

# Psychosocial Factors Related to Low Back Pain among School Personnel in Nagoya, Japan

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**Abstract:** Related factors of low back pain (LBP) among school personnel were investigated. We designed a cross-sectional study employing questionnaires, which included a Japanese version of the Job Content Questionnaire. Subjects consisted of 3306 male and 3184 female school personnel in all public schools and kindergartens operated by Nagoya City, Japan. Prevalence of LBP in each work category was compared to that in general teachers of each gender after adjusting for age. Male teachers at schools for the handicapped and in classrooms for the handicapped showed significantly higher LBP prevalence. Among female participants, teachers at schools for the handicapped, physical education teachers, kindergarten personnel and school nurses displayed higher LBP prevalence. In work categories which demonstrated high LBP prevalence, low social support and low job satisfaction were related to LBP of school nurses despite low physical loads. High job demand and physical loads correlated to LBP in kindergarten personnel.

**Key words:** Low back pain, Psychosocial factors, School personnel

## Introduction

Low back pain (LBP) has been shown to be an important health and socio-economic problem of occupational diseases, which plague a large segment of the population in industrialized countries<sup>1,2</sup>. It signifies not only poor quality of life of individuals, but also decreasing labor productivity due to off-work, absenteeism and early retirement. Additionally, escalating medical costs are associated with LBP.

Risk factors for LBP have been identified<sup>1,3</sup>, including (i) individual factors such as body weight and age, (ii) biomechanical factors such as heavy physical load, lifting, twisted posture and vibration, and (iii) psychosocial factors such as job control, job satisfaction, etc. Interest has been increasing with respect to psychosocial factors relating to LBP during the past several years in occupational health research. Considerable evidence exists which indicates that

social and psychosocial factors play a major role in the symptom complex of LBP<sup>1,3-9</sup>.

In Japan, although the incidence of illness from employment is declining, frequency of LBP maintains high rates<sup>10</sup>. 70.0% of diseases resulting from employment in 1998 were caused by injuries during the working hours, 81.6% of which consisted of LBP<sup>10</sup>. Over the past decade, the rate of LBP in the manufacturing and construction industries has declined. In contrast, LBP rates in such industries as health and hygiene, service and entertainment, cleaning, butchery, etc., remain high<sup>10</sup>. This fact indicates the need to examine LBP risks in other professions, in addition to the manufacturing and construction industries, which have demonstrated high LBP risks. Thus, LBP care of school personnel should be investigated.

Several studies have been published regarding LBP among schoolteachers<sup>11-13</sup>. However, data were compiled in limited small areas; moreover, few surveys in large fields such as entire compliments of personnel in large cities or prefectures have been conducted. In addition, very few reports regarding

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psychosocial factors on LBP among school personnel occur in the literature. A combination of high physical and psychosocial loads results in substantial increase in risk<sup>4</sup>; consequently, investigations into work-related physical risk factors for LBP should not lack quantification of the physical load. Moreover, these evaluations should account for confounding by individuals as well as psychosocial factors.

In the present study, the objective was to determine whether physical and psychosocial occupational factors are associated with work with respect to LBP in school personnel. Consequently, we investigated the contribution of physical and psychosocial factors of LBP based on school type, work category and gender.

## Subjects and Methods

### *Study group*

Subjects consisted of male and female school personnel working at 31 kindergartens, 262 elementary schools, 109 junior and 15 senior high schools, and four schools for the handicapped operated by Nagoya City, Japan. This survey was conducted at the time of the teachers' annual mandatory health check-up in 1997. Self-administered questionnaires, which included items pertaining to LBP and related factors, were delivered to the participants prior to the health screening. Questionnaires were collected on the day of the health check-up. The entire process was conducted with regard to the attendees' privacy protection. Informed written consent was obtained in all cases.

### *Data collection*

This survey covered basic demographic variables such as age, gender, years of experience, school type, position, specialty in education and present physical status. The questionnaire consisted of 167 items in 24 categories such as work classification, teaching subject, medical history, indicators concerning jobs, i.e., job demand, job control, job satisfaction, etc., by modified Japanese version of Job Content Questionnaire (JCQ)<sup>14, 15</sup>. In order to investigate occupational physical factors, three items of physical load in the JCQ and two items of sustain were employed.

Questions pertaining to LBP were classified into four grades. (1) "I have pain in my back almost every day (5–7 days per week)", (2) "I have pain in my back on several days per week (3–4 days per week)", (3) "I have pain in my back on a few days per week (1–2 days per week)", (4) "I seldom or never have pain in my back (less than one day per week)". The two former grades were defined as possessing subjective LBP.

### *Statistical analyses*

Data were analyzed by SAS software (Ver. 8.1) for Windows OS. Cochran-Mantel-Haenszel chi-square (CMH) test was used for examination of distinct LBP prevalence among personnel classifications. The unpaired t-test was utilized for comparison of various factors of LBP. A *p* value less than 0.05 was considered significant. Adjustment by age was calculated using the number of subjects exhibiting LBP and the expected number.

## Results

Questionnaires were delivered to 10351 school personnel (men 5122, women 5129). Responses were collected from 6490 subjects (3306 men, 3184 women). The response rate was 62.7% (men 63.3%, women 62.1%). Prevalence of subjective LBP was 20.4% and 23.2% among men and women, respectively. After adjusting for age, the prevalence among women was significantly higher than that among men (CMH test,  $p < 0.01$ ). Analyses were effected separately among each gender following age adjustment as the LBP rate displayed differences between men and women.

Table 1 presents the prevalence of LBP classified by work category. LBP prevalence in each work category was compared with that in general teachers utilizing the CMH test adjusted by age bracket. In male subjects, teachers in classrooms for the handicapped and schools for the handicapped showed significantly high LBP rates (40.7%,  $p < 0.001$  and 30.6%,  $p < 0.05$ , respectively). In female subjects, kindergarten chiefs and teachers (43.0%,  $p < 0.001$ ), PE teachers (45.2%,  $p < 0.001$ ), teachers at schools for the handicapped (36.7%,  $p < 0.005$ ) and school nurses (27.7%,  $p < 0.005$ ) demonstrated significantly higher rates of LBP than those of general teachers. To the contrary, personnel exhibiting lower LBP rates than those of general teachers were male principals and vice-principals (15.4%,  $p < 0.001$ ), as well as male office workers (17.4%,  $p < 0.001$ ).

Table 2 depicts the different factors related to LBP in each work category displaying high LBP prevalence detected by JCQ. Rates were compared with those in general teachers by unpaired t-test. In male teachers in classrooms for the handicapped, physical load ( $p < 0.001$ ) and job control ( $p < 0.05$ ) were significantly higher, whereas job demand ( $p < 0.05$ ) was significantly lower. This finding indicates that physical load is a factor for LBP. Male teachers at schools for the handicapped were subject to significantly higher physical load ( $p < 0.001$ ) and sustain ( $p < 0.001$ ). In the same manner, LBP in female PE teachers and female teachers at schools for the handicapped could derive from physical

**Table 1. Prevalence of low back pain (LBP) of each work category was compared with that of general teachers using Cochran-Mantel-Haenszel chi-square test adjusted for age bracket**

## Male

Working categories	Subjects			CMH	
	No. of subjects	LBP (+)	Ratio of LBP	chi-square	p value
Principal and Vice-principal	591	91	15.4%	11.3	<0.001
Kindergarten chief	2	0	0.0%	–	–
General teacher	2273	466	20.5%	0.00	1.00
(general teacher at ES)	(1099)	(227)	(20.7%)	(0.001)	(0.98)
(general teacher at JHS)	(796)	(161)	(20.2%)	(0.011)	(0.92)
(general teacher at SHS)	(378)	(78)	(20.6%)	(0.028)	(0.97)
PE teacher	203	51	25.1%	2.56	0.11
Teacher in classrooms for the handicapped	54	22	40.7%	12.7	<0.0005
Teacher at schools for the handicapped	62	19	30.6%	4.46	<0.05
Assistant	9	4	44.4%	–	–
Office worker	109	19	17.4%	24.1	<0.0001
Dietitian	3	2	66.7%	–	–
Total	3306	674	20.4%		

## Female

Working categories	Subjects			CMH	
	No. of subjects	LBP (+)	Ratio of LBP	chi-square	p value
Principal and Vice-principal	34	3	8.8%	–	–
Kindergarten teacher and chief	142	61	43.0%	42.1	<0.0001
General teacher	2299	477	20.7%	0.00	1.00
(general teacher at ES)	(1641)	(331)	(20.2%)	(2.85)	(0.09)
(general teacher at JHS)	(545)	(122)	(22.4%)	(2.26)	(0.13)
(general teacher at SHS)	(113)	(24)	(21.2%)	(0.31)	(0.58)
PE teacher	73	33	45.2%	24.1	<0.0001
Teacher in classrooms for the handicapped	69	20	29.0%	3.27	0.07
Teacher at schools for the handicapped	49	18	36.7%	8.91	<0.005
School nurse	329	91	27.7%	4.23	0.38
Assistant	26	5	19.2%	–	–
Office worker	145	31	21.4%	0.00	1.00
Dietitian	63	14	22.2%	0.50	0.48
Total	3184	737	23.1%		

CMH: Cochran-Mantel-Haenszel chi-square test, ES: elementary school, JHS: junior high school, SHS: senior high school, PE: physical education. 'General teachers' denotes teachers with the exception of those in PE and in classes and schools for the handicapped pupils. 'Kindergarten chiefs' are included with teachers as they often work as teachers. 'PE teachers' are in junior and senior high schools, whereas general teachers teach nearly all subjects at elementary schools and schools for the handicapped. 'Classrooms for the handicapped' indicates teachers working in elementary and junior high schools where compulsory education is held, and the teacher is in charge of the classroom.

factors. Physical load ( $p < 0.001$ ) and sustain ( $p < 0.05$ ) of female PE teachers were significantly higher. Female teachers at schools for the handicapped showed significantly higher physical load ( $p < 0.05$ ), sustain ( $p < 0.05$ ) and social support ( $p < 0.001$ ); moreover, these subjects demonstrated lower job demand ( $p < 0.001$ ).

Physical factors of LBP in school nurses were not high. Physical load among school nurses was significantly lower ( $p < 0.001$ ). Nurses also showed significantly higher job

control ( $p < 0.05$ ), and significantly lower job demand ( $p < 0.005$ ) and social support scores ( $p < 0.005$ ). LBP in kindergarten chiefs and teachers could be related to both physical and psychosocial factors. Physical load ( $p < 0.001$ ), sustain ( $p < 0.001$ ), job demand ( $p < 0.001$ ) and social support ( $p < 0.001$ ) in these personnel were significantly higher. Table 2 also presents subjective job satisfaction. In female participants, job satisfaction among teachers at schools for the handicapped ( $p < 0.001$ ) was higher. In contrast, job

**Table 2.1. Physical and psychosocial factors of LBP in each work category in male participants**

General Male Teachers

Variable	Mean	S.D.	N
BMI	23.23	2.76	2252
Physical Load	7.13	1.67	2234
Sustain	3.91	1.16	2238
Job Demand	34.29	5.39	2201
Job Control	68.19	9.07	2196
Social Support	22.77	3.31	2051
Job Satisfaction	10.22	1.62	2205

Male Teachers for classrooms for the Handicapped

Variable	Mean	S.D.	N	t value	p value
BMI	23.45	2.34	54	-0.68	0.50
Physical Load	8.16	1.60	54	-4.73	<0.0001
Sustain	4.05	1.06	54	-1.01	0.32
Job Demand	32.35	4.45	53	3.14	0.0027
Job Control	70.91	8.49	54	-2.34	0.023
Social Support	22.81	2.80	51	-0.11	0.91
Job Satisfaction	10.51	1.56	54	-1.34	0.19

Male Teachers at Schools for the Handicapped

Variable	Mean	S.D.	N	t value	p value
BMI	22.99	2.77	62	0.66	0.51
Physical Load	8.34	1.98	59	-5.45	<0.0001
Sustain	4.46	1.47	59	-3.58	0.0004
Job Demand	33.86	4.85	58	0.65	0.52
Job Control	67.80	9.39	60	0.32	0.75
Social Support	22.38	3.82	55	0.74	0.47
Job Satisfaction	10.47	1.94	60	-1.14	0.26

BMI: body mass index (kg/m<sup>2</sup>), Factors in each group were compared with those of general teachers.

satisfaction was lower among kindergarten chiefs and teachers (p<0.001), and among school nurses (p<0.005).

**Discussion**

The present cross-sectional study investigated the relationship of LBP with respect to specific work category and physical and psychosocial conditions among school personnel. We found that LBP in school nurses and kindergarten chiefs and teachers possesses characteristic correlations with psychosocial factors. Personnel exhibiting high LBP prevalence related to physical factors included male teachers at schools for the handicapped and in classrooms for the handicapped as well as female PE teachers and teachers at schools for the handicapped. LBP among kindergarten personnel partially related to physical factors.

Teachers for the handicapped experience physical loads

**Table 2.2. Physical and psychosocial factors of LBP in each work category in female participants**

General Female Teachers

Variable	Mean	S.D.	N
BMI	21.22	2.38	2247
Physical Load	7.64	1.67	2222
Sustain	3.86	1.19	2222
Job Demand	35.15	5.11	2178
Job Control	67.34	8.85	2164
Social Support	22.67	3.31	1934
Job Satisfaction	10.20	1.56	2220

Female Kindergarten Chiefs and Teachers

Variable	Mean	S.D.	N	t value	p value
BMI	21.17	2.32	137	0.22	0.82
Physical Load	10.07	1.68	138	-16.54	<0.0001
Sustain	5.29	1.49	133	-13.17	<0.0001
Job Demand	38.56	4.86	136	-7.92	<0.0001
Job Control	66.80	8.53	127	0.69	0.49
Social Support	24.16	3.32	114	-4.66	<0.0001
Job Satisfaction	9.57	1.37	136	4.61	<0.0001

Female PE Teachers

Variable	Mean	S.D.	N	t value	p value
BMI	21.66	2.40	72	-1.55	0.13
Physical Load	8.74	1.71	72	-5.35	<0.0001
Sustain	4.15	1.13	73	-2.14	0.036
Job Demand	34.45	5.30	73	1.11	0.27
Job Control	66.76	7.92	71	0.61	0.55
Social Support	22.46	3.12	65	0.52	0.61
Job Satisfaction	10.19	1.65	73	0.03	0.98

Female Teachers at School for the Handicapped

Variable	Mean	S.D.	N	t value	p value
BMI	20.98	2.46	48	0.65	0.52
Physical Load	8.18	1.81	45	-2.14	0.033
Sustain	4.19	0.83	42	-2.49	0.017
Job Demand	31.07	4.88	43	5.42	<0.0001
Job Control	67.09	7.46	44	0.22	0.83
Social Support	24.68	2.46	38	-3.73	0.0002
Job Satisfaction	10.65	1.34	46	-2.27	0.028

Female School Nurses

Variable	Mean	S.D.	N	t value	p value
BMI	21.28	2.49	282	-0.43	0.67
Physical Load	6.56	1.63	272	10.25	<0.0001
Sustain	3.86	1.30	273	<0.01	>0.99
Job Demand	34.03	5.57	261	3.08	0.0023
Job Control	68.88	9.45	263	-2.50	0.013
Social Support	21.97	3.71	219	2.90	0.0038
Job Satisfaction	9.89	1.55	275	3.09	0.0021

BMI: body mass index (kg/m<sup>2</sup>), Factors in each group were compared with those of general teachers.

at the waist due to the exertion necessary to assist children with respect to wheelchairs or busses, bathroom visits, administration of lessons involving a half-sitting posture and dealing with unexpectedly sudden behaviors<sup>16, 17</sup>). Kindergarten teachers are often involved in work that exerts force at the waist, i.e., forward-leaning posture, squat, kneeling, etc.<sup>18, 19</sup>). This work is characterized by physical load actions related to LBP such as heavy lifting, unbalanced posture, including waist rotation or flexion while standing still or stooping, loading, etc. Unanticipated postural change, sudden use of muscular power<sup>20</sup>) or unexpected physical load<sup>21</sup>) affect LBP attack. Moreover, severe LBP exhibits a dose-response correlation with working posture<sup>22</sup>).

Physical work loads in these persons could be reduced by health care instruction with respect to environmental change and actions at work<sup>23</sup>). Intervention for LBP patients is highly relevant to primary care practice<sup>24</sup>). Additionally, high LBP rates among athletes are well-known and excessive exercise during the growth period leads to future LBP<sup>25, 26</sup>). Although moderate exercise prevents LBP<sup>27, 28</sup>), many PE teachers could possess extensive sports experience. Very few reports exist regarding LBP among PE teachers in Japan; consequently, future studies pertaining to detailed sports and medical histories as well as daily physical activity will be necessary.

Physically demanding work revealed a strong correlation with LBP. However, physical load scores among school nurses were low, despite the high prevalence of LBP in these subjects. Job demand scores were low among school nurses, which could affect improving LBP. However, nurses showed low social support and low job satisfaction, which could be related to high LBP rates. Several studies noted that high frequency of job difficulties, job dissatisfaction, mental and social load, low social support from superiors or colleagues, etc., can be risk factors of LBP, independent of physical load<sup>7-9</sup>). A cohort and case-control studies revealed that low social support in the workplace and low job satisfaction are risk factors for back pain<sup>4</sup>). Peculiarity of school nurses can be derived from different psychological stresses associated with the working conditions relative to those of teachers. That is, administrative persons or general teachers may not ascribe great importance to school health<sup>29, 30</sup>). Consequently, nurses feel discrimination from teachers<sup>30</sup>). These perceptions may arise as school nursing careers may not have included sufficient clinical training since school graduation. Alternatively, these perceptions may derive from low social status. Interviews with nurses revealed that it was seldom possible to talk with teachers regarding student mental and physical problems. As a result, it proved difficult for nurses to voice opinions to teachers or administrative

personnel. Moreover, the number of students remaining in exam rooms, thus absent from their lessons, is increasing.

As shown in Table 2.1, kindergarten chiefs and teachers of women displayed high social support and high job satisfaction. Nevertheless, LBP prevalence was high. This observation could result from high physical load, high sustain and high job demand<sup>31</sup>).

In conclusion, this study indicated that factors relating to LBP in school nurses can be due to poor social and psychological conditions. Moreover, in female kindergarten personnel, LBP can be attributed to both physical and psychosocial conditions. In cross-sectional studies regarding the temporal relationship between LBP and risk factors, the timing of the occurrence of LBP and the period of chronic pain are not known. In the future, the association between LBP and psychosocial factors in school personnel should be investigated with longitudinal and intervention study designs. It appears beneficial to differentiate between various types of LBP and moderate methods via which to intervene in specific teacher types in epidemiologic studies of low back disorders.

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