

行政院國家科學委員會專題研究計畫 成果報告

電話服務作業員工之工作壓力與人因工程危害探討

計畫類別：個別型計畫

計畫編號：NSC94-2213-E-040-002-

執行期間：94年08月01日至95年07月31日

執行單位：中山醫學大學職業安全衛生學系

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Abstract

The prevalence of job stress, distribution of major job stressors, and the association of job stress with multiple self-reported health complaints were examined among call center operators of two telecommunication companies. Information on demographics, health status, perceived job stress levels, major job stressors and psychosocial job characteristics were obtained by a self-administered questionnaire. The prevalence of musculoskeletal complaints, visual fatigue, and discomfort of throat were found to be the most pronounced and prevalent complaints after prolonged working at call centers. Higher levels of perceived job stress were found among subjects who were female, and those with length of employment over 2 years. “Dealing with difficult customers” was ranked as the most important job stressor of operators across two telecommunication companies. After adjustment for gender and length of employment, operators who perceived higher levels of job stress had significantly increased risks of multiple

health problems, including discomforts of eyes, ears, throat, respiratory organs, cardiovascular system, digestive organs, renal organs, and musculoskeletal system. Stratified analyses showed that the strength of the associations with health risks between male and female were different. In male operators, the associations for levels of perceived job stress and health complaints were not statistically significant between low-stress operators and higher levels of job stress operators. Female operators, but not male, with high level job stress experienced significant increase in health complaints.

Keyword: Questionnaire, Call center, Job stress, physical problem

1. Introduction

Telephone operator work has become progressively mechanized and computerized over the last decades. These changes have resulted in a reduction in the variety of tasks performed by the operator and increased repetitiveness and machine-regulation of the work (DiTecco et al., 1992). Many employees in the telecommunication

industry utilize VDTs during their normal workday, and high rates of upper extremity (UE) musculoskeletal symptoms and visual fatigue have been reported among some telecommunication employee group (Ferguson, 1976; Gunnarsson & Söderberg, 1983; Hocking, 1987; Hales et al., 1994; Ferreira et al., 1997; Ferreira et al., 2002). Hales et al. (1994) indicated that work-related upper extremity musculoskeletal disorders were relatively common among telecommunication employees. Hocking (1987) reported the prevalence rate of repetition strain injury (RSI) in female and male were 27% and 20%, respectively, in Australia telecommunication employees.

More recently, attention has been progressively moving to aspects of work organization, worker performance and psychosocial environment related to health complaints in telecommunication employees (DiTecco et al., 1992; Lund, 1992; Smith et al., 1992; Westin, 1992; Smith & Bayehi, 2003; Chi & Lin, 2004). DiTecco et al. (1992) identified major sources of work-related stress among telephone workers by a questionnaire survey. They discovered that call-time pressures items were most strongly related to job stress by workers, and over 50% of workers reported that telephone monitoring led to their job stress. Smith et al. (1992) also reported that electronic performance monitoring could influence worker stress responses

in telecommunications companies.

Some studies have shown that high levels of workplace stress which results in a variety of adverse health conditions, such as cardiovascular disease, hypertension and digestive ailments from manufacturing industries to service industries (Kristensen, 1989; Homer et al., 1990; Schnall et al, 1994; Hellerstedt & Jeffery, 1997). Major sources of job stress identified in the literature included heavy job demands and long working hours, lack of control, routing tasks, inter-personal conflicts, and organizational problems (Hurrell et al, 1998).

As job stress is a widespread problem in most call center operators, there are few reports to examine the association of job stress with self-perceived health complaints, such as musculoskeletal disorders and visual problems. Yet, there has been no research, to our knowledge, investigating how the call center operators face multiple health risks related to job stress in the workplace. Therefore, the present study employed a cross-sectional questionnaire survey on individual factors, health status, perceived job stress levels, major job stressors and psychosocial job characteristics to investigate the rates of subjective physical discomforts, and assess the prevalence of job stress and the patterns of major job stressors among call center operators of two large telecommunication companies in Taiwan.

In addition, the associations of job stress with self-perceived health status were examined, and the differences in these associations between male and female were also studied.

2. Method

2.1 Study subjects

Our study sites were call centers of two large mobile telecommunication companies (FE and CH) in Taiwan, which provide telecommunication and information-related services. The operators' task in the call center is to answer questions related to the company products and services including information about product promotions, customer account status, and service fees issues. All operators must have a high school diploma, and proficiency in communication with skill for clear expression. A total of 1,100 operators (FE = 800 and CH = 300) participated in this survey.

2.2 Questionnaire

A standardized self-administered questionnaire was delivered to each subject by a trained interviewer, and the purposes of the study were explained in person. Once the questionnaire was finished, the interviewer performed on-site checking to ensure the completeness of the questionnaire. Information collected included measurements of individual factors, health status, perceived job stress, major job stressors, and psychosocial job

characteristics, etc. Participants were asked to provide information on their age, gender, years of employment in the current company, full/part time work, and marital status. In term of health status, the severity and frequency of discomforts were rated for 9 body areas (skin, eyes, ears, throat, respiratory organs, cardiovascular system, digestive organs, renal organs and musculoskeletal system) using a self-administered questionnaire. For each of the body areas, a disorder was considered present if symptoms occurred at least weekly and the severity level was rated as "moderate" or worse during the past 12 months, and there were no preceding non-occupational discomforts or injuries.

The perceived job stress and job stressors were collected by a series of questions modified from the study of DiTecco et al. (1992). Perceived job stress was assessed by the self-reported response to the questions "How often do you feel very stressed at work?", the response was recorded on a five-point scale (never, seldom, at times, often, always). With regard to job stressors, participants were asked to choose three major reasons that contributed most greatly to their stress at work from a list of possible job stressors. Ten job stressors were described, which were believed to capture the major sources of job stress among operators, including: (1)being monitored by a manager without warning; (2)having to deal with

difficult customers; (3) your call activities being monitored by the system; (4) calls that take a long time to process; (5) difficulty talking to co-workers at workstation; (6) difficulty in serving customers well and still keeping average work time; (7) call pace controlled by machine; (8) insufficient rest breaks; (9) being expected to remain constantly at your workstation; and (10) being distracted by other workers around you.

Psychosocial job characteristics was assessed by using a Chinese version 22 item Job Content Questionnaire (C-JCQ), which was revised from the Karasek et al.'s (1998) Job Content Questionnaire (JCQ). Of these analyses, we used the job control dimension by summing up two subscales: skill discretion of six items, and decision authority of three items. Job demands scale is measured by five items. The work-related social support scale is the sum of two subscales: support from supervisors and support from co-workers, both measured by four items. For each item, the response was recorded on a four-point Likert scale, range from 1 (strongly disagree) to 4 (strongly agree). The C-JCQ was developed for domestic workers in Taiwan and has been tested and validated (Cheng et al. 2003).

Among FE company operators, 760 usable returns were received, while 263 useable returns were received from CH company operators, resulting in response rates of 95% and 88%,

respectively.

2.3 Statistical Analyses

Comparison of operators' demographic parameters such as gender, age, length of employment (year), marital status, full time work, and prevalence of body discomfort were performed between FE and CH companies by means of Student's t test or Mantel-Haenszel chi-square test. The prevalence of job stress and the patterns of major job stressors were examined by demographic and employment factors.

To measure the associations, multivariate logistic regression techniques were used to determine the relationship of perceived levels of job stress with various health complaints. The questionnaire data provided by respondents were analyzed using the SPSS for Windows package with the significance level of 0.05.

3. Results

3.1 Characteristics of the study population

Characteristics of the study population were summarized in Table 1. The average age of FE and CH companies were 28.0 and 33.9 years, respectively, and the mean (SD) length of employment was 2.7 (2.1) and 9.1 (10.2) years for FE and CH companies. Most of the call center operators were female (83% vs. 90%), single (80% vs. 53%) and full-time workers (99% vs. 88%). As for the age, length of employment, gender, marital status

(single), and full-time worker, the differences between FE and CH companies were statistically significant (Table 1).

3.2 Physical discomfort prevalence

Regarding physical discomforts, the proportion of discomfort ratings for various body areas were listed in Table 2. Prevalence rates at different body areas were similar between FE and CH call center operators. The prevalence of visual fatigue (70% vs. 84%), musculoskeletal complaints (73% vs. 81%), and discomfort of throat (78% vs. 78%) were found to be the most pronounced and prevalent complaints after prolonged working at call centers. For all body areas, operators of CH had higher prevalence rates of physical discomforts than those of FE employees. The differences were significant for the discomfort complaints at eyes, musculoskeletal system, cardiovascular system, and digestive organs (Table 2).

3.3 Prevalence of perceived job stress and major job stressors

Distributions of workers who “often” or “always” felt much stressed at work (i.e., high-stress workers) by demographic and employment characteristics are presented in Table 3. Overall, 34% of FE operators and 32% of CH operators were classified as high-stress workers, respectively, while

24% of male and 35% of female reported that they often or always felt under pressure. And, finally, operators working more than 2 years in call center had an increased risk of having high levels of job stress.

The patterns of major job stressors were shown in Table 4. Overall, the top five sources of job stress among the study subjects were (1) “Having to deal with difficult customers” (70.1% for FE and 63.0% for CH), (2) “Difficulty in serving customers well and still keeping average work time” (41.6% for FE and 34.5% for CH), (3) “Calls that take a long time to process” (38.9% for FE and 32.1% for CH), (4) “Your call activities being monitored by the system” (29.0% for FE and 34.8% for CH), and (5) “Being monitored by a manager without warning” (25.6% for FE and 50.2% for CH). Among these major job stressors, it was noticed that “Having to deal with difficult customers” was ranked as the most important job stressor across both companies. However, the ranks of the other four major job stressors were observed different between FE and CH (Table 4).

3.4 Psychosocial job characteristics

The results of C-JCQ scores by company and gender were presented in Table 5. Little difference was found between male and female operators. Male operators scored significantly higher levels in both skill discretion and decision authority than female operators

(Table 5). However, significant differences between FE and CH companies were found in most of the C-JCQ sub-scales. High job control, high work demands and high workplace supports were reported by FE company operators.

3.5 Health problems in association with job stress

The associations of perceived levels of job stress with various health complaints were examined. As shown in Table 6, the associations between perceived levels of job stress and health complaints are presented for all the study subjects by gender. Gender and length of employment were found to confound the relationships of job stress and health outcomes (Table 3). To adjust for potential confounding effects of gender and length of employment, a multivariate logistic regression was performed. As shown in Table 6, compared with low-stress operators, operators with higher levels of job stress had significantly increased risks of various health complaints. Gender and length of employment-adjusted odds ratios (95%CI) for discomfort complaints among the study subjects were shown as following: 1.52 for skin (0.91-2.55), 2.33 for eyes (1.44-3.75), 2.05 for ears (1.31-3.21), 3.25 for throat (1.93-5.49), 2.01 for respiratory organs (1.28-3.16), 4.97 for cardiovascular system (2.75-8.98), 4.45 for digestive organs (2.68-7.36), 2.99 for renal organs

(1.66-5.36), and 2.74 for musculoskeletal system (1.68-4.46).

When analyses were performed by gender, it became clear that the strength of the associations of job stress with health risks was more pronounced among female operators, while no association for levels of perceived job stress and health complaints was found among male operators.

4. Discussion

4.1 Prevalence of physical discomforts

The overall prevalence of musculoskeletal discomforts (73% for FE and 81% for CH) and visual fatigue (70% for FE and 84% for CH) were significantly higher after prolonged working at call centers, as shown in Table 1. These findings were similar to the prevalence among disabled workers in the call center (Chi & Lin, 2004). This study also found a high prevalence of throat ailment (78% for FE and 78% for CH) for the call center operators. However, this was not evident from the previous survey.

Musculoskeletal discomforts and visual fatigue were the most pronounced and prevalent complaints for the VDT task and could get worse after a long period of work, inadequate workstation, low luminance contrast, close viewing distance, and fast moving targets (Duncan & Fergusson, 1974; Hunting et al., 1981; Knave et al., 1985; Sauter et al., 1991; Chi & Lin, 1998). Thus, appropriate ergonomic improvements

could benefit workers' musculoskeletal comfort (Bayeh & Smith 1999). For the current computer-telephone interactive tasks, a high prevalence of discomfort rate of the musculoskeletal system (73% for FE and 81% for CH) could be partially explained by the constrained VDT workstation. Evidence also existed for the relationships between work-related psychosocial factors and musculoskeletal pain (Bongers et al., 1993, Burdorf & Sorock, 1997). In this study, about one-thirds of call center operators (34% for FE and 32% for CH) were classified as high-stress workers, and prevalence of musculoskeletal discomforts increased substantially with level of job stress (OR ranging from 1.95 to 2.74). Therefore, both high levels of job stress and constrained settings may contribute to the high prevalence of musculoskeletal discomforts.

The reported prevalence of complaints about eyes (70% for FE and 84% for CH) could be attributed to the intensive usage of VDT displays. One feasible way to reduce the VDT screen viewing would be to update the frequently asked question (FAQ) information on a regular basis according to the knowledge accumulated by experienced agents (Watanabe et al., 2004) and put it into printed material for dissemination. In addition, short work duration with frequent break may also possibly relieve any visual fatigue and could be tested in further study (Shieh &

Chen, 1997).

Throat ailment (78% for FE and 78% for CH) and ears discomfort (44% for FE and 51% for CH) caused by excessive talking with customers and intensive usage of the phones and earphones respectively, were seldom investigated previously. Airo et al. (2004) measured the equivalent sound pressure levels inside the communication earpiece of broadcast production personnel. They suggested that a signal-to-noise ratio of 5 to 15 db is required for acceptable intelligibility. This means that communication sound has to be between 54.7 and 83.3 db based on the measured noise level of between 49.7 and 68.8 db (Airo et al., 2004). There is a general agreement that daily average noise levels below 80dBA are innocuous, and that noise levels above 90dBA are hazardous. Individuals exposed to noise between 85 and 90dBA need to be monitored because it may develop hearing loss if they are exposed to high level noise for a long enough period of time. There are also some linkage between noise exposure and certain stress diseases, such as cardiovascular disorders and ulcers. However, the noise level was not measured extensively inside and outside the earphones or with sophisticated and sensitive equipment in this study. Further study needs to be conducted, such as that indicated in Airo et al. (2004), in order to assess the acoustic effect of the call center communication

on ear discomfortness of operators. An evaluation on the operators' preferred and no-harm volume settings is necessary.

4.2 Prevalence and risks factors of job stress

Nearly one-thirds of the operators (34% for FE and 32% for CH) were classified as high-stress workers. This was lower than that of DiTecco et al.'s study (57%). However, 24% of male and 35% of female reported that they often or always felt very stressed at work. These were significantly higher than those, i.e., 7.6% for male and 6.5% for female, observed in the national working population survey in Taiwan (Cheng et al., 2001). The association between perceived job stress and body discomforts in the present study demonstrated that the work at the call center is characterized with perceived job stress, which may in turn result in high reports of body discomforts. Several studies have documented job stress as an important risk factor for health-related quality of life (Lerner et al., 1994; Amick et al., 1998). Furthermore, in compliance with previous reports, the associations of job stress with health risks appeared to be much stronger among female operators.

The call center operators of company CH had higher discomfort prevalence rates for eyes, musculoskeletal system, cardiovascular system, and digestive organs than those

of company FE as shown in Table 2. Though, the percentages of high-stress operators between FE and CH companies were not significant different (Table 3), other individual factors, such as age, length of employment, and psychosocial conditions were significantly different (see Table 1 & Table 5). Results shown in Table 1 revealed that CH company's operators were older (33.9 years old vs. 28.0 years old) and with much more working experience at call center (9.1 years vs. 2.7 years) than the FE company operators. Nevertheless, Company CH's operator scored substantially less in job control (skill discretion, decision authority) and supervision support.

Difference in the ranks of top five job stress was found between the two call centers in the present study (Table 4). Interestingly, a great majority of the study subjects, 70.1% for FE and 63.0% for CH, considered "Having to deal with difficult customers" as the top one job stressor. This finding was different from that of the DiTecco et al.'s study (1992), which reported that the most important job stressor was "Difficulty in serving customer well and still keeping average work time down." We examined all the major job stressors between DiTecco et al.'s and our studies and found that operators of both studies reported similar specific stressors which contributed to their feelings of job stress, for instance, "Difficulty in serving customers well and still keeping average

work time,” “Your call activities being monitored by the system,” and “Being monitored by a manager without warning.” These findings also supported Smith et al.’s (1992) report that electronic performance monitoring could influence worker’s stress responses in telecommunications companies.

Regarding the psychosocial work conditions, there was a significant difference between these two study companies. Company FE operators scored substantially higher in job control (skill discretion, decision authority), job demands and workplace supports (supervision support). This difference in psychosocial working condition may contribute to the different prevalence rates of discomforts and stress. Between male and female operators of the present study, a combination of high demands and lack of work control was observed in the daily activities of the female operators, which reflected a highly stressful job and may increase the risk to develop health complaints. When the analyses were performed by gender, we found that the associations of job stress with health discomforts were not significant among male operators. This might be explained by gender differences in attitude toward the work role. On the other hand, it might also be explained by the fact that male operators are less concerned about job stress than female.

5. Conclusions

This study indicated that

work-related visual fatigue, musculoskeletal discomforts, and discomfort of throat are rather common among the call center operators. The findings also indicated that perceived job stress was significantly associated with health complaints. Risk for physical discomforts among call center operators points out the need to implement comprehensive prevention strategies. These health problems require an integrated approach including psychosocial prevention with physical and ergonomics design improvement to effectively reduce the prevalence of physical discomforts and job stress.

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Table 1 Characteristics of the study subjects

Characteristic	FE	CH	p
	(n = 760)	(n = 263)	
Age-years, Mean \pm SD	28.0 \pm 8.3	33.9 \pm 10.1	<0.01 ^a
Length of employment-years, Mean \pm SD	2.7 \pm 2.1	9.1 \pm 10.2	<0.01 ^a
Female, n (%)	632(83%)	236(90%)	0.014 ^b
Single, n (%)	611(80%)	139(53%)	<0.01 ^b
Full-time worker, n (%)	756(99%)	230(88%)	<0.01 ^b

^a t test.^b Mantel-Haenszel chi-square test.

Table 2 Percentage of workers with discomfort by body areas and study companies

Body discomfort area (prevalence)	FE	CH	P*
	(n = 760)	(n = 263)	
Skin	23%	27%	ns
Eyes	70%	84%	<0.01
Ears	44%	51%	ns
Throat	78%	78%	ns
Respiratory organs	42%	48%	ns
Cardiovascular system	26%	41%	<0.01
Digestive organs	40%	51%	<0.01
Renal organs	24%	24%	ns
Musculoskeletal system	73%	81%	<0.01

* Mantel-Haenszel chi-square test.

Table 3 Percentage of operators reporting high-stress

Variable	Proportion of high-stress workers (%)	P*
Company		ns
FE	34%	
CH	32%	
Gender		<0.01
Male	24%	
Female	35%	
Marital status		ns
Single	34%	
Married	33%	
Age (years)		ns
<28	33%	
≥28	34%	
Length of employment (years)		0.038
<2	30%	
≥2	37%	

* Mantel-Haenszel chi-square test.

Table 4 Ranks of major job stressors and reporting percentage of study subjects

Stressors at work	FE company	CH company
	Rank (%)	Rank (%)
(1) Having to deal with difficult customers	1(70.1%)	1(63.0%)
(2) Difficulty in serving customers well and still keeping average work time	2(41.6%)	4(34.5%)
(3) Calls that take a long time to process	3(38.9%)	5(32.1%)
(4) Your call activities being monitored by the system	4(29.0%)	3(34.8%)
(5) Being monitored by a manager without warning	5(25.6%)	2(50.2%)

Table 5 Distributions of C-JCQ scores by company and gender

JCQ Subscale (# of items)	Company		p	Gender		P*
	FE (n = 760)	CH (n = 263)		Male (155)	Female (868)	
Skill discretion (6)	30.6(4.1)	28.4(4.8)	<0.01	30.5(4.6)	29.9(4.4)	ns
Decision authority (3)	30.8(5.5)	27.0(6.6)	<0.01	30.4(5.9)	29.7(6.1)	ns
Job control (9)	61.4(8.2)	55.3(10.0)	<0.01	60.9(9.1)	59.6(9.1)	ns
Job Demands (5)	32.3(4.5)	29.6(4.2)	<0.01	31.0(5.0)	31.7(4.5)	ns
Supervision support (4)	12.4(2.0)	11.0(2.1)	<0.01	12.2(1.8)	12.0(2.1)	ns
Coworker support (4)	12.9(1.9)	12.7(2.4)	ns	12.6(1.9)	12.9(2.1)	ns
Work-related support (8)	25.3(3.5)	23.7(3.3)	<0.01	24.8(3.4)	24.9(3.5)	ns

* Student t test.

Table 6 Gender and length of employment adjusted odds ratios of job stress for body discomforts

Body area	discomfort	Stress level ^a	Total population (n = 1023)		Male (n = 155)		Female (n = 868)	
			OR	(95%CI)	OR	(95%CI)	OR	(95%CI)
Skin		Low	1	-	1	-	1	-
		Intermediate	1.03	(0.57-1.56)	1.18	(0.38-3.63)	1.04	(0.60-1.80)
		High	1.52	(0.91-2.55)	1.39	(0.36-5.37)	1.75*	(1.00-3.08)
Eyes		Low	1	-	1	-	1	-
		Intermediate	1.47	(0.95-2.26)	0.55	(0.20-1.53)	1.54	(0.95-2.49)
		High	2.33**	(1.44-3.75)	0.77	(0.33-1.81)	2.80**	(1.66-4.75)
Ears		Low	1	-	1	-	1	-
		Intermediate	1.17	(0.76-1.79)	0.47	(0.17-1.34)	1.35	(0.85-2.16)
		High	2.05**	(1.31-3.21)	1.04	(0.41-2.66)	2.18**	(1.34-3.55)
Throat		Low	1	-	1	-	1	-
		Intermediate	1.48	(0.95-2.32)	0.55	(0.23-1.30)	1.48	(0.90-2.44)
		High	3.25**	(1.93-5.49)	0.70	(0.26-1.90)	3.44**	(1.94-6.11)
Respiratory organs		Low	1	-	1	-	1	-
		Intermediate	1.36	(0.88-2.09)	0.42	(0.16-1.08)	1.20	(0.75-1.92)
		High	2.01**	(1.28-3.16)	0.55	(0.19-1.62)	1.86*	(1.14-3.03)
Cardiovascular system		Low	1	-	1	-	1	-
		Intermediate	2.02*	(1.13-3.62)	1.67	(0.45-6.24)	2.30*	(1.21-4.37)
		High	4.97**	(2.75-8.98)	2.68	(0.65-11.01)	5.52**	(2.89-10.57)
Digestive organs		Low	1	-	1	-	1	-
		Intermediate	2.03**	(1.25-3.30)	1.71	(0.53-5.52)	2.28**	(1.35-3.84)
		High	4.45**	(2.68-7.36)	2.54	(0.71-9.06)	4.84**	(2.82-8.31)
Renal organs		Low	1	-	1	-	1	-
		Intermediate	1.43	(0.81-2.55)	3.38	(0.41-27.60)	1.36	(0.75-2.46)
		High	2.99**	(1.66-5.36)	4.22	(0.46-38.35)	2.72**	(1.49-4.96)
Musculoskeletal system		Low	1	-	1	-	1	-
		Intermediate	1.95**	(1.26-3.01)	0.61	(0.26-1.43)	2.00**	(1.23-3.25)
		High	2.74**	(1.68-4.46)	0.76	(0.28-2.04)	2.87**	(1.69-4.86)

*P<0.05;**P<0.01.

^a “Low”: never or seldom felt stressed at work; “Intermediate”: felt very stressed at work at times; “High”: often or always felt very stressed at work.