of pediatric patients visiting pediatric specialists has however been increasing, possibly reflecting parents' preferences for specialized care[11]. The patient load per pediatric department or clinic may therefore not be much reduced. The number of pediatric patients who visit hospitals at night or during the weekend, even for non-emergency care, has also increased. The proportion of outpatients attending overnight (0:00–08:00) is about 30% of total pediatric outpatients in urban areas[10]. Pediatricians who undertook night or weekend duties worked an average of 86.7 hours overtime per month[9]. A survey reported that 74% of pediatricians working in hospitals expressed concern regarding continued hard work, with an average of six night duties per month in addition to daily routine duties[12]. The rapid progresses of medical science and patients' demands for better quality of care have increased the burden of pediatricians and other doctors, but the number of pediatricians per capita is lower in Japan than in the UK, US and Germany[13]. The current situation could be characterized by a lack of pediatricians relative to a changing demand for pediatric care. The inflow of new pediatricians has also decreased due to young doctors avoiding such a demanding job.

Several workload-related factors have been identified by previous studies as determinants of perceived job stressors, perceived general stress and psychological distress among physicians[6, 14]. These include working hours[5, 15, 16], overtime[17], frequency of on-call duties[18] and work-home interference[1, 3, 4, 7, 19]. A few studies reported that long working hours were not associated with perceived stress at work[20] or psychological morbidity[21–23]. Some studies have reported that the Demand-Control-Support (DCS) model[24, 25] is an important predictor of psychological morbidity among physicians[17, 26–28]. Workload-related factors, such as working hours and on-call duties, may be associated with psychosocial job stressors (greater job demand, lack of job control, lack of worksite support), and with psychosomatic symptoms.

While these studies of physicians mainly focused on the effects of working hours and other workload-related factors on their health, studies of other workers suggest that insufficient recovery from work is an important mediator in the pathway from long working hours to adverse health[29, 30]. Fewer recovery opportunities, such as shorter rest hours after work of each day and fewer days off during weekends, may limit the process of recovery from exposure to job stressors, and may prolong psycho-physiological unwinding, eventually leading to chronic health problems[31]. Workdays with no overtime, as well as weekend holidays, could therefore be important preventive factors for job stressors and psychological distress among pediatricians. A recent study of nurses reported that "working during time off" (i.e. working while sick or working on a day off/vacation day) was associated with increased musculoskeletal problems[32]. Pediatricians often tend to work on days off, responding to a sudden change in a patient's clinical state and/or other demands from their workplace, particularly in Japan. The resulting partial days off may not have enough of a beneficial effect on recovery, or may not help recovery at all. Such information would be useful for developing a strategy for reducing perceived job stress and improving the mental health of pediatricians in Japan. Unfortunately, no previous study has addressed these issues for pediatricians or even physicians.

The present study was carried out to explore what work-related factors were associated with psychosocial job stressors as determined by the DCS model and psychosomatic symptoms, among pediatricians in Japan. We focused on working hours and work schedules (night and weekend duties, on-call duties), as well as recovery-related factors (workdays with no overtime, days off with no work, days off with some work), as work-related factors possibly determining job stressors and psychosomatic symptoms.

Method

Subjects

The subjects were a random sample of 3,000 individual members from the 2005 nationwide register of the Japan Pediatric Society (n=17,982). In the summer of 2005, we sent a mailed anonymous questionnaire to the subjects with an introductory letter signed by the chair of the Japan Pediatric Society. Those who did not respond were sent a reminder. We received 850 responses, giving a response rate of 28.3%.

The respondents consisted of 581 male and 269 female members, of which 790 (93%) answered that they were currently working as a pediatrician more than 5 d per week. Their workplaces included university hospitals, general hospitals, clinics and non-clinical work settings (e.g. research institutes, public offices, educational institutions, nursing institutions). Six hundred and seventeen respondents answered that they were currently working as a pediatrician for more than 35 h per week. We used the data of 590 eligible respondents, excluding the 27 respondents with missing values in the psychosocial job stressors and psychosomatic symptoms scales.

We obtained informed consent from each respondent with the returned questionnaire. The study design and procedure were reviewed and approved by the Research Ethics Committee of the Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences.

Measurements

The questionnaire consisted of items on demographic characteristics, selected work- related factors, psychosocial job stressors and psychosomatic symptoms.

Work-related factors

1. Working hours and work schedule

We asked respondents to report their average working hours per week, and (a) hours of work at their workplace and (b) hours on duty at home and other places, on each day of a typical week. We then asked them to add these hours together to estimate their average total working hours per week. Average working hours were divided into five groups: 50 h or less, 51–60 h, 61–70 h, 71–80 h and more than 80 h. We also asked (1) the number of night duties in the past month, (2) the number of weekend duties in the past month, on which subjects worked during the day on a weekend or national holiday, and (3) the number of days with on-call duty in the past month on which subjects stayed at home but were ready to go to their workplace if called. We divided subjects into three groups of almost equal size for each factor. Groups for the number of night duties were: 0 d, 1–3 d and 4 or more days. Groups for the number of weekend duties were: 0 d, 1 d and 2 or more days. Groups for the number of days with on-call duty were: 0 d, 1–8 d and 9 or more days.

2. Recovery-related factors

We asked respondents to report on the following recovery-related factors: (1) the number of workdays with no overtime in the past month, (2) the number of days off with no work in the past month, and (3) the number of days off with some work in the past month. Days off with some work were described as days off on which subjects went to their workplace to check a patient's clinical state, or due to other workplace demands. The number of workdays with no overtime were divided into four groups: 15 or more days (more than half the month), 5–14 d (more than once per week), 1–4 d (at most once per week), and 0 d (never). We also divided subjects into four groups of almost equal size based on the number of days off with no work (5 or more days, 3–4 d, 1–2 d and 0 d) and the number of days off with some work (0 d, 1–2 d, 3–5 d and 6 or more days).

Psychosocial job stressors

We used the Brief Job Stress Questionnaire (BJSQ)[33] to measure job demand (perceived quantitative workload), job control, supervisor support and coworker support, using the DCS model[24, 25]. Job demand was measured with a three-item scale consisting of the items "working hard", "amount of work" and "no sufficient time to complete work", with a four-point response scale (from "strongly agree"=4 to "strongly disagree"=1). Job control was measured with a three-item scale consisting of the items "work at own pace", "make decisions at work" and "influence over worksite policy", with the same response scale. Total scores for these two scales ranged from 3 to 12, with a higher score indicating a greater degree of job demand or job control. Supervisor support and coworker support were assessed using three-item, four-point, Likert-type scales. Each scale consisted of items on (a) the extent to which a respondent felt at ease when talking with supervisors/coworkers, (b) the extent to which supervisors/coworkers were relied on when things got tough at work, and (c) the extent to which supervisors/coworkers were willing to listen to a respondent's personal problems, with a four-point response scale (from "strongly agree"=4 to "strongly disagree"=1). The total scores ranged from 3 to 12 with a higher score indicating greater support from supervisors/coworkers. These scales showed acceptable levels of internal consistency reliability in this study (Cronbach's alpha for job demand, job control, supervisor support and coworker support: 0.72, 0.75, 0.84 and 0.81, respectively).

Psychosomatic symptoms

We used a scale from the Checklist for the Accumulation of General Fatigue of the Workers (CAGFW) [34] to measure psychosomatic symptoms. The scale consisted of 13 items on a wide range of psychosomatic symptoms: irritability, anxiety, loss of tranquility, depression, insomnia, feeling sick, loss of concentration, carelessness, sleepiness at work, loss of energy, exhaustion, fatigue in the morning and tiredness. The response options on the scale of psychosomatic symptoms were based on frequency and scored from "almost never"=0 to "very often"=3. Total scores ranged from 0 to 39, with a higher score indicating more psychosomatic symptoms. The scale showed acceptable levels of internal consistency reliability (Cronbach's alpha, 0.90) in this study sample. In the original scoring system of the CAGFW, the score of the psychosomatic symptoms scale is added to the score of a working conditions scale to determine a level of fatigue. We only used the psychosomatic symptoms scale. We dichotomized subjects into high and low levels of symptoms based on the median of the scale score.

Demographic characteristics

We asked questions about gender, age, career duration, work settings (university hospitals, general hospitals, clinics, non-clinical work settings), employment status (full-time or part-time), workplace location (urban or rural) and marital status, which could all be potential confounders. We divided age into six groups: twenties, thirties, forties, fifties, sixties and seventies and above. We asked each respondent if their workplace was located in a population sparse (rural) area or a population dense (urban) area. We also asked how many pediatricians (including the respondent) there were at the workplace, and used this to divide them into four groups of almost equal size: 1 pediatrician, 2–3 pediatricians, 4–8 pediatricians and 9 or more pediatricians.

Statistical analysis

First we tested for differences in the average scores of the four psychosocial job stressor scales and the psychosomatic symptoms scale among the groups classified on the basis of the demographic variables: gender, age, work settings and the number of pediatricians in the respondent's workplace (*t*-test or analysis of variance, ANOVA). The prevalence of high levels of psychosomatic symptoms was compared among the groups classified on the basis of the demographic variables (χ^2 test). We conducted this analysis for the total sample, as well as for male and female samples separately. We compared the average scores of psychosocial job stressor and psychosomatic symptoms scales and the prevalence of high levels of psychosomatic symptoms among the groups classified on the basis of the seven work-related factors (ANOVA and χ^2 test, respectively). We conducted this series of analyses for the total sample, as well as for male and female samples separately. We also compared these average scores and the prevalence of high levels of psychosomatic symptoms among the groups classified on the basis of work-related factors, adjusting for gender, age, marital status, work settings and the number of pediatricians in the respondent's workplace (ANCOVA and multiple logistic regression, respectively). In addition, we conducted a series of comparisons for the working conditions other than working hours additionally adjusted for average working hours per week in order to examine their unique contribution independent of work hours, such as the recovery effects of these variables. The logistic regression results were expressed in terms of adjusted odds ratios and 95% confidence intervals. We analyzed the data using the SPSS version 11.5 statistical package.

Results

Table 1 shows the demographic characteristics of the subjects.

Table1. Demographic characteristics of subjects (N=590)

Characteristics	Number	(%)
Gender		
Male	405	(68.6)
Female	185	(31.4)
Work settings		
University hospitals	127	(21.5)
General hospitals	301	(51.0)
Clinics	148	(25.1)
Non-clinical	14	(2.4)
Employment status		
Full-time	533	(90.3)
Part-time	45	(7.6)
Unknown	12	(2.0)
Location of workplace		
Rural area	57	(9.7)
Urban area	521	(88.3)
Can't decide	10	(1.7)
Unknown	2	(0.3)
Marital status		
Married	468	(79.3)
Single	122	(20.7)
	Mean	(range)
Age		
Overall	44.2 ± 11.8	(26–81)
Male	46.2 ± 11.6	(26–81)
Female	39.7 ± 11.1	(26–68)
Career duration (yr)		
Overall	18.7 ± 11.7	(1–56)
Male	20.5 ± 11.6	(1–56)
Female	14.8 ± 11.1	(2–45)

The average score for supervisor support was significantly higher among female pediatricians than male pediatricians (Table 2). Average scores of job control were significantly different among age groups, with higher scores among older pediatricians. Average scores of supervisor support, coworker support and psychosomatic symptoms were also significantly different among age groups, with higher scores among younger pediatricians. High levels of psychosomatic symptoms were more prevalent among younger pediatricians. Average scores of all the scales other than supervisor support were significantly different among the four groups classified by work settings ($p<0.05$), as well as among the three groups excluding the non-clinical setting group (all $p<0.05$). Average scores of job demand, supervisor support, coworker support and psychosomatic symptoms were highest among university hospital pediatricians, and lowest among clinic pediatricians. Average scores of job control were highest among clinic pediatricians and lowest among university hospital pediatricians. The number of pediatricians in the respondent's workplace was significantly and positively associated with job demand, supervisor support, coworker support and psychosomatic symptoms, and was significantly and negatively associated with job control (p for trend <0.001). Almost similar patterns were observed both for male and female samples, although some of the associations became statistically non-significant due to the small sample sizes (Table 2).

Average working hours per week was significantly and positively associated with job demand, supervisor support, coworker support and psychosomatic symptoms (Table 3), and was significantly and negatively associated with job control (p for trend <0.05). The number of night duties in the past month was significantly and positively associated with job demand, supervisor support and psychosomatic symptoms, and was significantly and negatively associated with job control (p for trend <0.05). The number of weekend duties in the past month was

Table 2. Mean score and standard deviation of psychosocial job stressor scales and psychosomatic symptoms scale by demographic characteristics by gender

		Job demand	Job control	Supervisor support		Coworker support		Psychosomatic symptoms	
Demographic Characteristics	n	Mean (SD)	Mean (SD)	n[$]	Mean (SD)	n[$]	Mean (SD)	Mean (SD)	High (%)[Φ]
Gender									
Male	405	9.7 (1.9)	8.1 (2.1)	352	7.6 (2.2)	371	8.1 (2.0)	12.0 (8.2)	45.9
Female	185	9.4 (1.9)	8.2 (2.1)	173	8.1 (2.2)	177	8.2 (2.2)	12.8 (8.7)	51.0
t test/χ^2 test		p=0.080	p=0.800		p=0.029		p=0.574	p=0.318	p=0.221[§]
Age									
Total									
Twenties	89	9.1 (2.0)	7.3 (1.9)	89	8.6 (2.1)	88	8.6 (1.9)	14.1 (9.2)	56.2
Thirties	150	9.8 (1.8)	7.7 (2.0)	149	8.0 (2.1)	148	8.4 (2.1)	13.7 (7.5)	62.0
Forties	174	9.7 (1.9)	8.1 (2.1)	156	7.3 (2.3)	167	7.8 (2.1)	12.5 (8.7)	43.1
Fifties	121	9.5 (1.9)	8.7 (2.0)	96	7.4 (2.3)	102	7.9 (2.0)	10.6 (8.2)	37.2
Sixties	42	9.5 (2.0)	9.3 (1.9)	30	7.7 (2.5)	34	7.8 (2.3)	9.1 (6.8)	35.7
Seventies and above	14	9.1 (1.8)	10.4 (1.5)	5	7.4 (2.2)	9	8.3 (1.7)	5.2 (4.9)	21.4
One-way ANOVA/χ^2 test		p=0.069	p<0.001		p<0.001		p=0.019	p<0.001	p<0.001[§]
Male									
Twenties	37	9.0 (1.9)	7.4 (1.6)	37	8.6 (2.1)	37	8.5 (1.8)	13.1 (8.5)	51.4
Thirties	92	9.9 (1.7)	7.5 (2.0)	91	7.8 (2.2)	92	8.5 (2.1)	13.9 (8.0)	62.0
Forties	138	9.8 (2.0)	7.9 (2.1)	122	7.2 (2.3)	131	7.7 (2.1)	12.8 (8.7)	42.8
Fifties	92	9.6 (1.8)	8.6 (1.9)	74	7.5 (2.2)	77	8.0 (1.8)	10.9 (7.9)	41.3
Sixties	32	9.6 (2.1)	9.2 (2.0)	23	7.7 (2.5)	25	8.0 (2.4)	8.4 (5.9)	31.3
Seventies and above	14	9.1 (1.8)	10.4 (1.5)	5	7.4 (2.2)	9	8.3 (1.7)	5.2 (4.9)	21.4
One-way ANOVA/χ^2 test		p=0.198	p<0.001		p=0.022		p=0.066	p<0.001	p=0.004[§]
Female									
Twenties	52	9.2 (2.1)	7.2 (2.1)	52	8.6 (2.1)	51	8.7 (2.0)	14.7 (9.7)	59.6
Thirties	58	9.7 (1.9)	8.0 (2.0)	58	8.3 (2.1)	56	8.2 (2.2)	13.5 (6.8)	62.1
Forties	36	9.5 (1.7)	8.8 (1.9)	34	7.8 (2.1)	36	8.2 (2.0)	11.4 (9.1)	44.4
Fifties	29	9.0 (2.0)	9.1 (2.2)	22	6.9 (2.7)	25	7.5 (2.5)	9.8 (9.0)	24.1
Sixties	10	9.2 (1.8)	9.6 (1.6)	7	7.7 (2.6)	9	7.3 (2.1)	11.4 (9.3)	50.0
Seventies and above	0	– (–)	– (–)	0	– (–)	0	– (–)	– (–)	–
One-way ANOVA/χ^2 test		p=0.473	p<0.001		p=0.040		p=0.145	p=0.114	p=0.010[§]
Work settings									
Total									
University hospitals	127	10.4 (1.5)	7.3 (2.1)	127	8.0 (2.0)	127	8.5 (2.0)	13.4 (7.4)	55.9
General hospitals	301	9.3 (2.0)	7.8 (1.9)	299	7.8 (2.2)	297	8.1 (2.0)	13.0 (8.6)	51.5
Clinics	148	9.4 (1.8)	9.6 (1.8)	86	7.2 (2.7)	11	7.7 (2.3)	10.3 (8.5)	35.8
Non-clinical	14	9.1 (2.5)	8.1 (2.0)	13	7.2 (1.6)	13	7.6 (1.8)	6.1 (4.5)	14.3
One-way ANOVA/χ^2 test		p<0.001	p<0.001		p=0.054		p=0.015	p<0.001	p<0.001[§]
Male									
University hospitals	84	10.4 (1.5)	7.4 (1.9)	84	8.0 (2.0)	84	8.5 (1.9)	12.5 (7.7)	47.6
General hospitals	210	9.5 (2.0)	7.7 (1.9)	208	7.6 (2.2)	207	8.0 (2.0)	13.1 (8.4)	51.9
Clinics	103	9.5 (1.8)	9.6 (1.7)	53	7.0 (2.6)	73	7.9 (2.2)	9.8 (8.0)	35.0
Non-clinical	8	9.4 (2.7)	8.0 (2.2)	7	7.1 (1.8)	7	7.4 (2.2)	6.6 (4.7)	12.5
One-way ANOVA/χ^2 test		p=0.001	p<0.001		p=0.101		p=0.163	p=0.002	p=0.008[§]
Female									
University hospitals	43	10.4 (1.6)	7.0 (2.3)	43	8.2 (2.0)	43	8.7 (2.1)	15.0 (6.7)	72.1
General hospitals	91	9.0 (2.0)	8.0 (1.9)	91	8.2 (2.1)	90	8.3 (2.1)	12.9 (9.1)	50.5
Clinics	45	9.2 (1.7)	9.4 (1.9)	33	7.6 (2.9)	38	7.4 (2.4)	11.4 (9.5)	37.8
Non-clinical	6	8.8 (2.5)	9.2 (1.0)	6	7.2 (1.5)	6	7.8 (1.2)	5.3 (4.5)	16.7
One-way ANOVA/χ^2 test		p<0.001	p<0.001		p=0.428		p=0.061	p=0.039	p=0.003[§]

(continued on next page)

Table 2. Mean score and standard deviation of psychosocial job stressor scales and psychosomatic symptoms scale by demographic characteristics by gender (continued)

Demographic Characteristics	n	Job demand Mean (SD)	Job control Mean (SD)	Supervisor support n[$]	Supervisor support Mean (SD)	Coworker support n[$]	Coworker support Mean (SD)	Psychosomatic symptoms Mean (SD)	Psychosomatic symptoms High (%)[Φ]
Number of pediatricians in the respondent's workplace									
Total									
1	137	9.4 (1.8)	9.4 (1.8)	83	6.9 (2.4)	105	7.4 (2.1)	10.5 (8.0)	38.0
2–3	104	9.0 (2.1)	8.4 (2.0)	97	7.5 (2.5)	98	7.8 (2.2)	10.8 (8.3)	39.4
4–8	149	9.5 (1.9)	7.6 (1.9)	147	7.9 (2.1)	147	8.3 (2.0)	13.5 (8.6)	53.0
≥9	184	10.2 (1.7)	7.5 (2.0)	183	8.2 (2.0)	182	8.6 (1.9)	13.4 (8.2)	56.0
Unknown	16	9.5 (2.0)	8.0 (1.9)	15	8.7 (2.2)	16	8.5 (2.3)	11.1 (9.2)	37.5
One-way ANOVA[#]/χ^2 test		$p<0.001$	$p<0.001$		$p<0.001$		$p<0.001$	$p=0.001$	$p=0.002$[§]
Trend test		$p<0.001$	$p<0.001$		$p<0.001$		$p<0.001$	$p<0.001$	
Male									
1	95	9.4 (1.8)	9.4 (1.8)	51	6.5 (2.1)	68	7.1 (1.9)	10.1 (7.6)	36.8
2–3	67	9.0 (2.2)	8.4 (2.1)	61	7.1 (2.5)	64	7.9 (2.1)	10.6 (8.1)	38.8
4–8	104	9.6 (1.9)	7.6 (1.9)	102	7.8 (2.1)	102	8.2 (2.0)	13.6 (8.4)	53.8
≥9	129	10.3 (1.6)	7.5 (1.9)	128	8.1 (2.1)	127	8.5 (1.9)	13.0 (8.4)	50.4
Unknown	10	9.7 (2.3)	8.2 (1.8)	10	9.0 (2.2)	10	8.1 (2.2)	9.9 (6.6)	40.0
One-way ANOVA[#]/χ^2 test		$p<0.001$	$p<0.001$		$p<0.001$		$p<0.001$	$p=0.006$	$p=0.042$[§]
Trend test		$p<0.001$	$p<0.001$		$p<0.001$		$p<0.001$	$p=0.002$	
Female									
1	42	9.2 (1.8)	9.5 (1.9)	32	7.5 (2.7)	37	7.7 (2.4)	11.4 (8.8)	40.5
2–3	37	8.9 (2.0)	8.5 (1.9)	36	8.2 (2.5)	34	7.6 (2.2)	11.2 (8.7)	40.5
4–8	45	9.2 (1.9)	7.6 (2.0)	45	8.1 (2.2)	45	8.4 (2.0)	13.2 (9.2)	51.1
≥9	55	10.0 (1.9)	7.5 (2.2)	55	8.3 (1.8)	55	8.7 (2.0)	14.4 (7.7)	69.1
Unknown	6	9.2 (1.3)	7.7 (2.3)	5	8.0 (2.2)	6	7.8 (2.3)	13.2 (12.8)	33.3
One-way ANOVA[#]/χ^2 test		$p=0.033$	$p<0.001$		$p=0.365$		$p=0.043$	$p=0.220$	$p=0.014$[§]
Trend test		$p=0.029$	$p<0.001$		$p=0.122$		$p=0.008$	$p=0.050$	

[$]: Numbers of subjects analyzed for the supervisor support and coworker support scales were reduced due to missing data; n=525 and 548 (male sample 352 and 371, female sample 173 and 177), respectively. [Φ]: Prevalence of high levels of psychosomatic symptoms. [§]: χ^2 test.
[#]: The "unknown" group was excluded in the analysis of one-way ANOVA and χ^2 test.

significantly and positively associated with psychosomatic symptoms, and significantly and negatively associated with job control (p for trend <0.05). Job control, supervisor support and psychosomatic symptoms were significantly different among the groups based on the number of days with on-call duty in the past month ($p<0.05$). A significant linear trend was observed when comparing job control and psychosomatic symptoms (p for trend <0.05). The number of workdays with no overtime in the past month was significantly and negatively associated with job demand, supervisor support, coworker support and psychosomatic symptoms, and was significantly and positively associated with job control (p for trend <0.05). The number of days off with no work in the past month was significantly and negatively associated with job demand, coworker support and psychosomatic symptoms, and was significantly and positively associated with job control (p for trend <0.05). The number of days off with some work in the past month was significantly and positively associated with job demand, supervisor support, coworker support and psychosomatic symptoms, and was significantly and negatively associated with job control (p for trend <0.05).

When we stratified the respondents by gender, almost similar patterns for the total sample were still observed for the male sample, although some associations became non-significant (Table 4). The number of days off with no work in the past month was significantly and negatively associated with supervisor support for the male sample (p for trend <0.05). Almost similar patterns for the total sample were still observed for the female sample, although some associations became non-significant (Table 5). We here note the gender differences. The associations of average working hours per week with supervisor support and coworker support were less clear and were not significant for the female sample. The association of the number of night duties in the past month with job demands and coworker support was clearer and significant for the female sample ($p<0.05$). Supervisor support and psychosomatic symptoms were significantly different among the groups classified based on the number of weekend duties in the past month ($p<0.05$), although there was no significant linear trend for the female sample. The number of days off with some work in the past month

Table 3. Crude mean score and standard deviation of psychosocial job stressor scales and psychosomatic symptoms scale stratified by work-related factors in the total (male + female) sample

Work-related factors	n	Job demand Mean (SD)	Job control Mean (SD)	Supervisor support n[$]	Supervisor support Mean (SD)	Coworker support n[$]	Coworker support Mean (SD)	Psychosomatic symptoms Mean (SD)	Psychosomatic symptoms High(%)[Φ]
Average working hours per week									
≤50	163	8.6 (2.0)	9.2 (1.9)	123	7.5 (2.4)	137	7.7 (1.9)	9.5 (7.7)	33.1
51–60	124	9.6 (1.7)	8.0 (2.1)	114	7.7 (2.1)	118	8.0 (2.1)	11.9 (8.4)	44.4
61–70	133	10.2 (1.7)	8.0 (2.0)	121	7.7 (2.3)	125	8.3 (2.2)	13.0 (8.5)	49.6
71–80	77	10.0 (1.7)	7.4 (1.9)	76	8.1 (2.2)	76	8.4 (2.1)	14.7 (8.8)	61.0
>80	93	10.0 (1.9)	7.4 (1.9)	91	8.0 (2.3)	92	8.5 (1.9)	14.4 (7.8)	63.4
One-way ANOVA/χ^2 test		p<0.001	p<0.001		p=0.338		p=0.015	p<0.001	p<0.001[§]
Trend test		p<0.001	p<0.001		p=0.047		p=0.001	p=0.001	p<0.001
Number of night duties in the past month									
0	183	9.2 (2.1)	8.9 (1.9)	146	7.4 (2.4)	164	7.9 (2.1)	10.8 (8.3)	39.3
1–3	183	9.7 (1.8)	7.8 (2.1)	173	7.9 (2.2)	174	8.2 (2.1)	13.0 (8.6)	50.8
≥4	191	9.8 (1.9)	7.5 (1.9)	189	7.9 (2.1)	188	8.2 (2.1)	13.3 (7.9)	55.5
Unknown	33	9.8 (1.4)	9.3 (2.1)	17	7.9 (2.9)	22	8.3 (1.8)	9.6 (8.8)	30.3
One-way ANOVA[#]/χ^2 test		p=0.007	p<0.001		p=0.038		p=0.144	p=0.007	p=0.006[§]
Trend test		p=0.003	p<0.001		p=0.021		p=0.084	p=0.004	p=0.002
Number of weekend duties in the past month									
0	189	9.4 (1.9)	8.5 (2.1)	161	7.6 (2.2)	176	7.9 (2.0)	11.4 (8.1)	44.4
1	183	9.6 (1.9)	8.1 (1.9)	167	7.7 (2.3)	171	8.0 (2.2)	11.8 (7.9)	44.8
≥2	182	9.7 (1.9)	7.6 (2.0)	177	8.0 (2.2)	176	8.3 (2.0)	14.0 (8.8)	57.1
Unknown	36	9.8 (1.6)	9.3 (2.1)	20	7.3 (2.7)	25	8.6 (1.8)	9.9 (8.7)	30.6
One-way ANOVA[#]/χ^2 test		p=0.278	p<0.001		p=0.331		p=0.174	p=0.005	p=0.022[§]
Trend test		p=0.125	p<0.001		p=0.147		p=0.076	p=0.002	p=0.015
Days with on-call duties in the past month									
0	274	9.5 (2.0)	8.5 (2.1)	229	7.6 (2.3)	245	8.0 (2.1)	11.4 (8.5)	43.8
1–8	173	9.7 (1.8)	7.5 (2.0)	172	8.1 (2.1)	173	8.4 (2.0)	13.8 (8.4)	55.5
≥9	107	9.5 (1.9)	7.7 (2.0)	105	7.5 (2.3)	106	8.0 (2.0)	13.1 (7.8)	52.3
Unknown	36	9.7 (1.5)	9.3 (2.0)	19	7.8 (2.7)	24	8.0 (2.2)	8.3 (7.1)	25.0
One-way ANOVA[#]/χ^2 test		p=0.463	p<0.001		p=0.029		p=0.224	p=0.010	p=0.042[§]
Trend test		p=0.571	p<0.001		p=0.692		p=0.879	p=0.020	p=0.048
Workdays with no overtime in the past month									
≥15	100	8.3 (1.9)	9.4 (1.8)	77	7.0 (2.4)	84	7.7 (2.3)	8.7 (6.7)	27.0
5–14	136	9.3 (1.7)	8.0 (2.2)	120	7.6 (2.1)	127	7.7 (1.8)	12.4 (8.8)	46.3
1–4	76	9.6 (2.0)	8.1 (2.0)	74	8.4 (2.3)	73	8.4 (1.9)	12.7 (8.9)	50.0
0	250	10.3 (1.7)	7.7 (2.0)	234	7.9 (2.2)	242	8.4 (2.1)	13.7 (8.4)	56.4
Unknown	28	9.1 (1.7)	8.8 (1.8)	20	7.8 (2.0)	22	8.1 (2.0)	10.1 (7.4)	42.9
One-way ANOVA[#]/χ^2 test		p<0.001	p<0.001		p=0.002		p=0.002	p<0.001	p<0.001[§]
Trend test		p<0.001	p<0.001		p=0.003		p<0.001	p<0.001	p<0.001
Days off with no work in the past month									
≥5	145	8.7 (1.9)	8.8 (2.1)	123	7.5 (2.2)	131	7.8 (2.0)	10.5 (7.8)	37.9
3–4	165	9.9 (1.8)	8.1 (2.1)	144	7.5 (2.4)	154	8.0 (2.1)	12.0 (8.9)	43.0
1–2	146	9.9 (1.7)	7.9 (2.1)	139	8.0 (2.2)	139	8.2 (1.9)	13.0 (8.1)	54.1
0	105	10.1 (1.8)	7.5 (2.0)	100	8.0 (2.3)	102	8.3 (2.2)	14.6 (8.6)	60.0
Unknown	29	9.0 (2.0)	8.7 (1.9)	19	8.6 (2.2)	22	9.5 (1.7)	10.4 (6.3)	44.8
One-way ANOVA[#]/χ^2 test		p<0.001	p<0.001		p=0.202		p=0.186	p=0.001	p=0.001[§]
Trend test		p<0.001	p<0.001		p=0.055		p=0.031	p<0.001	p<0.001
Days off with some work in the past month									
0	157	9.1 (2.0)	8.5 (2.1)	125	7.5 (2.2)	136	7.8 (1.9)	10.8 (8.6)	39.5
1–2	122	9.3 (2.1)	8.6 (2.2)	108	7.5 (2.5)	116	8.1 (2.3)	11.1 (8.1)	40.2
3–5	136	9.8 (1.7)	7.8 (1.9)	129	7.9 (2.1)	129	8.0 (1.9)	12.8 (8.5)	48.5
≥6	135	10.2 (1.7)	7.6 (1.8)	133	8.0 (2.2)	134	8.5 (2.0)	14.7 (7.7)	63.7
Unknown	40	9.3 (2.1)	8.5 (2.4)	30	8.0 (2.2)	33	8.5 (2.4)	11.7 (8.6)	45.0
One-way ANOVA[#]/χ^2 test		p<0.001	p<0.001		p=0.179		p=0.058	p<0.001	p<0.001[§]
Trend test		p<0.001	p<0.001		p=0.035		p=0.013	p<0.001	p<0.001

[$] : Numbers of subjects analyzed for the supervisor support and coworker support scales were reduced due to missing data; n=525 and 548, respectively.

[Φ]: Prevalence of high levels of psychosomatic symptoms.

[§] : χ^2 test.

[#] : The "unknown" group was excluded in the analysis of one-way ANOVA and χ^2 test.

Table 4. Crude mean score and standard deviation of psychosocial job stressor scales and psychosomatic symptoms scale stratified by work-related factors in the male sample

Work-related factors	n	Job demand Mean (SD)	Job control Mean (SD)	Supervisor support n$	Supervisor support Mean (SD)	Coworker support n$	Coworker support Mean (SD)	Psychosomatic symptoms Mean (SD)	Psychosomatic symptoms High(%)Φ
Average working hours per week									
≤50	101	8.7 (2.1)	9.0 (2.0)	72	7.1 (2.3)	80	7.5 (2.0)	9.3 (7.4)	32.7
51–60	89	9.5 (1.7)	8.1 (2.0)	79	7.6 (1.8)	84	7.9 (1.9)	11.3 (7.7)	42.7
61–70	97	10.3 (1.7)	8.1 (2.0)	86	7.6 (2.3)	91	8.4 (2.1)	13.1 (8.6)	48.5
71–80	48	10.1 (1.6)	7.6 (1.9)	47	8.0 (2.3)	47	8.4 (2.1)	13.7 (8.5)	54.2
>80	70	10.2 (1.8)	7.3 (1.9)	68	7.8 (2.4)	69	8.4 (1.9)	14.1 (8.3)	60.0
One-way ANOVA/c^2 test		p<0.001	p<0.001		p=0.200		p=0.018	p=0.001	p=0.005§
Trend test		p<0.001	p<0.001		p=0.037		p=0.002	p<0.001	p<0.001
Number of night duties in the past month									
0	123	9.4 (2.2)	9.0 (1.8)	94	7.3 (2.3)	108	8.0 (1.9)	10.2 (8.1)	36.6
1–3	128	9.8 (1.8)	7.7 (2.1)	120	7.7 (2.3)	121	8.0 (2.1)	13.4 (8.4)	51.6
≥4	132	9.8 (1.8)	7.5 (1.8)	130	7.9 (2.1)	129	8.2 (2.1)	12.9 (7.7)	53.0
Unknown	22	10.0 (1.5)	9.7 (2.2)	8	6.9 (2.9)	13	9.0 (1.5)	8.7 (8.7)	22.7
One-way ANOVA#/c^2 test		p=0.219	p<0.001		p=0.171		p=0.727	p=0.004	p=0.015§
Trend test		p=0.133	p<0.001		p=0.065		p=0.427	p=0.009	p=0.010
Number of weekend duties in the past month									
0	131	9.5 (1.9)	8.5 (2.0)	108	7.5 (2.1)	120	7.9 (1.8)	10.7 (7.7)	41.2
1	126	9.7 (1.9)	8.0 (2.0)	115	7.8 (2.4)	117	8.0 (2.3)	12.4 (8.0)	46.0
≥2	124	9.7 (2.0)	7.6 (1.9)	119	7.6 (2.1)	119	8.2 (1.9)	13.7 (8.6)	55.6
Unknown	24	10.2 (1.5)	9.4 (2.3)	10	6.4 (2.7)	15	9.3 (1.5)	8.7 (8.3)	20.8
One-way ANOVA#/c^2 test		p=0.816	p=0.001		p=0.512		p=0.553	p=0.014	p=0.065§
Trend test		p=0.548	p<0.001		p=0.637		p=0.277	p=0.004	p=0.022
Days with on-call duties in the past month									
0	195	9.6 (2.0)	8.5 (1.9)	159	7.5 (2.2)	171	8.0 (2.1)	11.2 (8.2)	42.6
1–8	118	9.8 (1.7)	7.4 (2.0)	118	8.1 (2.1)	118	8.3 (2.0)	13.7 (8.6)	53.4
≥9	69	9.6 (2.1)	7.7 (2.0)	67	7.0 (2.4)	69	7.7 (2.0)	13.5 (7.7)	53.6
Unknown	23	9.8 (1.5)	9.7 (2.2)	8	7.4 (2.4)	13	8.8 (1.8)	6.2 (3.8)	13.0
One-way ANOVA#/c^2 test		p=0.614	p<0.001		p=0.005		p=0.162	p=0.016	p=0.103§
Trend test		p=0.725	p<0.001		p=0.428		p=0.581	p=0.011	p=0.055
Workdays with no overtime in the past month									
≥15	70	8.4 (1.9)	9.2 (1.9)	54	6.9 (2.2)	57	7.5 (2.3)	8.7 (6.2)	27.1
5–14	91	9.6 (1.7)	7.7 (2.1)	78	7.1 (2.1)	84	7.5 (1.8)	12.4 (8.9)	44.0
1–4	49	9.7 (2.2)	8.1 (1.8)	47	8.3 (2.3)	46	8.5 (1.9)	11.1 (7.5)	44.9
0	177	10.3 (1.6)	7.8 (2.0)	163	7.9 (2.2)	172	8.4 (2.0)	13.8 (8.5)	55.9
Unknown	18	8.8 (1.9)	9.1 (1.9)	10	7.8 (2.4)	12	8.3 (1.7)	8.2 (5.6)	33.3
One-way ANOVA#/c^2 test		p<0.001	p<0.001		p=0.001		p=0.001	p<0.001	p=0.001§
Trend test		p<0.001	p<0.001		p=0.001		p<0.001	p<0.001	p<0.001
Days off with no work in the past month									
≥5	93	8.7 (2.0)	8.5 (2.1)	77	7.2 (2.1)	81	7.7 (2.0)	10.2 (7.8)	38.7
3–4	111	10.0 (1.8)	8.1 (2.0)	94	7.3 (2.2)	103	8.0 (2.0)	11.9 (8.9)	40.5
1–2	101	10.0 (1.7)	8.0 (2.0)	95	7.8 (2.2)	96	8.1 (1.9)	12.8 (7.2)	53.5
0	79	10.1 (1.8)	7.6 (2.1)	74	8.1 (2.4)	76	8.5 (2.1)	13.9 (9.1)	53.2
Unknown	21	8.8 (2.2)	9.0 (1.7)	12	8.3 (2.4)	15	9.2 (1.7)	9.8 (5.6)	42.9
One-way ANOVA#/c^2 test		p<0.001	p=0.036		p=0.052		p=0.139	p=0.021	p=0.065§
Trend test		p<0.001	p=0.005		p=0.007		p=0.022	p=0.022	p=0.015
Days off with some work in the past month									
0	106	9.0 (2.0)	8.6 (2.2)	81	7.5 (2.3)	91	7.9 (1.9)	10.4 (8.4)	35.8
1–2	78	9.6 (2.0)	8.6 (2.2)	68	7.2 (2.5)	72	8.2 (2.2)	11.1 (8.4)	41.0
3–5	91	10.0 (1.6)	7.7 (1.8)	84	7.7 (2.0)	85	7.8 (1.9)	12.2 (8.2)	44.0
≥6	103	10.3 (1.6)	7.5 (1.9)	101	7.9 (2.2)	102	8.4 (2.0)	14.6 (7.7)	63.1
Unknown	27	9.4 (2.3)	8.8 (2.0)	18	7.8 (2.5)	21	8.4 (2.5)	10.4 (7.1)	40.7
One-way ANOVA#/c^2 test		p<0.001	p<0.001		p=0.294		p=0.196	p=0.002	p=0.001§
Trend test		p<0.001	p<0.001		p=0.124		p=0.208	p<0.001	p<0.001

$: Numbers of subjects analyzed for the supervisor support and coworker support scales were reduced due to missing data; n=352 and 371, respectively.

Φ: Prevalence of high levels of psychosomatic symptoms.

§ : χ^2 test.

: The "unknown" group was excluded in the analysis of one-way ANOVA and χ^2 test.

Table 5. Crude mean score and standard deviation of psychosocial job stressor scales and psychosomatic symptoms scale stratified by work-related factors in the female sample

Work-related factors	n	Job demand Mean (SD)	Job control Mean (SD)	Supervisor support n[$]	Supervisor support Mean (SD)	Coworker support n[$]	Coworker support Mean (SD)	Psychosomatic symptoms Mean (SD)	Psychosomatic symptoms High(%)[Φ]
Average working hours per week									
≤50	62	8.5 (1.8)	9.4 (2.0)	51	8.0 (2.3)	57	7.8 (1.9)	9.8 (8.1)	33.9
51–60	35	10.0 (1.7)	7.7 (2.0)	35	7.9 (2.5)	34	8.4 (2.4)	13.2 (9.9)	48.6
61–70	36	9.9 (1.6)	7.9 (2.0)	35	8.0 (2.3)	34	7.9 (2.5)	12.9 (8.2)	52.8
71–80	29	9.8 (1.9)	6.9 (1.9)	29	8.1 (1.9)	29	8.6 (2.2)	16.3 (9.2)	72.4
>80	23	9.5 (2.2)	7.6 (1.9)	23	8.5 (2.0)	23	8.6 (1.8)	15.4 (6.4)	73.9
One-way ANOVA/c^2 test		$p<0.001$	$p<0.001$		$p=0.898$		$p=0.381$	$p=0.005$	$p=0.002$[§]
Trend test		$p=0.002$	$p<0.001$		$p=0.409$		$p=0.126$	$p<0.001$	$p<0.001$
Number of night duties in the past month									
0	60	8.8 (1.9)	8.8 (2.1)	52	7.5 (2.6)	56	7.7 (2.5)	12.0 (8.8)	45.0
1–3	55	9.5 (1.8)	8.2 (2.1)	53	8.4 (1.9)	53	8.7 (1.9)	12.2 (9.1)	49.1
≥4	59	9.8 (2.0)	7.4 (2.0)	59	8.2 (2.0)	59	8.4 (2.0)	14.2 (8.3)	61.0
Unknown	11	9.4 (1.3)	8.5 (1.8)	9	8.8 (2.8)	9	7.3 (1.9)	11.5 (9.0)	45.5
One-way ANOVA[#]/c^2 test		$p=0.010$	$p=0.002$		$p=0.091$		$p=0.040$	$p=0.317$	$p=0.194$[§]
Trend test		$p=0.003$	$p<0.001$		$p=0.133$		$p=0.061$	$p=0.171$	$p=0.082$
Number of weekend duties in the past month									
0	58	9.0 (2.0)	8.4 (2.4)	53	7.9 (2.4)	56	8.0 (2.4)	13.0 (8.9)	51.7
1	57	9.5 (1.9)	8.3 (1.7)	52	7.6 (2.0)	54	8.0 (2.1)	10.5 (7.4)	42.1
≥2	58	9.7 (1.9)	7.6 (2.3)	58	8.7 (2.1)	57	8.6 (2.0)	14.8 (9.2)	60.3
Unknown	12	8.9 (1.5)	9.0 (1.4)	10	8.1 (2.6)	10	7.7 (1.7)	12.3 (9.4)	50.0
One-way ANOVA[#]/c^2 test		$p=0.153$	$p=0.088$		$p=0.027$		$p=0.200$	$p=0.030$	$p=0.147$[§]
Trend test		$p=0.061$	$p=0.045$		$p=0.054$		$p=0.136$	$p=0.253$	$p=0.354$
Days with on-call duties in the past month									
0	79	9.2 (2.0)	8.5 (2.4)	70	7.7 (2.3)	74	8.1 (2.2)	12.1 (9.3)	46.8
1–8	55	9.5 (2.1)	7.8 (2.0)	54	8.2 (2.1)	55	8.4 (2.2)	14.2 (8.0)	60.0
≥9	38	9.4 (1.5)	7.8 (1.8)	38	8.4 (2.0)	37	8.4 (2.0)	12.3 (8.1)	50.0
Unknown	13	9.5 (1.3)	8.7 (1.5)	11	8.2 (3.0)	11	7.0 (2.2)	12.0 (9.8)	46.2
One-way ANOVA[#]/c^2 test		$p=0.671$	$p=0.088$		$p=0.236$		$p=0.575$	$p=0.364$	$p=0.315$[§]
Trend test		$p=0.521$	$p=0.049$		$p=0.094$		$p=0.354$	$p=0.677$	$p=0.535$
Workdays with no overtime in the past month									
≥15	30	8.1 (1.8)	9.8 (1.5)	23	7.4 (2.8)	27	8.0 (2.4)	8.7 (7.7)	26.7
5–14	45	8.7 (1.7)	8.5 (2.2)	42	8.4 (2.0)	43	8.1 (1.9)	12.6 (8.5)	51.1
1–4	27	9.5 (1.7)	8.1 (2.4)	27	8.4 (2.2)	27	8.3 (1.9)	15.6 (10.5)	59.3
0	73	10.3 (1.8)	7.3 (2.0)	71	8.0 (2.3)	70	8.3 (2.4)	13.4 (8.1)	57.5
Unknown	10	9.6 (1.2)	8.1 (1.4)	10	7.8 (1.5)	10	7.9 (2.3)	13.7 (9.1)	60.0
One-way ANOVA[#]/c^2 test		$p<0.001$	$p<0.001$		$p=0.325$		$p=0.868$	$p=0.021$	$p=0.028$[§]
Trend test		$p<0.001$	$p<0.001$		$p=0.634$		$p=0.422$	$p=0.025$	$p=0.012$
Days off with no work in the past month									
≥5	52	8.6 (1.7)	9.3 (1.8)	46	8.0 (2.2)	50	7.9 (2.0)	11.1 (8.0)	36.5
3–4	54	9.6 (2.0)	8.1 (2.1)	50	8.0 (2.6)	51	8.1 (2.4)	12.1 (9.2)	48.1
1–2	45	9.6 (1.9)	7.6 (2.2)	44	8.3 (2.1)	43	8.6 (2.0)	13.4 (9.7)	55.6
0	26	10.0 (1.8)	7.2 (1.7)	26	7.6 (1.9)	26	7.9 (2.3)	16.6 (6.7)	80.8
Unknown	8	9.5 (1.5)	7.9 (2.2)	7	9.1 (1.8)	7	10.0 (1.8)	12.0 (8.1)	50.0
One-way ANOVA[#]/c^2 test		$p=0.004$	$p<0.001$		$p=0.628$		$p=0.456$	$p=0.057$	$p=0.003$[§]
Trend test		$p=0.001$	$p<0.001$		$p=0.837$		$p=0.552$	$p=0.009$	$p<0.001$
Days off with some work in the past month									
0	51	9.4 (1.9)	8.4 (2.1)	44	7.6 (2.2)	45	7.6 (1.9)	11.5 (9.0)	47.1
1–2	44	9.0 (2.2)	8.6 (2.3)	40	8.0 (2.6)	44	8.0 (2.4)	11.1 (7.6)	38.6
3–5	45	9.4 (1.8)	7.8 (2.2)	45	8.2 (2.2)	44	8.5 (2.0)	13.8 (9.2)	57.8
≥6	32	9.9 (1.8)	7.9 (1.4)	32	8.5 (2.1)	32	8.8 (2.2)	14.9 (7.7)	65.6
Unknown	13	9.1 (1.6)	7.9 (3.0)	12	8.3 (1.8)	12	8.8 (2.2)	14.2 (11.1)	53.8
One-way ANOVA[#]/c^2 test		$p=0.185$	$p=0.221$		$p=0.329$		$p=0.074$	$p=0.147$	$p=0.087$[§]
Trend test		$p=0.203$	$p=0.107$		$p=0.067$		$p=0.009$	$p=0.039$	$p=0.047$

[$] : Numbers of subjects analyzed for the supervisor support and coworker support scales were reduced due to missing data; n=173 and 177, respectively.

[Φ]: Prevalence of high levels of psychosomatic symptoms.

[§] : χ^2 test.

[#] : The "unknown" group was excluded in the analysis of one-way ANOVA and χ^2 test.

was significantly and positively associated with coworker support ($p<0.05$) and was marginally significantly associated with supervisor support ($p=0.067$). This association was less clear in the male sample. On the other hand, the associations of the number of days off with some work with job demand and job control were less clear and were not significant for the female sample.

After adjusting for gender, age, marital status, work settings and the number of pediatricians in the respondent's workplace, longer average working hours per week was still significantly associated with greater job demand, lower job control and more psychosomatic symptoms, with a relatively large proportion of variance explained by the variable (Table 6, $p<0.05$). The number of days with on-call duty in the past month was significantly associated only with lower job control ($p<0.05$). The greater number of workdays with no overtime in the past month and the greater number of days off with no work in the past month were significantly associated with lower job demand, greater job control and less psychosomatic symptoms, again with a relatively large proportion of variance explained by the variable ($p<0.05$). The greater number of days off with some work in the past month was significantly associated with greater job demand ($p<0.05$).

After additional adjustment for average working hours (Table 7), the number of days with on-call duty in the past month was still significantly and negatively associated with job control ($p<0.05$). The number of workdays with no overtime in the past month was significantly associated with job demand, job control, and psychosomatic symptoms ($p<0.05$). The number of days off with no work in the past month was negatively and significantly associated with job demand, and the number of days off with some work in the past month was positively and significantly associated with job demand ($p<0.05$).

When we stratified the respondents by gender, almost all patterns were still observed, with some gender differences (data not shown). For the male sample, the average working hours per week and the number of days off with no work in the past month were not significantly associated with job control after adjusting for age, marital status, work settings and the number of pediatricians in the respondent's workplace, but the number of night duties in the past month was significantly and negatively associated with job control ($p<0.05$). For the female sample, the association between the number of night duties in the past month and job demand, and the association between the number of days off with no work in the past month and job control after adjusting for age, marital status, work settings and the number of pediatricians in the respondent's workplace, were more clear ($p<0.05$).

Discussion

Our study demonstrated that longer average working hours per week was associated with greater job demand, lower job control and more psychosomatic symptoms among pediatricians in Japan (working 35 or more hours per week). After adjusting for working hours, more workdays with no overtime in the past month was associated with lower job demand, greater job control and less psychosomatic symptoms. More days off with no work was associated with lower job demand, and more days off with some work was associated with greater job demand, again after adjusting for working hours.

The findings that longer working hours are associated with greater job stressors and more psychosomatic symptoms among Japanese pediatricians are consistent with previous reports that long working hours among physicians was associated with lower job control and greater work-home interference[1], poor psychological resources[5], and psychological morbidity[16]. It is reasonable for working hours to be associated with job demand, since longer working hours may lead to a feeling that job demands are greater, or conversely, greater job demands may increase working hours. Our study also revealed that longer working hours was associated with decreased job control among physicians, as indicated by a previous study[1]. According to the job demands-control model[24], the combination of greater job demand and lower job control, called job strain, predicts adverse health effects including psychosomatic symptoms and overt diseases[35]. We suggest that longer working hours increases job strain among pediatricians in Japan according to the job demands-control model, and increases psychosomatic symptoms, possibly through an increase in job strain. The association between longer working hours and more psychosomatic symptoms may also be explained by greater work-home interference among subjects who worked longer hours, which is known to affect psychological distress[1, 3, 4, 7, 16, 19, 36].

Our study also indicated that, even after adjusting for working hours, more workdays with no overtime in the past month was associated with lower job demand, greater job control and fewer psychosomatic symptoms. Overtime is supposed to reduce time for recovery from psychological (e.g. tension and fatigue) and physiological states (neuroendocrine activation) due to exposure to work on a daily basis, which leads to difficulties in unwinding after work[29, 31]. By having daily hours free from work, pediatricians may be able to reduce the feeling of being overwhelmed by job stressors, and release the continuous tension and elevated physiological activation derived from their daily work. Workdays with no overtime may also decrease work-home interference, since pediatricians can take care of their family matters on such days. Our findings suggest that, in addition to actual working hours, the number of workdays with no overtime is important for reducing job strain as determined by the demands-control model and psychosomatic symptoms. Due to the cross-sectional nature of the study the observed

Table 6. Mean score of psychosocial job stressor scales and psychosomatic symptoms scale stratified by work-related factors; adjusted odds ratio with 95%C.I. after controlling for the effect of covariates[§] in the total sample

	Job demand	Job control	Supervisor support	Coworker support	Psychosomatic symptoms	
Work-related factors[#]	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	OR (95%C.I.)
Average working hours per week						
≤50	8.6 (0.2)	8.7 (0.2)	7.8 (0.2)	7.9 (0.2)	10.2 (0.7)	1
51–60	9.6 (0.2)***	8.0 (0.2)**	7.8 (0.2)	8.1 (0.2)	11.8 (0.7)	1.4 (0.8–2.3)
61–70	10.1 (0.2)***	8.2 (0.2)	7.6 (0.2)	8.2 (0.2)	13.0 (0.7)**	1.7 (1.0–2.9)
71–80	10.1 (0.2)***	7.8 (0.2)**	7.7 (0.3)	8.2 (0.2)	13.9 (1.0)**	2.3 (1.2–4.5)
>80	10.1 (0.2)***	7.7 (0.2)**	7.7 (0.2)	8.2 (0.2)*	14.3 (0.9)**	2.8 (1.5–5.2)
ANCOVA	$p<0.001$	$p=0.005$	$p=0.972$	$p=0.878$	$p=0.006$	
%variance explained	7.5%	2.3%	0.1%	0.2%	2.4%	
Number of night duties in the past month						
0	9.3 (0.2)	8.4 (0.2)	7.8 (0.2)	8.3 (0.2)	12.1 (0.7)	1
1–3	9.7 (0.1)	7.9 (0.1)*	7.8 (0.2)	8.1 (0.2)	12.6 (0.6)	1.1 (0.6–1.8)
≥4	9.7 (0.2)	7.9 (0.2)	7.7 (0.2)	7.9 (0.2)	12.5 (0.7)	1.1 (0.6–1.9)
ANCOVA	$p=0.144$	$p=0.072$	$p=0.813$	$p=0.391$	$p=0.853$	
%variance explained	0.7%	0.8%	0.1%	0.3%	0.1%	
Number of weekend duties in the past month						
0	9.5 (0.2)	8.3 (0.2)	7.8 (0.2)	8.2 (0.2)	11.9 (0.6)	1
1	9.7 (0.1)	8.0 (0.1)	7.7 (0.2)	8.0 (0.2)	11.9 (0.6)	0.9 (0.5–1.3)
≥2	9.6 (0.2)	7.9 (0.2)*	7.7 (0.2)	8.1 (0.2)	13.5 (0.6)	1.2 (0.8–2.0)
ANCOVA	$p=0.624$	$p=0.151$	$p=0.858$	$p=0.774$	$p=0.142$	
%variance explained	0.2%	0.6%	0.1%	0.1%	0.7%	
Days with on-call duty in the past month						
0	9.5 (0.1)	8.4 (0.1)	7.7 (0.2)	8.2 (0.1)	11.9 (0.5)	1
1–8	9.6 (0.2)	7.8 (0.2)**	7.9 (0.2)	8.1 (0.2)	13.4 (0.6)	1.2 (0.8–1.9)
≥9	9.7 (0.2)	7.7 (0.2)**	7.5 (0.2)	8.1 (0.2)	12.8 (0.8)	1.3 (0.8–2.2)
ANCOVA	$p=0.679$	$p=0.004$	$p=0.478$	$p=0.908$	$p=0.207$	
%variance explained	0.1%	1.7%	0.3%	<0.1%	0.6%	
Workdays with no overtime in the past month						
≥15	8.3 (0.2)	8.8 (0.2)	7.4 (0.3)	8.0 (0.2)	9.5 (0.9)	1
5–14	9.3 (0.2)***	7.9 (0.2)**	7.6 (0.2)	7.8 (0.2)	12.4 (0.7)**	2.0 (1.1–3.7)
1–4	9.6 (0.2)***	8.2 (0.2)	8.3 (0.3)**	8.4 (0.2)	12.5 (0.9)*	2.3 (1.2–4.6)
0	10.3 (0.1)***	7.9 (0.1)**	7.7 (0.2)	8.2 (0.1)	13.6 (0.6)***	2.8 (1.6–4.9)
ANCOVA	$p<0.001$	$p=0.002$	$p=0.104$	$p=0.260$	$p=0.002$	
%variance explained	12.6%	2.2%	1.2%	0.7%	2.5%	
Days off with no work in the past month						
≥5	8.8 (0.2)	8.4 (0.2)	7.7 (0.2)	8.0 (0.2)	11.0 (0.7)	1
3–4	9.8 (0.1)***	8.0 (0.2)	7.6 (0.2)	8.1 (0.2)	12.1 (0.7)	1.1 (0.7–1.8)
1–2	9.8 (0.2)***	8.2 (0.2)	7.8 (0.2)	8.0 (0.2)	12.6 (0.7)	1.5 (0.9–2.5)
0	10.1 (0.2)***	7.7 (0.2)**	7.8 (0.2)	8.2 (0.2)	14.4 (0.8)**	2.1 (1.2–3.6)
ANCOVA	$p<0.001$	$p=0.031$	$p=0.938$	$p=0.885$	$p=0.025$	
%variance explained	6.7%	1.4%	0.1%	0.1%	1.6%	
Days off with some work in the past month						
0	9.1 (0.2)	8.2 (0.2)	7.7 (0.2)	8.0 (0.2)	11.2 (0.7)	1
1–2	9.4 (0.2)	8.3 (0.2)	7.6 (0.2)	8.2 (0.2)	11.7 (0.7)	1.0 (0.6–1.6)
3–5	9.8 (0.2)**	7.9 (0.2)	7.8 (0.2)	8.0 (0.2)	12.6 (0.7)	1.2 (0.7–2.0)
≥6	10.1 (0.2)***	8.0 (0.2)	7.8 (0.2)	8.2 (0.2)	13.9 (0.7)**	2.0 (1.2–3.4)
ANCOVA	$p<0.001$	$p=0.336$	$p=0.957$	$p=0.685$	$p=0.067$	
%variance explained	3.3%	0.5%	0.1%	0.3%	1.3%	

[§]: Covariates: gender, age, marital status, work settings and number of pediatricians in the respondent's workplace. Analysis of covariance (ANCOVA) was used for the comparison of means; multiple logistic regression was used to estimate odds ratios for psychosomatic symptoms (dichotomous categories).

[#]: The number of subjects varied across the working condition variables because of missing responses (for details, see Table 3).

*$p<0.05$, **$p<0.01$, ***$p<0.001$ (2-tailed) show statistically significant differences (comparing first line to other lines).

Table 7. Mean scores of psychosocial job stressor scales and psychosomatic symptoms by working conditions and the adjusted odds ratio (with 95%C.I.) after controlling for average working hours per week and other covariates§ in the total sample

	Job demand	Job control	Superiors support	Coworkers support	Psychosomatic symptom	
Work-related factors#	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	OR (95%C.I.)
Number of night duties in the past month						
0 d	9.3 (0.2)	8.4 (0.2)	7.8 (0.2)	8.3 (0.2)	12.1 (0.7)	1
1–3 d	9.7 (0.1)*	7.9 (0.1)*	7.8 (0.2)	8.1 (0.2)	12.7 (0.6)	1.1 (0.6–1.8)
≥4 d	9.7 (0.2)	8.0 (0.2)	7.7 (0.2)	7.9 (0.2)	12.5 (0.7)	1.1 (0.6–1.9)
ANCOVA	p=0.135	p=0.071	p=0.818	p=0.379	p=0.842	
%variance explained	0.7%	0.8%	0.1%	0.4%	0.1%	
Number of weekend duties in the past month						
0 d	9.5 (0.1)	8.3 (0.1)	7.8 (0.2)	8.2 (0.2)	12.0 (0.6)	1
1 d	9.7 (0.1)	8.0 (0.1)	7.7 (0.2)	8.0 (0.2)	12.0 (0.6)	0.9 (0.6–1.4)
≥2 d	9.5 (0.1)	7.9 (0.1)	7.7 (0.2)	8.1 (0.2)	13.3 (0.6)	1.2 (0.7–1.9)
ANCOVA	p=0.473	p=0.200	p=0.857	p=0.794	p=0.256	
%variance explained	0.3%	0.5%	0.1%	0.1%	0.5%	
Days with on-call duties in the past month						
0 d	9.6 (0.1)	8.3 (0.1)	7.7 (0.2)	8.2 (0.1)	12.2 (0.5)	1
1–8 d	9.6 (0.1)	7.9 (0.2)*	7.9 (0.2)	8.1 (0.2)	13.3 (0.7)	1.1 (0.7–1.7)
≥9 d	9.5 (0.2)	7.8 (0.2)*	7.5 (0.2)	8.0 (0.2)	12.1 (0.8)	1.0 (0.6–1.8)
ANCOVA	p=0.888	p=0.023	p=0.494	p=0.768	p=0.342	
%variance explained	<0.1%	1.2%	0.3%	0.1%	0.4%	
Workdays with no overtime in the past month						
≥15 d	8.3 (0.2)	8.7 (0.2)	7.4 (0.3)	8.0 (0.2)	9.8 (0.9)	1
5–14 d	9.4 (0.2)***	7.8 (0.2)**	7.6 (0.2)	7.9 (0.2)	12.8 (0.7)**	2.1 (1.2–3.8)
1–4 d	9.6 (0.2)***	8.2 (0.2)	8.3 (0.3)*	8.4 (0.2)	12.6 (0.9)*	2.2 (1.1–4.3)
0 d	10.2 (0.1)***	8.0 (0.1)**	7.7 (0.2)	8.2 (0.1)	13.2 (0.6)**	2.3 (1.3–4.2)
ANCOVA	p<0.001	p=0.005	p=0.100	p=0.341	p=0.020	
%variance explained	9.5%	1.9%	1.2%	0.6%	1.7%	
Days off with no work in the past month						
≥5 d	8.9 (0.2)	8.3 (0.2)	7.6 (0.2)	8.0 (0.2)	11.5 (0.7)	1
3–4 d	9.9 (0.2)***	8.0 (0.2)	7.6 (0.2)	8.1 (0.2)	12.2 (0.7)	1.0 (0.6–1.6)
1–2 d	9.8 (0.2)***	8.2 (0.2)	7.8 (0.2)	8.0 (0.2)	12.4 (0.7)	1.2 (0.7–2.1)
0 d	9.9 (0.2)***	7.8 (0.2)	7.8 (0.2)	8.1 (0.2)	13.8 (0.9)	1.6 (0.9–2.9)
ANCOVA	p<0.001	p=0.212	p=0.912	p=0.943	p=0.268	
%variance explained	4.3%	0.7%	0.1%	<0.1%	0.7%	
Days off with some work in the past month						
0 d	9.2 (0.2)	8.2 (0.2)	7.7 (0.2)	8.1 (0.2)	11.5 (0.7)	1
1–2 d	9.4 (0.2)	8.3 (0.2)	7.6 (0.2)	8.2 (0.2)	11.9 (0.8)	1.0 (0.6–1.6)
3–5 d	9.8 (0.2)*	7.9 (0.2)	7.8 (0.2)	7.9 (0.2)	12.4 (0.7)	1.1 (0.6–1.8)
≥6 d	9.8 (0.2)**	8.1 (0.2)	7.8 (0.2)	8.2 (0.2)	13.5 (0.8)	1.7 (1.0–3.0)
ANCOVA	p=0.014	p=0.613	p=0.924	p=0.677	p=0.293	
%variance explained	1.8%	0.3%	0.1%	0.3%	0.7%	

§ : Covariates: gender, age, marital status, worksetting, average working hours per week, number of pediatricians in the same workplace adjusted. Analysis of covariance (ANCOVA) was used for the comparison of means; multiple logistic regression was used to estimate ratios for psychosomatic symptoms (dichotomous categories).

: The number of subjects varied across the working condition variables because of missing responses (for details, see Table 3).

*: for p<0.05; ** for p<0.01; *** for p<0.001 (2-tailed) showed significant level of the simple contrast (comparing first line to other lines).

association may however reflect an inverse causal relationship, in that subjects with greater job demands had little opportunity for workdays with no overtime, and/or subjects with lower job control had little influence over overtime on workdays. The findings should be confirmed by a future longitudinal study.

The number of days off with no work in the past month was one of the recovery-related factors associated with job demand, but was not significantly associated with other job stressors or psychosomatic symptoms after adjusting for working hours. Frequent days off, free from work, may reduce pediatricians' perceptions of job demands. The effect of the number of days off with no work on job control and psychosomatic symptoms seems

to be explained by the total working hours. Interestingly, the association between the number of days off with no work in the past month and job control was more clearly observed in the female sample than in the male sample. The gender difference may be attributable to the particular importance among female pediatricians of keeping time free on days off to meet family demands, which may give them a better perception of job control. Due to the cross-sectional nature of the study, the observed association may however reflect the fact that female pediatricians with greater job control tend to take days off (particularly days off with no work) more frequently, possibly to meet their family demands.

The number of days off with some work was significantly associated with greater job demand after adjusting for working hours. This is partly in concordance with a previous finding among nurses[32] that working on days off was associated with more musculoskeletal symptoms. Working on a day off may encroach on recovery and recuperation time for physicians and nurses. As we asked respondents to report average working hours per week including work on days off, this finding suggests that working on a day off has a detrimental effect of more than a simple extension of working hours. It is very common for pediatricians to work on a day off because they feel responsibility and loyalty to their patients, coworkers and/or the job itself. Further study is needed to address more details of this topic relating to pediatricians and other medical staff.

We found that a high frequency of on-call duties in the past month was significantly associated with low job control, which is also partly in concordance with previous studies of physicians and nurses[18, 32]. Frequent exposure to unexpected on-call days may decrease a feeling of job control among pediatricians. It was unexpected that the number of night or weekend duties was not significantly associated with psychosocial job stressors or psychosomatic symptoms in our sample. The frequency of these extra duties may be a secondary factor for psychological morbidity among Japanese pediatricians, compared with working hours, workdays with no overtime, and days off with/without work. If adjustments are made for total working hours and there is a certain frequency of days free from work and overwork, extra duties may not be a burden for Japanese pediatricians. A slight gender difference was found in the effect of night duties: the number of night duties was associated with job demands among females, while it was associated with lack of job control among males. Frequent night duties may be more psychologically and physically demanding for female pediatricians. On the other hand, male pediatricians may perceive their night duties as an uncontrollable part of their job. These results should be interpreted with care, because the frequency of extra duties in our sample was low. The finding may be attributable to a possible selection bias, in that those who had fewer extra duties were more likely to respond to the survey. A further study is needed to explore the effects of extra duties on job stressors and psychosomatic symptoms among pediatricians in Japan.

The negative association of the number of pediatricians at the workplace with job control and the positive association of the number of pediatricians at the workplace with social support are in the expected direction. However, it was somewhat unexpected that pediatricians who had more coworkers reported greater job demand and more psychosomatic symptoms. This may be a result of some of the characteristics of pediatric health care in Japan. A larger hospital covers primary as well as secondary and/or tertiary pediatric care, and pediatricians working in such a hospital see a wider range of pediatric patients, from emergencies to chronic diseases. This may explain why respondents from large hospitals reported greater job demand and more psychosomatic symptoms.

Normative data for the four psychosocial job stressor scales are available for comparison. They were collected from a large sample of 15,933 male and 8,477 female workers with a wide range of occupations (managers, professionals, technicians, clerks, sales, transport industry, telecommunications, manufacturing industry, security agencies and unknown job categories)[37]. When we compared average levels of these psychosocial job stressors with the normative data, both male and female pediatricians had higher scores for job demand and job control, suggesting that pediatricians have active jobs according to the DCS model. The average score of supervisor support in male pediatricians was similar to the normative score, but the score was higher in female pediatricians, while the score for coworker support was very similar in both genders (the normative scores in men and women were 8.7 and 7.9 for job demand, 7.9 and 7.2 for job control, 7.5 and 6.6 for supervisor support and 8.1 and 8.2 for coworker support, respectively). The median score for psychosomatic symptoms in our sample was 11, which was higher than the median score of 8 reported in a survey of 109 male workers at a car manufacturer in Japan[38]. These comparisons suggest that Japanese pediatricians have greater job demand, greater job control, and more psychosomatic symptoms compared with workers in other occupations.

The relatively low response rate (28.3%) limited the validity of the results in this study, but the response rate of physician surveys is commonly low[5, 39, 40]. Even though the response rate was low, the proportion of each gender was almost the same as that of all registered pediatricians in 2002[41], while the average age of the subjects was slightly younger than that calculated from the Japan Pediatric Society register (49 yr). When we compared the distribution of work settings in our sample with that

of a sample of 100 members of the Japan Pediatric Society randomly selected from the membership register, the proportion of general hospital pediatricians was higher (51% in our sample vs 40% in the random sample) and the proportions of clinic pediatricians and pediatricians who worked in non-clinical work settings were lower (25% and 2% in our sample vs 35% and 6% in the random sample). Hospital pediatricians seemed to be more interested in the study and more likely to respond. Clinic pediatricians had a greater tendency to be eliminated from the analyses because of missing responses, possibly due to the questionnaire being more suitably designed for hospital pediatricians. Our findings may better reflect work characteristics and situations among hospital pediatricians in Japan. Measurements of work-related factors and psychosocial job stressors/psychosomatic symptoms were self-reported, which may result in overestimation. Another limitation of our study was its cross-sectional nature, as described above, which makes it difficult to ascertain causality. There is also a seasonal variance of workload in the Japanese pediatrician workforce. Some respondents working in clinics claimed that the scales used to assess psychosocial job stressors were not appropriate for them. We examined recovery effects of working conditions independent of total work hours, while there may be more complex interactions or combination effects among the working conditions, which should be addressed in future research with a larger sample. Despite these limitations, our study suggests that shorter working hours and an increased frequency of workdays with no overtime are important factors for reducing job stressors and psychosomatic symptoms among pediatricians in Japan. Increasing the number of days free from overtime/work and controlling total working hours may be useful measures for improving health among Japanese pediatricians with high workloads. This study is a part of a project of the Committee on Work Environment of Pediatricians of the Japan Pediatric Society to improve the work environment, in which Japanese pediatricians work on average for 65 hours per week. The Committee is going to take action to reduce working hours following the results of many studies including this study, with strategies concentrating pediatricians to a hospital covering a particular area, distinguishing high-level pediatric care from primary care, facilitating employment of pediatricians who can't work full-time, and so on.

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Types of psychosocial job demands and adverse events due to dental mismanagement: a cross sectional study

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Abstract

Background: A harsh work environment including psychosocial job demands might cause adverse events due to medical mismanagement, but the association has not been explored. The purpose of the study was to investigate whether some types of psychosocial job demands are associated with adverse events due to dental mismanagement experienced by general dental practitioners.

Methods: A self-administered questionnaire was mailed to members of a local branch of the Japan dental association. A total of 261 dental practitioners responded anonymously (response rate 53%). Psychosocial job demands were measured by a Japanese version of the Copenhagen Psychosocial Questionnaire, which comprises five sub-scales: quantitative demands, cognitive demands, emotional demands, demands for hiding emotions, and sensorial demands. The outcome was defined according to whether the respondent's patients experienced one of the following adverse events due to dental mismanagement at least once during the previous one year: dropping of dental instrument or broken injection needle, soft tissue or nerve injury, accidental bleeding, loss of a tooth root into the maxillary sinus, and emphysema. Associations between each demand index and experience of adverse events were examined by logistic regression analyses adjusting for potential confounders.

Results: Emotional demands and sensorial demands were significantly associated with the experience of adverse events (odds ratio = 3.9 for each). Other than the indices, male gender, younger age, practice alone, many dental chairs (five or more), and many patients (30 or more per day) were the risks. Working hours per week and number of paramedical staff had no significant associations.

Conclusion: Emotional and sensorial job demands are a potential target for the reduction of adverse events due to dental mismanagement.

Background

Injury or complications in patients undergoing medical mismanagement has become a significant social concern, as the consequences are often very serious [1]. Thus, the benefits of preventing such adverse events are large for the appropriate health services.

It has been reported that dental practitioners experience higher levels of occupational stress than general working populations [2-5]. As classifications of dental work pressure, rising patient expectations, aggression exhibited by some patients in the practice, the risk of cross-infection, litigation and working as a team member are recently identified stressors [6]. Furthermore, dental practitioners experience a distinctive type of job demand due to the relationship with their patients [2,7]. Although a harsh work environment including psychosocial job demands is suspected to cause adverse events through practitioners' errors [8-12], there are few studies that have proven this association in the context of medical mismanagement, including dental mismanagement.

The purpose of this study was to examine the association between psychosocial job demands and experiences of adverse events due to dental mismanagement among a group of Japanese dental practitioners. It was hypothesized that dental practitioners exposed to a higher level of job demand would experience adverse events more frequently than those with a lower level of job demand. To date, few studies have implemented questionnaires comprising scales measuring distinctive job demands among dental practitioners [6]. Evidence based on such scales would provide insight into preventive measures against adverse events. In this study, we used the Copenhagen Psychosocial Questionnaire (COPSOQ) - a newly developed, comprehensive instrument to measure psychosocial job demands [13].

Methods

Subjects

A self-administered questionnaire was mailed to all members (n = 490) of a local branch of a Japanese dental association in the Kagawa prefecture, Japan (431 men and 59 women). Although this is a small region, the members constituted a representative sample of the dental practitioners of the prefecture. The questionnaire was anonymous. Informed consent was obtained from the respondents by including a question in the questionnaire as to whether they agreed to participate in the study.

Outcome

An adverse event was defined as any injury or complication in a patient due to dental mismanagement. The outcome was defined according to whether the respondent's patients experienced one of the following adverse events at least once during the previous one year: dropping of dental instrument or broken injection needle, soft tissue or nerve injury (numbness), accidental bleeding, loss of a tooth root into the maxillary sinus, and emphysema.

Psychosocial job demands

Psychosocial job demands were measured by a Japanese version of the COPSOQ [13]. COPSOQ was developed as a comprehensive tool for assessment and improvement of the psychosocial work environment. The reliability, validity, and applicability of the original Danish version have been discussed [13]. COPSOQ has been translated into several languages. The Japanese version was developed by the translation and back-translation procedure [14]. The Japanese version comprises five sub-scales: quantitative demands (seven items, e.g. "Do you have to work very fast?"), cognitive demands (eight items, e.g. "Does your work require that you remember a lot of things?"), emotional demands (three items, e.g. "Is your work emotionally demanding?"), demands for hiding emotions (two items, e.g. "Does your work require that you hide your feelings?"), and sensorial demands (five items, e.g. "Does your work require a high level of precision?" and "Does your work require that you have to control your movements, e.g. your arms and hands, consciously?"). The scales of the COPSOQ are formed by adding the points of the individual questions, giving equal weight to each question. The questions have five response options and the weights are 0, 25, 50, 75, and 100. The scale value is calculated as the simple average, and all scales range from 0 to 100. Respondents who answer less than half of the questions in a scale are regarded as missing. If a person has answered at least half of the questions, the scale value is calculated as the average of the questions answered. In our study population, Cronbach's alpha coefficients of the scales were 0.88, 0.87, 0.85, 0.65, and 0.82, respectively. In this study, dental practitioners with a score of ≥ 75 points (from 100) in each sub-scale were defined as the group exposed to respective job demands.

The study design and procedure were reviewed and approved by the Human Ethics Committee for Epidemiological Research at the Okayama University Graduate School of Medicine and Dentistry, Japan.

Statistical analyses

A series of cross-tabulations of sociodemographic and work-related variables with the five job demand indices was performed, using the χ^2 test. To examine the association of job demand indices and adverse events experienced, logistic regression analysis was conducted by entering each job stress measure separately. Sex, age (≤ 40, 41–50, 51–60, ≥ 61 years), working hours per week (≤ 40, 41–50, ≥ 51 hours per week), and the numbers of dentists (1, 2, ≥ 3), paramedical staff (≤ 3, 4–5, ≥ 6), patients per

day (up to around 25, around 30–35, around 40 or more), and dental chairs in the clinic (≤ 2, 3, 4, ≥ 5) were selected as confounding factors in the logistic models. Ordinal or discrete variables were represented by dummy variables. All associations were inferred with an α level of 0.05. These were performed using the SPSS computer program, version 13 (Chicago, IL, USA).

Results

A total of 261 dental practitioners responded (response rate 53%). Table 1 shows the profile of the study population. We found no significant differences in the proportions of gender, age groups, and specialties in our study population compared with the total population of the branch (data not shown).

The prevalences of experiences of adverse events during the previous year were as follows: soft tissue injury 27%, accidental bleeding 18%, dropping of dental instrument 10%, emphysema 3%, nerve injury (numbness) 2%, dropping of broken injection needle 1%, and loss of a tooth root into the maxillary sinus 1%. Of the respondents, 113 dental practitioners (43%) experienced one of the adverse events at least once during the previous year.

Table 2 shows the relationship between sociodemographic and work conditions and psychosocial job demands. The psychosocial job demands appeared to reflect the hectic work condition of the dentists. Quantitative demands were associated with working hours per week, and the numbers of patients per day, paramedical staff, and dental chairs in the clinic. Cognitive demands were associated with the number of patients, paramedical staff, and dental chairs in the clinic. Cognitive demands were more prevalent among younger dentists than older dentists. Emotional demands were associated with the numbers of patients per day and paramedical staff in the clinic. Sensorial demands were associated with the number of paramedical staff in the clinic. There were no statistically significant associations between demand for hiding emotions and selected work conditions.

The associations between psychosocial job demands and experience of adverse events due to dental mismanagement are shown in Table 3. Except for 'Demands for hiding emotions,' dental practitioners exposed to higher levels of job demands had higher odd ratios of experiences of adverse events due to dental mismanagement. Of the psychosocial job demand indices, emotional and sensorial demands were significantly associated with the experience of adverse events (odds ratio = 3.9 for each).

Other than the job demand indices, males, dentists younger than 40 years, single-handed, 30 or more patients per day, and five or more dental chairs were identified as being high risk for adverse events (data not shown). Working hours per week and the number of paramedical staff had no significant associations with adverse events due to dental mismanagement.

Discussion

Using a newly validated comprehensive job demands questionnaire, this cross-sectional study of dental practitioners revealed that two types of psychosocial job demand – emotional and sensorial – were associated with experiences of adverse events due to dental mismanagement. Since research suggests that stress management programs lead to a reduction in medical malpractice incidents [15], our findings imply that the indicated job demands are an important target for the reduction of adverse events due to dental mismanagement.

It is possible that clinics with more beds or more patient contact hours may have higher demand levels and are more likely to be at risk of medical errors or malpractice. Even after adjusting for these possible confounders, emotional and sensorial demands were independently associated with experiences of adverse events due to dental mismanagement. There is empirical evidence that the type of job demand is associated with occupational accidents or injuries. Swaen et al. observed that high psychological job demands, emotional demands, and conflicts with the supervisor and/or colleagues were risk factors for being injured in an occupational accident [12]. Experiencing a high degree of ergonomic stress was reported to be a risk factor for occupational injuries [16]. Too many such demands might lead to distress, fatigue, or poor cognitive performance, including difficulty in giving constant care or impaired health care judgments and decision-making among dental practitioners [17,18], which in turn increase the risk of errors.

Other than the psychosocial job demand indices, conditions of the workplace such as the number of patients per day and the number of dentists were also associated with experienced adverse events. A previous study revealed that dentists were more likely to report high levels of emotional exhaustion and low levels of personal accomplishment if they worked in practices with few other dentists [19]. Furthermore, social support in the workplace, measured here by the number of dentists in the practice, appears to have a protective effect against some aspects of burnout [19]. Similarly, a survey in general practitioners revealed that having little free time from practice work was associated with depression [20]. Lack of resources (help) and the consequences might be associated with adverse events due to dental mismanagement.

The demographic characteristics that were shown to be associated with adverse events due to dental mismanage-

Table 1: Profile of the study population (N = 261)

Study variables	%
Sex	
Men	90
Women	10
Age (yeas old)	
≤40	20
41–50	35
51–60	26
≥61	18
Working hours per week	
≤40	40
41–50	45
≥51	15
Numbers of patients per day	
Up to around 25	62
Around 30–35	23
Around 40 or more	15
Numbers of dentists	
1	64
2	30
≥3	7
Number of paramedical staff in the clinic	
≤3	40
4–5	36
≥6	24
Number of the dental chairs in the clinic	
≤2	11
3	44
4	29
≥5	16

ments seem to be compatible with the related literature. Employees who were injured in an occupational accident were more likely to be male [12]. Younger workers tend to have higher occupational accident rates than older workers [12,21]. The number of patients per day was associated with adverse events, but working hours were not. Rather than just the length of working hours, the intensity of demands might be a more important quantitative predictor of occupational accidents [13].

Measurement of distinctive job demands would allow us to consider concrete preventive measures of adverse events due to dental mismanagement. Both emotional and sensorial demands tap the psychological aspect rather than environmental or organizational. Individual approaches, including coping or relaxation, would be an appropriate measure to counteract the consequences of such demands. Ergonomic measures, such as a supporting devices for the arms, are also applicable against sensorial demands. Furthermore, the findings suggest the importance of fostering a supportive environment.

There are some limitations of our study. Firstly, the subjects were limited to members of a local branch of a Japanese dental association, thus restricting the applicability of the results to the general population. Furthermore, as the response rate of this study was slightly low, we cannot deny that dental practitioners who were extremely busy and those who had perpetrated medical errors might have not responded to the questionnaire or under-reported their experiences, which could lead to underestimation of the associations. However, attrition analysis supported the view that our study population was representative of the dental practitioners of the prefecture. Secondly, the present study was a cross-sectional study using a self-administered questionnaire, and thus a causal relationship between psychosocial job demands and experienced adverse events could not be determined. High levels of job demands may have led to a high incidence of adverse events, but it is also possible that dental practitioners with a history of adverse events may pay more attention to their working situation; that is, they may perceive greater job demands. However, the reverse association, such as

Table 2: Sociodemographic and work conditions and psychosocial job demands

	Quantitative demands		Cognitive demands		Emotional demands		Demands for hiding emotions		Sensorial demands	
	%	p	%	p	%	p	%	p	%	p
Sex										
Men	12	0.585	47	0.940	9	0.681	13	0.855	91	0.394
Women	8		48		12		12		96	
Age (yeas old)										
≤40	19	0.070	64	0.008	12	0.162	14	0.223	89	0.892
41–50	11		51		14		17		91	
51–60	12		40		6		15		93	
≥61	2		32		4		4		92	
Working hours per week										
≤40	5	<0.001	44	0.068	7	0.046	10	0.120	91	0.606
41–50	10		44		9		13		90	
≥51	33		64		21		23		95	
Numbers of patients per day										
Up to around 25	5	<0.001	37	<0.001	5	0.005	11	0.105	88	0.088
Around 30–35	19		54		14		12		95	
Around 40 or more	26		74		21		24		97	
Numbers of dentists										
1	12	0.800	47	0.302	8	0.332	14	0.644	92	0.804
2	9		44		12		13		90	
≥3	12		65		18		6		94	
Number of paramedical staff in the clinic										
≤3	5	0.005	30	<0.001	5	0.001	13	0.732	87	0.017
4–5	10		53		7		12		90	
≥6	22		67		22		17		100	
Number of the dental chairs in the clinic										
≤2	4	0.040	38	0.008	3	0.104	7	0.511	79	0.103
3	7		38		6		13		93	
4	19		60		15		18		91	
≥5	15		59		15		12		95	

increasing patient numbers after adverse events, is less likely.

Conclusion

Despite the above-mentioned limitations, our study sheds light on the importance of psychosocial job demands as a target for the prevention of adverse events due to dental mismanagement. More specifically, coping against emotional and sensorial demands could be a worthwhile strategy. The implications of our study also include the observation that enhanced support resources within the workplace could be effective in reducing adverse events.

Competing interests

The author(s) declare that they have no competing interests.

Authors' contributions

AT conceived of the study, and participated in its design and coordination and drafted the manuscript. KU performed the statistical analysis and helped to draft the manuscript. HO participated in the design of the study and helped to collect the data and draft the manuscript. NK participated in coordination of the study and helped to draft the manuscript. All authors read and approved the final manuscript.

Table 3: Psychosocial demands and experience of adverse events due to dental mismanagement

Psychosocial demands	Adjusted odds ratio	95% confidence interval
Quantitative demands	1.5	0.5, 2.4
Cognitive demands	1.4	0.8, 2.6
Emotional demands	3.9	1.3, 12.1
Demands for hiding emotions	1.0	0.4, 2.2
Sensorial demands	3.9	1.1, 13.3

Notes: Logistic models were employed by entering each job demand measure separately. Adjusted for sex, age, working hours per week, and the numbers of patients per day, dentists, paramedical staff, and the dental chairs in the clinic.

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