072	.118	.066	.311	.247	

b)		(upper right: 40–49 lower left: 50–69)										
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
A1	amusement		.195	-.117	.202	.240	-.022	.237	.269	.361	-.042	.156
A2	highly salted food	.224		-.108	.390	.084	-.043	.203	.347	-.037	-.406	-.220
A3	regularity of meal	.108	-.068		-.204	-.013	.016	.017	-.200	-.079	.229	.051
A4	favorite food (rich in sugar)	.357	.431	-.007		.001	.013	.307	.300	.006	-.375	-.079
A5	motivation to cooking	.352	-.020	-.054	.172		.042	.290	.386	.507	.051	.435
A6	wife-husband type	-.023	-.074	-.045	-.059	.037		-.042	.015	-.010	-.021	.007
A7	meat and fish	.334	.228	.124	.349	.258	-.055		.522	.174	-.048	.163
A8	fat and oil	.366	.427	-.044	.538	.339	-.084	.402		.328	-.187	.137
A9	education	.439	-.014	.058	.185	.599	.000	.329	.405		.106	.450
A10	care of food	-.001	-.324	.209	-.262	.088	-.108	-.113	-.155	.139		.252
A11	care of health	.319	-.175	.062	-.012	.576	.010	.238	.189	.550	.264	

Significance of correlation coefficient

20–39: $|r| \geq .094$ (5% level) $|r| \geq .123$ (1% level)40–49: $|r| \geq .109$ (5% level) $|r| \geq .142$ (1% level)50–69: $|r| \geq .136$ (5% level) $|r| \geq .176$ (1% level)

correlation with the level of education. It is the lowest, according to occupation, among those with occupation.

The rate of those with negative view on health (Fig. 1 (g)), i.e., viewing diseases as constitutional or hereditary, is low in the 20–29 age category, but increases in the 40–49, 50–59 categories with the level of education.

(c) Correlation Coefficients among the Scales

Internal correlation coefficients of various combinations between any two of all the thirty scales

Table 5. Correlation coefficient between any pair of high salted food, favorite food, meat and fish, and fat and oil

	all age	20-39	40-49	50-
highly salted food – favorite food (rich in sugar)	.383	.355	.390	.431
highly salted food – meat and fish	.218	.223	.203	.228
highly salted food – fat and oil	.361	.335	.347	.427
favorite food (rich in sugar) – meat and fish	.328	.328	.307	.349
favorite food (rich in sugar) – fat and oil	.396	.346	.300	.538
meat and fish – fat and oil	.450	.429	.522	.402

Table 6. Correlation coefficients among 11 scales on life habit and the other 21 scales

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
	amuse- ment	highly salted food	regu- larity of meal	favor- ite food	moti- vation to cook- ing	wife- hus- band type	meat & fish	fat & oil	educa- tion	care of food	care of health
B1 multicomplaint	-.000	.132	-.175	.122	-.000	.022	.016	.063	-.003	-.165	.042
B2 depressiveness	-.052	.101	-.142	.093	-.069	-.013	-.034	.024	-.073	-.170	-.144
B3 extrovert-introvert	.104	-.019	-.003	.000	.137	.068	.043	.091	.140	.005	.202
B4 negative view of health	.037	.027	-.005	.035	-.056	.043	-.046	-.011	-.042	-.078	.012
B5 empathy	.154	.018	-.026	-.008	.208	.114	.079	.089	.219	.071	.269
B6 motivation of exercise	.137	-.030	-.019	.037	.253	.002	.051	.126	.240	.029	.141
B7 frequency of diseases	-.017	.007	-.102	.004	-.021	.055	.004	-.020	.039	-.018	.147
B8 adaptability	.048	.038	.039	.052	.089	-.008	.129	.045	.041	.005	.048
B9 emotional instability	.011	.131	-.102	.108	-.074	-.001	.010	.001	-.093	-.107	-.078
B10 spontaneity	.142	-.007	.000	.008	.233	.138	.080	.139	.243	.009	.257
C1 theoretical type	.050	-.101	.052	.011	.199	.019	.119	.097	.354	.092	.215
C2 duty type	.083	.017	.078	-.017	.053	.017	.086	.001	.041	.103	.174
C3 economic type	.145	.134	.037	.054	-.060	-.086	.092	-.003	-.073	.088	.058
C4 traditionalism	.116	.062	.117	-.024	.047	-.040	.099	-.013	.004	.170	.201
C5 conservative type	.108	.067	.128	.006	-.048	-.040	.071	-.017	-.059	.119	.106
C6 ethic type	.119	-.054	-.026	.040	.226	.045	.078	.127	.373	.077	.174
C7 self-indulgence type	.208	.149	.005	.106	.022	-.035	.060	.058	-.027	.034	.091
C8 social type	.085	-.049	.032	-.000	.166	.052	.105	.075	.251	.106	.194
D degree of culture	.122	-.009	.032	.021	.266	-.012	.166	.134	.281	.041	.273

$|r| \geq .078$ (1% level)

were computed for four different age categories: from 20 to 39 years (group A), 40 to 49 (Group B), 50 to 69 (Group C) and all ages (Group D), respectively.

Tables 4 (a)–(b) present the correlation coefficients among 11 scales (A1–A11) of life habits. Upper right half of Table 4–(a) presents Group D (all ages) while the lower left half presents Group A (20–39). Upper right half of Table 4 (b) presents the Group B (40–49) and lower left of Table 4 (b) is for Group C (50–69).

Table 5 shows the correlation coefficients of all the combinations of the scales for habitual intake of “highly salted food”, “food rich in sugar”, “meat and fish” and “fat and oil”, retabulated

from Tables 4 (a) and (b). All values are statistically significant at the 1% level, the highest among which are the ones for the pair of the "food rich in sugar" and "fat and oil" scales (0.522 in Group B). A significant correlation is also observed between the scales for "highly salted food" and "food rich in sugar", which increases as the age advances.

Other higher values to be noted on the upper right half of the Table 4 (a), i.e., all age group, are the combinations of scales for "education" and "interest in cooking" (0.481), "interest in cooking" and "care of health" (0.415), and "care of health" and "education" (0.392). This suggests that those with higher education have more interest in cooking and care more about their health. Table 6 shows the correlation coefficients between 11 scales of life habits and the remaining 19 scales. (Calculated only with the data on all-age group: others are omitted.)

Although the values are generally low, some significant correlations found among the scales are "amusement", "highly salted food", "education", "eating habit" and "care of health" respectively. The scale for "highly salted food" especially has the high correlation with such scales as "amusement" and "economy oriented" in the value system scales at the 5% level, and in group of those in their forties, such scales as "multicomplaint" and "depressiveness" are correlated at the 1% level. In groups of 20-39 and 40-49 years of age, the scale for "food rich in sugar" has the significant correlation with the "amusement" scale, while the "wife-husband type" scale is correlated considerably high with the "voluntary and highly motivation" scale in all three groups. The "fat and oil" scale is significantly correlated with the "voluntary and highly motivation" scale in three groups and with the "theoretical type" scale in both 20-39 and 50-69 age groups.

The "meat and fish" scale has significant correlation with scales of "theoretical type" and "aestheticism" in 20-39 age group, with "traditional values" and conservatism" scales in 40-49 age group.

High correlation exists between the scale of "view on health" and that of "depressiveness" or "emotional instability" in two age categories, 20-39 and 40-49. Those who feel they have some physical or mental disorder are likely to have more negative view on health, believing that heredity plays dominant role in determining one's health or physical constitution.

On the other hand, the scale of "motivation to exercise" has significant correlation with "theoretical type", "obligations", "aestheticism" and "social welfare" scales of the value system in all three age categories, and with "voluntary and highly motivation" or "susceptivity" scales in the personality.

This fact might imply that rather intellectual housewives who long for intellectual way of living have strong motivation for exercise.

(d) Factor Analysis

Ten factors are derived by principal factor analysis from each of respective three age categories, 20-39, 40-49, 50-69 years of age, four of which with larger contribution being further selected in the following analysis. Figures 2 (a)-(f) present the contribution of each factor and factor loading of each scale, combining the first and second factors, third and fourth factors respectively. Factors

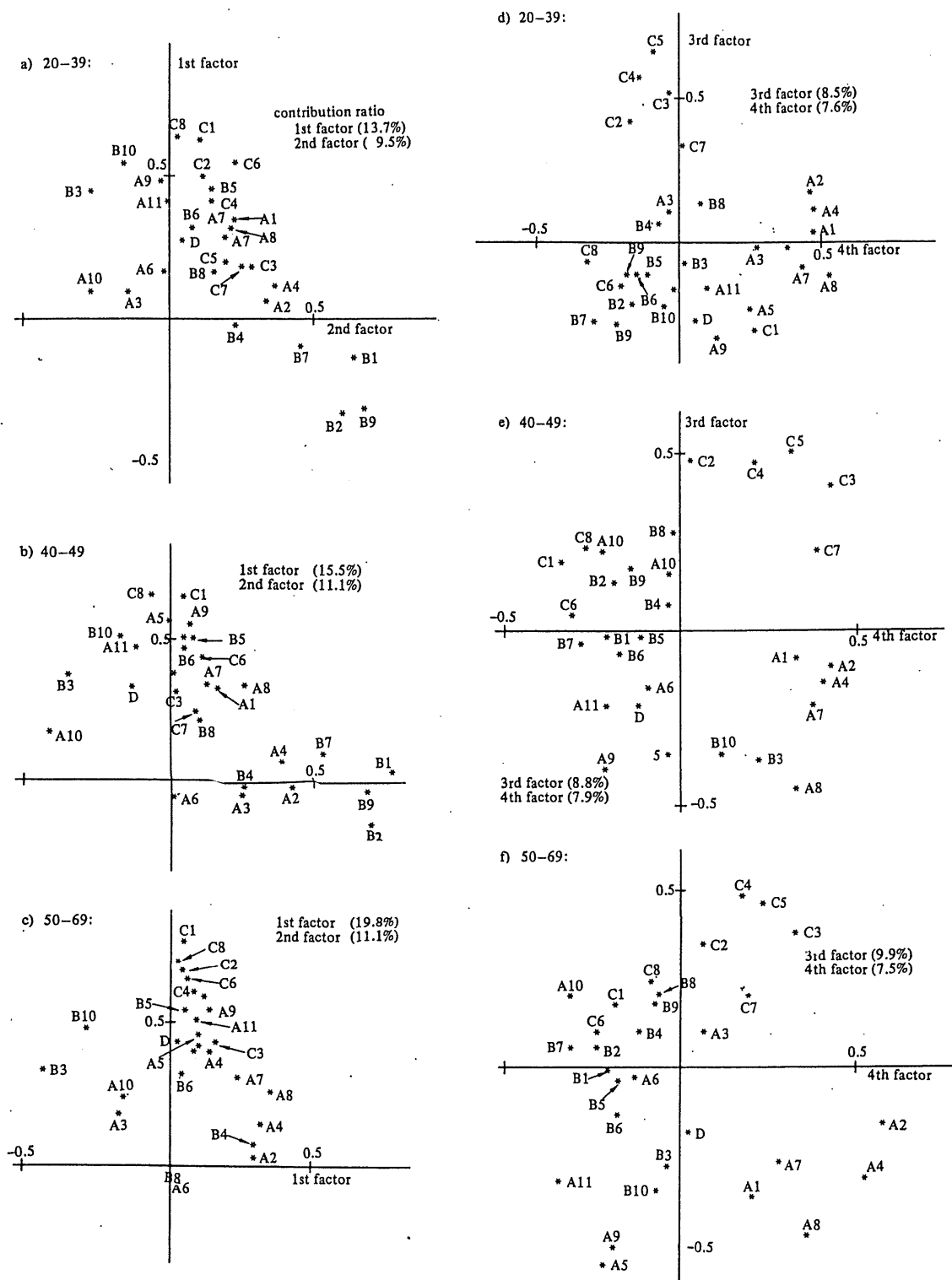


Figure 2. Configuration of 30 scales by factor loadings
(For the names of scales, see Table 1)

Table 7. Frequency of previous disease record for each of six age groups

	20-29	30-39	40-49	50-59	60-	Total (%)
anemia	9 (11.5)	49 (11.5)	50 (15.9)	26 (12.7)	8 (10.3)	142 (12.9)
hypertension	0 (0)	12 (2.8)	25 (7.9)	45 (22.0)	18 (23.1)	100 (9.1)
peptic ulcer	3 (3.8)	14 (3.3)	7 (2.2)	6 (2.9)	6 (7.7)	36 (3.3)
diabetes mellitus	0 (0)	1 (0.2)	4 (1.3)	13 (6.3)	1 (1.3)	19 (1.7)
renal disease	0 (0)	3 (0.7)	6 (1.9)	3 (1.5)	2 (2.6)	14 (1.3)
tuberculosis	0 (0)	2 (0.5)	3 (1.0)	4 (2.0)	0 (2.0)	9 (0.8)
liver disease	0 (0)	1 (0.2)	5 (1.6)	3 (1.5)	0 (0)	9 (0.8)
gout	0 (0)	2 (0.5)	4 (1.3)	2 (1.0)	0 (0)	8 (0.7)
angina pectoris	0 (0)	0 (0)	1 (0.3)	4 (2.0)	1 (0.3)	6 (0.5)
cardiac infarction	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	1 (0.1)

derived from three different age groups are almost identical. Now, we shall briefly sketch what these four factors imply.

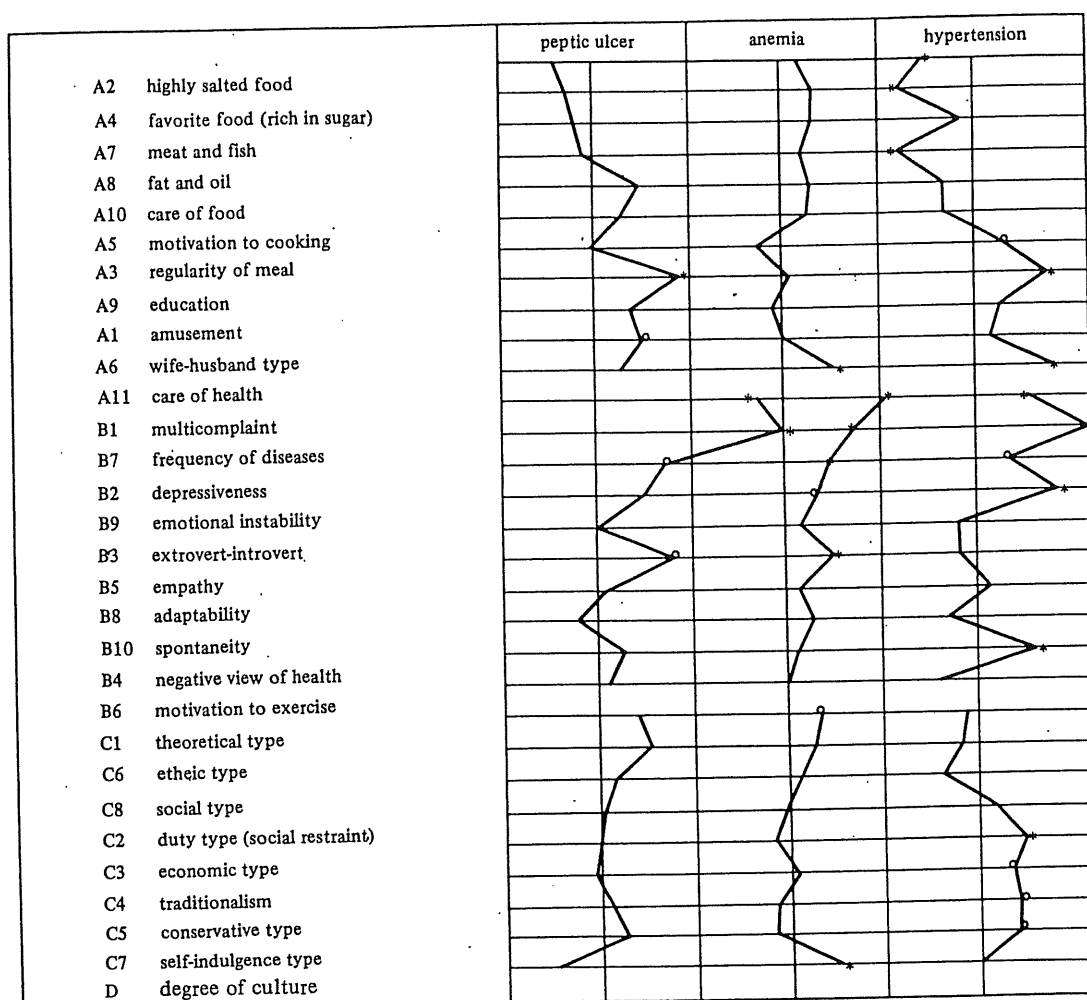
1) First Factor: Factor having high factor loading on "society", "theory", "aestheticism" scales of value system, "voluntary and highly motivation", "extroversion", "susceptivity" scales in personality, and the "education" scale of the life habits.

The housewives with high scores on this factor are more likely to be highly educated, independent and eager to take more exercise and prefer taking meat, fish, oil and fat to taking to highly salted food or food rich in sugar. No change as to different age categories is seen except in the group over 50 years of age. Scales in personality such as "voluntary and highly motivation" or "extroversion" have less associated with the first factor.

2) Second Factor: Factor having high factor loading on the scales such as "depressiveness", "emotional instability", "multicomplaint defined in terms of many subjective complaints on physical conditions" and "frequency of diseases". Housewives with high scores in the scales with high factor loading of this factor are relatively in unstable condition, with some complaint either mentally or physically (or both). The finding that this factor has high loadings on the scales of "highly salted food" or "food rich in sugar" suggests that those who are emotionally or physically unstable tend to consume greater amount of highly salted food as well as good rich in sugar.

Though there is not a conspicuous change with aging, the association between "multicomplaint", "emotional instability", "depressiveness" and "frequency of diseases" becomes stronger among those in their forties and fifties, as compared to those in their twenties and thirties.

3) Third Factor: Factor with high loading on scales such as "conservatism", "traditionalism", "economy oriented" and "obligations" in value system scales, on which the first factor also had rather high loadings. This factor can be said to reflect the so-called value system of older generation, thus being little associated with other scales. In 20-39 age group factor analysis reveals the negative factor loading in the age group of 40-59, on the "extroversion" and "voluntary and highly motivation" scales in personality, and the "education" scale, suggesting that those who are introvert and less spontaneous are more likely to behave on traditional value system and consume less fat and oil.



* : significant in the 1% level
 o : significant in the 5% level

Figure 3. Profiles of the respondent with hypertension, anemia and peptic ulcer by the mean values of scores of 30 scales

4) Fourth Factor: Analysis on 20–39 age group (Figure 2 (a)) shows that scales of “highly salted food”, “food rich in sugar”, “fat and oil” “meat and fish” and that of “amusement” have high loading on this factor, while as the age advances to 40 and over (Figure 2 (e)), the “amusement” and “economy oriented” scales in value system have rather high factor loading.

(e) Analysis on Previous Disease Record

Ten diseases which the respondents had in the past are listed with its percentage in Table 7 in the order of their frequency in each age group. The disease with the highest frequency is anemia (12.9%), followed by hypertension (9.1%) and peptic ulcer (3.3%). The rate of morbidity of the ten diseases increases as the age advances from 11.3% of 20–29 years of age to 19.7% (30–39 years old), 33.4% (40–49 years old), 52.2% (50–59 years old) respectively, and reaches as high as 45.3% at 60 and over, though the rate of increase falls down after 60. Anemia is found mostly among those in their forties, while diabetes is often found among those of 50–59 years of age.

In regard to each of the top three diseases in frequency (hypertension, anemia and peptic ulcer), the profile of the median on each of 30 scales are shown in Figure 3. In case of hypertension, scales with positive significant difference at the 1% level are the ones for "education", "care of health", "multicomplaint", "frequency of disease", "emotional instability", "view of health" and "economy oriented". On the other hand, negative significant difference is observed in the scales for "highly salted food", "food rich in sugar" and "fat and oil". In case of anemia, scales with positive significant difference are for "multicomplaint", "frequency of disease", "depressiveness", "susceptivity", and "culture level", while for peptic ulcer, scales for "education", "multicomplaint" and "frequency of disease" have positive significant difference.

III DISCUSSION

(a) Methodology

This study is designed to analyze the relationship between life habit of housewives and their background factors (education, occupation, age, personality, value system, etc.) based on the data obtained by questionnaire. Therefore, we should interpret the findings of the study after due consideration as to the reliability of the items questioned.

Out of the 255 items, we formed 30 scales, which we used as the basis for our analysis, by grouping those items according to their homogeneity. Each group contained 8 to 10 homogeneous items.

Through the procedure the reliability of the scale is guaranteed to be relatively high, as can be seen in Table 3.

Still, among housewives in 50-69 age group, a tendency was observed to leave some of the items unanswered, due to the multiplicity of items. We excluded from our analysis the data of those who left more than 10% of the items unanswered. Although our survey included 4 scales for eating habit, i.e., "highly salted food", "food rich in sugar", "meat and fish", "fat and oil", we have not reached the state at this moment to fully assure the degree of accuracy in estimating the amount of each food taken really through such questionnaire survey. In regard to the "highly salted food" scale, it is necessary to verify the concurrent validity of the scale by obtaining correlation between the assumed amount of salt intake and the converted amount of salt intake; the amount of Na output was measured by conducting 24-hour storage of urine on approximately half of the women to enable this calculation. Furthermore, it is also useful for verification of the validity of the scale in order to study the relation between the food intake survey, which was made at the same time, and the measured amount of hormone. We are also going to see regional differences. With above-mentioned points in our mind, let us examine our findings.

(b) Interpretation of the Findings

Differences according to age and education in scores of many scales are obvious as seen from

Figure 1. In regard to the factors related to eating habits, conspicuous difference due to educational level was seen in the "highly salted food" scale; habitual intake of highly salted food decreased as the level of education becomes higher, and habitual intake of food rich in sugar as well as fat and oil decreased with age. When viewed from educational level, university and junior college graduates obviously take greater amount of protein-rich food such as meat and fish, and fat and oil.

It is interesting to note that those who take highly salted food and food rich in sugar are emotionally less stable and complain more about physical symptoms, as compared to those who presume to take greater amount of fat and oil, and protein rich food.

On the other hand, those who take greater amount of fat and oil, and food rich in protein, have favorable characteristics such as voluntary, highly motivated and susceptible, as well as motivation for cooking which lead them to read cooking columns in newspapers and magazines. This implies a possibility of controlling excessive intake of salt and sugar by providing women with chances for higher education and appropriate education on nutrition and cooking.

Since motivation to exercise is also related to education, it is also possible to strengthen it by providing women in their middle ages who are likely to be in want of exercise, with sufficient understanding of the significance of exercise.

As to the relation of three diseases listed as previous illness, i.e., anemia, hypertension and duodenal ulcer, with 30 scales, it is characterized by high scores of such scales as for "multicomplaint", "frequency of diseases" and "emotional instability". This is shown in Figure 3.

However, the low scores by women with previous record of hypertension in scales for "highly salted food", "food rich in sugar" and "fat and oil" may reflect that these foods are regarded as risk factors for hypertension. In other words, the results of our survey reflect that those who suffer from hypertension are moderate in taking highly salted food, food rich in sugar, and fat and oil.

Regarding the value system scales, those with past record of hypertension tend to have traditional value systems, being economy oriented and conservative as well; while those with peptic and duodenal ulcer record are inclined to have theoretical and aesthetic value system, being intellectual, and characterized by rather unstable emotion and empathy. This finding coincided with the report made by Yamashita et al. on the personality analysis of peptic ulcer patients using YG test,¹²⁾ indicating the relation with stress. From above findings, high involvement of psychological factors such as personality and value system in occurrence of cerebrovascular diseases is made clear. It is therefore believed that life guidance with due regard not only to age, education and occupation, but also to psychological factors is effective for prevention of cerebrovascular diseases and ischemic heart diseases.

In order to connect above findings to the prevention of diseases, relation between correlation and causality has to be considered. Admitting the existence of such correlation between the two variables, i.e., X and Y, it is well known that no clear information is given whether X is the cause of Y or vice versa. There can also be cases in which neither is true. In regard to our hypothesis that those with more physical and emotional complaints take greater amount of salt and sugar, for example, there may be cases in which cause and effect direction is reversed. There suggests also a possibility of a third

factor intervening in the relation between subjective symptoms and intake of salt and sugar. Thus, as to the problem of assuming cause and effect relation, many methodological points should be examined. But statistically speaking, application of such measures as partial correlation analysis, path analysis and Takagi's Model¹³⁾ may be useful.

(c) Standardization of Questionnaire

We have not touched upon the distribution pattern of scores for 30 scales used in this report. Most of these are quite close to normal distribution. While it is necessary to standardize those 30 scales, we are not sure whether it is justifiable to consider the sample of this survey as a standard population when viewed from a nationwide scale in Japan. Since we are making the identical surveys at Nakano City in Nagano Prefecture, Tanushimaru-machi in Oita Prefecture, and other regions, at present, we will be able to achieve standardization by summarizing the results of our studies in those regions. We wish to further scrutinize the validity of the scale used in this survey through such process of standardization so as to enable more generalized use of this kind of survey on life habits.

IV CONCLUSION

Wide-ranged survey on life habits (consisting of 255 items, 30 scales) including personality, degree of mental and physical health, value system, etc. of individuals was conducted on 1,101 housewives living in Nakai-machi, Ashigara-kami-gun, Kanagawa Prefecture. The following are the findings obtained from the analysis of its data:

- 1) Habitual intake of highly salted food decreases as the level of education becomes higher. Non-theoretical women with "amusement" and "economy oriented" value system take highly salted food more frequently.
- 2) Habitual intake of food rich in sugar decreases with aging. Positive correlation is observed between the intake of highly salted food and intake of food rich in sugar, and those with mental and physical multicomplaints tend to take greater amount of both highly salted food and food rich in sugar.
- 3) Habitual intake of fat and oil decreases with aging. It is conspicuous in working women, when classified according to occupation, as well as in graduates of universities and junior colleges, when classified according to the level of education. Those who are highly interested in cooking take greater amount of fat and oil as well as meat and fish, and they are apt to be favorable in their character, being voluntary, highly motivative and susceptible.
- 4) Motivation to exercise has negative correlation with aging and positive correlation with the level of education. Occupationally speaking, working women are least eager to take exercise. Those who are voluntary-highly motivative and susceptible in character and recognize the value of social welfare activities and theoretical thinking are more eager to take exercise.
- 5) Not many women in 20-29 age category blame their diseases on physical constitution or heredity; however, in 40-59 age category, tendency to do so increases as the level of education goes up. It is also found that depressive and emotionally unstable women are apt to be possessed with this

kind of thinking.

- 6) Housewives tend to strengthen their leadership in the family as they become older. Those with voluntary-highly motivative and susceptible character are likely to hold stronger leadership.
- 7) Hypertension, anemia, and peptic and duodenal ulcers are frequently listed at previous disease record. Hypertension is more frequently found among those with higher educational level and traditional way of thinking. On the other hand, frequency of peptic and duodenal ulcer is higher among those with higher cultural level and theoretical way of thinking.
- 8) Possibility of standardizing the scale employed in this study was suggested.

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