

Associations between Lifestyle and Mental Health in a Group of Japanese Overseas Workers and Their Spouses Resident in Düsseldorf, Germany

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Received November 1, 2004 and accepted December 28, 2005

Abstract: This study investigated associations between lifestyle factors and selected aspects of mental health in a group of Japanese overseas workers and their accompanying spouses who were residing in and around Düsseldorf, Germany, in February 1994. Considering four aspects of mental health (depression, mental instability, nervousness and neurosis) and six lifestyle factors (alcohol consumption, sleeping hours, cigarette smoking, physical exercise, eating breakfast and eating snacks), a cross-sectional study involving 822 volunteers (486 workers and 336 spouses) was performed using the Todai Health Index (THI) for surveying self-perceived health and a lifestyle related self-administered questionnaire. Alcohol consumption had no associations with any of the four aspects of mental health, and only very weak inverse associations were found between the other five lifestyle factors and the four aspects of mental health in the workers group. In the spouses group, physical exercise was the only lifestyle factor significantly associated with mental health.

Key words: Cross-cultural, Lifestyle, Mental health, Overseas workers, Spouses, THI

Introduction

This study investigated associations between lifestyle factors and selected aspects of mental health in a group of Japanese overseas workers and their accompanying spouses resident in and around Düsseldorf, Germany. The purpose was to identify lifestyle factors that associate with mental health. Lifestyle factors have been reported to influence both physical health^{1–4)} and mental health^{3, 5, 6)}. Although living and working abroad has been shown to be associated with many challenges that could adversely affect their mental health^{7–10)}, the incidence of mental health problems among Japanese overseas workers and their accompanying spouses is not precisely known.

Overseas workers and their accompanying spouses usually face many challenges in the cross-cultural environments in which they live. The extent of the problem and whether the adverse effects associated with cross-cultur-

al environments are due to changes in their living conditions, working conditions, atmosphere and lifestyle, or to some complex combination of factors is unclear. Increasingly however attention is being drawn to the importance of mental health as a public health problem¹²⁾ and more studies are now focusing on it^{13, 14)}. Despite that, only few reports have been published about the mental health of accompanying spouses of overseas workers^{7, 8, 13)} even though going abroad with their partners no doubt affects their mental health as well.

A variety of mental stress-factors relating to regional peculiarities, the environment, access to medical care and education, solitude and loneliness, cultural differences, local mutual support groups and being understood by co-workers have all been suggested to have associations with the mental health of overseas workers and their accompanying spouses^{15–18)}. Social norms, communicating in the local language, and living with one's family while overseas¹³⁾ have also been suggested. Clearly, there is a need to further research ways of improving the mental

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health of overseas workers and their accompanying spouses.

Düsseldorf, located in Germany's Nordrhein-Westfalen (NRW) state, is a city of about 600,000 people. About half of the Japanese enterprises in Germany have their branch head office in NRW state. In 1994, when this study was done, about 10,000 Japanese workers and their families resided in NRW state, and the majority of them (about 7,000) resided in the Düsseldorf area¹⁹⁾. One of the largest Japanese communities in continental Europe resides in Düsseldorf. It has facilities such as Japanese food restaurants and markets, karaoke bars and Japanese schools (kindergartens, elementary, junior high and cram schools) to cater for the large Japanese community. Its infrastructure also is not much different from that of Japan. The Japan Club and the Japan Chamber of Commerce and Industry are two organizations that play central roles in the lives of the Japanese community.

Materials and Methods

Using two self-administered questionnaires, a cross-sectional study was performed on a group of Japanese overseas workers and their accompanying spouses who resided in and around Düsseldorf, Germany, in February 1994. The questionnaires were mailed to 180 workplaces registered with the Japan Chamber of Commerce and Industry in Düsseldorf who had earlier agreed to participate in the study. A letter in Japanese explaining the aim and objectives of the survey accompanied each questionnaire. They were distributed and collected at the workplaces by the healthcare administrators of the companies and remitted via the Japan Chamber of Commerce and Industry. Workers were given two identical sets of questionnaires, one for themselves and the other for their spouses. Both questionnaires were in Japanese and subjects had the option of writing their names on them or not.

One questionnaire, developed for this study, consisted of 41 items relating to general lifestyle, work, food consumption frequency and dietary habits. The other questionnaire was the *Todai Health Index (THI)* which was developed in Japan as a general health questionnaire to replace the *Cornell Medical Index (CMI)*^{20, 21)}. The THI is used for measuring subjective health quantitatively with a scaling factor that accounts for biophysical and socio-cultural conditions²²⁾. It has 130 items constituting 12 scales and three discriminant function (DF) values for estimating the inclination or disposition toward psychosomatic disease²³⁾, neurosis and schizophrenia²⁴⁾. Since it was developed as a general health questionnaire, its scales consist of items for both psychological and physical symptoms. Each respondent is evaluated according

to the scale scores by summing up the response values. The discriminant power of the DF value for neurosis is represented by a correct screening proportion of 78.8%²⁴⁾.

When using questionnaires developed in foreign countries there is usually the need for them to be translated, evaluated and their validity confirmed. Apart from that, the translation itself has to be verified. Since the THI was originally developed for Japanese and validated among the Japanese population, it was utilized in this study to eliminate problems associated with translation and cross-cultural problems that often arise when attempting to determine the prevalence and incidence of psychiatric disorders in different populations.

There were 1,932 Japanese employees in the workplaces registered with the Japan Chamber of Commerce and Industry in Düsseldorf at the time of the study²⁵⁾. Based on a rough estimation to include spouses, a total of 3,800 self-administered questionnaires were sent out for distribution to the workers and their spouses. There was no way of knowing how many were actually distributed to the workers. However, 1,001 completed questionnaires (26.3% response rate) were returned from 611 workers (570 men and 41 women) and 390 spouses (12 men and 378 women) with ages ranging between 20 and 62 yr. The information provided was treated confidentially. The investigators entered all data personally after assigning identification numbers to the subjects. Participation was voluntary among all subjects.

Some of the most commonly studied lifestyle factors include sleeping patterns, habitual physical exercise, eating breakfast, cigarette smoking, alcohol consumption, and working hours^{1, 2, 5, 6, 26)}. This study undertook to investigate six lifestyle factors (alcohol consumption, sleeping hours, cigarette smoking, physical exercise, eating breakfast and eating snacks) and their relation to four aspects of mental health (depression, mental instability, nervousness and neurosis) in the overseas workers and their spouses.

A *Cumulative Lifestyle Index (CLI)* was created based on six items from the lifestyle questionnaire by dichotomizing the responses to those items, assigning equal weights of "one" to the "healthy" response to each item and "zero" to the "unhealthy" response, then summing the values for each participant. (Please see Appendix I for an English translation and Appendix II for more about the Index.) Mental health was measured using the scale scores (depression, mental instability and nervousness) and DF values (neurosis) of the THI. (Please see Appendix III for English translations of the relevant THI items.)

Some subjects (84 workers and 54 spouses) were excluded before carrying out the statistical analyses. Exclusion criteria included being employed locally, being

a spouse with a full-time job, and returning an incomplete questionnaire. A questionnaire was regarded as being incomplete if at least one question pertaining to any of the lifestyle factors or mental health was not answered. Using the above criteria excluded all the male spouses. Of the remaining workers only 9 (1.8%) were females. Since excluding them from the workers group made no material difference to the results, they were also excluded from the analyses in order to make the spouses and workers groups more unvarying. 822 subjects (486 male workers and 336 female spouses) were finally included in the analyses.

The SAS 8.0 and SPSS 11.0 statistical programs were used to perform the statistical analyses. First, bivariate linear correlation analyses between CLI and the various aspects of mental health were performed. Then, considering the various aspects of mental health as dependent variables and the six dichotomized lifestyle items used in the CLI as explanatory variables, full model multiple regression analyses were performed to identify those dichotomized independent variables that had significant associations with the various aspects of mental health. The regression models were not for prediction purposes, but rather for detecting significant associations between dependent and explanatory variables and for assessing the strengths of those associations.

Analyses were first made for the entire subject population, then separately for the workers and spouses groups. Differences between the two groups were tested by Student's *t*-test or Chi-squared test.

All *p*-values are two-tailed and only differences with

$p < 0.05$ were considered significant.

Results

The workers were all males while the spouses were females. In all, 92.0% of the workers were married. The mean age of workers was 38.5 (\pm 8.0) yr and of spouses 34.8 (\pm 8.8) yr. The mean current length of stay abroad was 35.9 \pm 32.6 months for the workers and 33.5 \pm 31.9 months for the spouses (Table 1). The majority of the workers were from the manufacturing, $n = 318$ (65.4%), and the commerce, $n = 102$ (21.0%), sectors.

Significantly higher percentages of spouses than workers reported not smoking, eating breakfast at least five times per week, and not drinking alcohol. Significantly higher percentages of workers, however, reported eating snacks at most twice a week and getting physical exercise at least once a week (Table 2). The spouses also had a higher mean CLI score than the workers (Table 3), indicating healthier lifestyle practices among the spouses group. However, the spouses had a significantly higher mean scale score for mental instability and (marginally) for depression and a higher mean DF value for neurosis than the workers, indicating a greater disposition towards mental problems in the aspects of mental health considered here. Apart from nervousness, the differences in the mean mental health and CLI scores between the two groups were all statistically significant (Table 3).

Table 4 shows cross-correlations among the lifestyle factors for the whole subject population. The largest cross-correlation, $r = -0.378$ ($p < 0.0001$), was between

Table 1. Some characteristics of the workers and spouses groups

	Workers (n=486)	Spouses (n=336)	Difference ^a (<i>p</i> -value)
Sex	Males	Females	-
Married (%)	92.0	100.0	-
BMI (kg/m ²)	23.1 \pm 2.7	20.3 \pm 2.1	<0.0001
Age (yr)	38.5 \pm 8.0	34.8 \pm 8.8	<0.0001
Current length of stay abroad (months)	35.9 \pm 32.6	33.5 \pm 31.9	0.283

BMI, age and current length of stay abroad shows mean \pm SD.

^aDifferences were tested by Student's independent sample *t*-test.

Table 2. Healthy lifestyle practices of the workers and spouses groups

	Workers (n=486) %	Spouses (n=336) %	Chi-squared test <i>p</i> -value
Sleeping hours (at least 6 h a day)	87.5	89.0	0.503
Cigarette smoking (not smoking)	53.5	93.2	<0.0001
Eating breakfast (at least 5 times a week)	81.3	95.8	<0.0001
Eating snacks (at most twice a week)	86.8	25.3	<0.0001
Alcohol consumption (not drinking alcohol)	15.0	61.0	<0.0001
Physical exercise (at least once a week)	32.3	25.3	<0.0001

Table 3. Mean mental health and CLI scores of the workers and spouses groups

	Workers (n=486) mean \pm SD	Spouses (n=336) mean \pm SD	Differences ^a <i>p</i> -value
Depression	13.9 \pm 3.5	14.4 \pm 3.6	0.049
Mental Instability	21.6 \pm 4.4	23.9 \pm 5.2	<0.0001
Nervousness	15.7 \pm 3.6	15.8 \pm 3.5	0.740
Neurosis	-2.1 \pm 1.5	-1.6 \pm 1.7	<0.0001
CLI Score	3.6 \pm 1.0	3.9 \pm 0.9	<0.0001

^aDifferences were tested by Student's independent sample t-test.

Table 4. Cross-correlations^a between lifestyle factors for the whole subject population (n=822)

	Sleeping hours	Cigarette smoking	Eating breakfast	Eating snacks	Alcohol consumption	Physical exercise
Sleeping hours	1					
Cigarette smoking	0.011	1				
Eating breakfast	0.039	0.287***	1			
Eating snacks	0.042	-0.329***	-0.174***	1		
Alcohol consumption	-0.031	0.242***	0.081*	-0.378***	1	
Physical exercise	0.015	0.025	-0.001	0.092**	-0.089*	1

^aSpearman's. ****p*<0.0001, ***p*<0.01, **p*<0.05.

Table 5. Correlation^a between CLI scores and the various aspects of mental health for the whole population, the workers and the spouses groups

	Depression	Mental instability	Nervousness	Neurosis
Whole subject population (n=822)	-0.190***	-0.140**	-0.032	-0.136***
Workers (n=486)	-0.245***	-0.157**	-0.078	-0.218***
Spouses (n=336)	-0.114*	-0.118*	0.024	-0.089

^a Spearman's. ****p*<0.0001, ***p*<0.01, **p*<0.05.

eating snacks at most twice per week and not drinking alcohol.

Correlations between CLI and the various aspects of mental health considered are shown in Table 5. No significant correlation between CLI and nervousness was found either for the entire subject population or separately for the workers and spouses groups. Also, in the spouses group neurosis was not associated with CLI. The other aspects of mental health had weak associations with CLI; the largest absolute value of *r* was 0.245 (*p* < 0.0001).

Table 6 shows that there were only very weak inverse associations between the lifestyle factors and the various aspects of mental health in the workers group. In the spouses group, no lifestyle factors had significant associations with mental health except physical exercise. The largest value of R-squared was 0.092. No associations were found between not consuming alcohol and any of the aspects of mental health under investigation; however, the types and quantities of alcoholic beverages consumed by those who did drink were not investigated. Sleeping at least 6 h a day had weak inverse associations with depression, nervousness and neurosis in the whole

subject population and in the workers group. Smoking was weakly and inversely associated with only depression in the whole subject population and in the workers group. Similarly eating breakfast regularly was weakly and inversely associated with depression and neurosis in the whole subject population and the workers group. Engaging in physical exercise at least once a week consistently associated weakly and inversely with depression, mental instability and neurosis in the whole subject population and in both the workers and spouses groups. Eating snacks fewer than three times a week had no association with nervousness, although it was associated weakly and inversely with depression, mental instability and neurosis in the whole subject population and with depression in the workers group.

Discussion

Even after all the lifestyle factors were entered into the regression model, their power of explaining the aspects of mental health considered was very low. This study's findings differ from those of earlier investigators²⁷⁻³²,

Table 6. Results of multiple regression analysis separately for the whole population, workers and spouses groups

	Sleeping hours			Cigarette smoking			Eating breakfast		
	β^a	SE ^b	Sig ^c	β^a	SE ^b	Sig ^c	β^a	SE ^b	Sig ^c
Depression									
Whole population	-0.073	0.369	0.032	-0.077	0.287	0.040	-0.078	0.375	0.030
Workers	-0.089	0.465	0.044	-0.099	0.315	0.029	-0.128	0.403	0.005
Spouses									
Mental instability									
Whole population									
Workers									
Spouses									
Nervousness									
Whole population	-0.098	0.379	0.005						
Workers	-0.108	0.496	0.019						
Spouses									
Neurosis									
Whole population	-0.074	0.168	0.005				-0.115	0.170	0.001
Workers	-0.108	0.205	0.015				-0.181	0.178	<0.0001
Spouses									
	Eating snacks			Physical exercise			F-value	R-square	
	β^a	SE ^b	Sig ^c	β^a	SE ^b	Sig ^c			
Depression									
Whole population	-0.115	0.277	0.003	-0.166	0.264	<0.0001	8.88***	0.061	
Workers	-0.108	0.459	0.016	-0.167	0.328	0.0002	8.12***	0.092	
Spouses				-0.152	0.446	0.005		0.028	
Mental instability									
Whole population	-0.201	0.378	<0.0001	-0.133	0.334	<0.0001	11.45***	0.078	
Workers				-0.098	0.422	0.031	3.80**	0.046	
Spouses				-0.170	0.643	0.002	2.81*	0.049	
Nervousness									
Whole population							2.23*	0.016	
Workers								0.020	
Spouses									
Neurosis									
Whole population	-0.132	0.126	<0.0006	-0.144	0.120	<0.0001	10.16***	0.070	
Workers				-0.122	0.145	0.006	7.42***	0.085	
Spouses				-0.161	0.208	0.003		0.032	

Only significant results are shown. Alcohol consumption did not show any significant association so it is not included in the table. The F-value significance is ***, ** and * ($p < 0.0001$, $p < 0.01$ and $p < 0.05$ respectively).

^aStandardized beta coefficient, ^bstandard error, ^csignificance.

Whole subject population (n=822), workers (n=486) and spouses (n=336).

who found stronger associations between lifestyle factors and mental health, rather than the very weak associations found in this study. The previous studies' populations did not consist of overseas workers and their spouses, and they used methods of assessing mental health other than THI. The very weak associations observed could be a result of biases in this study.

The low response rate (26.3%) suggests that answers from respondents may have differed substantially from

those of non-respondents. Non-response bias must therefore be borne in mind when interpreting this study's findings. Also, this study's subject selection procedure is likely to have introduced selection bias. This selection bias probably also exists between the spouses and the workers groups since whether or not the spouses received questionnaires and whether any questionnaires they completed were turned in depended on the workers. Selection bias is also likely to have been introduced with regards

to the companies and respondents who volunteered for the study. It is possible that only health conscious companies and subjects volunteered for the study. Given that volunteerism is likely to be associated with high health consciousness, it can therefore not be claimed that the subjects in this study are representative of all overseas Japanese workers and their spouses in Düsseldorf.

The major limitations of this study therefore include the low response rate and the procedures through which subjects were recruited for the study. Also, only a single dichotomized variable was used to measure each of the six lifestyle factors. The development and standardization of a more objective (quantitative) way of measuring lifestyle factors would be useful for future studies. It would also be useful to standardize the lifestyle factors used in analyzing associations between lifestyle and mental health and to utilize such standardized factors to study such associations in overseas workers and their spouses living in different locations and cultures.

Differences in culture and manners have been said to influence the mental health of overseas workers^{17, 33, 34}. When the cultural difference is large, its effects on mental health are greater¹⁷. In terms of security and infrastructure, there is little difference between Düsseldorf and most Japanese cities¹⁶. As of October 2000 the Japanese community in Düsseldorf was about 1% of the city's population¹³. Facilities and establishment such as Japanese schools, markets, restaurants, the Japan Club and the Japan Chamber of Commerce and Industry form part of the well-organized support system for the Japanese overseas workers and their families there. In view of this, it might not be possible to generalize the findings of this study to other populations of overseas Japanese workers and their spouses.

The spouses group had higher mean scale scores for depression and mental instability and a less negative mean DF value for neurosis than did the workers group (Table 3). Although the primary aim of this study was not to identify the levels of mental diseases in this subject population, it can be said from the results that the spouses had a higher tendency toward mental disease (depression, mental instability and neurosis) than did the workers since higher scale scores and less negative DF values of the THI indicate higher tendencies towards disease. One study that also used the THI in assessing overseas Japanese workers and their accompanying spouses similarly found that in terms of all the 12 scales of the THI, the workers were better-off than their spouses³⁵. Other authors have also reported that wives of Japanese workers overseas were more prone to mental health problems than were wives of workers at home⁸.

The differences in mean CLI and mental health scores between the spouses and workers groups, with the spouses

having a higher mean CLI score, could be due to the spouses' being more health conscious and therefore tending to practice healthier lifestyles than the workers. Differences observed in mental health scores between the two groups on the other hand could be due to differences in their ability to speak the local language, attitudes toward the foreign culture, solitude and loneliness in the spouses¹⁵, strained relationships between spouses and their partners³³, spouses' ability to move around easily on their own to go shopping and visit friends, and other reported factors^{8, 10, 33, 34} acting individually or in combination.

The observed differences between the workers and the spouses in mean mental health scores, CLI scores and lifestyle associations with mental health, support the notion that in their daily interactions, the accompanying spouses experience different aspects of the cross-cultural environment than do the overseas workers and consequently face types of challenges different from those faced by the workers¹⁵. Consequently the same lifestyle factors could associate differently with mental health in the two groups.

Whether healthy lifestyles result in healthy mental status, or vice versa, could not be determined since this was a cross-sectional study. It is believed however that healthy lifestyles probably have positive effects on mental health which may be due in part to the positive effects of healthy lifestyles on physical health^{1, 2, 4}. This however still remains to be fully understood. In the future, a cohort and an interventional study could be carried out to further clarify the mechanisms involved in associations between lifestyle and mental health in overseas workers and their accompanying spouses.

In conclusion, this group of Japanese overseas workers and their accompanying spouses, resident in the Düsseldorf area in 1994, showed only very weak lifestyle and mental health associations in the workers group. In the spouses group, however, no lifestyle factors had associations with mental health except physical exercise. Further studies are needed to further clarify these associations.

Acknowledgements

We are very grateful to the workers and their spouses for the time and energy they devoted to filling out the questionnaires and to the Japan Chamber of Commerce in Düsseldorf (especially Mr. Takeda Jun'ichi) for their tremendous help and cooperation. We also would like to say a special thank you to Dr. Eugene Boostrom for his helpful comments on the manuscript. This study was supported in part by a Grant-in-Aid for Scientific Research (Grant number 14209011) of the Ministry of Education, Science, Sports, Culture and Technology of Japan.

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Appendix

I. Questions about Lifestyle

1. How many hours do you sleep at night?
 - Less than 6 hours From 6 to 8 hours
 - More than 8 hours
2. Do you smoke?
 - No Occasionally: about _____cigarette(s) per week
 - Yes: about _____cigarette(s) per day
3. Do you have breakfast?
 - Almost every day 3 ~ 4 times a week
 - 1 ~ 2 times a week No
4. Do you have snacks?
 - Almost every day 3 ~ 4 times a week
 - 1 ~ 2 times a week No
5. Do you drink alcohol?
 - Almost every day 3 ~ 4 times a week
 - 1 ~ 2 times a week 1 ~ 3 times a month No
6. Do you exercise?
 - Almost every day 3 ~ 4 times a week
 - 1 ~ 2 times a week 1 ~ 3 times a month No

II. Creation of the Cumulative Lifestyle Index (CLI)

To create the Index, responses to questions relating to each lifestyle factor to be analyzed were dichotomized and healthy lifestyle practices were assigned the value of 1 while unhealthy lifestyle practices were assigned 0. The cumulative scores for each subject were then tabulated (added), with higher scores therefore indicating healthier lifestyles.

Lifestyle Factor	Healthy lifestyle practices (1)
Sleeping hours	Sleeping at least 6 h a day
Cigarette smoking	Not smoking
Eating breakfast	Eating breakfast at least 5 times a week

Eating snacks	Eating snacks at most twice a week
Alcohol consumption	Not drinking alcohol
Physical exercise	Exercising at least once a week

Lifestyle Factor	Unhealthy lifestyle practices (0)
Sleeping hours	Sleeping less than 6 h a day
Cigarette smoking	Currently smoking
Eating breakfast	Eating breakfast less than 5 times a week
Eating snacks	Eating snacks more than twice a week
Alcohol consumption	Drinking alcohol
Physical exercise	Exercising less than once a week

III. The Todai Health Index

A. Depression Scale Items

1. Do you feel blue?
2. Do you feel that your life is hopeless?
3. Do you lose interest in things you usually enjoy?
4. Do you feel lonely even when you attend a meeting or are in a group?
5. Do you feel lonely?
6. Do you sometimes feel like not seeing other people?
7. Do you feel inferior?
8. Are you depressed?
9. Do you feel as if your life is going badly?
10. Have you had less confidence lately?

B. Mental Instability Scale Items

1. Does your face flush easily?
2. Do you worry about the past?
3. Do you think your character is easily misunderstood by others?
4. Do you worry about what people think of you?
5. Do you have cold sweats?
6. Do you get mentally tired?
7. Do you perspire when you have to speak to your boss or superior or while taking an examination?
8. Do you feel uneasy in strange places?
9. Do you have periods of both mania and depression?
10. Are you bothered by trivial or small things?
11. Do you get nervous and shaky when approached by your boss or superior?
12. Do you tremble or feel weak whenever someone shouts at you?
13. Do you become frightened at sudden movements or noises at night?
14. Do you experience difficulty in continuing your work when you are been observed by others?

C. Nervousness Scale Items

1. Are you a perceptive person?
2. Do you think before you act?
3. Do you worry about trivial or small things?
4. Do you worry about soil or dirt on your clothes and hands?
5. Are you sensitive to your surroundings?
6. Are you nervous?
7. Are you inclined to worry about everything?

8. Are you a very particular person?

Answers to A, B and C

1. Often 2. Sometimes 3. Hardly ever or Never

D. Discriminant function (DF) values for neurosis

The discriminant function (DF) values for neurosis were calculated as proposed by Aoki *et al.* (1974)¹⁸.