and high demands were more likely to be heavy drinkers than to be light drinkers[10]. Hemmingsson *et al.* found that low work control was related to later alcohol abuse among young men by longitudinal study[11]. Greenberg *et al.* reported that low job autonomy, low use of capacities and lack of participation in decision making in the workplace were associated with heavy drinking and negative consequences from drinking[12]. Clarke *et al.* investigated the relationship of drinking frequency, alcohol consumption, duration of heavy drinking, and severity of alcohol dependence to six of the eight factors common to jobs with high incidence of alcohol dependence as reported by Plant (availability of alcohol, social pressure to drink, separation from family due to work commitments, lack of supervision, collusion in heavy drinking by colleagues, and strains and stresses; they excluded high or low income and recruitment of individuals predisposed to drink heavily)[13]. They found no significant correlation. Moreover, when they examined nine occupational stress factors and stressors (feeling strained, working alone, working irregular shifts, dangerous work, work overload, responsibility for others, job security, complicated work, and assessment by quantity of output), they found that, among men, none correlated to alcohol consumption and frequency, and among women, a significant correlation existed only with "responsibility for others".

There are few studies for Japanese workers. Kawakami *et al.* studied male workers in a Japanese computer factory and found lack of intrinsic rewards was correlated to heavy and problem drinking. Job overload, lack of control over pace and job future ambiguity was not significantly correlated to them[14]. Hagihara *et al.* reported that "work requiring advanced knowledge and skill", "time pressure", "clear job purpose or goal" was related with heavy drinking among male white-collar workers[15]. They conducted another study for 30–50 yr-old male white-collar workers and documented that job demands and skill discretion (such as a variety of skills and creativity at work) defined in the job demands-control model[30] were associated with alcohol consumption[16].

Some studies have used the demand/control model[30] to assess psychosocial work environments. Using such a model, highly stressful work environments are those with high job demand and low job control. However, different studies have arrived at different conclusions[1, 5, 17, 18]. In addition, several studies have used the effort-reward imbalance model. Using this model, work is considered stressful if despite high effort, rewards, such as wages, social approval, job security, and career advancement opportunities, are low[31]. Some studies have found that this imbalance increases the risk for alcohol dependence among men[8], but others have found no significant correlation with heavy drinking[1].

Drinking is also reported to be influenced by social support[19]. Workplace support can be divided into general support and support that directly relates to drinking, and both types of support may play a role in drinking among workers[32]. Hemmingsson *et al.* found evidence that low level of workplace support was related to later alcohol abuse among young men[11]. But in the Japanese study by Kawakami *et al.*, lack of workplace support was not correlated to heavy and problem drinking[14]. Hagihara *et al.* reported that social support has both positive and negative influences on the relationship between job stress and alcohol consumption[20].

As far as the interaction between stress and drinking is concerned, various models, including the tension reduction hypothesis[33], have been proposed, but it is generally accepted that no single model could explain all cases[34]. Cooper *et al.* stated that this association was complicated by individual differences in types of stress, coping mechanisms, responses to stress, and expectancies for effects of drinking[35]. Furthermore, national and racial differences exist in the use of alcohol to relieve stress and tension[36], and clear gender differences have been reported[37, 38]. In terms of age, studies have shown that young people are more likely to use alcohol to relieve and deal with stress[11, 39]. In contrast, some studies have not shown a clear correlation between stress factors and alcohol consumption among the elderly[40].

Therefore, the discrepancies in the results of previous studies on the association between job stress and heavy drinking are due to not only study design and measurement methods, but also race, gender, age, stress vulnerability, motivation to drink, and geographical factors.

It is supposed that certain job stressors are associated with heavy drinking among male Japanese workers. Based on the results of the above-mentioned studies, we hypothesized that the association between occupational stress and heavy drinking varies among different age groups in male Japanese workers. In order to prove this hypothesis, the association between various job stressors and heavy drinking was investigated by different age groups using the scale that could assess lots of job stressors.

Methods

Subjects

The present study was conducted using the data obtained as a baseline survey of the Japan Work Stress and Health Cohort Study (JSTRESS Study) (reported in detail elsewhere[41, 42]). A questionnaire was distributed to 29,471 workers at nine companies and factories from April 1996 to

May 1998; 25,104 workers replied (average response rate, 85.2%). Of the total respondents, 19,681 men answered questions about age, recent drinking history, and average alcohol consumption. After excluding 2,180 nondrinkers, a total of 17,501 men remained as subjects. Nondrinkers were eliminated in order to further clarify the association between job stressors and heavy drinking, because many have specific reasons for abstaining from drinking or cannot drink due to constitutional factors. Women were also excluded, because habitual drinkers are few among them.

Job stressors and heavy drinking assessment

Job stressors and workplace social support indicators were measured using the Generic Job Stress Questionnaire (GJSQ)[43]. The GJSQ was developed by researchers at the U.S. National Institute for Occupational Safety and Health (NIOSH) and assesses the components of the job-stress model. In addition to 13 stressors (physical environment, role conflict, role ambiguity, intragroup conflict, intergroup conflict, job control, quantitative work load, variance in work load, underutilization of abilities, responsibility for people, cognitive demands, job future ambiguity, and employment opportunities), it can assess buffers of stress-stress reactions (social support and self-esteem). It is designed in a modular style, and researchers can adjust forms and scales to suit each investigation. The degree of reliability for the internal consistency of each stressor ranged from 0.75 to 0.89. The validity and reliability of the Japanese version of the GJSQ have been confirmed[44, 45]. Thirteen job stressor scales and two workplace support indicator scales (supervisor support and coworker support) were used in the present study. The questionnaire contained the following: a ten-item physical environment scale, eight-item role conflict scale, six-item role ambiguity scale, eight-item intragroup conflict scale, eight-item intergroup conflict scale, sixteen-item job control scale, eleven-item quantitative workload scale, three-item variance in workload scale, three-item underutilization of abilities scale, four-item responsibility for people scale, five-item cognitive demands scale, four-item job future ambiguity scale, three-item employment opportunities scale, four-item social support from supervisors scale, and four-item social support from coworkers scale.

Heavy drinking was defined as weekly alcohol consumption of >275 g. This is based on alcohol consumption with increased risk for sickness absence as reported by a previous study[46]. This definition is also based on the estimates of increased health risk related to hazardous alcohol consumption, commonly used several countries[1]. For each subject, based on answers provided on the questionnaire form (average alcohol consumption per drinking day, average number of drinking days per month and types of alcohol beverages), weekly alcohol consumption (in grams) were calculated.

Statistical analysis

Subjects were divided into the following four age groups: 18–29, 30–39, 40–49 and 50–72 yr.

First of all, the average score for the above-mentioned 13 job stressors and workplace support indicators was calculated for each age group, and average scores were subjected to a variance analysis. The Scheffe method was used for multiple comparison. The scores of the job stressors and workplace supports were divided into tertiles labeled "low", "intermediate" or "high", so that, for example, those subjects within the top third of all scores on the physical environment scale were labeled as having "high physical environment score".

Next, the association between job stressors and heavy drinking was analyzed in three stages. First of all, logistic regression analysis was conducted by handling heavy drinking as a dependent variable and the 13 job stressor scores and 2 workplace support indicators as independent variables. For each job stressor, adjusted odds ratio and 95% confidence interval for heavy drinking were calculated. Second, the same analysis was conducted adjusting for shift work and occupational class. Third, the same analysis was conducted additionally adjusting for marital status and smoking. These analyses were carried out using SPSS 10.0J.

Ethical considerations

Because the present study analyzed the data obtained by the JSTRESS study, it was not reviewed by the Kitasato Ethical Review Board. Prior to implementation, the Human Subject Committee at Gifu University approved the investigation methods, contents and procedures of the JSTRESS study.

Results

Descriptive statistics

The rate of daily drinking (≥28 d/month) was 11.1% among the 18–29 yr old group, 26.8% among the 30–39 yr old group, 36.1% among the 40–49 yr old group and 37.9% among 50–72 yr old group.

Of the total subject population, 1,131 men (6.5%) were identified as heavy drinkers. The mean and standard deviation of weekly alcohol consumption were 351.0 mg and 168.6 mg in heavy drinkers, 81.3 mg and 65.5 mg in non-heavy drinkers.

Table 1. Demographic variables, occupational class and shift work by age group among male respondents of the baseline survey of the Japan Work Stress and Health Cohort Study

	Age group (yr)			
	18–29 (n=2,256)	30–39 (n=5,328)	40–49 (n=6,832)	50–72 (n=3,085)
	n (%)	n (%)	n (%)	n (%)
Heavy drinkers*	45 (2.0)	259 (4.9)	549 (8.0)	278 (9.0)
Basic education				
Less than high school	10 (0.4)	112 (2.1)	845 (12.7)	973 (32.4)
High school or some college	1,546 (69.5)	2,819 (53.8)	3,978 (59.6)	1,592 (53.0)
College or higher	667 (30.0)	2,309 (44.1)	1,850 (27.7)	440 (14.6)
Unknown	33 (–)	88 (–)	159 (–)	80 (–)
Marital status				
Married	612 (27.6)	4,059 (77.3)	5,972 (89.3)	2,861 (95.2)
Never married	1,596 (71.9)	1,100 (20.9)	569 (8.5)	63 (2.1)
Previously married	11 (0.5)	92 (1.8)	145 (2.2)	81 (2.7)
Unknown	37 (–)	77 (–)	146 (–)	80 (–)
Occupational class				
Manager	0	301 (5.7)	1,741 (25.9)	812 (27.0)
Professionals	232 (10.5)	1,290 (24.5)	796 (11.8)	198 (6.6)
Technicians	485 (22.0)	1,195 (22.7)	747 (11.1)	182 (6.1)
Clerks	149 (6.7)	400 (7.6)	422 (6.3)	185 (6.2)
Service & sales workers	13 (0.6)	44 (0.8)	69 (1.0)	80 (2.7)
Craft and related trade workers	314 (14.2)	561 (10.7)	960 (14.3)	427 (14.2)
Machine operators and assemblers	804 (36.4)	999 (19.0)	1,216 (18.1)	602 (20.0)
Laborers	163 (7.4)	297 (5.6)	404 (6.0)	283 (9.4)
Other	49 (2.2)	177 (3.4)	372 (5.5)	239 (7.9)
Unknown	47 (–)	64 (–)	105 (–)	77 (–)
Shift work				
Yes	810 (36.2)	1,376 (25.9)	1,065 (15.7)	440 (14.4)
No	1,430 (63.8)	3,931 (74.1)	5,702 (84.3)	2,620 (85.6)
Unknown	16 (–)	21 (–)	65 (–)	25 (–)
Smoking				
Smoker	1,230 (54.9)	2,951 (55.8)	3,833 (56.8)	1,504 (49.9)
Non-smoker	1,009 (45.1)	2,336 (44.2)	2,921 (43.2)	1,513 (50.1)
Unknown	17 (–)	41 (–)	78 (–)	68 (–)

*Average weekly consumption >275 g of absolute alcohol.

Table 1 shows the subject profiles in each age group. A χ^2 test showed a significant difference in the proportion of heavy drinkers among the age groups ($p<0.01$); the tendency was toward a higher proportion of heavy drinkers with increasing age. Moreover, χ^2 test showed a significant difference in the proportion of rotating-shift workers ($p<0.01$); the tendency was toward a lower proportion of rotating-shift workers with increasing age.

Job stressor and workplace support scores

Table 2 shows the average scores for the job stressors and workplace support indicators for each age group. The average scores of Physical environment, role conflict, role ambiguity, intragroup conflict, intergroup conflict, quantitative work load, underutilization of abilities, job future ambiguity, social support from supervisor and social support from coworkers were higher in younger age groups. The average scores of job control, responsibility for people, cognitive demands and employment opportunities were higher in elder age groups. Analysis of variance (multiple comparison by Scheffe method) showed a significant intergroup difference for role conflict, role ambiguity, intragroup conflict, intergroup conflict, quantitative work load, variance in work load, job future ambiguity, and employment opportunities among all age groups ($p<0.01$, $p<0.05$). As to the other job stressors, a significant difference was seen for some two-group combinations. Similarly, for the social support indicators, a significant difference was seen for some two-group combinations.

Table 2. Job stressor and workplace support scale scores by age groups

		18–29		30–39		40–49		50–72	
	Score range	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
Job stressor									
Physical environment	10–20	2,216	14.6 (2.9)	5,242	14.1 (3.0)	6,641	13.9 (3.1)	2,913	13.8 (3.0)
Role conflict	8–56	2,200	24.5 (7.2)	5,223	25.7 (7.4)	6,613	23.9 (7.5)	2,955	22.2 (7.8)
Role ambiguity	6–42	2,208	20.1 (5.6)	5,258	19.0 (5.7)	6,669	17.2 (5.6)	2,982	16.2 (5.7)
Intragroup conflict	8–40	2,196	20.0 (5.1)	5,203	20.4 (5.1)	6,534	19.6 (4.9)	2,874	18.9 (5.1)
Intergroup conflict	8–40	2,196	20.0 (5.2)	5,203	20.4 (5.1)	6,534	19.5 (5.1)	2,874	19.0 (5.2)
Job control	16–90	2,194	39.8 (9.9)	5,186	46.2 (11.4)	6,582	50.6 (12.6)	2,927	50.7 (13.4)
Quantitative work load	11–55	2,195	36.6 (6.2)	5,187	38.3 (6.5)	6,550	37.7 (6.5)	2,916	35.7 (6.6)
Variance in work load	3–15	2,228	8.9 (3.0)	5,273	9.5 (3.0)	6,707	9.2 (3.0)	2,994	8.5 (3.1)
Underutilization of abilities	3–15	2,231	11.0 (2.8)	5,274	10.3 (2.7)	6,717	10.1 (2.8)	2,995	10.2 (2.8)
Responsibility for people	4–20	2,225	8.0 (3.3)	5,253	10.1 (3.9)	6,683	11.9 (4.2)	2,979	11.9 (4.3)
Cognitive demands	4–20	2,228	14.2 (2.3)	5,258	15.0 (2.4)	6,725	15.2 (2.4)	3,015	15.2 (2.5)
Job future ambiguity	4–20	2,224	15.2 (3.1)	5,251	14.7 (3.4)	6,684	14.3 (3.7)	2,972	13.8 (4.3)
Employment opportunities	3–15	2,224	11.3 (1.8)	5,250	11.5 (1.7)	6,683	12.0 (1.8)	3,004	12.3 (1.8)
Workplace support									
Social support from supervisor	4–20	2,219	15.1 (3.0)	5,240	14.8 (3.1)	6,660	14.8 (3.1)	2,973	14.9 (3.2)
Social support from coworkers	4–20	2,219	15.7 (2.8)	5,240	15.2 (2.8)	6,660	15.1 (2.8)	2,973	15.1 (2.9)

One-way ANOVA (multiple comparison: Scheffe):

Not significant:

Physical environment 40–49:50–72, Job control 40–49:50–72,

Underutilization of abilities 30–39:40–49, 40–49:50–72, 30–39:50–72, Responsibility for people 40–49:50–72,

Cognitive demands 30–39:50–72, 40–49:50–72, Social support from supervisor 18–29:50–72, 30–39:40–49, 30–39:50–72, 40–49:50–72,

Social support from coworkers 30–39:40–49, 30–39:50–72, 40–49:50–72

$p<0.05$: Role conflict 18–29:40–49, Intergroup conflict 18–29:30–39

$p<0.01$: Others

Logistic regression analysis

When the scores for the thirteen job stressors and the two workplace supports were entered as explanatory variables, "physical environment" and "social support from supervisor" were significantly and positively associated with heavy drinking for the 18–29 yr-old group. For the 30–39 yr-old group, "physical environment", "role conflict" and "intragroup conflict" were significantly and positively associated with heavy drinking, and "cognitive demands" was negatively associated with heavy drinking. For the 40–49 yr-old group, in addition to "physical environment", significant associations existed with "quantitative work load" and with "underutilization of abilities". "Physical environment" and "underutilization of abilities" were positively associated with heavy drinking, and "quantitative workload" was negatively associated with heavy drinking. For the 50–72 yr-old group, "responsibility for people" and "social support from supervisor" were significantly associated with heavy drinking. In the "responsibility for people" scale, the proportion of heavy drinkers was lowest in intermediate score group. In the "social support from supervisor" scale, it was highest in the intermediate score group.

When rotating shift and occupational class were added as explanatory variables, only one factor, "social support from supervisor" was significantly and positively associated with heavy drinking for the 18–29 yr-old group and 50–72 yr-old group. For the 50–72 yr-old group, the proportion of heavy drinkers was highest in intermediate score group. For the 30–39 yr-old group, "role conflict", "intragroup conflict" and "job control" were significantly and positively associated with heavy drinking, and "cognitive demands" was negatively associated with heavy drinking. For the 40–49 yr-old group, the association of job stressors and workplace supports with heavy drinking remained unchanged.

Table 3 shows the results of the analysis including marital status and smoking as explanatory variables. Even when adjusted for marital status and smoking, there was no change in the association of heavy drinking with the job stressors and workplace support indicators for three groups. For the 30–39 yr-old group, "intragroup conflict", "job control" and "cognitive demands" were significantly associated with heavy drinkers. But "role conflict" was not significantly associated with heavy drinkers. No significant correlation existed between shift rotation and heavy drinking for any age group.

Table 3. Association of job stressors and workplace supports with heavy drinking by age groups: odds ratios (ORs) with 95% confidence intervals (CIs)

	Age group (years)							
	18–29		30–39		40–49		50–72	
	n	OR (95% CI)	n	OR (95% CI)	n	OR (95% CI)	n	OR (95% CI)
Job stressors								
Physical environment								
Low score (<14, n=6,524)	569	1.00	1,660	1.00	2,293	1.00	899	1.00
Intermediate score (n=4,718)	564	1.24 (0.46–3.35)	1,272	0.97 (0.66–1.42)	1,415	1.07 (0.83–1.40)	572	1.12 (0.75–1.67)
High score (>15, n=5,770)	767	1.57 (0.60–4.07)	1,566	1.27 (0.87–1.85)	1,568	1.34* (1.02–1.77)	650	1.17 (0.75–1.80)
Role conflict								
Low score (<22, n=5,998)	643	1.00	1,299	1.00	1,886	1.00	964	1.00
Intermediate score (n=5,117)	578	1.01 (0.43–2.38)	1,337	1.44 (0.98–2.12)	1,635	0.87 (0.67–1.13)	610	0.76 (0.51–1.15)
High score (>27, n=5,876)	679	1.41 (0.56–3.55)	1,862	0.98 (0.64–1.50)	1,755	0.92 (0.69–1.23)	547	1.03 (0.67–1.58)
Role ambiguity								
Low score (<16, n=6,281)	391	1.00	1,307	1.00	2,263	1.00	1,066	1.00
Intermediate score (n=4,529)	550	0.42 (0.15–1.16)	1,232	0.72 (0.49–1.07)	1,406	1.05 (0.81–1.36)	502	0.79 (0.51–1.21)
High score (>19, n=6,307)	959	0.89 (0.38–2.08)	1,959	0.80 (0.54–1.18)	1,607	0.76 (0.56–1.02)	553	1.22 (0.78–1.91)
Intragroup conflict								
Low score (<18, n=5,686)	613	1.00	1,317	1.00	1,910	1.00	855	1.00
Intermediate score (n=5,996)	689	1.57 (0.69–3.58)	1,644	1.15 (0.77–1.71)	1,903	0.91 (0.70–1.19)	726	0.76 (0.51–1.12)
High score (>22, n=5,125)	598	0.92 (0.31–2.69)	1,537	1.63*(1.05–2.54)	1,463	1.27 (0.93–1.75)	540	0.68 (0.41–1.12)
Intergroup conflict								
Low score (<18, n=5,636)	628	1.00	1,300	1.00	1,918	1.00	815	1.00
Intermediate score (n=5,545)	609	0.86 (0.37–2.01)	1,510	1.19 (0.80–1.78)	1,733	1.16 (0.88–1.52)	705	1.34 (0.90–2.00)
High score (>22, n=5,626)	663	0.84 (0.32–2.23)	1,688	1.11 (0.70–1.75)	1,625	1.07 (0.77–1.49)	601	1.32 (0.80–2.18)
Job control								
Low score (<44, n=5,690)	1,165	1.00	1,681	1.00	1,239	1.00	508	1.00
Intermediate score (n=5,451)	590	1.60 (0.78–3.28)	1,573	1.23 (0.86–1.76)	1,618	1.16 (0.87–1.54)	643	0.83 (0.53–1.31)
High score (>52, n=5,748)	145	0.30 (0.36–2.40)	1,244	1.54* (1.00–2.37)	2,419	1.06 (0.77–1.47)	970	0.84 (0.51–1.39)
Quantitative work load								
Low score (<35, n=6,101)	787	1.00	1,406	1.00	1,700	1.00	942	1.00
Intermediate score (n=5,458)	612	0.79 (0.34–1.83)	1,405	0.81 (0.55–1.20)	1,801	0.72* (0.55–0.94)	671	1.01 (0.67–1.53)
High score (>40, n=5,289)	501	0.74 (0.25–2.19)	1,687	0.92 (0.57–1.47)	1,775	0.72 (0.51–1.01)	508	1.09 (0.63–1.90)
Variance in work load								
Low score (<8, n=5,568)	669	1.00	1,254	1.00	1,559	1.00	831	1.00
Intermediate score (n=5,915)	677	1.55 (0.65–3.69)	1,541	1.01 (0.68–1.50)	1,827	0.98 (0.74–1.29)	705	0.95 (0.63–1.45)
High score (>10, n=5,719)	554	1.64 (0.51–5.31)	1,703	1.20 (0.73–1.96)	1,890	0.99 (0.70–1.41)	585	0.93 (0.53–1.65)
Underutilization of abilities								
Low score (<10, n=6,786)	564	1.00	1,796	1.00	2,221	1.00	932	1.00
Intermediate score (n=4,179)	430	0.63 (0.25–1.55)	1,169	0.99 (0.69–1.40)	1,322	1.04 (0.80–1.37)	484	0.88 (0.58–1.34)
High score (>11, n=6,252)	906	0.56 (0.25–1.25)	1,533	0.92 (0.64–1.33)	1,733	1.42** (1.10–1.84)	705	1.09 (0.73–1.61)

(Continued)

Discussion

Recently Osaki *et al.* conducted a nationwide survey on alcohol drinking behavior and alcohol dependence among Japanese adults using a representative sampling method, and reported that daily drinking rate was 18.6% for 20–29 yr-old men, 25.4% for 30–39 yr-old men, 36.1% for 40–49 yr-old men and 44.7% for 50–59 yr-old men[47]. The rate of daily drinking in this sample was slightly lower but almost comparable.

There were fair differences of the average scores for the job stressors among age groups. They are certainly reflected with some characteristic aspects of the working situation in each age group, which can indirectly affect the relationship between job stressors and heavy drinking.

In the present study, we were able to confirm that a significant correlation exists between heavy drinking and several job stressors and that this relationship varies among the different age groups.

While the causes for age difference could not be clarified

Table 3. (Continued) Association of job stressors and workplace supports with heavy drinking by age groups: odds ratios (ORs) with 95% confidence intervals (CIs)

	Age group (years)							
	18–29		30–39		40–49		50–72	
	n	OR (95% CI)	n	OR (95% CI)	n	OR (95% CI)	n	OR (95% CI)
Responsibility for people								
Low score (<9, n=5,661)	1,167	1.00	1,734	1.00	1,182	1.00	496	1.00
Intermediate score (n=5,404)	585	0.63 (0.29–1.34)	1,611	0.98 (0.70–1.38)	1,518	1.00 (0.75–1.34)	641	0.67 (0.42–1.05)
High score (>12, n=6,075)	148	0.52 (0.11–2.39)	1,153	0.98 (0.65–1.48)	2,576	1.14 (0.84–1.55)	984	0.96 (0.60–1.52)
Cognitive demands								
Low score (<14, n=4,528)	691	1.00	1,166	1.00	1,191	1.00	517	1.00
Intermediate score (n=5,817)	687	0.97 (0.47–2.04)	1,505	0.72 (0.51–1.02)	1,793	0.96 (0.73–1.26)	667	1.38 (0.90–2.10)
High score (>15, n=6,881)	522	0.72 (0.28–1.88)	1,827	0.67* (0.47–0.97)	2,292	1.15 (0.87–1.52)	937	1.09 (0.70–1.69)
Job future ambiguity								
Low score (<13, n=5,530)	416	1.00	1,363	1.00	1,881	1.00	846	1.00
Intermediate score (n=6,317)	839	1.04 (0.43–2.56)	1,773	0.90 (0.64–1.27)	1,883	0.83 (0.65–1.07)	640	1.12 (0.77–1.63)
High score (>16, n=5,284)	645	1.25 (0.48–3.26)	1,362	0.84 (0.57–1.24)	1,512	0.94 (0.71–1.23)	635	0.79 (0.52–1.22)
Employment opportunities								
Low score (<12, n=6,909)	988	1.00	2,189	1.00	1,976	1.00	603	1.00
Intermediate score (n=5,138)	573	0.68 (0.31–1.48)	1,329	0.83 (0.59–1.15)	1,602	0.89 (0.69–1.15)	631	0.78 (0.51–1.19)
High score (>12, n=5,114)	339	0.86 (0.35–2.10)	980	1.09 (0.77–1.55)	1,698	1.10 (0.87–1.40)	887	1.03 (0.71–1.50)
Workplace supports								
Social support from supervisor								
Low score (<14, n=5,342)	533	1.00	1,408	1.00	1,628	1.00	681	1.00
Intermediate score (n=6,432)	681	3.69* (1.16–11.68)	1,725	0.86 (0.61–1.22)	2,040	1.03 (0.79–1.34)	777	1.66* (1.10–2.50)
High score (>16, n=5,418)	686	5.44** (1.60–18.42)	1,365	0.70 (0.45–1.07)	1,608	1.05 (0.76–1.45)	663	1.33 (0.80–2.22)
Social support from coworkers								
Low score (<15, n=6,062)	525	1.00	1,610	1.00	1,934	1.00	848	1.00
Intermediate score (n=5,510)	556	1.16 (0.47–2.86)	1,491	1.04 (0.73–1.49)	1,809	0.86 (0.67–1.11)	629	0.84 (0.56–1.25)
High score (>16, n=5,520)	819	0.63 (0.24–1.61)	1,397	1.12 (0.75–1.68)	1,533	0.83 (0.61–1.13)	644	0.80 (0.50–1.28)
Shift work								
No (n=13,683)	1,215	1.00	3,330	1.00	4,472	1.00	1,819	1.00
Yes (n=3,691)	685	1.34 (0.65–2.78)	1,168	1.05 (0.76–1.44)	804	0.77 (0.57–1.04)	302	1.16 (0.74–1.82)
Occupational class								
A group (n=9,135)	780	1.00	2,873	1.00	3,203	1.00	1,131	1.00
B group (n=7,236)	1,120	1.34 (0.60–3.01)	1,625	1.56* (1.11–2.19)	2,073	1.13 (0.88–1.45)	990	0.88 (0.60–1.29)
Marital status								
Married (n=13,504)	528	1.00	3,489	1.00	4,755	1.00	2,029	1.00
Never/previously married (n=3,657)	1,372	1.86 (0.79–4.34)	1,009	1.17 (0.85–1.62)	521	1.30 (0.96–1.75)	92	1.38 (0.71–2.69)
Smoking								
Non-smoker	854	1.00	2,014	1.00	2,365	1.00	1,099	1.00
Smoker	1,046	5.58** (2.13–14.57)	2,484	1.91** (1.40–2.60)	2,911	1.63** (1.32–2.01)	1,022	1.97** (1.44–2.71)

A group: managers/professionals/technicians/clerks, B group: service&sales workers/craft and related trade workers/machine operators and assemblers/laborers.

*p<0.05, **p<0.01.

in the present study, several hypotheses could be formed.

First of all, as suggested by Kasl *et al.*[40], when compared to young people, older people have set drinking habits which are not affected by environmental factors. This could explain the finding that no significant correlation existed between heavy drinking and all job stressors for the 50–72 yr-old group. But then the same results were found among 18–29 yr-old groups. Japanese young workers may tend to cope their stress with other means but drinking.

Secondly, certain stressors may affect drinking behavior in different age groups[19]. For the 30–39 yr old group, heavy drinking correlated to intragroup conflict, job control and cognitive demands. Intragroup conflict may induce high strain that relate to heavy drinking because of work ethics

and workplace responsibilities among the group. The higher job control, the higher the incidence of heavy drinking. The direction of this relationship was opposite to what was expected. But findings about this relationship are somewhat inconclusive in previous studies[10, 21, 22]. It may be also affected with national and rational differences about the use of alcohol to relieve stress and tension. The higher cognitive demands were, the lower the prevalence of heavy drinking was. The direction of this relationship was also opposite to what was initially expected. For the 30–39 yr-old group, lower class occupations (B group), which are supposed to have lower cognitive demands compared to higher class occupations (managers, etc.), were more likely to be heavy drinker. Occupational difference in norms and behaviors for drinking, not just cognitive demands itself, may be a primary factor for the negative association between cognitive demands and heavy drinking. For the 40–49 yr-old group, heavy drinking was correlated to physical environment, quantitative workload and underutilization of abilities. Japanese male workers between the ages of 40–49 tend to be busy with things besides work, such as family obligations, and if quantitative workload is high, the amount of time for drinking may be reduced, thus lowering the likelihood of heavy drinking. Underutilization of abilities may play a role because of prides for abilities among the group. In the report by San José *et al.*, physical working conditions and job demands were significantly associated with heavy drinking among middle and old aged citizens[10]. Greenberg *et al.* reported that low use of capacities and lack of participation in decision making in the workplace were associated with heavy drinking and negative consequences from drinking[12]. The results of the present study are similar to those of the reports.

Moreover, social support from supervisor was related with heavy drinking among two age groups. In 18–29 yr-old group, the higher the social support from supervisor, the higher the incidence of heavy drinking. In 50–72 yr-old group, the risk for heavy drinking was highest in intermediate group. In general, social support is thought to alleviate stress, and the greater the social support, the lower the stress[11, 19]. Support from supervisor and coworkers is an important form of social support. Lack of supervision can delay the recognition of problem drinking, thereby promoting heavy drinking[48]. However, supervisors and coworkers can play different roles in heavy drinking as Hagihara *et al.* pointed out[20]. Some of the high scores for support from supervisor might have resulted from men being encouraged to drink during social gatherings and meetings. Furthermore, if supervisors are tolerant of heavy drinking and problems stemming from it, heavy drinking can be exacerbated. In other words, supervisors can enable heavy drinking[49]. This could have played a role for the 18–29 yr-old and 50–72 yr-old groups.

As to shift rotation, the present study did not show a significant correlation to heavy drinking. Regland *et al.* reported that shift work was associated with alcohol consumption[18]. There are several forms of rotating shifts, such as 2-shift and 3-shift schedules. In order to more closely investigate the association between heavy drinking and rotating shift, it will be necessary to include shift pattern and duration of employment as variables.

Some of the advantages of the present study are that numerous questions and items related to job stress were analyzed in a large number of male workers. It was possible to investigate various stressors and confounding factors.

However, when interpreting the results of the present study, it is necessary to consider its limitations.

First of all, it is well known that people underestimate alcohol consumption. This can undervalue the true association between heavy drinking and stressors. In addition to the items that exhibited a significantly correlation to heavy drinking, other important job stressors might exist. We did not also take drinking pattern into consideration. Drinking the weekly total in fewer settings can be more harmful than drinking the same total amount spread throughout the week. The relation of job stressors with drinking may be different by drinking pattern.

Secondly, although we used a questionnaire that evaluates many facets of job stressors, there may be other job stressors that closely correlate to heavy drinking. For example, differences are apparent in the volume of drinking and the severity of problem drinking among the different occupations. In the past, some studies have been conducted on the association between occupation and drinking[50–52]. Even when adjusting for demographic variations, there appear to be significant differences in the incidence of alcohol dependence and the volume of alcohol consumption among various occupations. Hypotheses that explain such occupational differences can be roughly divided into four groups[52]: 1) the structural model states that alienation and stress caused by the structural characteristics of work influence drinking; 2) the social control model states that workplaces with loose regulations about drinking promote heavy drinking in people with a tendency for alcohol dependence; 3) the social availability model states that problem drinking is facilitated if drinking is a norm for a group. In Japan, studies have suggested that attitudes toward drinking at the workplace (tolerance toward problem drinking, and acceptance of the

benefits of drinking for work) correlate to problem drinking[53]; and 4) the motivational model states that motivation to drink is accelerated by physically poor working environments or break-ups of trust, social and sexual relationships. Job stressors are most closely related to the first and fourth models. It is possible that the components for these models influence the association between heavy drinking and job stressors. For example, if a workplace with poor physical environments tends to be more lenient about problem drinking, then only the association between heavy drinking and physical environment may be apparent. Besides, some combinations of job stressors may be strongly related to heavy drinking. As the aim of the present study was investigating the association of each stressor with heavy drinking, we did not examine the possibilities. It should be studied in the future.

Thirdly, we did not consider stressors that are not directly related to workplace as explanatory variables. It is possible that such stressors could explain the age differences. Moreover, we did not add individual factors such as coping styles and expectancies for effects of drinking to explanatory variables. They can modify the relation between job stress and heavy drinking. But it is difficult to intervene for them in the workplace.

Lastly, the present study was cross sectional, and only the association between heavy drinking and job stress was investigated. Therefore, some findings could be interpreted ambiguously. Several job stressors may actually encourage heavy drinking, but on the other hand, problem drinking may affect job stress. For example, workers who have occupational problems caused by heavy drinking may experience strong intragroup conflicts. In order to more closely assess the effects of occupational stress on heavy drinking, longitudinal studies will be needed in the future.

Despite these limitations, the present study yielded important findings regarding the relationship between job stressors and heavy drinking. At present, measures to improve mental health are being promoted in many workplaces in Japan. Assessment and improvement of job stress are also important in improving mental health. Investigating stress-reducing measures from the viewpoint of preventing problem drinking can contribute to maintenance and promotion of worker health. The results of this study suggests that the scheme of the stress management for preventing heavy and problem drinking should be formed individually for each age group. The measure which is effective among some age groups may be invalid among other age groups. Further studies should be conducted on this point.

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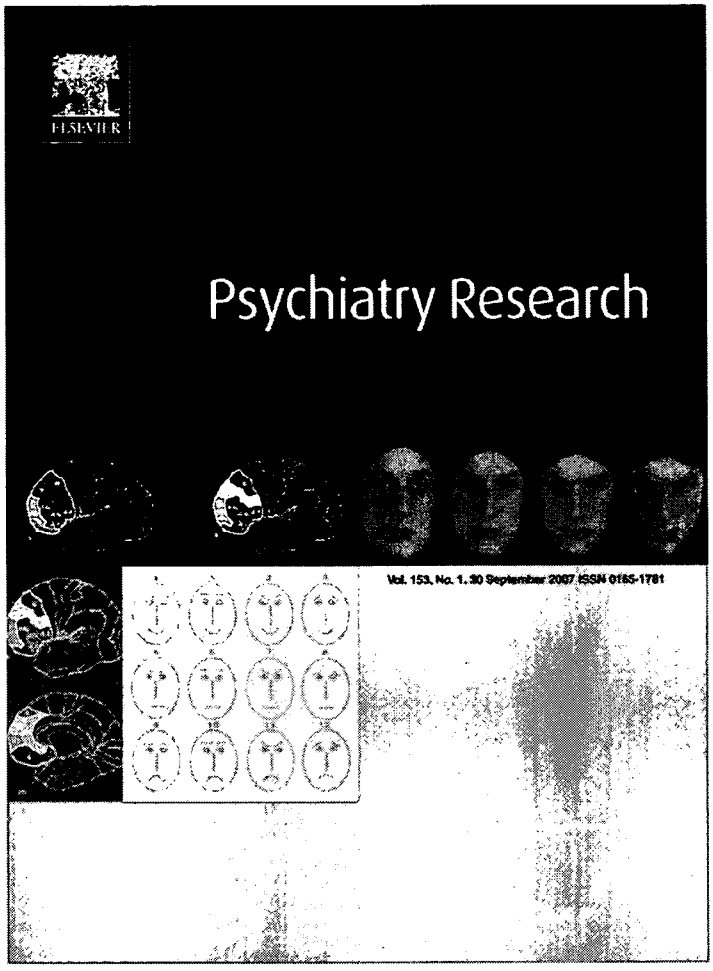

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The new GRID Hamilton Rating Scale for Depression demonstrates excellent inter-rater reliability for inexperienced and experienced raters before and after training

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Abstract

The Hamilton Rating Scale for Depression (HAMD) is the *de facto* international gold standard for the assessment of depression. There are some criticisms, however, especially with regard to its inter-rater reliability, due to the lack of standardized questions or explicit scoring procedures. The GRID-HAMD was developed to provide standardized explicit scoring conventions and a structured interview guide for administration and scoring of the HAMD. We developed the Japanese version of the GRID-HAMD and examined its inter-rater reliability among experienced and inexperienced clinicians ($n=70$), how rater characteristics may affect it, and how training can improve it in the course of a model training program using videotaped interviews. The results showed that the inter-rater reliability of the GRID-HAMD total score was excellent to almost perfect and those of most individual items were also satisfactory to excellent, both with experienced and inexperienced raters, and both before and after the training. With its standardized definitions, questions and detailed scoring conventions, the GRID-HAMD appears to be the best achievable set of interview guides for the HAMD and can provide a solid tool for highly reliable assessment of depression severity.

Keywords: Depressive disorder; Psychiatric status rating scales; Mental status schedule; Reproducibility of results

1. Introduction

The Japanese Society of Clinical Psychopharmacology has long realized the need to standardize the administration of the Hamilton Rating Scale for Depression

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(HAMD) (Hamilton, 1960), the *de facto* international standard for the assessment of depression (Furukawa et al., 2005), within Japan and appointed a team headed by Dr. Higuchi to develop a model training program in 2000. In the course of these efforts, we learned that a group of researchers had met in the USA in 1999 and proposed to establish a common set of standards for scoring and administering the HAMD that would be acceptable to the Food and Drug Administration and be used by pharmaceutical, academic and clinical researchers. This proposal led to the formation of the Depression Rating Scale Standardization Team (DRSST), a group of individuals representing clinicians, academia, government and the pharmaceutical industry. The goal of this group was to standardize the administration and scoring of the HAMD without significantly altering the original intent of Hamilton's items or the scoring profile rather than to develop a new instrument (Kalali et al., 2002; Bech et al., 2005).

The product of their efforts is the GRID-HAMD, which has three components: the GRID scoring system, (scoring intensity and frequency separately to obtain the severity score), the manual of scoring conventions with detailed anchor descriptions and more behavioral exemplars, and a semi-structured interview guide. The DRSST clarified and operationalized ambiguous anchor descriptions and incorporated the new definitions into the individual items. The GRID-HAMD can be downloaded free of charge at the International Society for CNS Drug Development homepage (http://www.iscdd.org). Given the many versions of the scale in use, the DRSST concluded that standardization would improve the current scale and lay the groundwork for development of a new scale.

The Japanese team felt that the GRID-HAMD would set a new standard in depression rating and decided to develop the Japanese training program around it. We developed the Japanese version of the GRID-HAMD (see Section 2) and then conducted a model training course for the GRID-HAMD in March 2004. The primary purpose of the study is to examine the inter-rater reliability of the Japanese version of the GRID-HAMD among experienced and inexperienced Japanese psychiatrists and psychologists, how rater characteristics may affect it, and how training can enhance it.

2. Methods

2.1. Participants

Psychiatrists ($n=52$), clinical psychologists ($n=12$) and medical students ($n=6$) from three university medical schools in Japan (Nagoya City University, Nagoya University and Fujita Health University) took part in a full day training course for the newly developed Japanese version of the GRID-HAMD. Of the 70 participants, 20 had no previous experience with any version of the HAMD, whereas 17 had administered it between one and five times and 33 had administered it six or more times. However, only 16 of the last group had ever received formal training in the administration of the instrument. The mean (S.D.) of clinical experience was 6.3 (6.1) years for the psychiatrists and 3.5 (3.0) years for the clinical psychologists.

2.2. Instrument

The Japanese version of the GRID-HAMD was developed in collaboration with the DRSST. The original English version of the GRID-HAMD was translated into Japanese by TAF. A team of seven psychiatrists, all of them experts in depression treatment and research, checked the translation and amended it where necessary, based upon the consensus of the team. Two research assistants, both proficient in English and one with a Bachelor's degree in psychology, and both blind to the original English version, then back-translated the Japanese translation of the probe questions into English. AK checked the backtranslation and pointed out possible discrepancies, based upon which TAF retranslated the questioned sentences into Japanese. This process was repeated three times, until AK was able to ascertain semantic equivalence between the original and back-translated versions.

2.3. Procedure

We used three pairs of videotapes of pre- and post-treatment administration of the HAMD. Two pairs used simulated Japanese patients (one man and one woman) and the other pair used a simulated English patient. The Japanese man, woman and their interviewers were played by professional actors and actresses, based on rough scenarios but including a substantial amount of ad lib interactions. The participants' general impression was that the patients were very well played and appeared natural, but that the interviewers appeared rather stiff. The English patient's interviews had Japanese subtitles. Each interview lasted between 15 and 40 min. The experts' consensus total scores for the six videotapes were 26 for the Japanese man pre-treatment, 10 post-treatment, 37 for the Japanese woman pre-treatment, 19 post-treatment, 21 for the English woman pre-treatment and 0 post-treatment. These videotapes were prepared independently of and before our training workshop for the GRID-

HAMD. The interviewers in these videotapes by and large followed the conventions of the Structured Interview Guide for the Hamilton Depression Rating Scale (SIGH-D) (Williams, 1988), which sometimes did not probe specifically enough into the frequency of the symptoms during the last week.

The participants in the workshop used GRID-HAMD to rate each interview. When the videotape failed to ask for the frequency, the participants were instructed to assume that the frequency was 50% of the time. This was the case for items 2, 3, 7, 10, 11, 12, and 13 of the pre-treatment videotape of the Japanese man, for items 2, 11, and 13 of the post-treatment videotape of the Japanese man, for items 2, 3, 6, 7, 10, 12, 13, and 15 of the pre-treatment video of the Japanese woman, and for items 2, 5, 7, 10, 12, and 13 of the post-treatment video of the Japanese woman. In other words, 24 out of the 68 items (35%) required participants to rely on this rating convention.

Because the rating difficulty might differ between the videotapes of the Japanese man and woman, the participants were randomly divided into two groups, and each group saw either the man's videos or the woman's videos first. There was no discussion immediately following the two videos. The videos therefore served as pre-training and post-training assessments of the raters' reliability. After this pre-training assessment in the reliability of the GRID-HAMD, their training began with a lecture on the history of the Hamilton Rating Scale for Depression and a general discussion of assessment in psychiatry. The training of the GRID-HAMD formed the core of the workshop and used the English woman's videotapes. After scoring each English woman's videotapes, possible discrepancies and questions were discussed among the participants and the trainers. The three pairs of videotapes were therefore presented during this 1-day course as shown in Fig. 1.

2.4. Analyses

The inter-rater reliability for each item of the GRID-HAMD and for its total score was estimated by way of the ANOVA intraclass correlation coefficient (ICC) (one-way random effects model, single rater) of the SPSS (SPSS Inc., 2002). Because of its intrinsic paradoxical characteristic whereby we obtain low ICC despite high agreement (Feinstein and Cicchetti, 1990), we did not calculate ICC

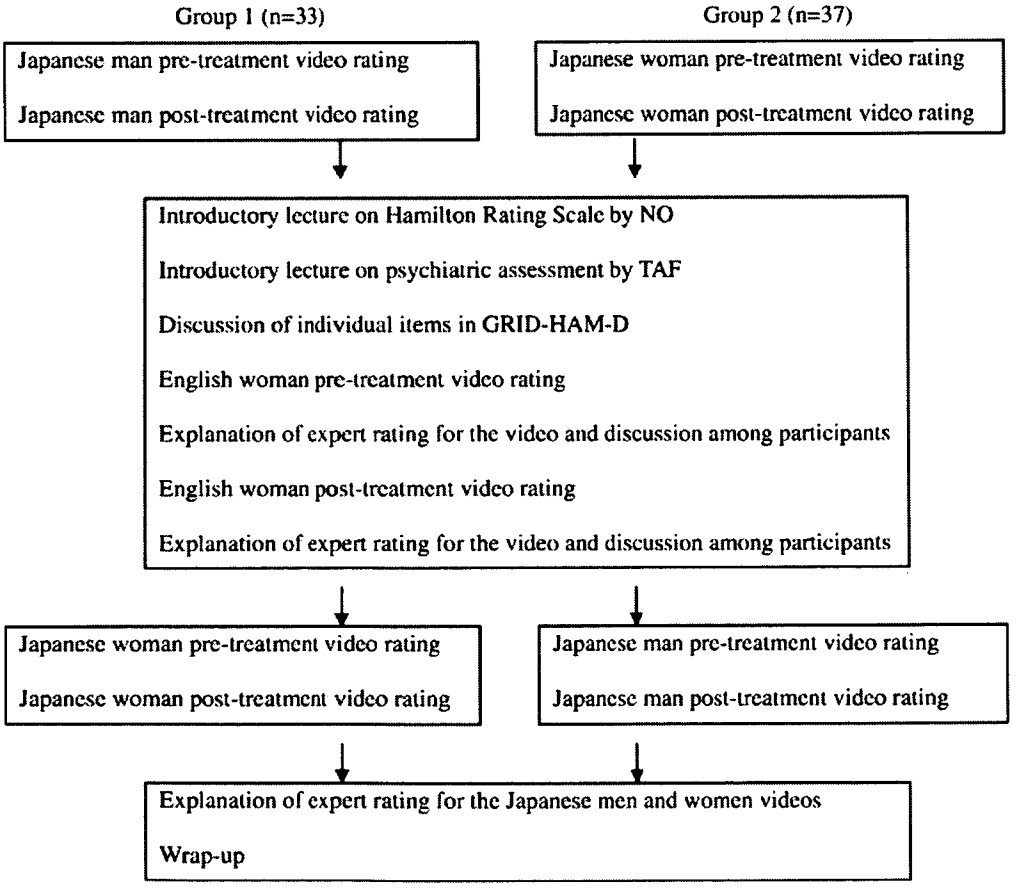

Fig. 1. Procedure of the model training program.

when one rating predominated (≥0.90 of all the ratings) for a particular item. It has been suggested that ICCs between 0.61 and 0.80 are "substantial" and those greater than 0.80 are "almost perfect" (Landis and Koch, 1977).

Because we were interested in the effects of experience and training, we subgrouped our participants based on their previous experience with the HAMD as follows.

Group A (n=20) No previous experience with the HAMD
Group B (n=17) Have administered the HAMD between one and five times
Group C (n=17) Have administered the HAMD six or more times, but have never had formal training in its administration
Group D (n=16) Have administered the HAMD six or more times, and have received formal training in its administration.

To examine the influence of the rating convention of assigning 50% frequency to such items as where the interviewer failed to ask for frequency in the videotape, we ran a supplementary sensitivity analysis by comparing

Table 1
ANOVA ICC for each item and the total score of the GRID-HAMD for the four subgroups of participants before and after training

Item		Group A		Group B		Group C		Group D	
		Before training	After training	Before training	After training	Before training	After training	Before training	After training
1	Depressed mood	0.83 (0.64–0.95)	0.89 (0.76–0.97)	0.78 (0.50–0.96)	0.84 (0.61–0.97)	0.91 (0.74–0.98)	0.84 (0.62–0.97)	0.84 (0.57–0.97)	0.92 (0.55–0.99)
2	Guilt	0.69 (0.41–0.89)	0.60 (0.30–0.86)	0.41 (0.07–0.84)	0.71 (0.40–0.94)	0.67 (0.34–0.93)	0.59 (0.27–0.91)	0.70 (0.34–0.94)	0.58 (0.19–0.91)
3	Suicide	0.89 (0.75–0.97)	0.87 (0.70–0.96)	0.92 (0.79–0.99)	0.90 (0.73–0.98)	0.92 (0.78–0.99)	0.89 (0.72–0.98)	0.94 (0.83–0.99)	0.97 (0.91–1.00)
4	Insomnia, early	0.90 (0.76–0.97)	0.90 (0.77–0.97)	1.00 (1.00–1.00)	1.00 (1.00–1.00)	0.72 (0.41–0.95)	0.85 (0.63–0.97)	0.86 (0.62–0.98)	1.00 (1.00–1.00)
5	Insomnia, middle	0.78 (0.55–0.93)	0.75 (0.50–0.92)	0.66 (0.32–0.93)	0.79 (0.51–0.96)	0.78 (0.50–0.96)	0.70 (0.39–0.94)	0.87 (0.64–0.98)	0.78 (0.47–0.96)
6	Insomnia, late	0.86 (0.69–0.96)	0.93 (0.83–0.98)	0.91 (0.74–0.98)	0.97 (0.91–1.00)	0.87 (0.66–0.98)	0.95 (0.86–0.99)	0.92 (0.77–0.99)	0.96 (0.8–0.99)
7	Work and activities	0.63 (0.34–0.87)	0.69 (0.42–0.90)	0.70 (0.37–0.94)	0.72 (0.40–0.94)	0.73 (0.42–0.95)	0.75 (0.47–0.95)	0.73 (0.39–0.95)	0.71 (0.35–0.94)
8	Psychomotor retardation	0.67 (0.39–0.89)	0.80 (0.68–0.94)	0.67 (0.34–0.93)	0.78 (0.50–0.96)	0.85 (0.63–0.97)	0.83 (0.61–0.97)	0.59 (0.20–0.91)	0.61 (0.22–0.92)
9	Psychomotor agitation	na	na	−0.05 (−0.18–0.43)	−0.05 (−0.18–0.43)	0.13 (−0.10–0.67)	na	na	0.00 (−0.21–0.57)
10	Anxiety, psychic	0.75 (0.50–0.92)	0.38 (0.08–0.74)	0.64 (0.30–0.92)	0.75 (0.45–0.95)	0.73 (0.41–0.95)	0.74 (0.45–0.95)	0.82 (0.54–0.97)	0.96 (0.88–0.99)
11	Anxiety, somatic	0.88 (0.73–0.96)	0.82 (0.61–0.94)	0.80 (0.53–0.96)	0.87 (0.66–0.98)	0.89 (0.70–0.98)	0.86 (0.65–0.97)	0.93 (0.80–0.99)	0.89 (0.69–0.98)
12	Loss of appetite	0.87 (0.72–0.96)	0.91 (0.78–0.97)	0.89 (0.71–0.98)	0.95 (0.84–0.99)	0.88 (0.69–0.98)	0.82 (0.58–0.97)	0.91 (0.74–0.99)	0.87 (0.64–0.98)
13	Somatic symptoms, general	0.53 (0.21–0.82)	0.50 (0.20–0.81)	0.64 (0.30–0.93)	0.48 (0.13–0.87)	0.57 (0.21–0.90)	0.36 (0.07–0.81)	0.63 (0.25–0.93)	0.44 (0.05–0.86)
14	Sexual interest	na	na	na	na	na	na	na	na
15	Hypochondriasis	0.60 (0.30–0.86)	0.62 (0.33–0.87)	0.53 (0.18–0.89)	0.73 (0.42–0.95)	0.69 (0.37–0.94)	0.83 (0.60–0.97)	0.85 (0.59–0.97)	0.73 (0.39–0.95)
16	Loss of weight	0.63 (0.34–0.87)	0.65 (0.36–0.88)	0.64 (0.30–0.92)	0.79 (0.51–0.96)	0.71 (0.39–0.94)	0.84 (0.73–0.98)	0.77 (0.46–0.96)	0.71 (0.35–0.94)
17	Loss of insight	na	na	na	na	0.03 (−0.15–0.55)	na	na	na
Total		0.95 (0.87–0.98)	0.95 (0.87–0.91)	0.93 (0.82–0.99)	0.95 (0.86–0.99)	0.97 (0.91–1.00)	0.95 (0.85–0.99)	0.97 (0.90–1.00)	0.99 (0.96–1.00)

Figures in parentheses indicate the 95% confidence intervals.
na = not applicable due to too little variation because the particular score predominated and more than 90% of the obtained ratings were the same.
Group A (n=20): No previous experience with the HAMD.
Group B (n=17): Have administered the HAMD between one to five times.
Group C (n=17): Have administered the HAMD six or more times, but have never had formal training in its administration.
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the average ANOVA ICCs between items for which the interviewers did not ask about frequency in more than half of the videotapes (items 2, 7, 10, 12, and 13) and those for which the interviewers asked (items 1, 4, 5, 6, and 15).

3. Results

Table 1 shows the ANOVA ICCs and their 95% confidence intervals for each item and the total score of the GRID-HAMD as applied to the Japanese man and woman's videotapes, for Groups A through D, both before and after training with lectures and practice with the English woman's videotapes. Excluding items 9, 14, and 17 (Psychomotor agitation, Sexual interest, and Loss of insight), which showed too little variation among raters to calculate meaningful chance-corrected agreement coefficients, and item 13 (Somatic symptoms, general), which often had ANOVA ICCs below 0.60, the inter-rater reliability of individual items was already largely in the substantial to excellent range before the training and did not show much increase after the training. Thus the respective averages of the ANOVA ICCs for individual items were 0.75 and 0.74 for Group A before and after training, 0.73 and 0.81 for Group B, 0.78 and 0.79 for Group C, and 0.81 and 0.79 for Group D. The ANOVA ICCs for the total score were almost perfect for all groups both before and after the training (range: 0.93 to 0.99). The average ICC for the items where the interviewers asked for frequency was 0.83 (range: 0.70 to 0.92) and that for the items where they failed to ask and where therefore the subjects were instructed to assume 50% frequency was 0.69 (range: 0.52 to 0.89).

4. Discussion

Our results suggest that when we relied on the GRID-HAMD scoring conventions, the inter-rater reliability of the total score was excellent to almost perfect and that satisfactory inter-rater reliability for individual items was also achievable, even with inexperienced raters and even without training. These findings are at variance with some previous studies on inter-rater reliability for HAMD items, which often reported poor reliability at the individual item levels. Cicchetti and Prusoff (1983) assessed reliability before treatment initiation and 16 weeks later at trial end. Before treatment, only one item was sufficiently reliable and 13 items had coefficients below 0.50. After treatment, again only one item was sufficiently reliable and 11 items had coefficients below 0.50. Craig et al. (1985) also found that only one item had adequate inter-rater reliability. On the other hand, Moberg et al. (2001) reported that nine items showed adequate reliability when the standard HAMD depression scale was administered, but all items showed adequate reliability when the scale was administered with the SIGH-D interview guidelines of Williams (1988). Our findings appear to extend theirs. Narita et al. (2002) pointed out specific weaknesses/ambiguities in the rating instructions in the SIGH-D, especially with regard to items for middle insomnia, somatic anxiety, loss of weight, depersonalization/derealization, and loss of insight; all of these are well anchored in the GRID-HAMD.

On the other hand, our results suggested that inter-rater reliability for general somatic symptoms may be low. However, we suspect that this was due to the difference in emphasis between SIGH-D item 13 and GRID-HAMD item 13, the former following the traditional HAM-D interpretation and focusing on heaviness and aches and the latter emphasizing fatigue and anergia in accordance with DSM-IV criterion symptoms.

With regard to the total score of the HAMD, most of the previous studies reported substantial to satisfactory inter-rater reliability, with ICCs ranging from 0.46 to 0.99 (Bagby et al., 2004). Some investigators provided evidence that the skill level or expertise of the interviewer and the provision of structured queries and scoring guidelines affect reliability (O'Hara and Rehm, 1983; Hooijer et al., 1991). Our findings suggest that with the use of explicit scoring conventions as outlined in the GRID-HAMD, even inexperienced raters can achieve satisfactory inter-rater reliability. We failed to show a significant effect of expertise or training, possibly because of the ceiling effect of these already high baseline reliability coefficients, although the raw scores do hint at even higher reliability coefficients after training and for more experienced users.

Weaknesses of the present study may be as follows: Firstly, the present study is based on videotaped interviews with simulated patients. Although the actor and actress played their roles naturally, with much ad lib interaction, the generalizability of the present findings to bona fide patients cannot be taken for granted and warrant another study. However, it should be pointed out that experienced physicians have been reported to be unable to differentiate standardized patients from real patients when they were sent unannounced into a physician's office, even when the physician was told in advance that this would be occurring (Kobak et al., 2003). The videotaped reliability study with simulated patients may also have inflated reliability estimates in comparison with test–retest design with real patients, which would more accurately reproduce clinical realities. Secondly, we used videotapes that had been made prior to and independently of our workshop for the GRID-HAMD.

The interviewers in the videotapes therefore did not abide by the GRID-HAMD conventions but roughly followed the SIGH-D questions. They therefore did not probe specifically enough about the frequency of some symptoms. The rating convention of assigning a 50% frequency to such items may have inflated the reliability estimates, but our sensitivity analysis did not support this possibility. Had the interviewers in the videotapes followed the GRID-HAMD interview guides, it is safe to assume that reliability could have been even higher. Thirdly, the videotaped interviews in the present study were such that there was little variation for three out of 17 items of the GRID-HAMD. We could therefore not ascertain satisfactory reliability for these items. In future studies we need to prepare videotapes that allow more variation in ratings for these items. Fourthly, although the ICCs did not change materially before and after the training, it must be pointed out that the present findings do not obviate the need for clinical expertise in depression assessment, as almost all the participants had substantial clinical experience already. In order to assure satisfactory rater performance, the raters' ability to conduct assessments on real patients is important in itself, in addition to the reliability of the instrument (Lipsitz et al., 2004). Lastly, the present study was conducted in Japanese with the Japanese version of the GRID-HAMD. The Japanese version was developed in strict adherence to the established back-translation procedure to ensure its linguistic equivalence with the English original, and we believe the present findings can be replicated with the original version as well, as it is thanks to the well-structured, adequately explained nature of the GRID-HAMD and not to any particularities of its Japanese version that we could achieve satisfactory reliability. Strictly speaking, however, the cross-cultural generalizability of the present findings must await independent replication studies in English and other languages and cultures.

Recently, a comprehensive review of the HAMD by Bagby et al. (2004, 2005) concurred that the GRID-HAMD is a major improvement over the previous versions in developing clear structured interview prompts and scoring guidelines, and in standardizing the scoring system. However, the retention of "loss of insight" that makes neither a conceptual nor an empirical contribution to the severity of depression or the lack of such DSM-IV criterion symptoms as "loss of concentration" remain major difficulties with the GRID-HAMD. Also the report from a 2002 National Institute of Health sponsored conference in the US on the assessment of depression and anxiety in clinical trials recommended the GRID-HAMD as the optimal way to administer the HAMD. A recent National Institutes of Health sponsored conference on assessment of suicidality also recommended the GRID-HAMD as the preferred version of the HAMD for assessing suicidality.

We feel that the GRID-HAMD is the best achievable set of semi-structured guides for the HAMD, the *de facto* standard in depression rating for over four decades, and this fact was corroborated in the present study by its robust reliability findings. In conclusion, the GRID-HAMD appears to provide a solid tool for highly reliable assessment of depression severity for both experienced and inexperienced mental health professionals.

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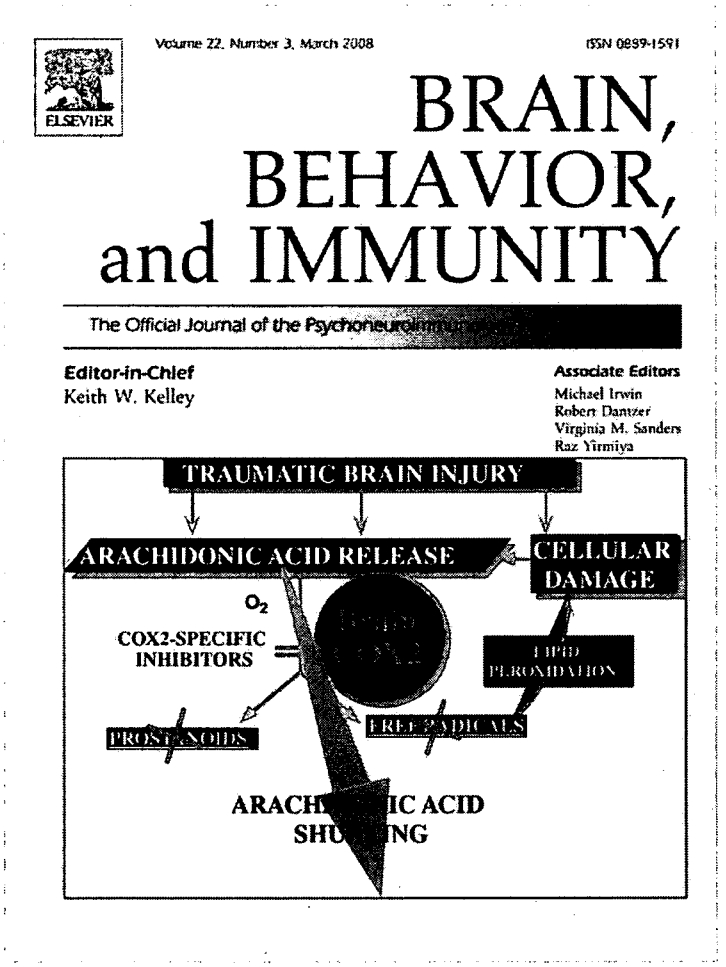

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Associations among central nervous, endocrine, and immune activities when positive emotions are elicited by looking at a favorite person

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Abstract

Recent studies on psychoneuroimmunology have indicated that positive psychological events are related to immune functions; however, limited information is available regarding associations among the central nervous, endocrine, and immune systems when positive emotions are elicited. In the present study, we demonstrated associations among these systems by simultaneously recording brain, endocrine, and immune activities when positive emotions were evoked in participants as they watched films featuring their favorite persons. Interestingly, the activity of peripheral circulating natural killer cells and the peripheral dopamine level were elevated while participants experienced positive emotions, and these values were positively correlated. The following brain regions were significantly activated in the positive condition relative to the control condition: medial prefrontal cortex, thalamus, hypothalamus, subcallosal gyrus, posterior cingulate cortex, superior temporal gyrus, and cerebellum. Further, covariate analyses indicated that these brain regions were temporally associated with endocrine and immune activities. These results suggest that while an individual experiences positive emotions, the central nervous, endocrine, and immune systems may be interrelated and attraction for favorite persons may be associated with the activation of the innate immune function via the dopaminergic system.

Keywords: Positive emotion; Positron emission tomography; Natural killer cell activity; Dopamine

1. Introduction

Studies on psychoneuroimmunology have revealed that the central nervous, peripheral autonomic nervous, endocrine, and immune systems are interrelated via complex biochemical pathways (Ader, 2000). Some have also revealed that acute psychosocial stressors such as public speaking, examinations, and even short-term mental arithmetic are sufficient to effect changes in immunological parameters (Goebel and Mills, 2000; Downing and Miyan, 2000; Isowa et al., 2004, 2006; Kimura et al., 2005). These stressors can activate the sympathetic nervous system and the hypothalamus–pituitary–adrenal (HPA) axis and

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