The Present Relationship between Japanese Workers' Health Status and Lifestyle

Ichiro SAKURADA¹, Yasushi OKUBO¹, Yasushi SUWAZONO¹, Etsuko KOBAYASHI¹, Koji NOGAWA¹, Teruhiko KIDO² and Natsuo KINOUCHI³

¹Department of Hygiene, Chiba University School of Medicine, ²Department of Community Health Nursing, Kanazawa University School of Health Science and ³Kinugawa Rubber Industry Co. Ltd.

Abstract: The Present Relationship between Japanese Workers' Health Status and Lifestyle:

Ichiro SAKURADA, et al. Department of Hygiene, Chiba University School of Medicine—To clarify the factors of lifestyle which are really relevant to present Japanese industrial workers' health, the relationship between physical or mental health status and lifestyle among workers of three different companies in Japan (2265 male) was investigated. The indices of physical health status investigated here were as follows: SBP, DBP, GOT, GPT, γ -GTP, T-CHO, TG, RBC, Hb. The index of mental health status was SDS. The explanatory variables were age, nine lifestyle factors, and obesity index. Age and obesity index were statistically significant to physical health status in the three companies. The relationship between health status and the other lifestyle factors differed among the three companies. The lifestyle factors which were significant to the mental health status differed among the three companies. These results suggest that the management of obesity may be the most important issue for present day Japanese industrial workers. But the focus of effective mental health education differed among the three companies.

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Key words: Physical health status, Mental health status, Lifestyle, Worker, Obesity

Breslow pointed out that seven kinds of lifestyle affect health status^{1–4)}. Morimoto conducted studies concerning the relationship between health status and lifestyle in a working population^{5–7)}. His results did not contradict the reports by Breslow. And now it has been clarified that lifestyle is relevant not only to health status but also

constitutes a cause of some diseases^{8–9)}.

According to the information based on those studies, advice on daily life has been given to Japanese industrial workers, especially to workers who have any trouble with physical health. In Japan, all employers are under obligation to make workers undergo medical examinations. The Industrial Safety and Health Law has enforced this obligation. Health care based on the results of medical examinations such as health education by an industrial physician or a public health nurse has been an obligation since 1996.

On the other hand, mental health care has just begun among Japanese industrial works. Many problems related to mental health have become evident paralleling changes in the working environment or changes in the style of employment such as the abolishment of lifetime employment.

Under these working conditions, we thought it important to identify the lifestyle factors which are the most relevant to present day Japanese industrial workers' health and to adequately measure workers' health. This prompted to us perform a cross-sectional study on the relationship between physical or mental health status and lifestyle among Japanese workers in three different companies.

Methods

The target companies of this investigation were a rubber-product manufacturing company (K Company), an electric-device manufacturing company (H Company), and an aluminum-product manufacturing company (Y Company).

The data for all male workers who underwent a medical examination at each company were analyzed. A total of 1,200 male workers in K Company, 649 male workers in H company, and 416 male workers in Y Company were examined (Table 1).

Workers in K Company worked in two shifts, and the

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Correspondence to: I. Sakurada, Department of Hygiene, Chiba University School of Medicine, 1–8–1 Inohana, Chuoku, Chiba 260-8670, Japan

Table 1. Number of workers

	Company K	Company H	Company Y	All workers
20 y.o. or younger	9	10	1	20
20~29 y.o.	303	194	222	719
30~39 y.o.	279	109	177	565
40~49 y.o.	326	194	14	534
50~59 y.o.	278	142	1	421
60 y.o. or elder	5	0	1	6
Total	1200	649	416	2265

Table 2. Mean values of indices of health status of workers

	K Company	H Company	Y Company
SBP (mmHg)	127.3 ± 14.1	126.6 ± 13.6	121.5 ± 13.6
DBP (mmHg)	78.4 ± 10.7	77.3 ± 10.4	76.1 ± 10.6
GOT (IU/l)	25.3 ± 13.8	25.0 ± 10.8	24.2 ± 8.0
GPT (IU/l)	25.3 ± 13.8	30.2 ± 21.2	29.0 ± 21.8
γGTP (IU/l)	48.4 ± 68.9	41.4 ± 44.9	32.9 ± 29.4
T-CHO (mg/dl)	191.3 ± 35.1	183.7 ± 32.7	175.9 ± 31.9
TG (mg/dl)	177.8 ± 161.5	148.0 ± 107.1	95.4 ± 70.6
RBC (10 ⁴ /μl)	487.6 ± 38.9	483.0 ± 37.1	494.1 ± 29.9
Hb (g/dl)	15.1 ± 1.0	15.0 ± 1.0	15.4 ± 0.8
SDS	40.0 ± 8.0	40.2 ± 7.9	38.5 ± 7.0

Mean ± standard deviation.

majority of them had graduated from high school. Workers in H Company worked in three shifts with the majority of them also having graduated from high school. Workers in Y Company were on day work and the majority of them were university graduates.

In this study, systolic blood pressure (SBP), diastolic blood pressure (DBP), GOT, GPT, γ-GTP, total cholesterol (T-CHO), triglyceride (TG), RBC, and hemoglobin (Hb) were used as indices of physical health status and were obtained from the health examination data. The Self-rating Depression Scale score (SDS)⁽¹⁰⁻¹²⁾ was used as an index of mental health status (Table 2).

Information on sleeping time, working time, number of holidays per month, eating breakfast, eating snacks, consumption of soft drinks, consumption of alcohol, smoking, and habitual physical exercise was obtained by means of a questionnaire at the time of the health examination, and was used as the explanatory variables. The obesity index was included in the explanatory variables of lifestyle as a factor reflecting behavior in daily life.

Nine indices of physical health status, SDS, age, and obesity index were treated as quantitative variables, and the explanatory variables of lifestyle except the obesity

index were treated as qualitative variables, as shown in Table 3.

The general linear models (GLM) were used to analyze the relationship between the physical or mental health status and lifestyle of workers in each company and all workers examined. The formula for the GLM procedure was as follows:

$$\begin{aligned} \text{Physical or mental health status} = & \beta_0 + \beta_1 \times (\text{age}) + \beta_2 \\ & \times (\text{sleep time}) + \beta_3 \times (\text{work time}) + \beta_4 \times (\text{holiday}) \\ & + \beta_5 \times (\text{breakfast}) + \beta_6 \times (\text{snack}) + \beta_7 \times (\text{soft drink}) \\ & + \beta_8 \times (\text{alcohol}) + \beta_9 \times (\text{smoking}) + \beta_{10} \times (\text{exercise}) \\ & + \beta_{11} \times (\text{obesity index}) \end{aligned}$$

where β_0 – β_{11} are coefficients. GLM were performed with SAS/STAT software.

Results

1 Relationship between Physical Health Status and Lifestyle

The results of analysis of all workers are shown in Table 4-1. The results of analysis for each company are shown in Tables 4-2, 4-3 and 4-4.

According to the results of the analysis of all workers, the obesity index was significant in all indices of physical

Table 3. Lifestyle of workers (%)

	K Company	H Company	Y Company
Sleep Time / day			
5 hours or less	4.4	4.4	9.2
6 hours	36.9	35.3	55.9
7 hours	43.8	43.3	31.7
8 hours	14.4	16.4	3.2
9 hours or more	0.5	0.7	0
Work Time / day			
8 hours or less	3.3	9.8	1.2
9 hours	48.0	66.1	17.5
10 hours	14.5	4.0	23.6
11 hours	16.2	8.6	24.2
12 hours or more	18.2	11.5	33.5
Holidays / month			
5 days or more	94.3	84.3	96.3
4 days or less	5.7	12.7	3.7
Eating Breakfast*			
5 days or more	70.6	73.3	57.0
4 days or less	29.4	26.7	43.0
Eating Snacks*			
5 days or more	7.9	7.7	4.4
4 days or less	92.1	92.3	95.6
Soft drinks*			
5 days or more	57.5	72.6	45.5
4 days or less	42.5	27.4	54.5
Alcohol*			
5 days or more	31.7	39.3	33.4
4 days or less	68.3	60.7	66.6
Smoking			
Yes	62.4	66.4	63.4
No	37.6	33.6	36.6
Physical Exercise			
Yes**	55.0	66.0	55.5
No	45.0	34.0	44.5

*Frequency of consumption/week. **Habitual Physical Exercise (At least once a week).

Sleeping time (5 hours or less=5, 6 hours=6, 7 hours=7, 8 hours=8, 9 hours or more=9), Working time (8 hours or less=8, 9 hours=9, 10 hours=10, 11 hours=11, 12 hours or more=12), Holiday (5 days or more per month=0, 4 days or less per month=1), Breakfast (4 days or less per week=0, 5 days or more per week=1), Snack (5 days or more per week=0, 4 days or less per week=1), Soft drinks (5 days or more per week=0, 4 days or less per week=1), Alcohol (5 days or more per week=0, 4 days or less per week=1), Smoking (yes=0, no=1) and Exercise (yes=0, no=1).

health status, and age was significant in all indices of physical health status except GPT. Sleeping time was significant only in DBP and Hb. Eating breakfast was significant only in SBP, DBP, and γ -GTP. Smoking was significant only in SBP and Hb. Habitual physical exercise was significant only in RBC.

According to the analysis for each company, the obesity index was significant in all indices of physical health status in all companies. Age was significant in all indices of physical health status except GOT in K Company, significant to DBP, GOT, γ -GTP, T-CHO, RBC, and Hb in H Company, and significant to SBP, DBP, γ -GTP, T-CHO, and TG in Y Company. But no lifestyle parameter except the obesity index, which was significant in all indices of physical health status in all three companies, was found.

II Relationship between Mental Health Status and Lifestyle

The results of analysis of all workers and each company are shown in Table 5.

According to the analysis of all workers, age, sleeping time, smoking, and habitual physical exercise were significant in SDS which is an index of mental health status. Advancing age and lifestyle parameters such as sleeping longer, smoking and habitual physical exercise had a close relationship to mental health.

But no lifestyle factor significantly related to the index of mental health status in all three companies was found.

Discussion

Breslow pointed out that seven lifestyle factors (sleeping pattern, eating breakfast, eating snacks, obesity, physical exercise, smoking and consumption of alcohol) affected health status¹⁻⁴⁾. Morimoto conducted a double check study concerning the relationship between health status and eight lifestyle factors (cigarette smoking, consumption of alcohol, physical exercise, mental stress, sleeping pattern, nutritional balance, eating breakfast and working pattern) in a working population, and arrived at the same conclusion⁵⁾.

In recent studies it has been reported that a healthy lifestyle is associated not only with health status and disorders but also with causes of disease such as changes in the immune system⁸⁻⁹⁾.

The fact that the structure of disease or lifestyle varies according to occupation has been confirmed¹³⁻¹⁷⁾. In working populations, significant relationships between physical health status and lifestyle factors such as dietary habits, consumption of alcohol and smoking have been reported^{5, 18, 19)}.

Takeda reported that the type of occupation might change the lifestyle, as a result of which, physical health status might vary owing to differences in occupation or the type of work²⁰⁾. For example, workers in

Table 4-1. Coefficients of general linear models in several physical health status parameters of all workers examined

Indicators	Intercept	Age	Sleep time	Work time	Holiday	Break-fast	Coefficients					
							Snack	Soft drinks	Alcohol	Smoking	Exercise	Obesity Index
SBP	116	0.183**	0.177	-0.245	-1.30	1.59*	0.605	1.22	-1.42*	-1.31*	0.857	0.264**
DBP	62.3	0.261**	0.775**	0.0465	-1.35	0.313	-0.0690	0.909	-1.15*	-0.163	0.723	0.192*
GOT	19.5	0.0892**	0.0702	0.145	-0.737	0.309	-0.00603	-0.417	-1.16	-0.189	0.731	0.166**
GPT	33.3	-0.0907	-0.837	0.0796	-1.28	0.811	-0.311	-0.336	1.35	-0.282	1.39	0.649**
γ -GTP	18.6	0.573**	0.860	-0.0672	-7.14	-0.549	-5.84	1.58	-11.2**	-0.683	4.59	0.472**
T-CHO	147	0.649**	0.485	0.162	-2.18	0.125	2.81	-0.650	0.735	0.786	1.75	0.742**
TG	93.5	0.998**	-2.41	-0.357	-17.7	2.44	-17.2	0.652	-0.537	-13.1	11.0	2.69**
RBC	524	-1.33**	1.23	0.0990	-3.56	1.32	-5.08	1.72	3.24	-1.19	3.42*	0.694**
Hb	15.9	-0.0232**	0.0604*	-0.00718	0.0480	-0.0335	-0.102	0.0229	-0.0599	-0.197**	0.0629	0.0187**

**Significant (p<0.01), *Significant (p<0.05).

Table 4-2. Coefficients of general linear models in several physical health status parameters of workers in K company

Indicators	Intercept	Age	Sleep time	Work time	Holiday	Break-fast	Coefficients					
							Snack	Soft drinks	Alcohol	Smoking	Exercise	Obesity Index
SBP	124	0.241**	-0.463	-0.465	-3.44	1.19	0.23	0.512	-1.10	-1.25	0.235	0.244**
DBP	62.9	0.282**	0.451	-0.0208	-2.89*	-0.354	0.852	0.804	-0.365	-0.541	0.152	0.172**
GOT	19	0.0732	0.291	0.146	-0.399	-1.06	-0.949	-0.0988	-0.679	-0.965	1.13	0.0856*
GPT	40.3	-0.193**	-0.791	-0.103	0.0669	-2.64	-2.50	-0.479	2.38	-1.22	0.554	0.512**
γ -GTP	8.18	0.599*	3.49	0.488	-8.16	-4.27	-15.7	2.72	-8.06	-5.2	5.3	0.359
T-CHO	171	0.329*	-0.996	0.545	3.55	2.97	-0.286	1.45	-1.58	0.355	1.75	0.681**
TG	207	1.32*	-8.42	-1.90	-34.8	14.4	-41.1	5.67	-2.74	-6.76	9.89	3.03**
RBC	554	-1.63**	-0.571	0.154	-6.93	0.787	-2.39	6.28*	0.528	-5.45*	4.12	0.745**
Hb	16.3	-0.0279**	0.033	-0.0187	-0.0615	0.0089	-0.115	0.162*	0.031	-0.161*	0.0835	0.0177**

**Significant (p<0.01), *Significant (p<0.05).

Table 4-3. Coefficients of general linear models in several physical health status parameters of workers in H company

Indicators	Intercept	Age	Sleep time	Work time	Holiday	Break-fast	Coefficients					
							Snack	Soft drinks	Alcohol	Smoking	Exercise	Obesity Index
SBP	114	0.0640	0.823	-0.166	0.747	1.59	3.23	2.59	-1.15	-2.28	1.31	0.256**
DBP	58.8	0.195**	1.31*	0.0547	0.424	-0.458	0.0271	2.24*	-1.39	-0.775	2.09*	0.182**
GOT	19.5	0.104**	-0.513	0.127	-0.438	0.492	1.92	-0.238	-1.73*	0.901	0.907	0.237**
GPT	29.4	-0.00238	-1.75	0.219	-0.906	1.61	3.17	-1.43	0.0441	0.112	3.32*	0.721**
γ -GTP	39.4	0.474**	-3.23	-0.488	-7.09	1.82	9.68	-0.0982	-15.9**	5.98	4.22	0.611**
T-CHO	139	0.880**	0.0151	-0.135	-6.41	-1.06	3.83	-3.19	3.34	2.57	4.60	0.908**
TG	61.8	0.488	4.71	-0.000984	-6.22	3.26	17.8	1.93	-1.70	-19.4*	12.6	2.50**
RBC	507	-1.10**	2.21	0.170	-3.52	1.82	-7.55	-2.44	6.72*	1.76	2.28	0.721**
Hb	15.3	-0.0182**	0.0976	-0.0641	0.134	-0.0837	-0.0542	-0.104	-0.0949	-0.329**	0.0115	0.0218**

**Significant (p<0.01), *Significant (p<0.05).

Table 4-4. Coefficients of general linear models in several physical health status parameters of workers in Y company

Indicators	Intercept	Age	Sleep time	Work time	Holiday	Break- fast	Coefficients					
							Snack	Soft drinks	Alcohol	Smoking	Exercise	Obesity Index
SBP	96.2	0.303*	1.94	0.333	1.05	2.94	−2.64	1.54	−2.43	0.162	2.09	0.342**
DBP	54.7	0.477*	1.13	0.370	−0.725	1.86	−4.79	−0.391	−2.71*	1.85	0.533	0.269**
GOT	20.7	0.0253	0.332	0.0163	−2.71	0.445	0.770	0.0867	−1.21	0.258	−0.270	0.236**
GPT	18.8	0.0182	0.256	0.193	−7.09	0.138	2.06	0.734	1.64	1.56	0.987	0.848**
γ-GTP	19.3	0.667*	−0.180	−0.744	−1.84	0.123	3.85	0.949	−10.7**	1.47	4.07	0.503**
T-CHO	59.8	1.85**	5.92*	1.41	−2.85	−6.85	14.4	−2.11	2.21	0.122	−3.78	0.555**
TG	41.5	1.67*	7.03	3.38	−8.84	0.845	7.18	−13.0	3.06	−16.2*	8.95	2.27**
RBC	497	−0.515	2.83	0.296	13.9	−5.08	−12.9	−1.44	5.03	2.38	3.87	0.555**
Hb	15.3	−0.0140	0.0739	0.0296	0.146	−0.0735	−0.161	−0.150	−0.0484	−0.107	0.102	0.0159**

**Significant (p<0.01), *Significant (p<0.05).

Table 5. Coefficients of general linear models in mental health status (SDS) of workers

Indicators	Company	Intercept	Age	Sleep time	Work time	Holiday	Break- fast	Coefficients					
								Snack	Soft drinks	Alcohol	Smoking	Exercise	Obesity Index
SDS	K	51.6	−0.152**	−0.728*	0.0172	−0.489	1.36	−1.39	−1.08*	0.0918	−0.701	1.42**	0.0156
SDS	H	50.1	−0.0734*	−0.379	−0.191	2.52*	−2.04*	−2.86*	−0.736	0.952	−0.110	1.25	−0.0377
SDS	Y	44.1	−0.0246	−1.35*	0.459	3.87	−0.496	−1.25	−0.199	0.264	−2.60**	1.35	−0.0247
SDS	All workers	48.8	−0.133**	−0.736**	−0.0464	1.06	−0.0721	1.55	−0.946	0.288	−0.975*	1.40**	−0.00540

**Significant (p<0.01), *Significant (p<0.05).

manufacturing companies enjoy more average annual holidays than in other kinds of companies in general, and blue-collar workers tend to enjoy holidays with greater physical and mental satisfaction than white-collar workers.

In this cross-sectional study, the obesity index was significantly related to all indices of physical health status in all three companies. In Japan all employers are under obligation to make workers undergo medical examinations. Any company which employs 50 or more workers is also under obligation to designate an occupational physician. Especially since the amendment to the Industrial Safety and Health Law in 1996, health care, such as counseling by an occupational physician or public health nurse, has been enforced, but the results of this study show that obesity influenced physical health in all three companies, suggesting that obesity is one of the most difficult lifestyle factors to improve.

Kaneko reported that consumption of alcohol affected liver function, and smoking affected blood pressure in studies on a Japanese car-manufacturing company and a Japanese car-sales company²¹⁾. Metzner reported that drinking and smoking are related to eight kinds of health

measures, whereas eating breakfast and sleeping time are not²²⁾. Whitehead reported that Hb is significantly increased in smokers, and RBC is reduced by alcohol consumption²³⁾.

In this study, sleeping time, eating breakfast, consumption of alcohol and smoking were related to blood pressure in all groups of workers. Consumption of alcohol was related to γ -GTP. Habitual physical exercise was related to RBC. Sleeping time and smoking were related to Hb. The effects of sleeping time, eating breakfast, consumption of alcohol and smoking varied among the three companies. These results may be attributable to differences in job type (blue-collar or white-collar), educational level (graduated high school or university) and work shift (shift work or daytime work). In addition, the average age at Y company was lower than that at the other companies.

Only obesity was significantly related to all indices of the physical health status of workers in all three companies. The lifestyle of workers with any serious physical disorders might have already been improved by health education. This may be one reason why no relationship between lifestyle and physical health status

was found in this cross-sectional study. But obesity was significantly related to all indices of physical health status in all three companies. Obesity is supposed to be the most important lifestyle factor which affects health status. Therefore devising measures to counteract obesity is thought to be the most urgent matter in the management of workers' health.

Irie reported that alcohol drinking and smoking were associated with worsening of mental health status, whereas habitual physical exercise affected an improvement in mental health status in a working population²⁴⁾. It was also reported that mental health status reflects lifestyle²⁵⁻³¹⁾. Morimoto reported that habitual physical exercise, consumption of alcohol, lack of attention to dietary habits, and excess soft drink consumption relate to mental health status factors such as SDS, but sleeping time or smoking in male habitants did not related to it significantly³²⁾.

In this study, age, sleeping time, smoking and habitual physical exercise significantly affected to the index of mental health status only in the analysis of all workers. But in the analysis of each company, age and sleeping time were significantly related to the index of mental health status in K and Y companies. Smoking was significant to the index of mental health status in Y company and habitual physical exercise in K company. Consumption of alcohol was not significantly related to the index of mental health status in any company.

It was thought that differences in the influence of sleeping time among the three companies were due to the difference in shift work: 2 shift work (K company), 3 shift work (H company) and daytime work (Y company). In addition, the distribution of sleeping time in Y company was different in K and H companies. Two shift work requires constant overtime work, and most of the workers in Y company were engaged in research and development which are known to require overtime work. The difference in the distribution of working time among the three companies sustains this argument. In these populations, prolonging sleeping time may reduce the SDS score.

SDS scores of non-smokers were significantly lower than those of smokers only in Y company and in all workers, although the reasons were not clear.

It seems that habitual exercise reduced the SDS score in all workers and in K company, and similar coefficients were observed in H and Y companies but were not significant.

This result partly agrees with previous reports²⁴⁻³¹⁾. No common lifestyle which is significantly relevant to mental health status was found in any of the three companies. It can be said that lifestyle may affect mental health status less than physical health status.

Nowadays it is reported that worker's stress has been increasing due to the complicated nature of work and to

other factors such as changes in work circumstances, changes in the type of employment, or restructuring of companies.

In the administration of workers' health, understanding the actual conditions of work in detail is therefore required at each company. Further investigations which include estimating the index of a healthy lifestyle must be conducted with regard to workers' health administration in Japan.

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