

Chronic fatigue of the small enterprise workers participating in an occupational health checkup center in southern Taiwan

Fu-Wei Wang · Yu-Wen Chiu · Ming-Shium Tu ·
Ming-Yueh Chou · Chao-Ling Wang · Hung-Yi Chuang

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Abstract

Purpose There has been increasing interest in the occupational health of workers in small enterprises, especially in developing countries. This study examines the association between psychosocial job characteristics and fatigue, and attempts to identify risk factors for fatigue among workers of small enterprises in southern Taiwan.

Methods A structured questionnaire was administered to workers receiving regular health examinations between August 2005 and January 2006. The questionnaire collected demographic information and data on working conditions, personal health status and life styles. It also collected information on psychosocial job characteristics, fatigue and psychological distress using three instruments.

Results A total of 647 workers with mean age of 43.7 were completed. Probable fatigue was found in 34.6% of the sample. Fatigue was found by multiple logistic regressions to be associated with the lack of exercise, working in shifts, depression score and lack of social support at workplace.

Conclusions This study found associations between life style, psychosocial job characteristics and fatigue. Because the high prevalence of probable fatigue was found in such small enterprises, the authors suggest that a short interview with some quick questionnaires in health checkup for these small enterprise workers are helpful to early detect psychosocial and fatigue problems.

Keywords Fatigue · Work stress · Small enterprise

Introduction

Fatigue is a common health problem among workers. Fatigue not only affects work performance and productivity, severe fatigue may lead to sick leave and work disability (Hardy et al. 1997; Beurskens et al. 2000). A few studies have emphasized the multifactor etiology of fatigue with psychosocial factors being one of the most common reported reasons for fatigue (Lewis and Wessely 1992; Pawlikowska et al. 1994; Bültmann et al. 2002b). In the Maastricht cohort study, psychosocial characteristics of the workplace were associated with fatigue in both men and women adjusting for psychological distress (Bültmann et al. 2002a). On the other hand, there are concerns over the adverse health impacts of working-related fatigue, which some epidemiological studies have linked to hypertension, cardiovascular diseases, psychosomatic symptoms, depression and adverse birth outcomes (Karasek and Theorell 1990; Schnall et al. 1994; Hellerstedt and Jeffery 1997). Workers usually felt fatigue in the early stage, which is why the important issue to screen fatigue in the regular occupational health examination.

Taiwan, a newly developed region, has experienced dramatic industrialization. It has been transformed from an

F.-W. Wang · M.-S. Tu · M.-Y. Chou
Department of Family Medicine,
Kaohsiung Veterans General Hospital, Kaohsiung, Taiwan

Y.-W. Chiu · C.-L. Wang · H.-Y. Chuang (✉)
Department of Community Medicine,
Kaohsiung Medical University Hospital,
#100 Shih-Chuan First Road, Kaohsiung 80708, Taiwan
e-mail: ericch@kmu.edu.tw

H.-Y. Chuang
Department of Public Health, College of Health Sciences,
Kaohsiung Medical University, #100 Shih-Chuan First Road,
Kaohsiung 80708, Taiwan

agriculture-based economy in the early 1960s to an economy dominated by small industries since the late 1980s. According to the governmental statistic data, more than 97% of total business or companies are <50 persons, which is defined as small-scale business or small enterprise (Ministry of Economic Affairs 2006). Moreover, about 60% of workforces are hired in this kind of business. Some studies have suggested that work stress and fatigue are important occupational health problems in Taiwan (Lu et al. 1995; Yang et al. 1997); however, these studies were done in workplaces for workers in large manufacturing companies or in public corporations, not small to midsize enterprises, the type where most of Taiwan's work force serves.

On comparison with the large manufacturing companies, working conditions appear to be worse to workers in small enterprises. The risks they face are generally of a chronic, longlasting nature, herewith implying negative health consequences. In addition, limited resources, heavy workload and multiple tasks for one worker may aggravate exposure to stressful working conditions. Small and medium-sized enterprises, in particular, have poor access to occupational health and safety services and other external support. They often lack knowledge about occupational health in general. Thus, World Health Organization (WHO) suggested that in smallscale enterprises, the adoption of the primary health care approach may be needed (World Health Organization 2001); moreover, WHO also raised awareness of work-related stress is a problem that is far from being resolved in developing countries, and growing concern in small business particularly. (Houtman et al. 2007).

This study attempts to measure the prevalence of fatigue among Taiwanese working in small enterprises and identify which psychosocial work characteristics are most associated with fatigue.

Materials and methods

Study population and questionnaire

The study enrolled participants who had been working at their jobs for more than 6 months and underwent periodic health examinations at a health checkup center in Kaohsiung from August 2005 to January 2006. The health checkup center is a rapid self-registration, which is convenient to employees in small enterprises and did few health examinations for large manufacturing companies. The amendment of labor health protection regulation in 2005 provisioned that the company with five and more employee should arrange health examination (Council of Labor Affairs 2005); thus, employee in small business could go to health checkup center themselves and paid by their companies due to this amendment.

At the health checkup, each participant provided a blood sample and filled out a self-administered questionnaire that collected demographic information, work and lifestyles. In the study period, an extra questionnaire was given to include items from three tools assessing psychosocial work characteristics, fatigue and psychological distress without extra fee. The study protocol was approved by the Institutional Review Board at Kaohsiung Veterans General Hospital. The purpose and contents of the questionnaire were explained to all the participants and they all signed written informed consent before they were enrolled in this study.

Blood sampling and measurements

Venous blood was collected from each participant after fasting status at least 12 h. All the blood samples were sent to the laboratory room for blood routine, CRP, biochemistry tests (including liver, renal functions and lipid profile) and carried out in the central laboratory of the medical center.

Demographic and health variables

In response to questionnaire items, the respondents provided information on gender, age, educational level, employment status (whether they worked on shifts or not, yearly salary was divided into three levels: <10,000, 10,000–30,000 and more than 30,000 US dollars), and if they had any chronic illnesses, including hypertension, diabetes mellitus, heart problems, liver problems and respiratory disorders. The personal habits, including smoking status, alcohol drinking (no, ≤ 3 times per week, or > 3 times per week), exercise habits (no, ≤ 3 times per week, or > 3 times per week), and betel nut chewing or not, also collected at the same time.

Psychosocial work characteristics

A validated Chinese version of the self-administered Job Content Questionnaire (JCQ) was used to measure the psychological demands, decision latitude and support at work. The Cronbach's α coefficient for psychological demands, decision latitude and support at work was 0.55, 0.80 and 0.86, respectively (Cheng et al. 2003).

In addition, the four categories of the demand/control model were created by dichotomizing psychosocial demands and decision latitude at their median and then cross-classifying the two measures: low-strain work (low demands, high-decision latitude), high-strain work (high demands, low-decision latitude), passive work (low demands, low-decision latitude) and active work (high demands, high-decision latitude). To assess whether employees perceived their work as

being physically demanding, a single item (yes/no) from the Chinese questionnaire on work and health was used. Another one item on perception and judgment of work was used to measure job insecurity (yes/no).

Fatigue

To determine the level of fatigue in the study participants, we used the Chinese version of checklist individual strength (CIS) (Wang et al. 2000). This multidimensional questionnaire consists of 20 items related to chronic fatigue. Participants were instructed to indicate how they had felt during the previous 2 weeks leading up to the interview. Higher the total CIS score, the greater is the level of fatigue. Cronbach's α coefficient for the total score was 0.88. All those employees scoring >76 on the CIS were defined as probable fatigue cases (Bültmann et al. 2000). The CIS was tested in the clinical setting (Vercoulen et al. 1996), and was validated in the working population (Beurskens et al. 2000). It covers several aspects of fatigue, such as subjective experience of fatigue, reduction in motivation, reduction in activity and reduction in concentration. Higher scores indicate a higher degree of fatigue, more concentration problems, reduced motivation or low levels of activity.

Psychological distress

The Taiwanese depression questionnaire (TDQ) was used to measure the presence of depression (Lee et al. 2000). The TDQ was developed as a culturally relevant screening instrument for detecting depressive disorder in the general population. This 18-item instrument makes use of Likert scoring (0, 1, 2, 3) and has a continuous distribution of scores ranging from 0 to 54. The Cronbach's α coefficient was 0.90. The 18-item TDQ had a sensitivity of 0.89 and a specificity of 0.92 at a cutoff point of 19, at which point an employee was defined a probably being depressed.

For this study, participants were grouped into the following categories based on their job titles: grade 1, administrators or managers; grade 2, professionals (doctors, lawyers, engineers, teachers and so on); grade 3, non-manual skilled workers (technicians, trading agents and so on); grade 4, non-manual low-skilled workers (secretaries, clerks, cashiers and so on); grade 5, manual skilled workers (carpenters, linemen, gardeners and so on); grade 6, manual low-skilled workers (machine operators, electronic assemblers, drivers, cleaners and so on).

Statistical analysis

Employees with the incomplete data were excluded from the analysis. Student's *t* test and Chi-square test were used to make comparisons among employees with and without

fatigue with regard to lifestyle and work-related factors and laboratory data. Pearson correlations were computed to examine the association among scores in three main components of psychosocial job characteristics, job demand, decision latitude and social supports, total CIS fatigue scores and total TDQ depression scores. Those variables found to be significant by univariate analysis were subsequently assessed by a multiple logistic regression method to identify independent risk factors predicting the presence of probable fatigue.

Results

From August 2005 to January 2006, there were totally 898 persons registered in the health checkup center. Of the total registered persons, 647 were eligible, which were currently hired in small enterprises for at least 6 months, and agreed to participate in the study. Their characteristics are showed in Table 1. Those who did not participated or enrolled in the study ($n = 251$) were elder (mean ages were 62.8 ± 8.4 and 57.1 ± 7.8 for males and females, respectively). Most of them were retired. A number of men and women were 176 and 75, which was not significantly different from those who participated.

About 34.5% ($n = 224$) of the participants were found to be possibly fatigued, and they were younger, female dominant. As can be seen in Table 1, these participants with fatigue were also lacked physical exercise. There was no difference in education, and the prevalence of chronic illness, smoking, alcohol drinking, and betel nut chewing between those who were fatigued and those who were not.

We compared the occupational characteristics and level of psychological distress, as measured by the TDQ, of those who were fatigued and those who were not (Table 2). Members of the fatigued group were more likely to have higher mean TDQ depression scores, more working in shifts, non-manual low skilled, and make less per year than those who were not fatigued. The fatigued group was also more likely to have low-decision latitude, less workplace social support, less job security, and a job requiring more physical effort than the non-fatigued counterparts. In addition, member of the fatigued group more likely to be passive and high-strain model workers than the non-fatigued group, who were more likely to be active and low-strain model workers.

As can be seen Table 3, which shows the result of our multiple logistic regression, the risk factors for perceived chronic fatigue are lack of exercise, working in shift, and low workplace social support. Job with shift work led to about three times higher risk for fatigue. People with regular exercise had lower (OR about 0.4) risk of probable fatigue.

Table 1 Sociodemographic characteristics between fatigue and non-fatigue subjects

Variable	Fatigue		P
	Yes (n = 224)	No (n = 423)	
Age (SD) (years)	42.1 (10.4)	44.6 (10.1)	0.003 ^a
Sex n (%)			
Men	127 (56.7)	287 (67.8)	0.006 ^b
Women	97 (43.3)	136 (32.2)	
Chronic illness n (%)			
No	173 (77.2)	346 (81.8)	0.178 ^b
Yes	51 (22.8)	77 (18.2)	
Educational level n (%)			
Primary school	10 (4.5)	10 (2.4)	0.055 ^b
Middle school	14 (6.3)	17 (4.0)	
High school	103 (46.0)	168 (39.7)	
University	61 (27.2)	157 (37.1)	
Graduate school	36 (16.1)	71 (16.8)	
Smoking status n (%)			
No	139 (62.1)	292 (69)	0.097 ^b
Yes	70 (31.3)	99 (23.4)	
Ex-smoker	15 (6.6)	32 (7.6)	
Drinking status n (%)			
No	133 (59.4)	233 (55.1)	0.48 ^b
≤3 times per week	77 (34.4)	173 (40.9)	
>3 times per week	14 (6.2)	17 (4.0)	
Exercise status n (%)			
No	94 (42)	84 (19.9)	<0.001 ^b
≤3 times per week	101 (45.0)	254 (60.0)	
>3 times per week	29 (13.0)	85 (20.1)	
Betel nut chewing n (%)			
No	205 (91.5)	402 (95)	0.087 ^b
Yes	19 (8.5)	21 (5)	

^a P value, Student's *t* test^b P value, Pearson's chi-square test

Discussion

To our knowledge, this is the first study in Taiwan to investigate the associations between fatigue and psychosocial job characteristics in employees of small enterprise. Fatigue in this study was associated with having lack of exercise, working shifts, high TDQ depression scores and low social support in the small enterprise workplace. The prevalence of self-perceived chronic fatigue, we found (34.5%) was higher than those were reported in the other studies (Bültmann et al. 2002a; Andrea et al. 2003). It might implicate employees in small enterprises not only working with long hour high pressure, but also less workplace social support than those working in large companies; in addition, they

Table 2 Work characteristics between fatigue and non-fatigue subjects

Variable	Fatigue		P
	Yes (n = 224)	No (n = 423)	
Shift work n (%)			
No	190 (84.8)	401 (94.8)	<0.001 ^b
Yes	34 (15.2)	22 (5.2)	
Employment status n (%)			
G6: manual low skilled	5 (2.2)	13 (3.1)	0.015 ^b
G5: manual skilled	33 (14.8)	58 (13.7)	
G4: non-manual low skilled	59 (26.3)	79 (18.7)	
G3: non-manual skilled	37 (16.5)	45 (10.6)	
G2: professional	59 (26.3)	146 (34.5)	
G1: administrator or manger	31 (13.9)	82 (19.4)	
Yearly salary (US dollar) n (%)			
<10,000	33 (14.7)	29 (6.9)	<0.001 ^b
10,000–30,000	133 (59.4)	202 (47.7)	
More than 30,000	58 (25.9)	192 (45.4)	
TDQ total score (SD)	18.2 (9.7)	6.3 (5.0)	<0.001 ^a
TDQ depression casen (%) ^c			
No	131 (58.5)	415 (98.1)	<0.001 ^b
Yes	93 (41.5)	8 (1.9)	
Psychosocial work characteristics (JCQ score)			
Job demand (SD)	32.6 (5.1)	32.0 (4.7)	0.16 ^a
Decision latitude (SD)	65.4 (11.9)	70.8 (11.4)	<0.001 ^a
Social support (SD)	21.6 (3.6)	23.6 (3.4)	<0.001 ^a
Job insecurity n (%)			
No	132 (58.9)	322 (76.1)	<0.001 ^b
Yes	92 (41.1)	101 (23.9)	
Physical effort n (%)			
No	119 (53.1)	267 (63.1)	0.015 ^b
Yes	105 (46.9)	156 (36.9)	
Job strain model n (%)			
Passive	94 (42.2)	142 (33.3)	<0.001 ^b
Low strain	26 (11.2)	103 (24.3)	
High strain	65 (29.1)	73 (17.2)	
Active	39 (17.5)	105 (24.8)	

TDQ Taiwanese Depression Questionnaire

^a P value, Student's *t* test^b P value, Pearson's chi-square test^c Total TDQ scores >19

may need more social network in business or social relationship, which is one of their occupational characteristics, and may lead to more risk of fatigue or even depression.

Social support in the workplace was significantly associated with fatigue among the Taiwanese. People with lower levels of social support were found more likely to be

Table 3 Risk factors for perceived chronic fatigue by multiple logistic regression analysis

Variable	Odds ratio	95% CI of OR
Age	1.01	0.97–1.04
Sex		
Women	1	
Men	0.77	0.46–1.28
Exercise status		
No	1	
≤3 times per week	0.43	0.26–0.73*
>3 times per week	0.44	0.21–0.91*
Shift work		
Yes	1	
No	0.32	0.13–0.77*
Employment status		
G6: manual low skilled	1	
G5: manual skilled	3.08	0.44–21.58
G4: non-manual low skilled	3.41	0.53–21.76
G3: non-manual skilled	3.62	0.56–28.33
G2: professional	2.17	0.37–12.92
G1: administrator or manager	1.06	0.17–6.72
Yearly salary (US dollar)		
≤10,000	1	
10,000–30,000	0.99	0.37–2.69
>30,000	0.56	0.17–1.82
Job insecurity <i>n</i> (%)		
No	1	
Yes	1.24	0.72–2.12
Physical effort <i>n</i> (%)		
No	1	
Yes	1.23	0.75–1.99
TDQ total score	1.28	1.22–1.33*
Psychosocial work characteristics		
Job demand	1.01	0.95–1.08
Decision latitude	0.99	0.97–1.02
Social support	0.91	0.84–0.98*

Nagelkerke $R^2 = 0.618$ * $P < 0.05$

fatigued, a finding that is compatible with a couple of western studies (Johnson and Hall 1988; Theorell and Karasek 1996), which found problematic relationships at work to be an important major stressor. In this study, we found even professional occupations or administrators and managers all implicated the association between workplace social support and fatigue.

This study is participant to some limitations. First, our study participants, recruited during an in-hospital health checkup, were mainly made up of people belonging to middle to high-class economic level fitting under various

occupational categories and job titles. There is a chance that economic level of people may be more health conscious and have a more active lifestyle and results based on this population alone might be an underestimation of the prevalence of chronic fatigue among the whole population. On the other hand, there might be an overestimation if fatigued workers were more likely than non-fatigued one to come into the health center for screening. Nevertheless, our results can still serve as primary findings and may be referred to by others researchers interested in this line of investigation.

This study is based on the cross-sectional design, and is, therefore, participant to causal interpretations of the observed associations. Furthermore, this study primarily focuses on the relationship between psychosocial work characteristics and fatigue; other variables, too, may influence likelihood of developing fatigue, including other work-related aspects (e.g., working seniority and hours), work-family aspects (e.g., domestic load) and non-work-related aspects (e.g., individual characteristics) and may limit the outcomes of this study.

Another important issue concerns the validity of self-reported data. In our study, information on psychosocial work characteristics, as well as on fatigue and psychological distress, was obtained by a self-administered questionnaire, which might result in an overestimation of the associations (Amick and Kasl 2000). Moreover, people with negative affect (Watson and Clark 1984) may perceive their work environment and health conditions less favorably, creating an artificial association between working stress and health outcomes. However, previous literature has suggested that negative affect does not substantially confound the stressor–strain associations, especially when physiological indicators of stress responses are applied (Bosma et al. 1997).

The validated CIS was used to measure fatigue in the working population. Like many medical conditions, fatigue is best viewed as a continuum (Chalder et al. 1993), as opposed to a dichotomy. Although one may lose information when using a cutoff point, it is useful when employees have to be monitored or when the prevalence of fatigue has to be compared in different subgroups. The prevalence found in the working population was 34.5%, which is higher than previous studies reported prevalence rates of substantial fatigue varying from 22% in the general Norwegian population (Loge et al. 1998) to 25% in an Australian primary care study (Hickie et al. 1996).

The present study found fatigue to be fairly well associated with psychological distress ($r = 0.739$) in the middle to high-income working population, a finding that is consistent with the findings of previous studies on the relationship of fatigue and psychological distress conducted in the community (Pawlikowska et al. 1994) and in a primary care

setting (Hickie et al. 1996). We conclude not that fatigue is caused by psychological distress, but that the two conditions overlap. The concordance between fatigue and psychological distress is inevitable given the similarities of the criteria and measures used to define them.

No clear associations were found for fatigue with respect to demographic and somatic health factors. In previous research, inconsistent findings have been reported regarding gender, age, and educational level with fatigue (Chen 1986; Fuhrer and Wessely 1995). In this study, a strong association between working shifts and fatigue was found, identical to the reports on the impact of working shifts on health and psychosocial well being over the years (Waterhouse et al. 1992). One reason for the negative impact of working shifts may rest a mismatch between the endogenous circadian timing system and the environmental synchronizers, with consequent disturbances of the normal circadian rhythms of psychophysiological functions, beginning with the sleep/wake rhythm (Akerstedt 2003).

We found evidence for a strong relationship between no physical activity during leisure time and fatigue in Taiwanese workers, which is consistent with a finding among male industrial employees reported in a cross-sectional study by Kristal-Boneh et al. (1996) and with the prospective results from the Maastricht Cohort Study (Bültmann et al. 2002c). This finding is important and provides a sound basis for the development of recommendations and interventions for improving personal health at either the individual or workplace level. The benefits of increased physical activity during leisure time should be heeded.

In conclusion, a high prevalence of possible fatigue was found 34.6% in such small business with long working hour and high pressure. The employees from small business may be lack of leisure time for regular exercise, and need to work in shifts, which resulted in a population at risk of fatigue. The authors would suggest a short interview with some quick questionnaires when occupational health examinations were performed for these small enterprises are helpful to early detect psychosocial and fatigue problems.

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