

Job Strain among Rubber-Glove-Factory Workers in Central Thailand

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Abstract: Job strain has become a major concern because of its potential impacts on worker well-being and performance. This cross-sectional study aimed to assess the prevalence of, and examine factors associated with, job strain among workers in a rubber-glove factory, in a central province of Thailand. A total of 200 workers aged 18–55 yr, who had worked at the factory for at least 6 months, completed the Job Content Questionnaire (JCQ) (Thai Version). Two of 5 scales in the JCQ were used to measure job strain, i.e.; job control and psychological job demand. The prevalence of job strain was 27.5%. Multiple logistic regression analysis indicated two variables significantly associated with job strain: low supervisor social support (adjusted OR=3.08; 95%CI: 1.38–6.91) and high job insecurity (adjusted OR=2.25; 95%CI: 1.04–4.88). Effective training for supervisors, to create good relationships among workers and supervisors, and ensuring steady and secure jobs for good employees, are necessary.

Key words: Job strain, Rubber glove, Factory workers, Occupational health, Psychosocial work factor, Thailand

Introduction

Factory workers develop a wide variety of occupational illnesses during their working lives, manifested in physical and psychological stress. Several studies have linked job strain (stress) to hypertension and coronary heart disease^{1–6}. High job strain increases the healthcare costs of organizations and leads to decreased organizational productivity, with frequent accidents, absenteeism, and increased turnover rates^{7–11}. Among many instruments used for the assessment of psychosocial work factors, the Job Content Questionnaire (JCQ), based on Karasek's demand-control model, has been the most popular. The model emphasizes the interaction of 2 factors: high psychological job demands and low job control, which result in psychological strain¹². The model has been redefined by the addition of workplace

social support. Jobs were considered most hazardous when high job strain combined with low workplace social support^{5, 12, 13}.

Over the past 2 decades, Thailand has developed into an industrialized country. Many thousands of people are now working in industrial estates. During these rapid economic and cultural changes, job strain among factory workers has become particularly serious and needs to be assessed. Rubber-glove manufacture is an important industry in Thailand in terms of both employment and exports. In 2004, the export value of rubber gloves was estimated at US\$ 486.1 million which was about a 2.4% increase over the previous year¹⁴. Due to markedly increased efforts to prevent the transmission of many infectious diseases to healthcare workers, the demand and usage of gloves is increasing dramatically. The factory that participated in this study was fitted out with modern machinery, using manual and semi-automatic systems. The machines were regularly checked and maintained by qualified quality-control experts.

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The manufacture of rubber-gloves is a labor-intensive and complex. The four main production stages for the high-quality gloves are dipping, leaching, vulcanization and quality control.

Most workers are production and quality control operators and about 95% have educational levels below bachelor degree. The workers in rubber-glove factory are suspected to be at high risk of job strain since during the manufacturing process, they are exposed to a work environment contaminated with dust, talcum powder, chemical byproducts, noise, repetitive motion, frequent lifting, and shift work which may lead to the development of jobstrain^{15–17}). Some workers feel intense psychological pressure because the supervisors are quite critical. In addition, extensive restructuring of the labor market, the increased demand for skilled workers and competition pressures that demand higher productivity levels, put workers at increased risk of exposure to high psychological job demands and job insecurity.

At present, very little information exists on job strain in Thai factories, and its effects on worker health and wellbeing. Only 2 published literatures reported the use of 14 JCQ questions on separated scores of psychological job demand and work control¹⁸) and psychological and physical job demands¹⁹). The first study examined the effect of heavy maternal workload which included the use of 14 items of Karasek's JCQ on fetal growth retardation and preterm delivery among women attending antenatal clinic of two hospitals in southern Thailand. The second study assessed whether psychological and physical demands were the significant predictors of exercise participation among female hospital nurses. Therefore, this study aimed to assess the prevalence of, and factors associated with, job strain using a 27-item questionnaire from JCQ among workers in a rubber-glove factory, in a central province of Thailand.

Subjects and Methods

Participants

This cross-sectional study was conducted in a medium-sized factory (area 17,600 square meters; personnel 300) producing examination and surgical gloves in a central province of Thailand. Rubber glove manufacture is an important industry in the province studied. Baseline data of occupational stress among workers were needed to identify any potential need for a stress management program in the workplace. The study subjects were recruited using universal sampling. Sample size was estimated using the single proportion formula²⁰), with 95% confidence interval. A sample size of 193 cases was calculated, based on a rate of 23.6%

job strain among workers in an electronics factory²¹). Precision was set at 6.0%. With an assumption of 10% non-response, the final sample size was 213. Inclusion criteria were factory workers—aged 18–55 yr who had worked in the factory under study for at least 6 months before conduct of this survey; still working in the factory during the survey; and willing to participate in the study. Workers who were diagnosed with mental-health disorders were excluded.

In the study, supervisors were asked to distribute self-administered questionnaires to their workers during a rest hour. A small souvenir was given to each worker returning a completed questionnaire. A total of 203 (response rate 95.3%) study subjects returned questionnaires. After excluding 3 incomplete questionnaires, the final response was 200 cases. The Ethics Committee of the Faculty of Public Health, Mahidol University, approved the research protocol. Permission to conduct the study was obtained from the factory manager. All study subjects provided verbal informed consent.

Instrumentation

The survey instrument was a three-part questionnaire. Part I comprised 9 closed-ended questions about the respondent's general characteristics, including sex, age, education level, marital status, number of children, job experience, job rank, chronic disease or other illness and perceived work environment. Part II was concerned with lifestyle factors, including shift work, working hours, smoking, alcohol consumption, and exercise. Part III dealt with psychosocial work factors. This part was a 27-item questionnaire from the Job Content Questionnaire²²). The questionnaire was translated into Thai with minor modifications to assess 5 major JCQ scales—job control, psychological job demand, workplace social support, physical job demand, and job insecurity. Job control and psychological job demand scales were used to measure job strain (Table 1). The job-control scale was the sum of two subscales, skill discretion, measured by 6 items, and decision authority, measured by 3 items. The psychological job demand scale was measured by 5 items. The workplace social support scale was the sum of 2 subscales, support from supervisors and support from co-workers, each measured by 4 items. The physical job demand scale was measured by 2 items and the job insecurity scale by 3 items. For each item, the response was recorded on a 4-point Likert-type scale, ranging from 1 (strongly disagree), 2 (disagree), 3 (agree), to 4 (strongly agree). For each scale, a sum of weighted item scores was calculated. Calculation formulas and possible scores^{22,23}) are shown in Table 1. The Cronbach's alpha coefficient (α) for scales and sub-scales ranged between 0.319–0.894

Table 1. Calculation formulas and possible scores for the JCQ

Scale (No. of items)	Formula	Possible score
Job control (9)	= skill discretion + decision authority	24–96
Skill discretion (6)	$[Q1+Q3+Q5+Q7+Q9+(5-Q2)] \times 2$	12–48
Decision authority (3)	$[Q4+Q8+(5-Q6)] \times 4$	12–48
Psychological job demand (5)	$3 \times (Q10+Q11) + 2 \times [15 - (Q12+Q13+Q14)]$	12–48
Workplace social support (8)	= supervisor support + coworker support	8–32
Supervisor support (4)	$Q20+Q21+Q22+Q23$	4–16
Co-worker support (4)	$Q24+Q25+Q26+Q27$	4–16
Physical job demand (2)	$Q15+Q16$	2–8
Job insecurity (3)	$Q19+[10-(Q17+Q18)]$	3–12

Table 2. Mean values, standard deviations (SD), ranges and Cronbach's alpha coefficients (α) of the JCQ subscale (n=200)

Scale (No. of items)	Mean	SD	Range	Cronbach's α coefficients
Job control (9)	63.7	7.4	32–86	0.669
Skill discretion (6)	32.4	3.8	16–42	0.594
Decision authority (3)	31.3	4.6	16–44	0.415
Psychological job demand (5)	33.0	3.3	19–45	0.505
Workplace social support (8)	21.9	3.7	10–32	0.855
Supervisor support (4)	10.6	2.5	4–16	0.894
Co-worker support (4)	11.3	2.0	4–16	0.861
Physical job demand (2)	5.9	0.9	2–8	0.470
Job insecurity (3)	6.5	2.0	3–11	0.319

(Table 2). All 22 items of the 4 scales of supervisor support, co-worker support, job control and psychological job demand were included for analyzing explanatory factors. The first factor was highly associated with the supervisor support scale with a loading range of from 0.67–0.87. The second factor was associated with co-worker support with a loading range of 0.77–0.86. The third factor was associated with job control scale with a loading range of 0.31–0.77. The item in Q2 “Repetitive work” did not have a loading >0.30 for any factors. The item in Q3 “Requires creativity” that might reflect factor four. The fourth factor was associated with psychological job demand scale with a loading ranged from –0.54 to 0.58. The item in Q10 “Work fast” did not have a loading >0.30 for any factor. The item in Q11 “Work hard” that might reflect factor one (Table 3).

Data analysis

Data entry and analysis were performed using SPSS for Windows Version 11.5²⁴). Descriptive statistics, i.e., frequency, percentage, mean, and median, were used to describe all studied variables. To determine the prevalence of job strain (high psychological job demand and low job control) in the personnel, job control and

psychological job demand scores were dichotomized by median cut-off points to obtain “high ($\geq$ median score)” and “low ($<$ median score)” values for each scale. Based on Karasek's model^{7, 12}), the interaction of job control and psychological job demand resulted in 4 types of jobs: active jobs (high psychological job demand and high job control), high strain jobs (high psychological job demand and low job control), passive jobs (low psychological job demand and low job control), and low stress jobs (low psychological job demand and high job control).

Associations were expressed as odds ratios (ORs) and 95% confidence intervals (CI). In the analysis, job strain was dichotomized into, “high job strain” and “non-high job strain²⁵”. All variables with p value ≤ 0.05 in univariate analysis and biological plausibility were simultaneously analyzed by multiple logistic regressions. The multivariate model included, age, sex, education, marital status, chronic diseases/other illness, perceived physical environment, working hours per day, smoking, alcohol drinking, physical exercise, job insecurity, supervisor support, co-worker support and physical demand. Shift work was not entered into the final regression model due to its colinearity with working hours. The level of significance was set at $p \leq 0.05$.

Results

Of the 200 respondents, 75.5% were female. 51.0% were aged >35 yr. 70.0% had finished secondary school or lower. 66.0% were married, and 38.0% had one child. 42.0% had work experience <5 yr. 83.0% did not have chronic diseases or other illness; 8.0% had hypertension; others included diabetes 1.5%, heart disease 0.5%, and hepatitis 0.5%. 53.5% perceived that the work environment was too warm or poorly ventilated (Table 4). In terms of lifestyle and psychological work factors, 46.0% of the respondents did shift work. 77.5% worked 7–8 h per day. 15.0% were current smokers. 19.0% were current alcohol drinkers. 10.5%

Table 3. Factor analysis of 22-items of the JCQ using principal component extraction with varimax rotation (n=200)

Scale	Item	Loading on 4 factors			
		F1	F2	F3	F4
Job control	Q1 Learn new things			0.62	
	Q2 Repetitive work ^a				
	Q3 Requires creativity				0.66
	Q4 Allow own decisions			0.49	
	Q5 High skill level			0.61	
	Q6 Little freedom of decision			0.31	
	Q7 Variety			0.33	0.47
	Q8 Lot of say			0.67	
	Q9 Develop own abilities			0.77	
Psychological job demand	Q10 Work fast ^b				
	Q11 Work hard	-0.54			
	Q12 No excessive work				0.43
	Q13 Enough time				0.58
	Q14 Conflicting demands				0.45
Supervisor support	Q20 Supervisor is concerned	0.84			
	Q21 Supervisor pays attention	0.87			
	Q22 Supervisor helpful	0.87			
	Q23 Supervisor good organizer	0.67			
Coworker support	Q24 Coworkers competent		0.77		
	Q25 Coworkers interested in me		0.85		
	Q26 Coworkers friendly		0.86		
	Q27 Coworkers helpful		0.79		
Variance explain (%)		16.7	14.9	11.5	9.4

Items with loading values >0.30 are shown

^aThe item indicated the highest loading on F3, which less than 0.3.

^bThe item indicated the highest loading on F4, which less than 0.3.

reported exercising ≥ 3 times per week. 57.0% had high workplace social support. 37.5% perceived job insecurity. 81.5% reported high physical job demand (Table 5).

Prevalence of job strain

The prevalence of high job strain was 27.5%. Among the non-high strain group, 41.0% were in active, and 17.0% in passive, jobs (Table 6).

Factors associated with job strain

All variables in Tables 4 and 5 were dichotomized; univariate analysis revealed 3 variables were statistically associated with job strain: supervisor social support, co-worker social support, and job insecurity (data not shown). In addition, variables with p value ≤ 0.05 in the univariate analysis and biological plausibility were simultaneously analyzed by multiple logistic regressions. Table 7 shows that workers with low supervisor social support and high job insecurity were more likely to develop job strain (the age and sex adjusted OR=3.36; 95%CI: 1.75–6.48 for supervisor support and age and sex adjusted OR=3.05; 95%CI: 1.60–5.81 for job inse-

curity). Almost the same results were seen with Model 2 which included additional potentially confounding factors. In Model 3 the adjusted ORs were decreased after additionally including life style and psychosocial work factors in the model (adjusted OR=3.08; 95%CI: 1.38–6.91 for supervisor support and adjusted OR=2.25; 95%CI: 1.04–4.88 for job insecurity).

Discussion

Job strain has become a major concern in recent years because of its potential impacts on both worker well-being and performance. In this study, the prevalence of job strain among workers was 27.5%. Due to the limited number of prior studies into job strain in Thailand. It was not possible to locate literature using the same criteria to define “job strain” to permit a meaningful comparison with the results of the present study. The means and standard deviations of Thai JCQ job control and psychological job demand scales were similar to the results for Taiwanese workers in four private factories, especially for men. However, the mean

Table 4. General characteristics of 200 respondents

Variable	Number	%
Sex		
Male	49	24.5
Female	151	75.5
Age (yr)		
≤35	98	49.0
>35	102	51.0
Mean=34.7 SD=8.0 Range 18–53		
Education level		
Secondary school & lower	140	70.0
High school and higher	60	30.0
Marital status		
Single	37	18.5
Married	132	66.0
Widowed/divorced	31	15.5
Children		
0	53	26.5
1	76	38.0
2–4	71	35.5
Job experience (yr)		
<5	84	42.0
5–9	61	30.5
≥10	55	27.5
Mean=6.1 SD=4.2 Range 1–18		
Job rank		
Supervisor	12	6.0
Worker	188	94.0
Chronic disease or other illness		
No	167	83.0
Hypertension	8	4.0
Others	22	13.0
Perceived work environment		
Positive perception	31	15.5
Too warm/poor ventilation	107	53.5
Loud noise	62	31.0

scores for supervisor support and the co-worker support scales were slightly lower than those for the Taiwanese workers²⁶).

The results also showed that workers with low supervisor social support were 3.08 times more likely to develop job strain than those with high supervisor social support. Two possible explanations were: the supervisor may place greater emphasis on the product and have little consideration for the workers; and/or, supervisors may not possess appropriate supervisory skills, and inflexibility may cause the workers to suffer increased anxiety about criticism and punishment. In such conditions, workers may feel insecure in the job position, leading to job strain. The results confirmed the findings of Vermeulen and Mustard (2000)²⁷, who reported that supervisor/co-worker support was significantly related

Table 5. Lifestyle and psychosocial work factors of 200 respondents

Variable	Number	%
Lifestyle factors		
Shift work (times/month)		
0	108	54.0
1–4	92	46.0
Working hours (per day)		
7–8	155	77.5
9–12	27	13.5
>12	18	9.0
Current smoking		
No	176	85.0
Yes	24	15.0
Current alcohol drinking		
No	162	81.0
Yes	38	19.0
Exercise (times/week)		
0–2	179	89.5
≥3	21	10.5
Psychosocial work factors ^a		
Workplace social support		
High (≥23)	114	57.0
Low (<23)	86	43.0
Supervisor support		
High (≥12)	108	54.0
Low (<12)	92	46.0
Co-worker support		
High (≥12)	132	66.0
Low (<12)	68	34.0
Job insecurity		
High (≥7)	75	37.5
Low (<7)	125	62.5
Physical job demand		
High (≥6)	163	81.5
Low (<6)	37	18.5

^aHigh = (≥median score), Low = (<median score).

Table 6. Prevalence of job strain among 200 respondents

Type of job strain	Number	%
High strain ^a	55	27.5 ^b
Non-high strain	145	72.5
Low strain	29	14.5
Active	82	41.0 ^b
Passive	34	17.0

^aMedian cutoff points for psychological job demand (≥33) and job control (<64).

^bSum of high strain and active job categories equals 68.5% which is >50% due to several tied median-score values.

to low perceived work stressors and low psychological distress. Bültman *et al.* (2002)²⁸, in the Maastricht Cohort Study, found that conflict with supervisors was significantly associated with psychological distress

Table 7. Odds ratios (ORs) for job strain among 200 respondents by multiple logistic regression analysis

Variable	Model 1		Model 2		Model 3	
	OR	95%CI	OR	95%CI	OR	95%CI
Supervisor social support						
High	1.00		1.00		1.00	
Low	3.36	1.75–6.48	3.39	1.73–6.65	3.08	1.38–6.91
Job insecurity						
High	1.00		1.00		1.00	
Low	3.05	1.60–5.81	3.03	1.56–5.88	2.25	1.04–4.88

Model 1: adjusted for age and sex.

Model 2: adjusted for age, sex, education, marital status, chronic disease/other illness, perceived physical environment.

Model 3: additionally adjusted for working hours per day, smoking, alcohol drinking, physical exercise, job insecurity, supervisor support, co-worker support and physical demand.

among employees. Park and Wilson (2003)²⁹⁾ reported that relationship with supervisor and co-workers was a significant predictive factor for level of psychological strain among Korean factory workers.

The findings also indicated that workers with high job insecurity were 2.25 times more likely to develop job strain than those with low job insecurity. This result was consistent with the findings of Aziah *et al.* (2004)³⁰⁾, who reported that the odds of hospital laboratory technicians' having job strain was 2.4 times higher than those with low job insecurity. Job insecurity can cause psychological tension, fear and anxiety among workers, eventually leading to job strain and illness^{29–31)}. D'Souza *et al.* (2003)³¹⁾ showed that insecure employment and high job strain had independent, consistent, and strong associations with physical and mental health. Chen *et al.* (2005)³²⁾ suggested that perceived job insecurity itself was an important source of job strain, even with adjustment of exposure to other adverse psychological work conditions, i.e., lower job control, higher job demand, and poor social support at work. Bartley *et al.* (2004)³³⁾ reported that secure and favorable working conditions considerably reduced the incidence and prevalence of limiting illness.

This study had 5 major limitations: 1) the self-reported psychosocial work factors were measured at only one time-point. Therefore, misclassification of the exposure variables was possible; 2) job strain was defined by dichotomizing the job control and psychological job demand scale scores. The prevalence of job strain might differ from defining job strain by demand-to-control ratio scale. Dichotomizing the continuous variables also induced loss of statistical power³⁴⁾; 3) the cross-sectional study design limited the ability to make valid causal interpretations of the findings; 4) since the sources of stress are multiple, other stressors, such as organizational factors and non-job factors (home

environment, support from family and marital relationship), financial stress, and personality factors, cannot be excluded. In addition, other stress buffering factors, such as good coping styles³⁵⁾ and job satisfaction³⁶⁾, play an important role in determining an individual's psychological and physical well-being; 5) the factory workers were selected from a rubber-glove factory in a central region province. The results may not be representative to other working people in the same industry in Thailand.

In conclusion, the prevalence of job strain among rubber-glove-factory workers was 27.5%. Workers with low supervisor social support and insecure positions were more likely to report high job strain. As the labor market become more globalized and competitive, workers are more likely to encounter job strain and insecurity. Therefore, effective training to create a good work environment, good relationships among workers and supervisors, and ensuring steady and secure employment for good employees, are needed. In addition, the Thai version of JCQ also needs to be further developed and investigated with larger samples from a wider range of occupations to improve the reliability and validity of the questionnaire.

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