

The relationship between mental-health status and work-related factors in male Japanese overseas employees

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The relationship between mental-health status and work-related factors in male Japanese overseas employees

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Abstract

Objectives: The aim of this study was to clarify the relationship between the mental-health status of overseas employees and work-related factors, and also to determine the difference between the mental-health status of these employees and their counterparts in Japan.

Method: Four hundred and fifty male overseas employees and 683 male employees in Japan were surveyed using a self-assessment questionnaire, namely the Japanese version of the Profile of Mood States, which is used to assess mental-health status.

Result: The mental-health status of overseas employees in the age range 34–39 years was worse, and that for those in their forties and fifties better, than those of employees in Japan.

A multiple logistic regression analysis showed that employees in East Asia, Southeast & South Asia and North America were positively associated with poor mental-health status compared with employees in Europe (e.g. odd ratio [OR]: 7.548, 95% confidence interval [CI]: 2.912–22.293, OR: 4.675, 95% CI: 1.679–14.433 and OR: 3.997, 95% CI: 1.495–11.895 in depression/dejection, respectively). Engineers and production controllers were positively associated with poor mental-health status compared with those in managerial posts (e.g. OR: 2.328, 95% CI: 1.168–4.679 and OR: 5.268, 95% CI: 1.520–18.013 in tension/anxiety, respectively). As regards average daily working hours, those employees working for between 12 and less than 13 hours and 13 hours or more were positively associated with poor mental-health status compared with those working for between 10 and less than 11 hours (e.g. OR: 2.063, 95% CI: 1.007–4.283 and OR: 2.651, 95% CI: 1.227–5.814 in depression/dejection, respectively). In terms of number of days' holiday in the last month, those employees who had taken less than five days and between five days and seven days were positively associated with poor mental-health status comparison with those who had taken eight days or more (e.g. OR: 2.285, 95% CI: 1.276–4.129 and OR: 2.219, 95% CI: 1.246–4.000 in fatigue, respectively).

Conclusion: Mental-health protection measures in overseas bases need to focus on Asia, especially East Asia and employees who work as engineers or production controllers. Furthermore, average daily working hours should be shortened as much as possible and employees should take at least eight days' holiday per month.

Key words

Japanese, mental health, occupational health, overseas employees, working hours, work-related factors

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Introduction

Japanese companies are keen to increase their overseas presence in the face of economic globalization. The 2005 Annual Statistical Report on Japanese Nationals Overseas reported that the total number of permanent residents and travelers staying abroad for more than three months had risen to more than one million for the first time since the war and that the number of long-stay travelers was more than 700,000. Private companies accounted for 56.5% of these employees, the majority of whom were long-stay travelers. The numbers increased in all regions, with Asia undergoing a remarkable increase as Japanese companies began to establish overseas operations in China¹⁾.

The largest number of long-stay travelers had traditionally been those travelling to North America, but Asia overtook North America in 2006²⁾ as business links with China in particular began to grow.

Over 60% of employees currently suffer from high anxiety or stress in the workplace in Japan³⁾, and this work-related psychological burden is leading to a rapidly increasing incidence of mental illness and even suicide in middle-aged working males⁴⁾. For this reason, mental-health protection measures are becoming a critical issue in the workplace.

Overseas assignments can also lead to the development of mental illness^{5,6)} and some studies have reported an increased suicide risk for these employees⁶⁾. This suggests that mental-health protection measures are also needed in overseas bases.

A number of mental-health studies in recent years have focused on the culture shock or intercultural stress suffered by overseas employees⁷⁾. However, to the best of our knowledge, there are few studies concerning the relationship between their mental-health status and working environment or job stress or comparing their mental-health status with those of their counterparts in Japan. Moreover, there are no studies concerning employees assigned to China.

The aim of this study was therefore to clarify the relationship between the mental-health status of overseas employees, including those in East Asia, and work-related factors and to compare their mental-health characteristics with their counterparts in Japan. Figure 1 shows the framework of this study which based on model of job stress and health⁸⁾.

Methods

1. Subjects

A cross-sectional study employing a self-

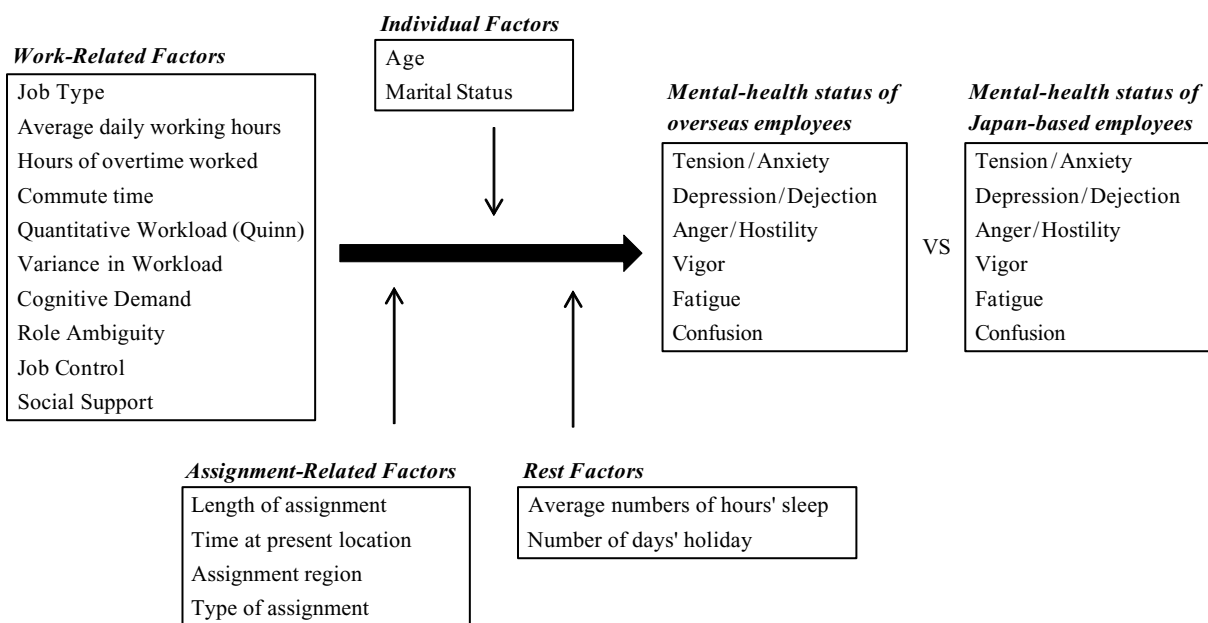


Figure 1. Framework of this study

assessment questionnaire was conducted from July to September 2005. The subjects were 546 male Japanese overseas employees of a metal-products manufacturing company that has about 70 overseas bases throughout the world. This company has been operating overseas since 1959 and started to operate in East Asia in 1992.

The data for employees in Japan were collected during a medical examination. The same company in Toyama prefecture with 6000 employees carried out a mental-health status examination for 35-, 45- and 55-year-old employees and middle-management or managerial posts from April 2005 to March 2006. Six hundred and eighty eight male employees were included.

2. Questionnaire

The same questionnaire as regards age, gender and Profile of Mood States was applied to overseas and Japan-based employees. The questionnaire for overseas employees also examined individual factors, assignment- and work-related factors and rest factors.

1) Individual factors

The subjects' age, gender and marital status (partner: yes/no) were assessed. Age was divided into four groups: 25–29, 30–39, 40–49 and 50–59 years.

2) Assignment-related factors

The subjects' length of assignment, time at present location (when did you arrive at your present location?), assignment region and type of assignment (are you a business bachelor [defined as a married man who has left his family behind in Japan to go and work abroad]? yes/no) were assessed. The length of assignment was divided into five groups: less than 2 years, 2 to less than 5 years, 5 to less than 10 years, 10 to less than 15 years and 15 years or more. The time at present location was divided into four groups: less than 1 year, 1 to less than 2 years, 2 to less than 4 years and 4 years or more.

3) Work-related factors

The subjects' job type (managerial, clerical, sales, production control, engineer, manufacturing and other), average daily working hours in the last week, hours of overtime worked in the last month

and commute time were assessed. Average daily working hours in the last week was divided into five groups: less than 10 hours, 10 to less than 11 hours, 11 to less than 12 hours, 12 to less than 13 hours and 13 hours or more. Hours of overtime worked in the last month was divided into six groups: less than 20 hours, 20 to less than 40 hours, 40 to less than 60 hours, 60 to less than 80 hours, 80 to less than 100 hours and 100 hours or more. Commute time was divided into three groups: less than 30 minutes, 30 to less than 60 minutes and 60 minutes or more.

4) Job stress questionnaire

The Japanese version of the Generic Job Stress Questionnaire (GJSQ) was used to assess subjects' job-related stress levels⁹⁻¹⁰. This questionnaire was developed by the U.S National Institute for Occupational Safety and Health (NIOSH)⁸ and translated into Japanese by Haratani et al.⁹⁻¹⁰. In this study we used five job stressors (Quantitative Workload [Quinn], Variance in Workload, Cognitive Demand, Role Ambiguity and Job Control) and one buffer factor (Social Support).

Although social support usually consists of four questions and assesses social support levels from supervisors, co-workers and family/friends individually, we selected only one question: "How do the following people take into consideration or help you to work well?". Social support was then calculated by summing each of the individual scores, therefore the range for social support in this study is 3–15. Higher quantitative workload, variance in workload, cognitive demand and role ambiguity scores indicate high job stress and higher job control and social support indicate low job stress.

The Cronbach's alpha for quantitative workload, variance in workload, cognitive demand, role ambiguity, job control and social support were 0.83, 0.85, 0.63, 0.87, 0.93 and 0.56, respectively in this study.

5) Rest factors

The subjects' average number of hours' sleep per workday and the number of days' holiday in the last month (including weekends and national holidays) were assessed. Average number of

hours' sleep per workday was divided into three groups: less than 6 hours, 6 to less than 7 hours, 7 hours or more. The number of days' holiday in the last month was divided into three groups: less than 5 days, 5 to 7 days and 8 days or more.

6) *Mental-health status*

The Japanese version of the Profile of Mood States (POMS) was used to assess the mental-health status of subjects^{11,12}. This questionnaire was developed by McNair et al.¹³, and translated into Japanese by Yokoyama et al.^{11,12}. POMS is a self-assessment questionnaire containing six sub-scales: Tension/Anxiety, Depression/Dejection, Anger/Hostility, Vigor, Fatigue, and Confusion. Each item is graded on a five-point Likert scale ranging from 0 (not at all) to 4: (extremely). Higher vigor scores indicate good mental-health status and higher scores for the others indicate worse mental-health status at that moment.

In this study, the Cronbach's alpha for tension/anxiety, depression/dejection, anger/hostility, vigor, fatigue, and confusion of overseas employees were 0.86, 0.93, 0.93, 0.90, 0.91, and 0.82, respectively, and 0.86, 0.94, 0.92, 0.91, 0.92 and 0.82, respectively, for their counterparts in Japan.

3. *Statistical analysis*

Data for mental-health status were summarized as mean \pm standard deviation. One-way analysis of variance (one-way ANOVA) was used to compare more than two groups. Bonferroni's multiple comparison or Tamhane's T2 was applied to compare each group individually. Student's t-test or the Welch test were used to compare two groups. Homogeneity was assessed by the Levene test.

The age-adjusted means for overseas employees and those in Japan was compared by analysis of covariance (ANCOVA) and Bonferroni's multiple comparison. Before applying this method, the age \times group interaction and regression coefficient $\neq 0$ were assessed by a test of slope homogeneity and a regression test, respectively. All statistical analysis were performed using SPSS 12.0J for Windows.

A multiple logistic regression analysis was applied to assess the association with mental-

health disturbances. The relationships between mental-health status and individual, assignment-related, work-related and rest factors were expressed as odds ratio (OR) and 95% confidence interval (CI). A stepwise procedure with $p < 0.20$ for entry and removal was applied to select significant independent variables. The forced entry method was applied to the variables length of assignment and average number of hours' sleep for the purpose of adjustment. Mental-health status, as a dependent variable, was classified into two groups, poor ("In light of other symptoms, decide whether to consult a specialist or not" and "You are recommended to consult a specialist") and good mental-health status based on the conversion table stratified age and gender¹¹. Multiple categorical variables and selected reference groups which showed best or worst mental-health status in the bivariate analysis were created except for the variables length of assignment, job stress and average number of hours' sleep. The criterion of multicollinearity was defined as a variance inflation factor (VIF) of more than 4. The VIFs for tension/anxiety, depression/dejection, anger/hostility, vigor, fatigue, and confusion were in the range 1.09–2.03, 1.09–3.34, 1.02–1.55, 1.03–1.68, 1.04–3.07 and 1.06–2.06 respectively. This statistical analysis was performed using the JMP ver 6.0 (SAS Institute Japan) package. The significance level was set at $p < 0.05$.

4. *Ethical considerations*

This study complied with the ethical guidelines for epidemiological research established by the Ministry of Education, Sports, Sciences and Technology, and the Ministry of Health, Labor and Welfare, Japan. Anonymous data were received from the company and analyzed by the authors.

Results

The criteria for a valid response from overseas employees were full response as regards age, gender, assignment region, job type, GJSQ and POMS. Four hundred and seventy three overseas employees fulfilled these criteria (response rate: 86.6%). There were very few overseas employees 60 years of age or older and assigned to South

Table 1. Characteristics of overseas and Japan-based employees

	n	Median	IQR [†]	Range
Overseas				
Age [yr]	450	39	33–46	25–59
Length of assignment [yr]	450	6	3–13	0–33
Time at present location [yr]	449	2	1–4	0–31
Average daily working hours in the last week [h/d]	447	12	10–12	3–19
Hours of overtime worked in the last month [h/mo]	359	60	40–80	0–200
Commute time [min]	446	25	15–40	2–210
Average number of hours' sleep per workday [h/d]	450	6	6–7	4–8
Number of days' holiday in the last month [d/mo]	447	7	4–8	0–21
	n	Mean	SD	Range
Quantitative Workload (Quinn)	450	14.3	3.3	5–20
Variance in Workload	450	10.3	2.5	3–15
Cognitive Demand	450	15.9	2.1	10–20
Role Ambiguity	450	16.5	5.5	6–42
Job Control	450	56.6	10.1	30–80
Social Support	450	10.8	2.3	3–15
	n	Median	IQR [†]	Range
Japan				
Age [yr]	683	50	45–55	34–59

[†]Interquartile range

Table 2-1. Mental-health status of overseas employees classified according to individual and assignment-related factors

	n (%)	Tension/ Anxiety	Depression/ Dejection	Anger/ Hostility	Vigor	Fatigue	Confusion
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Individual Factors							
Age [yr]							
a 25–29	44 (9.8)	12.4 (6.2)	12.2 (9.7)	12.7 (9.3)	12.0 (4.9)	11.6 (6.0)	10.1 (4.6)
b 30–39	194 (43.1)	12.6 (5.7)	11.8 (9.2)	13.5 (9.1)	11.3 (5.4)	12.3 (6.3)	10.1 (4.6)
c 40–49	138 (30.7)	12.5 (5.8)	11.6 (8.8)	12.3 (7.5)	11.5 (5.2)	10.7 (5.7)	10.1 (4.4)
d 50–59	74 (16.4)	11.7 (5.9)	10.8 (10.1)	11.3 (8.0)	11.9 (5.6)	9.1 (5.1)	9.4 (4.3)
One-way ANOVA		p=0.714	p=0.845	p=0.256	p=0.752	p<0.001	p=0.748
Tamhane's T2						b-d***	
Marital status (n=447)							
Married	393 (87.9)	12.3 (5.7)	11.3 (9.2)	12.6 (8.2)	11.6 (5.3)	11.1 (5.9)	9.9 (4.5)
Other	54 (12.1)	13.1 (6.5)	13.5 (9.9)	13.5 (10.3)	10.4 (4.7)	12.3 (6.6)	10.4 (4.5)
t test		p=0.327	p=0.108	p=0.439	p=0.121	p=0.162	p=0.410
Assignment-Related Factors							
Length of assignment [yr]							
a <2	87 (19.3)	13.2 (6.3)	12.7 (10.6)	13.1 (9.0)	11.4 (5.1)	11.9 (6.1)	10.9 (4.7)
b 2–<5	103 (22.9)	12.0 (5.4)	12.0 (8.3)	13.3 (8.4)	11.4 (5.0)	11.7 (6.0)	9.7 (4.3)
c 5–<10	101 (22.4)	13.0 (6.1)	12.1 (8.9)	13.6 (8.8)	11.5 (5.1)	12.4 (6.2)	10.3 (4.6)
d 10–<15	66 (14.7)	13.5 (6.0)	11.4 (9.5)	13.0 (8.7)	10.4 (5.8)	11.5 (5.8)	10.5 (4.7)
e ≥15	93 (20.7)	10.7 (5.0)	9.6 (9.1)	10.5 (7.3)	12.6 (5.5)	8.6 (5.0)	8.6 (3.8)
One-way ANOVA		p=0.008	p=0.194	p=0.079	p=0.141	p<0.001	p=0.006
Bonferroni's multiple comparison		a-e*				a-e**, b-e** c-e***, d-e*	a-e**
Time at present location [yr] (n=449)							
a <1	91 (20.3)	14.4 (6.0)	13.8 (10.1)	12.5 (8.0)	10.6 (4.4)	11.8 (5.6)	11.2 (4.5)
b 1–<2	115 (25.6)	12.1 (6.3)	11.0 (10.2)	12.3 (8.2)	11.9 (5.6)	11.2 (6.2)	9.7 (4.8)
c 2–<4	120 (26.7)	11.8 (5.3)	11.5 (8.3)	12.9 (8.5)	11.3 (5.2)	11.4 (5.8)	9.9 (4.3)
d ≥4	123 (27.4)	11.8 (5.4)	10.6 (8.5)	13.0 (9.2)	12.0 (5.7)	10.7 (6.3)	9.3 (4.2)
One-way ANOVA		p=0.004	p=0.073	p=0.901	p=0.217	p=0.592	p=0.018
Bonferroni's multiple comparison		a-b*, a-c** a-d**					a-d*
Assignment region							
a East Asia	158 (35.1)	13.4 (6.5)	13.1 (10.6)	14.1 (9.4)	11.3 (5.5)	12.1 (6.6)	10.6 (5.1)
b Southeast & South Asia [†]	104 (23.1)	12.7 (5.4)	11.7 (8.5)	12.5 (7.3)	11.9 (5.3)	11.2 (5.6)	10.0 (4.2)
c North America	105 (23.3)	11.9 (5.3)	10.9 (9.1)	11.4 (8.5)	11.4 (5.2)	10.8 (5.6)	9.8 (4.0)
d Europe	83 (18.4)	10.9 (5.1)	9.5 (7.3)	11.9 (7.7)	11.6 (5.2)	10.1 (5.5)	8.8 (3.8)
One-way ANOVA		p=0.011	p=0.028	p=0.060	p=0.861	p=0.081	p=0.031
Tamhane's T2		a-d**	a-d*				a-d*
Type of assignment (n=437)							
Business bachelor	141 (32.3)	13.2 (6.5)	13.0 (10.5)	12.5 (9.0)	11.0 (5.1)	11.2 (6.3)	10.4 (4.8)
Other	296 (67.7)	12.0 (5.4)	10.8 (8.6)	12.7 (8.2)	11.8 (5.4)	11.2 (5.9)	9.8 (4.3)
¹⁾ t test, ²⁾ Welch test		p=0.066 ²⁾	p=0.038 ²⁾	p=0.835 ¹⁾	p=0.129 ¹⁾	p=0.999 ¹⁾	p=0.190 ¹⁾

[†]Southeast Asia: n=82, South Asia: n=22

America and Africa, therefore 23 subjects were excluded. A final total of 450 subjects were included in the study.

Six hundred and eighty seven employees in Japan responded fully to the questionnaire (response rate: 99.9%). Four of these were excluded as they were 60 years of age or older, which led to a final total of 683 subjects included in

the study.

Table 1 shows the characteristics of overseas and Japan-based employees.

The lowest age of employees in Japan was higher than that for overseas employees. The mean and standard deviation were calculated for job stress for comparison with previous studies.

1. Mental-health status and various factors

Table 2-2. Mental-health status of overseas employees classified according to work-related and rest factors

	n (%)	Tension/ Anxiety Mean (SD)	Depression/ Dejection Mean (SD)	Anger/ Hostility Mean (SD)	Vigor Mean (SD)	Fatigue Mean (SD)	Confusion Mean (SD)
Work-Related Factors							
Job type							
a Managerial	156 (34.7)	12.3 (6.1)	10.0 (9.1)	11.9 (8.5)	11.6 (5.5)	10.5 (6.0)	9.4 (4.4)
b Clerical	36 (8.0)	10.1 (5.8)	10.0 (7.7)	10.9 (6.4)	11.9 (5.6)	10.6 (5.5)	9.1 (4.6)
c Sales	100 (22.2)	11.7 (5.8)	10.8 (8.9)	12.7 (8.6)	12.1 (5.8)	10.6 (6.0)	9.5 (4.5)
d Production control	21 (4.7)	15.1 (5.0)	15.6 (8.3)	14.8 (7.2)	11.0 (4.6)	13.5 (6.0)	10.1 (3.8)
e Engineer	116 (25.8)	13.6 (5.3)	14.2 (9.9)	14.0 (8.6)	11.1 (4.5)	12.5 (5.8)	11.2 (4.5)
f Other†	21 (4.7)	11.5 (5.1)	11.3 (8.7)	12.7 (10.5)	10.4 (5.5)	11.5 (6.2)	10.5 (4.1)
One-way ANOVA		p=0.003	p=0.002	p=0.221	p=0.686	p=0.034	p=0.015
Bonferroni's multiple comparison		b-d*, b-e*	a-e**				a-e*
Average daily working hours in the last week [h/d] (n=447)							
a <10	42 (9.4)	11.8 (5.2)	11.9 (10.5)	12.1 (8.7)	12.5 (4.9)	10.5 (6.2)	9.8 (4.1)
b 10-<11	89 (19.9)	10.4 (4.9)	8.6 (6.7)	10.5 (6.8)	12.8 (5.1)	8.8 (4.9)	8.3 (3.6)
c 11-<12	91 (20.4)	11.4 (5.7)	10.0 (8.3)	11.4 (8.2)	12.3 (5.1)	9.9 (5.9)	9.3 (4.4)
d 12-<13	124 (27.7)	14.1 (6.0)	13.4 (9.7)	14.0 (8.7)	10.8 (5.3)	13.0 (5.9)	11.0 (4.7)
e ≥13	101 (22.6)	13.4 (6.0)	13.5 (10.2)	14.4 (9.3)	10.1 (5.5)	12.8 (5.9)	10.8 (4.6)
One-way ANOVA		p<0.001	p<0.001	p=0.004	p<0.001	p<0.001	p<0.001
¹⁾ Bonferroni's multiple comparison		b-d*** ¹⁾	b-d*** ²⁾	b-d* ¹⁾	b-e** ¹⁾	b-d*** ¹⁾	b-d*** ¹⁾
²⁾ Tamhane's T2		b-e** ¹⁾	b-e** ²⁾	b-e* ¹⁾	c-e* ¹⁾	b-e*** ¹⁾	b-e** ¹⁾
		c-d*** ¹⁾				c-d*** ¹⁾	c-e** ¹⁾
Hours of overtime worked in the last month [h/mo] (n=359)							
a <20	50 (13.9)	13.1 (6.3)	13.6 (11.1)	13.6 (8.2)	10.9 (4.9)	11.9 (6.1)	10.7 (5.0)
b 20-<40	31 (8.6)	10.5 (5.4)	9.0 (8.0)	8.8 (5.4)	12.7 (5.4)	8.3 (4.2)	8.7 (3.5)
c 40-<60	78 (21.7)	10.5 (4.5)	9.0 (6.6)	10.7 (6.7)	12.3 (5.1)	9.8 (5.2)	9.0 (3.4)
d 60-<80	67 (18.7)	12.0 (6.0)	10.3 (6.7)	11.5 (7.3)	11.4 (4.9)	10.3 (5.7)	10.0 (4.9)
e 80-<100	68 (18.9)	13.6 (5.4)	13.5 (9.8)	13.2 (9.1)	11.2 (5.2)	12.4 (6.2)	10.2 (4.5)
f ≥100	65 (18.1)	13.8 (6.2)	13.2 (10.4)	15.3 (9.8)	10.1 (5.9)	13.6 (6.3)	11.0 (5.0)
One-way ANOVA		p<0.001	p=0.003	p=0.001	p=0.123	p<0.001	p=0.055
¹⁾ Bonferroni's multiple comparison		c-e* ¹⁾	c-e* ²⁾	a-b* ²⁾ , b-e* ²⁾		a-b* ²⁾ , b-e** ²⁾	
²⁾ Tamhane's T2		c-f** ¹⁾		b-f** ²⁾		b-f** ²⁾	
				c-f* ²⁾		c-f** ²⁾ , d-f** ²⁾	
Commute time [min] (n=446)							
a <30	226 (50.7)	12.4 (5.9)	11.2 (9.3)	12.7 (8.9)	11.9 (5.5)	11.2 (6.1)	9.9 (4.5)
b 30-<60	144 (32.3)	11.6 (5.7)	11.4 (9.5)	12.0 (7.9)	11.5 (5.4)	10.6 (5.8)	9.6 (4.6)
c ≥60	76 (17.0)	14.2 (5.5)	13.4 (8.7)	14.1 (8.0)	10.4 (4.7)	12.7 (5.7)	11.1 (4.2)
One-way ANOVA		p=0.007	p=0.199	p=0.202	p=0.113	p=0.043	p=0.058
Bonferroni's multiple comparison		b-c**				b-c*	
Rest Factors							
Average number of hours' sleep per workday [h/d]							
a <6.0	100 (22.2)	13.2 (5.5)	12.4 (9.0)	13.0 (7.6)	11.0 (5.9)	11.9 (5.6)	10.4 (4.6)
b 6.0-<7.0	224 (49.8)	12.6 (6.2)	11.8 (9.9)	13.1 (9.1)	11.4 (5.2)	11.7 (6.2)	10.1 (4.7)
c ≥7.0	126 (28.0)	11.4 (5.2)	10.6 (8.3)	11.7 (8.1)	12.2 (4.9)	10.0 (5.7)	9.4 (3.8)
One-way ANOVA		p=0.062	p=0.315	p=0.297	p=0.172	p=0.018	p=0.177
¹⁾ Bonferroni's multiple comparison		a-c** ²⁾				b-c* ¹⁾	
²⁾ Tamhane's T2							
Number of days' holiday in the last month [d/mo] (n=447)							
a <5	117 (26.2)	13.7 (6.1)	12.5 (10.2)	13.7 (9.4)	11.3 (5.5)	12.2 (6.3)	10.6 (4.8)
b 5-7	134 (30.0)	13.0 (5.8)	12.3 (9.6)	13.8 (8.3)	11.6 (5.2)	12.0 (6.1)	10.2 (4.7)
c ≥8	196 (43.8)	11.2 (5.4)	10.4 (8.3)	11.3 (7.9)	11.6 (5.3)	10.1 (5.5)	9.4 (4.1)
One-way ANOVA		p<0.001	p=0.090	p=0.011	p=0.868	p=0.002	p=0.047
¹⁾ Bonferroni's multiple comparison		a-c*** ¹⁾		b-c* ²⁾		a-c*** ¹⁾	
²⁾ Tamhane's T2		b-c* ¹⁾				b-c* ¹⁾	

†Including manufacturing: n=3

Table 2-1 shows the mental-health status of overseas employees classified according to individual and assignment-related factors.

As regards assignment-related factors, the tension/anxiety and confusion scores differed significantly between the four groups for time at present location, with the tension/anxiety score for less than 1 year being significantly higher than for the other groups and the confusion score for less than 1 year being significantly higher than for 4 years or more.

The tension/anxiety, depression/dejection and confusion scores differed significantly between the four assignment regions, with those for East Asia being significantly higher than those for Europe.

Table 2-2 shows the mental-health status of overseas employees classified according to work-related and rest factors.

As regards work-related factors, the tension/anxiety, depression/dejection, fatigue and confusion scores differed significantly between the six different job types, with the tension/anxiety scores for production controllers and engineers being significantly higher than for clerical workers and the depression/dejection and confusion scores for engineers being significantly higher than for those in managerial posts.

All mood states differed significantly between the five groups for average daily working hours in the last week, with the tension/anxiety,

depression/dejection, anger/hostility, fatigue and confusion scores for 12 to less than 13 hours and 13 hours or more being significantly higher than those for 10 to less than 11 hours, the tension/anxiety score for 12 to less than 13 hours being significantly higher than that for 11 to less than 12 hours, the fatigue score for 12 to less than 13 hours and 13 hours or more being significantly higher than those for 11 to less than 12 hours and the vigor score for 13 hours or more being significantly lower than that for 10 to less than 11 hours and 11 to less than 12 hours. Just over half (50.3%) of overseas employees worked 12 hours or more a day.

The tension/anxiety, depression/dejection, anger/hostility and fatigue scores differed significantly between the six groups for hours of overtime worked in the last month, with the tension/anxiety scores for 80 to less than 100 hours and 100 hours or more being significantly higher than those for 40 to less than 60 hours, the depression/dejection score for 80 to less than 100 hours being significantly higher than that for 40 to less than 60 hours, the anger/hostility and fatigue scores for less than 20 hours, 80 to less than 100 hours and 100 hours or more being significantly higher than that for 20 to less than 40 hours, these scores for 100 hours or more being significantly higher than those for 40 to less than 60 hours, and the fatigue score for 100 hours or more being

Table 3. Comparison between age and mental-health status of overseas and Japan-based employees by generation

	n	Age	Tension/ Anxiety	Depression/ Dejection	Anger/ Hostility	Vigor	Fatigue	Confusion
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
34-39 [yr]								
Overseas	119	36.2 (1.7)	12.7 (5.5)	11.7 (8.9)	13.4 (8.9)	11.0 (5.7)	12.3 (6.0)	9.8 (4.4)
Japan	67	36.1 (1.3)	10.6 (5.1)	10.5 (8.9)	10.1 (6.7)	10.5 (4.7)	9.4 (5.7)	9.2 (4.1)
		p=0.842 ²⁾	p=0.014 ¹⁾	p=0.360 ¹⁾	p=0.004 ²⁾	p=0.542 ¹⁾	p=0.001 ¹⁾	p=0.380 ¹⁾
40-49 [yr]								
Overseas	138	43.9 (2.9)	12.5 (5.8)	11.6 (8.8)	11.8 [†] (0.7) [‡]	11.5 (5.2)	10.4 [†] (0.5) [‡]	10.1 (4.4)
Japan	263	45.7 (2.1)	12.5 (5.4)	13.2 (10.2)	12.2 [†] (0.5) [‡]	9.8 (5.2)	10.7 [†] (0.4) [‡]	10.2 (4.4)
		p<0.001 ²⁾	p=0.986 ¹⁾	p=0.114 ¹⁾	p=0.623 ³⁾	p=0.002 ¹⁾	p=0.619 ³⁾	p=0.765 ¹⁾
50-59 [yr]								
Overseas	74	53.5 (2.7)	11.4 [†] (0.6) [‡]	10.8 (10.1)	11.3 (8.0)	12.2 [†] (0.6) [‡]	8.8 [†] (0.6) [‡]	9.2 [†] (0.5) [‡]
Japan	353	54.9 (2.4)	11.7 [†] (0.3) [‡]	11.6 (8.2)	11.1 (6.5)	10.7 [†] (0.3) [‡]	8.7 [†] (0.3) [‡]	9.6 [†] (0.2) [‡]
		p<0.001 ²⁾	p=0.707 ³⁾	p=0.455 ¹⁾	p=0.840 ²⁾	p=0.028 ³⁾	p=0.830 ³⁾	p=0.501 ³⁾
Total								
Overseas	331	43.3 (6.9)	12.4 (5.7)	11.5 (9.1)	12.5 (8.2)	11.6 [†] (0.3) [‡]	10.3 [†] (0.3) [‡]	9.8 (4.4)
Japan	683	49.5 (6.5)	11.8 (5.0)	12.1 (9.1)	11.3 (6.9)	10.3 [†] (0.2) [‡]	9.7 [†] (0.2) [‡]	9.8 (4.1)
		p<0.001 ¹⁾	p=0.152 ²⁾	p=0.282 ¹⁾	p=0.026 ²⁾	p<0.001 ³⁾	p=0.121 ³⁾	p=0.801 ¹⁾

¹⁾t test, ²⁾Welch test, ³⁾ANCOVA

[†]age-adjusted mean, [‡]standard error

Table 4. Comparison between age and mental-health status of employees for all regions (34-59 years of age)

Region	n	Age	Tension/ Anxiety	Depression/ Dejection	Anger/ Hostility	Vigor	Fatigue	Confusion
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
a East Asia	111	43.8 (6.8)	13.9 (6.5)	13.6 (10.4)	13.9 [†] (0.7) [‡]	11.4 [†] (0.5) [‡]	11.7 [†] (0.5) [‡]	10.7 (5.1)
b SE [#] & S [§] Asia	78	44.4 (7.3)	12.9 (5.1)	12.2 (8.8)	12.7 [†] (0.8) [‡]	11.8 [†] (0.6) [‡]	10.6 [†] (0.6) [‡]	9.9 (4.0)
c North America	82	42.9 (7.3)	11.6 (5.2)	9.8 (8.4)	10.4 [†] (0.8) [‡]	11.7 [†] (0.6) [‡]	9.6 [†] (0.6) [‡]	9.6 (3.9)
d Europe	60	41.5 (6.0)	10.0 (4.5)	8.8 (7.0)	10.5 [†] (1.0) [‡]	11.7 [†] (0.7) [‡]	8.2 [†] (0.7) [‡]	8.4 (3.4)
e Japan	683	49.5 (6.5)	11.8 (5.0)	12.1 (9.1)	11.5 [†] (0.3) [‡]	10.3 [†] (0.2) [‡]	9.7 [†] (0.2) [‡]	9.8 (4.1)
		p<0.001 ¹⁾	p<0.001 ¹⁾	p=0.004 ¹⁾	p=0.003 ³⁾	p=0.014 ³⁾	p<0.001 ³⁾	p=0.016 ¹⁾
		a-e***2)	a-d***2)	a-d**2)	a-c**4)		a-d***4)	a-d**2)
		b-e***2)	a-e*2)	d-e**2)	a-d**4)		a-e**4)	
		c-e***2)	b-d**2)		a-e*4)			
		d-e***2)	d-e*2)					

¹⁾One-way ANOVA, ²⁾Tamhane's T2, ³⁾ANCOVA, ⁴⁾Bonferroni's multiple comparison,

[#]Southeast, [§]South, [†]age-adjusted mean, [‡]standard error

significantly higher than that for 60 to less than 80 hours. Some 37.0% of overseas employees worked 80 hours or more overtime per month.

As for rest factors, the tension/anxiety, anger/hostility, fatigue and confusion scores differed significantly between the three groups for number of days' holiday in the last month, with the tension/anxiety and fatigue scores for 8 days or more being significantly lower than for the other groups and the anger/hostility score for 8 days or more being significantly lower than for 5 to 7 days.

2. Mental-health status of overseas and Japan-based employees

Table 3 shows the comparison between age and mental-health status of overseas and Japan-based employees by generation.

The mental-health status of overseas employees and those of employees in Japan was compared for three age ranges (34–39, 40–49, and 50–59 years of age) as the lowest age for employees based in Japan was 34 years. For the 34–39 years age group, the tension/anxiety, anger/hostility and fatigue scores for overseas employees were significantly higher than for those of employees in Japan. As for the groups in their forties and fifties and total subjects, overseas employees were, on average, younger and had a higher vigor score than employees in Japan, and for total subjects, the anger/hostility score for overseas employees was significantly higher than for those in Japan.

Table 4 shows the comparison between age and mental-health status of employees for all regions.

A significant difference between employees in Japan and in other regions was observed in age, tension/anxiety, depression/dejection, anger/hostility and fatigue scores, with employees in Japan being significantly older than in any of the other regions. Likewise, the tension/anxiety and depression/dejection scores of employees in Japan were significantly higher than those in Europe, whereas their tension/anxiety, anger/hostility and fatigue scores were significantly lower than those overseas employees in East Asia.

3. Factors associated with mental-health status

Table 5 shows the factors associated with the mental-health status of overseas employees as determined by multiple logistic regression analysis.

Poor mental-health status was significantly associated with age, time at present location, assignment region, job type, average daily working hours, commute time, job stress and average number of hours' sleep and number of days' holiday.

As regards age, employees in their forties were positively associated with poor mental-health status (tension/anxiety), and the 25–29 years age group and those in their thirties were negatively associated with depression/dejection and confusion, in comparison with those in their fifties; the 25–29 years age group was also negatively associated with anger/hostility and fatigue.

As for time at present location, those employees in the 2 to less than 4 years and 4 years or more groups were negatively associated with tension/

Table 5. Factors associated with the mental-health status of overseas employees as determined by multiple logistic regression analysis

	Tension/Anxiety			Depression/Dejection			Anger/Hostility			Vigor			Fatigue			Confusion		
	n (%)	OR	95% CI	n (%)	OR	95% CI	n (%)	OR	95% CI	n (%)	OR	95% CI	n (%)	OR	95% CI	n (%)	OR	95% CI
Individual Factor																		
Age [yr]																		
25-29	91 (20.6)	0.395	0.114-1.152	89 (19.9)	0.176	0.041-0.621 **	104 (24.0)	0.338	0.112-0.882 *	118 (26.2)	0.348	0.122-0.925 *	143 (32.2)	0.348	0.122-0.925 *	119 (26.7)	0.157	0.050-0.447 ***
30-39	351 (79.4)			358 (80.1)	0.481	0.240-0.954 *	329 (76.0)			332 (73.8)			301 (67.8)			327 (73.3)		
40-49		2.665	1.454-4.952 **															
50-59		1	reference		1	reference		1	reference		1	reference		1	reference		1	reference
Assignment-Related Factors																		
Length of assignment [yr]																		
<1	1.008	0.957-1.058		1.044	0.993-1.098		0.971	0.930-1.012		1.031	0.991-1.071		0.990	0.947-1.034		0.972	0.925-1.018	
1-2	0.680	0.321-1.429					1	reference		1	reference		1	reference		1	reference	
2-4	0.344	0.153-0.755 **					1.418	0.813-2.447										
≥4	0.275	0.121-0.607 **																
Assignment region																		
East Asia	5.594	2.157-16.487 ***		7.548	2.912-22.293 ***		1.604	0.939-2.742								0.640	0.355-1.129	
Southeast & South Asia	4.728	1.691-14.699 **		4.675	1.679-14.433 **											4.167	1.863-10.009 ***	
North America	2.607	0.947-7.899		3.997	1.495-11.895 **											2.391	1.038-5.801 *	
Europe	1	reference		1	reference		1	reference		1	reference		1	reference		1	reference	
Type of assignment																		
Business bachelor																		
Other																		
Work-Related Factors																		
Job type																		
Managerial	1	reference		1	reference		1	reference		1	reference		1	reference		1	reference	
Clerical	0.355	0.074-1.244					0.267	0.059-0.867 *		0.267	0.059-0.867 *		1.737	0.946-3.176				
Sales																		
Production control	5.268	1.520-18.013 **		2.601	0.734-8.401											2.779	0.987-7.957	3.102
Engineer	2.328	1.168-4.679 *		3.596	1.894-6.936 ***		2.965	1.094-7.813 *								2.809	1.576-5.061 ***	
Daily working hours in the last week [h/d]																		
<10	1	reference		1	reference		1	reference		1	reference		1	reference		1	reference	
10-11	2.330	1.195-4.590 *		2.063	1.007-4.283 *													
12-13	1.956	0.929-4.142		2.651	1.227-5.814 *													
≥14																		
30-<60	0.515	0.264-0.971 *																
≥60	1	reference																
Job stressors																		
Quantitative workload																		
Variance in workload	1.222	1.075-1.394 **		0.886	0.763-1.023		1.130	1.027-1.247 *		1.155	1.025-1.304 *		1.176	1.012-1.372 *		1.186	1.084-1.302 ***	
Cognitive Demand	1.186	1.016-1.390 *		1.180	1.008-1.387 *		1.176	1.017-1.364 *		1.226	1.094-1.379 ***		1.044	0.990-1.102		1.163	1.012-1.341 *	
Role Ambiguity	1.102	1.046-1.163 ***		1.071	1.008-1.140 **		1.073	1.022-1.128 **		1.079	1.024-1.138 **		0.975	0.945-1.006		1.060	1.005-1.120 *	
Job Control																		
Social Support																		
Buffer factor																		
0.951	0.915-0.986 **		0.840	0.743-0.947 **		0.880	0.784-0.987 *		0.844	0.762-0.934 **		0.857	0.772-0.950 **		0.970	0.939-1.002		
Rest Factors																		
Average number of hours' sleep per workday [h/d]																		
<5	0.972	0.660-1.438		1.028	0.699-1.519		1.033	0.737-1.454		0.729	0.535-0.988 *		1.136	0.831-1.562		1.104	0.784-1.561	
5-7																		
2.486	1.353-4.633 **		1.928	0.999-3.739		2.486	1.353-4.633 **		2.285	1.276-4.129 **		2.219	1.246-4.000 **					
≥8																		
1	reference		1	reference		1	reference		1	reference		1	reference		1	reference		
R square																		
0.242	***		0.218	***		0.163	***		0.125	***		0.187	***		0.190	***		

OR: Odds ratio, CI: Confidence interval, *p<0.05, **p<0.01, ***p<0.001

anxiety in comparison with those in the less than 1 year group, and in terms of assignment region, employees in East Asia and Southeast & South Asia were positively associated with tension/anxiety, depression/dejection and confusion, and those in North America were positively associated with depression/dejection and confusion, in comparison with employees in Europe.

In terms of job type, production controllers were positively associated with tension/anxiety, engineers were positively associated with tension/anxiety, depression/dejection and confusion, and clerical workers were negatively associated with anger/hostility, in comparison with those in managerial posts.

Employees working for between 12 and less than 13 hours per day were positively associated with tension/anxiety, depression/dejection, fatigue and confusion, and those working for less than 10 hours per day and 13 hours or more per day were positively associated with depression/dejection, in comparison with those working for between 10 and less than 11 hours per day. In terms of job stress, quantitative workload, variance in workload, cognitive demand and role ambiguity tend to be positively associated, and job control and social support tend to be negatively associated, with poor mental-health status.

Finally, for the rest factors, for the number of days' holiday in the last month, less than 5 days was positively associated with fatigue and between 5 and 7 days was positively associated with anger/hostility and fatigue in comparison with 8 days or more per month.

Discussion

1. Regional characteristics of mental-health status

This study revealed that the mental-health status of overseas employees in East Asia was worse than that of employees in Europe. The company's bases in East Asia only became fully operational in 2002, therefore their operations may not yet be stable. This situation is likely to negatively affect the mental-health status of employees in East Asia.

As for regional characteristics, a previous study showed that the mental-health status of employees in Ho Chi Minh City was worse than those in Vancouver and Dusseldorf¹⁴. Our study is consistent with this previous study in that those employees in developing countries had worse mental-health status than those in developed countries, although there was no difference between those in Western Europe, North America, and Southeast Asia¹⁵. It is, however, difficult to make a strict comparison between these two studies as the previous one did not include East Asia and the measurement methods were different. Further study is therefore needed on this topic.

Our findings that the mental-health status of employees in Europe was better than for those in Japan and that the vigor score of overseas employees in general was higher than that for employees in Japan might shed new light on previous studies based on the concept of culture shock or cross-cultural stress⁷. As typical working hours in Western countries are shorter than those in Japan¹⁶, future studies should classify the differences in working environment by region.

2. Time at present location

The findings regarding time at present location are consistent with the previous study¹⁵, which showed that the mental-health status of employees who had been at a location for less than 1 year was worse than those who had been abroad for 2 years or more. However, to the best of our knowledge, this study is the first to obtain a similar result using a multivariate analysis adjusted for length of assignment and other factors. General health questionnaires have been used to assess mental-health status in many previous studies¹⁵⁻¹⁷, therefore our use of a different questionnaire to determine mental-health status may be responsible for this result.

3. Working hours and overtime

Just over half (50.3%) of the employees in this study worked for more than 12 hours per day, whereas only around 2.3% of the male employees in Japan studied by Suwasono et al.¹⁸ did so. Some 37.0% of the employees in our study worked 80 hours or more overtime per month, whereas only

6.2% of the male and female employees in Japan studied by Sato et al.¹⁹⁾ did so. The average number of daily working hours and amount of overtime worked per month by overseas employees in this study were also higher than in other studies undertaken in Japan²⁰⁻²³⁾. The overseas employees in our study therefore work very long hours, which suggests the need to take measures to reduce their workload.

4. Working hours and mental-health status

As can be seen from Table 2-2, an average working day of 12 hours or more and 80 hours or more overtime per month are indicators of poor mental-health status. The multivariate analysis also showed that an average working day of 12 hours or more is associated with poor mental-health status. The average working day and amount of overtime worked per month should therefore be limited to less than 12 hours and 80 hours, respectively.

Previous studies showed that number of daily working hours was associated with irritability and chronic tiredness¹⁸⁾ and mental and physical fatigue²⁴⁾. As regards POMS, Proctor et al.²⁵⁾ showed that working for more than 8 hours a day was significantly associated with depression, fatigue and confusion. As these reports define working hours differently (e.g. per day¹⁸⁾, per month²⁴⁾, it is difficult to compare our study with these two. However, these reports support the findings of our study in the sense that a larger number of hours worked is associated with poor mental-health status.

As a working day of less than 10 hours was positively associated with depression/dejection in comparison with one of 10 to less than 11 hours, it appears that employees with poor mental-health status leave work early. Ezoe et al.²¹⁾ showed that a working day of 9 hours or less was associated with social dysfunction, therefore care should be taken when establishing a reference group in cross-sectional studies.

5. Job stress

The results obtained with the generic job stress questionnaire showed that the variance in workload and cognitive demand scores of overseas employees

are slightly higher, the role ambiguity score slightly lower and job control score substantially higher in this study than in a previous study undertaken in Japan²⁶⁾. These score patterns are similar to those for employees in managerial posts based on nationwide data for Japan²⁷⁾. This is probably due to the fact that overseas assignments often involve working as a technical assistant for local staff or field management. Ihara et al.²⁸⁾ found that job control after a one-year assignment was significantly higher than that before the assignment using a Job Content Questionnaire.

6. Rest characteristic and mental-health status

The percentage of employees in this study who took fewer than 5 days' holiday in the last month was 26.2% and those taking between 5 and 7 days was 30.0%; a holiday of 7 days or less was associated with poor mental-health status. Suwazono et al.¹⁸⁾ reported that the percentage of male employees in Japan taking 3 to 4 days and 5 to 6 days holiday was 2.7% and 7.0%, respectively. The number of days' holiday taken by overseas employees in this study seems very low. Previous studies of overseas employees have linked the frequency of paid leave with mental-health status¹⁵⁾. Although paid leave and holidays (which includes weekends in this study) are different, the trend whereby more holidays are associated with better mental-health status is the same. To prevent poor mental-health status, overseas employees should therefore take at least 8 days' holiday per month.

7. Study limitations and future research

This study of the mental-health status of employees in Japan focused on 35-, 45- and 55-year-old employees and middle manager and manager, which could indicate a selection bias. Furthermore, to the results should be adjusted for job type, job stress and so on to highlight the differences between the mental-health status of overseas and Japan-based employees.

Our study revealed that the mental-health status of overseas employees is difference between regions and they work very long hour. Future studies should therefore classify the differences in

working environment by region.

Conclusion

Mental-health protection measures at overseas bases need to focus on Asia, especially East Asia, employees in their forties and fifties, and those who work as engineers or production controllers. Attention should also be paid to those employees who have been abroad for less than a year, both for the first time and those with experience of working in foreign settings.

Overseas employees appear to be overworked and enjoy few holidays. The average daily working hours should therefore be shortened as much as possible and employees should take at least 8 days' holiday per month.

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日本人男性海外勤務者の精神的健康度と職業関連要因との関係

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要 旨

目的：海外勤務者の精神的健康度と職業関連要因の関係と日本国内勤務者の精神的健康度の違いを明らかにすることである。

方法：同一の金属製品製造業に勤務する男性海外勤務者450名と男性日本国内勤務者683名を対象に自記式質問紙調査を行った。精神的健康度は日本版気分プロフィール検査を用いて評価した。

結果：日本国内と海外勤務者の精神的健康度の比較では、34-39歳において海外勤務者が日本国内より低く、40代と50代では海外勤務者が日本国内より高かった。

ロジスティック重回帰分析の結果、精神的健康度の不良に関連していたものは、ヨーロッパに対して東アジア (e.g. オッズ比: 7.548, 95%信頼区間 [以下CI]: 2.912-22.293 [抑うつ-落込み [以下D]]), 東南・南アジア (e.g. オッズ比: 4.675, 95% CI: 1.679-14.433 [D]), 北米 (e.g. オッズ比: 3.997, 95% CI: 1.495-11.895 [D])。管理職に対してエンジニア (e.g. OR: 2.328, 95% CI: 1.168-4.679 [緊張-不安 [以下T-A]]) と生産管理 (OR: 5.268, 95% CI: 1.520-18.013 [T-A])。労働時間10-11時間未満に対して12-13時間未満 (e.g. OR: 2.063, 95% CI: 1.007-4.283 [D]), 13時間以上 (e.g. OR: 2.651, 95% CI: 1.227-5.814 [D])。休日日数8日以上に対して5日未満 (e.g. OR: 2.285, 95% CI: 1.276-4.129 [疲労 [以下F]]), 5-7日以下 (e.g. OR: 2.219, 95% CI: 1.246-4.000 [F]) であった。

結論：海外勤務者の精神保健対策は、地域別ではアジア圏特に東アジア、職種ではエンジニアや生産管理を中心に取り組んでいく必要がある。また実労働時間が12時間を超える者や休日日数が7日以下の者には、就労時間の制限や休日日数を8日以上確保することも対策として考えられた。