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# Occupational stress among healthcare workers in Japan

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## Abstract.

**BACKGROUND:** High distress levels in healthcare workers in Japan may deteriorate safe service provision.

**OBJECTIVE:** To clarify job stress of healthcare workers, we compared Brief Job Stress Questionnaire (BJSQ) scores among physicians, nursing staff and administrative workers.

**METHODS:** Healthcare workers ( $n = 9,137$ ) in 20 hospitals in Japan were asked to answer BJSQ. BJSQ is job stress questionnaire to measure “Job Stressors”, “Stress Responses” and “Social Supports”.

**RESULTS:** The “Total Health Risk” of the healthcare workers was 10% higher than the national average. While the physicians felt the stress of the quantitative and qualitative job overload, they had support from supervisors and coworkers and showed mild “Stress Responses”. The nursing staff felt the stress of the quantitative and qualitative job overload at the same level as the physicians, but they did not have sufficient support from supervisors and coworkers, and showed high “Stress Responses”. The administrative workers did not have sufficient support from supervisors and coworkers, but they experienced less stress as measured by the quantitative and qualitative job overload than the physicians or the nursing staff and showed moderate “Stress Responses”.

**CONCLUSIONS:** Further studies are needed to clarify the mechanisms and the influence of other factors to the stress trait in healthcare workers.

Keywords: Brief Job Stress Questionnaire (BJSQ), occupational health, stress, healthcare worker, job stress

## 1. Introduction

Healthcare workers can suffer from work-related or occupational stress as a result of organizational factors and an imbalance of demands, skills and/or social support at work. This may lead to severe distress, burnout or psychosomatic diseases, and the resulting deterioration in quality of life and service provision [1]. Reducing work stress is important to prevent stress-related diseases and to improve workers’ health, and hence to improve quality of healthcare.

Several self-report questionnaires have been developed to measure job stressors. The National Institute for Occupational Safety and Health [2], the Job Content Questionnaire [3] and the Brief Job Stress Questionnaire (BJSQ) by the Japan Ministry of Labour [4] are some examples of these.

The BJSQ was developed by Shimomitsu et al. [4] to measure workers’ job stress using a minimal number of items. In Japan, the BJSQ can be answered with ease and has been widely used as an assessing instrument of workers’ job stress in a variety of studies, including workers in manufacturing industries [5], sales and service workers [6], engineers [7] and clerical workers [8]. As for healthcare workers, a few studies using the BJSQ have been reported so far. Umehara et al. [9] examined the BJSQ score of a total of 850 pe-

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diatricians (response rate, 28%), and reported that long working hours could be a job stressor and a risk factor to psychosomatic symptoms in Japan. Kawano [10] examined a total of 1,551 female nurses in four acute care hospitals in Japan, and indicated that the quantitative and qualitative job overload was related to fatigue, anxiety, depression and somatic symptoms. Previous studies used relatively small number of participants, and there was no direct comparison among different healthcare professions.

We hypothesized that stress levels of healthcare workers are higher than those of other industries; and healthcare workers who have direct contact with patients are experiencing higher stress than those without direct contact. In addition, the physicians and the nursing staff (nurses and nursing aides) would have different stress traits. The aim of the present study was to clarify the job stress traits and the stress levels of healthcare workers.

## 2. Methods

### 2.1. Participants

This cross-sectional survey was conducted on healthcare workers of 20 hospitals in Japan from January 2009 to January 2010. In this study, the 20 hospitals joined voluntarily. The participating hospitals included nine urban hospitals and eleven rural hospitals. Bed size of these hospitals varied from 78 to 1,021 (9 hospitals < 300,  $300 \leq 7$  hospitals < 500, and 4 hospitals  $\geq 500$  beds). The participating hospitals included 14 teaching hospitals, five non-teaching hospitals and one university hospital. The questionnaires were distributed to all healthcare workers ( $n = 11,694$ ) with a sealed reply envelope, and were collected anonymously using a collection box at each hospital.

### 2.2. Instruments

The BJSQ is a 57 items multidimensional job stress questionnaire using the four-point Likert-type response option (from “strongly agree” = 4 to “strongly disagree” = 1) to measure “Job Stressors”, “Stress Responses” and “Social Supports” [4]. The BJSQ was developed based on the National Institute for Occupational Safety and Health Questionnaire [2] and the Job Content Questionnaire [3]. The questionnaire was based on the Job Demand-Control-Support model, and it has acceptable level of internal consistency, reliability

and factor based validity [4,12]. Higher scores indicate more obvious symptoms and severe stresses. The “Job Stressors” scale includes the following 9 factors: Quantitative Job Overload, Qualitative Job Overload, Physical Demand, Interpersonal Conflict, Poor Physical Environment, Job Control, Skill Discretion, Job Fitness and Job Satisfaction. Each “Job Stressors” factor can yield a total score ranging from 17 to 68. The “Stress Responses” scale includes Lack of Vigor, Irritability, Fatigue, Anxiety, Depressed Mood and Somatic Symptoms. The “Stress Responses” scale can yield a total score ranging from 29 to 116. The “Social Supports” scale includes Supervisor Support, Coworker Support, Family Support and Life-Job Satisfaction. The “Social Supports” scale can yield a total score ranging from 9 to 36.

As additional indicators of job stressors, we evaluated the health risks associated with job stressors measured by the Job Stress Assessment Diagram (JSAD) [11]. The JSAD consisted of the 12 question items of the BJSQ. The JSAD was composed of “Health Risk Associated with Job Strain”, “Health Risk Associated with Worksite Support” and “Total Health Risk”. The “Health Risk Associated with Job Strain” was estimated based on the combinations of Quantitative Job Overload and Job Control, and the “Health Risk Associated with Worksite Support” was estimated based on Supervisor and Coworker Support. The “Total Health Risk” was calculated by multiplying these two health risks. Greater health risk scores are indicative of a higher possibility of health problems associated with job stressors, with a score of 100 as an average risk in a normative sample of Japanese workers [11].

### 2.3. Data analysis

Firstly, we calculated a score of the JSAD and compared the scores of the healthcare workers with the national average of the previous study [11]. Secondly, we calculated arithmetic mean and standard deviation (SD) of the BJSQ score for each profession. Finally, we used analysis of variance (ANOVA) to test the differences among professions and age groups, and Tukey’s test was used for post hoc examinations. A probability of less than 0.05 ( $P < 0.05$ ) was considered statistically significant. Descriptive statistics, ANOVA and Tukey’s test were performed with the use of the SPSS Statistics version 17.0.

Table 1  
Respondent characteristics

	All Healthcare Workers ( <i>n</i> = 9137)		Physician ( <i>n</i> = 655)		Nursing Staff <sup>‡‡</sup> ( <i>n</i> = 5121)		Administrative Workers ( <i>n</i> = 1269)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Age								
< 20	27	0%	0	0%	22	0%	1	0%
20–29	2799	30%	150	23%	1874	37%	263	21%
30–39	2317	25%	194	30%	1289	25%	394	31%
40–49	1505	16%	146	22%	735	14%	285	22%
50–59	1217	13%	85	13%	586	11%	180	14%
> 59	570	6%	32	5%	321	6%	45	4%
No answer	702	9%	48	7%	294	6%	101	8%
Gender								
Female	6579	72%	131	20%	4475	87%	887	70%
Male	2018	22%	487	74%	405	8%	317	25%
No Answer	540	6%	37	6%	241	5%	65	5%

<sup>‡‡</sup>Nursing Staff is Nurses and Nursing Aides.

Table 2  
The mean scores of the JSAD among job titles

	All Healthcare Workers	Physician	Nursing Staff <sup>‡‡</sup>	Administrative Workers	National Average
Health Risk					
Total Health Risk	109	91	113	107	100
Health Risk Associated with Job Strain	110	105	114	104	100
Health Risk Associated with Worksite Support	99	87	99	103	100
Subscale Scores of Each Health Risk					
Quantitative Job Overload	9.3	9.5	9.7	8.8	8.7
Job Control	7.3	8.0	7.2	7.5	7.9
Supervisor Support	7.3	8.2	7.3	7.0	7.5
Coworker Support	8.4	8.8	8.5	8.2	8.1

<sup>‡‡</sup>Nursing Staff is Nurses and Nursing Aides.

### 3. Results

We surveyed all healthcare workers in the participating hospitals and received responses from 9,244 among 11,694 questionnaires distributed. We excluded 107 collected questionnaires with insufficient answers; including one or more entire sections that had no answers at all. There was total of 9,137 respondents including 655 physicians, 5,121 nursing staff, 1,269 administrative workers and 2,092 other professions, and the response rate was 79.0%. In comparing the stress traits among healthcare professions, only the data from physicians, nursing staff and administrative workers were used. The characteristics of the respondents are shown in Table 1 and the characteristics of the hospitals are shown in Appendix 1.

#### 3.1. JSAD by professions

The results of the JSAD are shown in Table 2 and Fig. 1. The “Total Health Risk” (score: 109) of the healthcare workers was 9% higher than the national

average [11]. The “Health Risk Associated with Job Strain” of the healthcare workers (score: 110) was 10% higher than the national average, although the score of “Health Risk Associated with Worksite Support” (score: 99) of the healthcare workers was similar to that of the national average.

With regard to the physicians, the “Health Risk Associated with Job Strain” (score: 105) was 5% higher than the national average, but the “Health Risk Associated with Worksite Support” (score: 87) was 13% lower than the national average and was the lowest among the healthcare professions. The “Total Health Risk” in the physicians (score: 91) was 9% lower than the national average and was the lowest among the healthcare professions. In the nursing staff, the “Health Risk Associated with Job Strain” (score: 114) was 14% higher than the national average and was the highest among the healthcare professions, but the score of “Health Risk Associated with Worksite Support” (score: 99) was similar to the national average. The “Total Health Risk” of the nursing staff (score: 113) was 13% higher than the national average and was the

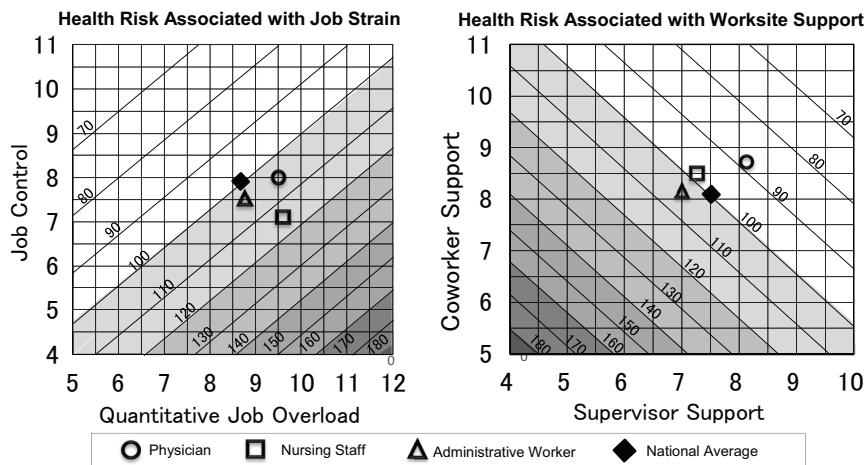


Fig. 1. The Job Stress Assessment Diagram (JSAD). Lower scores in the Job Control, Coworker Support and Supervisor Support indicated more obvious symptoms and severe stresses. On the other hand, higher scores in the Quantitative Job Overload indicated more obvious symptoms and severe stresses. The bottom-right vertex is the most stressful on the figure of "Health Risk Associated with Job Strain", and bottom-left vertex is the most stressful on the figure of "Health Risk Associated with Worksite Support".

highest among the healthcare professions. As regards to the administrative workers, the scores of "Health Risk Associated with Job Strain" (score: 104), "Health Risk Associated with Worksite Support" (score: 103) and "Total Health Risk" (score: 107) were slightly higher than the national average, and were lower than those of the nursing staff.

### 3.2. BJSQ score by professions

Descriptive statistics of each sub-dimension of the BJSQ and the results of the Tukey's test among each profession are shown in Table 3 and Appendix 2 to 4. In regard to the physicians, the scores of Quantitative Job Overload ( $M = 9.5$ ) and Qualitative Job Overload ( $M = 10.1$ ) were significantly higher than the administrative workers ( $M = 8.8$ ;  $8.7$ , respectively), and were similar to those of the nursing staff ( $M = 9.7$ ;  $10.0$ , respectively). However, the other sub-dimensions of "Job Stressors", the "Stress Responses" and the "Social Supports" were lower than those of the nursing staff and the administrative workers ( $P < 0.01$ ). In regard to the nursing staff, the scores of Quantitative Job Overload ( $M = 9.7$ ) and Qualitative Job Overload ( $M = 10.0$ ) were significantly higher than the administrative workers ( $M = 8.8$ ;  $8.7$ , respectively). The scores of the Physical Demands, Interpersonal Conflict, Job Control, Life-Job Satisfaction, and all sub-dimensions of "Stress Responses" were significantly higher than the physicians and the administrative workers. In regard to the administrative workers, the scores of Skill Discretion ( $M = 2.2$ ) and Job Satis-

faction ( $M = 2.2$ ), Supervisor Support ( $M = 8.0$ ) and Coworker Support ( $M = 6.8$ ) were significantly higher than the other professions, but the scores of Qualitative Job Overload ( $M = 8.7$ ), Physical Demands ( $M = 2.3$ ) and Interpersonal Conflict ( $M = 6.5$ ) were significantly lower.

## 4. Discussion

Our study had four major findings. First, the "Total Health Risk" of the healthcare workers was 10% higher than the national average, suggesting that the healthcare workers are experiencing higher stress than the workers of other industries. Second, although the physicians had the stress of the Quantitative and Qualitative Job Overload, they had support from their supervisors and coworkers and showed mild "Stress Responses" and "Total Health Risk". Third, that the nursing staff had the stress of the Quantitative and Qualitative Job Overload at the same level as the physicians, they did not have sufficient support from supervisors and coworkers, and showed high "Stress Responses". Finally, the administrative workers did not have sufficient support from the supervisors and coworkers, but they had lesser stress of the Quantitative and Qualitative Job overload than the physicians or the nursing staff and showed moderate "Stress Responses".

The physicians felt stress of the Quantitative Job Overload and Qualitative Job Overload which were higher than the administrative workers. Most physicians are forced to work long hours. The average work-

Table 3  
The differences of the BJSQ among job titles by Tukey's test

	All Healthcare Workers $\alpha$	Physician		Nursing Staff <sup>†‡</sup>		Administrative Worker		$F(2, 7042)^{\S}$
		$M$	$SD$	$M$	$SD$	$M$	$SD$	
		<b>Job stressors</b>						
Quantitative Job Overload	0.74	9.5	1.9 <sup>b,c</sup>	9.7	1.8 <sup>a,c</sup>	8.8	2.1 <sup>a,b</sup>	117.2**
Qualitative Job Overload	0.73	10.1	1.6 <sup>c</sup>	10.0	1.6 <sup>c</sup>	8.7	1.9 <sup>a,b</sup>	294.2**
Physical Demands <sup>f</sup>	–	2.9	0.8 <sup>b,c</sup>	3.4	0.7 <sup>a,c</sup>	2.3	0.9 <sup>a,b</sup>	1141.6**
Interpersonal Conflict	0.60	6.2	1.6 <sup>b,c</sup>	6.7	1.7 <sup>a,c</sup>	6.5	1.8 <sup>a,b</sup>	27.3**
Poor Physical Environment <sup>f</sup>	–	2.0	0.8 <sup>b,c</sup>	2.4	0.9 <sup>a</sup>	2.4	1.0 <sup>a</sup>	56.4**
Job Control	0.70	7.0	2.0 <sup>b,c</sup>	7.8	1.8 <sup>a,c</sup>	7.5	2.0 <sup>a,b</sup>	52.6**
Skill Discretion <sup>f</sup>	–	1.7	0.7 <sup>b,c</sup>	2.0	0.7 <sup>a,c</sup>	2.2	0.8 <sup>a,b</sup>	125.9**
Job Fitness <sup>f</sup>	–	1.8	0.6 <sup>b,c</sup>	2.3	0.7 <sup>a</sup>	2.2	0.8 <sup>a</sup>	118.0**
Job Satisfaction <sup>f</sup>	–	1.6	0.6 <sup>b,c</sup>	2.0	0.8 <sup>a,c</sup>	2.2	0.8 <sup>a,b</sup>	143.4**
<b>Stress Responses</b>								
Lack of Vigor	0.92	8.1	2.3 <sup>b,c</sup>	9.0	2.3 <sup>a,c</sup>	8.7	2.4 <sup>a,b</sup>	43.4**
Irritability	0.88	6.1	2.2 <sup>b,e</sup>	6.9	2.3 <sup>a,c</sup>	6.6	2.4 <sup>b,d</sup>	42.6**
Fatigue	0.91	6.7	2.3 <sup>b,c</sup>	8.2	2.5 <sup>a,c</sup>	7.0	2.5 <sup>a,b</sup>	175.7**
Anxiety	0.80	5.9	2.0 <sup>b,e</sup>	6.9	2.4 <sup>a,c</sup>	6.2	2.4 <sup>b,d</sup>	82.8**
Depressed Mood	0.90	9.5	3.8 <sup>b,c</sup>	11.6	4.5 <sup>a,c</sup>	10.2	4.0 <sup>a,b</sup>	107.7**
Somatic Symptoms	0.86	17.7	6.0 <sup>b,c</sup>	21.6	6.8 <sup>a,c</sup>	20.3	6.5 <sup>a,b</sup>	104.7**
<b>Social Supports</b>								
Supervisor Support	0.82	6.8	2.2 <sup>b,c</sup>	7.8	2.1 <sup>a,c</sup>	8.0	2.3 <sup>a,b</sup>	71.7**
Coworker Support	0.83	6.2	2.1 <sup>b,c</sup>	6.6	2.0 <sup>a,c</sup>	6.8	2.2 <sup>a,b</sup>	22.3**
Family Support	0.86	5.1	2.0	5.2	2.1	5.1	2.1	1.9
Life-Job Satisfaction <sup>f</sup>	–	3.8	1.2 <sup>b,c</sup>	4.6	1.3 <sup>a,c</sup>	4.3	1.2 <sup>a,b</sup>	129.3**

\*\* $P < 0.01$ . <sup>§</sup>Tukey's method in one-way ANOVA models. <sup>†‡</sup>Nursing staff is Nurses and Nursing Aides. <sup>a</sup> $P < 0.01$ , compared with Physician; <sup>b</sup> $P < 0.01$ , compared with Nursing Staff; <sup>c</sup> $P < 0.01$ , compared with Administrative Workers; <sup>d</sup> $P < 0.05$ , compared with Physician; <sup>e</sup> $P < 0.05$ , compared with Administrative Workers. <sup>f</sup>These factors were composed of 1 or 2 question items and we could not calculate alpha coefficient of these factors.

ing hours of physicians was reported to be more than 60 hours per week, and contributed to the Quantitative Job Overload [13,14]. Physicians have to make difficult decisions on treatment, and their decisions could affect the life and death of patients, which could explain the Qualitative Job Overload [13]. However, the score of their "Stress Responses" was generally lower than the nursing staff and the administrative workers. The discrepancy might be partly explained by the fact that they have high degree of professionalism accompanied by administrative authority which was shown by good Job Control score, and receive supports from their supervisors and coworkers [13]. Therefore, having job control and adequate supports might enable them to manage stress response. These results in Japan are congruent with previous studies in Switzerland and China that physicians had higher stress of the Qualitative Job Overload [15] than administrative workers, and had lesser stress of the Job Control than nurses and administrative workers [15,16]. On the other hand, these previous studies did not have the differences in the support level from supervisors and coworkers among healthcare workers. Although "Job Stressors" might be characteristics in common with these coun-

tries, "Social Supports" might have different characteristics. Therefore, these results in Japan might have limited applicability to other countries. In addition, these results might be attributed to the demographic characteristics. Our study included many teaching hospitals and average age of the physicians was relatively young. The results of this study suggested younger physicians could receive more support from coworkers than older physicians, but did not have the sense of job control (Appendices 1 and 2). These results are consistent with those reported by Umehara [9]. The influence of geographic factors as well as specialties should be investigated in further study.

The nursing staff felt especially stressed by Quantitative Job Overload and Qualitative Job Overload. These results agree with previous studies that nurses had higher stress of the Qualitative Job Overload and Quantitative Job Overload than administrative workers [15] or other healthcare workers [17]. Nursing staff partake in shiftwork, and are responsible for the physically demanding aspects of nursing care [13] such as postural change, bathing assistance and so on. Harada et al. [5] argued that the shift work and the amount of overtime increased work-related stress responses in

workers in a Japanese steel company. Nursing staff's score of "Stress Responses" was the highest among the healthcare professions. Comparison with the physicians would indicate that in the nursing staff the score of "Job Stressors" such as Quantitative and Qualitative Job Overload and Job Control was generally high, and the supports from their supervisors and coworkers were insufficient in contrast. Kawano et al. reported that nurses with high job control could manage stressors well and were likely to be immune to stress responses, and that less Job Control would be a serious risk factor for psychological distress such as lack of vigor, fatigue, anxiety and depression in nurses working at hospitals [10]. In addition, the stress response could be different by departments, thus different countermeasures will be needed to reduce health risk. Previous study [10] using nursing staff data reported that job stress and its mechanisms could vary depending on the departments; operation room against outpatient department. The associations of departments and job stress should be investigated in further studies.

With regard to the administrative workers, the Quantitative Job Overload, Qualitative Job Overload and Physical Demands were lower than that of the physicians and the nursing staff. These results concur with previous studies that the administrative workers had lesser the Quantitative and Qualitative Job Overload than the physicians or the nursing staff [15]. This could be partly explained by the fact that they are not likely to be engaged in shiftwork, and they do not have a physically heavy workload such as in nursing care, and they do not have direct contact with patients. However, the "Stress Responses" of the administrative workers was higher than that of the physicians. The lack of job control and the lack of supports from supervisors and coworkers could contribute to their "Stress Responses".

The findings of this study should be considered in light of its limitations. The analysis was conducted using 9,244 questionnaire replies from 20 hospitals chosen. The focus of this study was on identifying the differences in the stressors of the different professions, and not on its correlation to the characteristics of the hospitals. Although the present study was more representative of healthcare workers than any other prior studies in Japan, this number may limit a generalization of its findings to other hospitals. Since we did not control confounding variables such as age, gender, specialty and hierarchy, these variables might influence the result. For example, the proportion of male and female in each profession might influence the results.

Since the participants and hospitals voluntarily joined this study, their stress level might be lower than that of other hospitals in Japan. This study included many teaching hospitals, and demographic characteristics of staff including age distribution might not correspond well with those of other hospitals. More than half of the respondents were nursing staff and this could have influenced the stress level of healthcare workers disproportionately. Additionally, the response rates of each profession were not known. The profession which was low response rate might not show their accurate stress traits. Future research should seek to conduct random samplings.

In conclusion, the stress level of the healthcare workers was higher than that of the national average, and the physicians and the nursing staff that have direct contact with patients were experiencing high level of the Quantitative and Qualitative Job Overload. However, "Stress Responses" of the physicians and the nursing staff was different. Physicians' "Stress Responses" was lower than the other professions and the national average since the stress of the other sub-dimensions of "Job Stressors" including "Job Control" and "Social Supports" were generally low. The nursing staff did not have sufficient supports from supervisors and coworkers. Their job control was limited, and they showed high "Stress Responses". The different mechanisms of the stress in each healthcare profession may be indicative of the fact that each may require different countermeasures to reduce risk. Further studies are needed to clarify the mechanisms and the influence of other factors to the stress trait in healthcare workers, with which, a basis for a profession-based stress coping method may be yielded.

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Appendix 1: The characteristics of participating hospitals

Hospital Number	Type of Hospital				Number of Beds				Questionnaire		
	Long Term Care, Care Mix or Acute Care	Urban or Rural	Teaching or Non-teaching	Total	General Bed	Long-term Care Bed	Psychiatric Bed	Infection or Tuberculosis Bed	Number of Distribution	Number of Collection	Rate of Recovery
1	Acute Care	Rural	Teaching	78	78	0	0	0	151	96	63.6%
2	Acute Care	Rural	Teaching	140	120	0	0	20	188	150	79.8%
3	Acute Care	Rural	Teaching	300	300	0	0	0	386	362	93.8%
4	Acute Care	Rural	Teaching	374	314	0	60	0	474	426	89.9%
5	Acute Care	Rural	Teaching	410	410	0	0	0	660	602	91.2%
6	Acute Care	Rural	Teaching	475	475	0	0	0	707	646	91.4%
7	Acute Care	Urban	Teaching	225	225	0	0	0	284	208	73.2%
8	Acute Care	Urban	Teaching	310	310	0	0	0	491	416	84.7%
9	Acute Care	Urban	Teaching	430	400	0	0	30	658	381	57.9%
10	Acute Care	Urban	Teaching	464	464	0	0	0	599	473	79.0%
11	Acute Care	Urban	Teaching	517	517	0	0	0	793	700	88.3%
12	Acute Care	Urban	Teaching	634	584	0	50	0	1,076	582	54.1%
13	Acute Care	Urban	Teaching	812	810	0	0	2	1,742	1,627	93.4%
14	Acute Care	Urban	University	1,021	985	0	36	0	2,257	1,523	67.5%
15	Care Mix	Rural	Non-teaching	135	41	94	0	0	159	144	90.6%
16	Care Mix	Rural	Non-teaching	154	51	103	0	0	157	110	70.1%
17	Care Mix	Rural	Non-teaching	179	59	120	0	0	220	197	89.5%
18	Long Term Care	Rural	Non-teaching	180	0	180	0	0	251	229	91.2%
19	Long Term Care	Rural	Non-teaching	199	0	199	0	0	249	201	80.7%
20	Long Term Care	Urban	Non-teaching	151	0	151	0	0	192	171	89.1%
Total	—	—	—	7,188	6,143	847	146	52	11,694	9,244	79.0%

**Appendix 2: The differences of the BJSQ among age groups by Tukey's test (Physicians)**

	Age (years: yr)						P value		
	under 30 yr (n = 150)		30–49 yr (n = 340)		50 yr and above (n = 117)		under 30 yr vs 30–49 yr	under 30 yr vs 50 yr and above	30–49 yr vs 50 yr and above
	M	SD	M	SD	M	SD			
<b>Job Stressors</b>									
Quantitative Job Overload	9.4	1.7	9.4	2.0	9.8	2.0	NS	NS	NS
Qualitative Job Overload	9.8	1.6	10.1	1.6	10.3	1.5	NS	*	NS
Physical Demands	3.0	0.8	2.9	0.8	2.8	0.9	NS	NS	NS
Interpersonal Conflict	6.1	1.8	6.2	1.6	6.0	1.5	NS	NS	NS
Poor Physical Environment	2.0	0.7	2.1	0.8	2.0	0.9	NS	NS	NS
Job Control	8.2	1.8	6.8	1.9	6.3	1.9	**	**	*
Skill Discretion	1.7	0.6	1.7	0.7	1.5	0.7	NS	*	NS
Job Fitness	1.9	0.6	1.8	0.6	1.7	0.7	NS	**	NS
Job Satisfaction	1.6	0.6	1.6	0.6	1.6	0.6	NS	NS	NS
<b>Stress Responses</b>									
Lack of Vigor	7.9	2.1	8.2	2.3	8.1	2.2	NS	NS	NS
Irritability	6.1	2.2	6.1	2.1	6.0	2.3	NS	NS	NS
Fatigue	7.1	2.4	6.7	2.3	6.2	2.3	NS	**	NS
Anxiety	6.3	2.2	5.7	1.9	5.9	2.2	**	NS	NS
Depressed Mood	10.2	4.1	9.2	3.6	9.3	3.8	*	NS	NS
Somatic Symptoms	17.7	6.3	17.8	5.9	18.0	5.8	NS	NS	NS
<b>Social Supports</b>									
Supervisor Support	6.9	2.0	6.8	2.2	7.1	2.3	NS	NS	NS
Coworker Support	5.6	2.0	6.3	2.0	6.7	2.1	**	**	NS
Family Support	4.9	2.0	5.1	2.0	5.0	2.0	NS	NS	NS
Life-Job Satisfaction	4.0	1.2	3.8	1.2	3.5	1.2	NS	**	NS

\*  $P < 0.05$ ; \*\*  $P < 0.01$ .**Appendix 3: The differences of the BJSQ among age groups by Tukey's test (Nursing staff)**

	Age (years: yr)						P value		
	under 30 yr (n = 1896)		30–49 yr (n = 2024)		50 yr and above (n = 907)		under 30 yr vs 30–49 yr	under 30 yr vs 50 yr and above	30–49 yr vs 50 yr and above
	M	SD	M	SD	M	SD			
<b>Job Stressors</b>									
Quantitative Job Overload	9.8	1.7	9.6	1.8	9.6	1.9	**	**	NS
Qualitative Job Overload	10.1	1.6	9.9	1.6	9.7	1.7	**	**	**
Physical Demands	3.5	0.6	3.3	0.7	3.4	0.8	**	*	**
Interpersonal Conflict	6.6	1.6	6.8	1.6	6.6	1.7	**	NS	**
Poor Physical Environment	2.3	0.9	2.5	0.9	2.4	0.9	**	**	*
Job Control	7.9	1.7	7.8	1.8	7.5	1.9	*	**	**
Skill Discretion	1.9	0.6	2.0	0.7	2.0	0.7	*	*	NS
Job Fitness	2.4	0.7	2.3	0.7	2.2	0.8	**	**	**
Job Satisfaction	2.0	0.7	2.0	0.8	2.0	0.8			
<b>Stress Responses</b>									
Lack of Vigor	9.1	2.1	9.1	2.3	8.5	2.5	NS	NS	**
Irritability	7.0	2.3	7.0	2.3	6.6	2.3	NS	**	**
Fatigue	8.4	2.5	8.2	2.5	7.6	2.6	*	**	**
Anxiety	7.3	2.5	6.6	2.3	6.5	2.3	**	**	NS
Depressed Mood	12.3	4.5	11.3	4.4	10.6	4.3	**	**	**
Somatic Symptoms	21.6	6.8	21.5	6.7	21.3	6.9	NS	NS	NS
<b>Social Supports</b>									
Supervisor Support	7.8	2.0	7.6	2.1	7.8	2.0	NS	NS	*
Coworker Support	6.1	2.0	6.7	2.0	6.9	1.9	**	**	NS
Family Support	4.9	1.9	5.3	2.1	5.4	2.1	**	**	NS
Life-Job Satisfaction	4.7	1.3	4.6	1.3	4.3	1.3	NS	**	**

\*  $P < 0.05$ ; \*\*  $P < 0.01$ .

**Appendix 4: The differences of the BJSQ among age groups by Tukey's test (Administrative workers)**

	Age (years: yr)						P value		
	under 30 yr (n = 264)		30–49 yr (n = 679)		50 yr and above (n = 225)		under 30 yr vs 30–49 yr	under 30 yr vs 50 yr and above	30–49 yr vs 50 yr and above
	M	SD	M	SD	M	SD			
<b>Job Stressors</b>									
Quantitative Job Overload	8.7	2.0	8.9	2.1	8.6	2.1	NS	NS	NS
Qualitative Job Overload	8.2	1.9	8.9	1.8	8.7	1.8	**	**	NS
Physical Demands	2.1	0.9	2.3	0.9	2.3	0.9	NS	NS	NS
Interpersonal Conflict	6.2	1.8	6.5	1.9	6.6	1.8	*	NS	NS
Poor Physical Environment	2.3	1.0	2.5	1.0	2.3	0.9	**	NS	**
Job Control	7.4	2.0	7.7	2.1	7.3	1.9	NS	NS	*
Skill Discretion	2.3	0.8	2.2	0.8	2.1	0.7	NS	NS	NS
Job Fitness	2.2	0.8	2.2	0.8	2.2	0.8	NS	NS	NS
Job Satisfaction	2.1	0.8	2.2	0.8	2.2	0.7	NS	NS	NS
<b>Stress Responses</b>									
Lack of Vigor	8.6	2.3	8.7	2.5	8.7	2.3	NS	NS	NS
Irritability	6.4	2.3	6.8	2.4	6.3	2.2	NS	NS	*
Fatigue	7.0	2.5	7.1	2.6	6.6	2.6	NS	NS	*
Anxiety	6.0	2.4	6.2	2.4	6.1	2.4	NS	NS	NS
Depressed Mood	9.9	3.6	10.2	4.1	10.0	4.2	NS	NS	NS
Somatic Symptoms	20.5	6.2	20.5	6.4	19.3	6.6	NS	NS	NS
<b>Social Supports</b>									
Supervisor Support	7.8	2.1	8.1	2.4	8.1	2.0	NS	NS	NS
Coworker Support	6.4	2.1	6.7	2.2	7.4	2.0	NS	**	**
Family Support	4.7	1.9	5.0	2.0	5.4	2.1	*	**	NS
Life-Job Satisfaction	4.2	1.2	4.3	1.3	4.1	1.1	NS	NS	NS

\*  $P < 0.05$ ; \*\*  $P < 0.01$ .