

RELATIONSHIP BETWEEN JOB STRESS AND BODY MASS INDEX : APPLICATION OF BRIEF QUESTIONNAIRE FOR JOB STRESS (MINISTRY OF LABOUR) TO A SAMPLE OF JAPANESE FACTORY WORKERS

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Abstract

Recently, the Research Group for Prevention of Work-related Diseases sponsored by Japan Ministry of Labour (1995-99) developed Brief Questionnaire for Job Stress (BQJS) to assess work stressors, psychological and somatic responses, social support, and job satisfaction. In the study presented here, BQJS was applied to a sample of Japanese factory workers to assess the relationship between job stress and body mass index (BMI), which is one of key factors for life style diseases.

The study was conducted among 228 employees at a factory producing office apparatus in a city nearby Tsu, Mie, Japan. Self-administered questionnaires including BQJS were distributed among these workers, and 144 gave the answers with their informed consent. Among 144 respondents, results of regular health checks within 1 year of the study were available for 84 males and 38 females. Thus, data of a total of 122 subjects were used in the analysis. Average ages were 36.2 (SD 7.9) and 41.3 (SD 11.9) years for these males and females, respectively. BMI was defined as body weight (kg) divided by the square of height (m) $\times 100$ (%). Relationships of BMI to work stressors, psychological and somatic responses, social support, and job satisfaction were examined by stepwise multiple regression analysis using BMI as a dependent variable and scores on 19 scales of BQJS with age as independent variables.

Average BMI were 23.2 (SD 3.1) and 21.4 (SD 2.5) % for males and females, respectively. In males, BMI was significantly related to score on the scale of low social support from supervisors ($r = -0.297, p < 0.01$), indicating the positive effect of the support. In females, it was significantly related to score on the depression scale ($r = 0.404, p < 0.05$).

In the present study, support from supervisors increased BMI in male workers. This might have been attributed to increased appetite with relaxation brought about by good human relationships. On the other hand, excessive eating due to depression was supposed in female workers; eating behavior seems to be affected by mood in females. Thus, gender-specific approaches seem necessary to prevent life style diseases among workers.

Key Words: body mass index, job stress, life style diseases, depression

Introduction

Recently, there have been three major causes of death in Japanese population, i.e. cancer, cardiovascular disease and

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cerebrovascular disorders, which are called life-style diseases, and account for 60% of all causes of death. Life-style diseases are related to psychosocial stress, which may cause physiological changes in nervous, endocrine and immunological systems, resulting in a fight and flight reaction. Also, such stress lead to emotional reaction such as anxiety, depression, anger and melancholy, and cognitive changes including confusion and disturbed memory.

To avoid physical and/or psychological reactions caused by stress, the individual may take two strategies of coping, i.e. problem oriented behavior, by which the individual manage the problem that causes painful situation, and emotion oriented one, by which he/she control emotional reactions to stressors (Lazarus and Folkman 1991). The latter coping behavior involves smoking, drinking or overeating to reduce tension and anxiety. As these 'unhealthy' behaviors can cause risk factors of the above major three causes of death, which are hypertension, hyperlipidemia and diabetes as well as obesity (overweight), it is important for the individuals to learn the way of stress coping to keep and promote health and to prevent life-style diseases.

Since 1990 s, because of economy crisis a significant number of Japanese companies have cut the number of employees. Workers have to adapt themselves to rapid changes in job contents and competition under modernizing and information-oriented society. This might have caused increased work load of workers, resulting in a social problem such as "KAROUSHI" or suicide due to depression related to job stress. It has been reported that job stress are related to hypertension, cardiovascular disease (Netterstrom and Suadicani 1993), smoking and obesity (Reed et al. 1989). Also, effects of job stress on health should be studied considering gender differences, as previous study reported that job demands was positively associated with smoking, smoking intensity, and high fat intake in men, and with body mass index (BMI) and smoking intensity in women (Lean 2000).

The term overweight means a Body Mass Index (BMI) greater than 25 ; attention has been paid to the health effects of overweight and weight gain in adults' life based on their association with increased mortality (Yamada et al. 2002). Although the prevalence of obesity in Japan is still lower than those in developed western countries, it has increases as rapidly as in other countries during these decades; prevention of obesity controlling for work - related factors expediting weight gain is important issue in occupational health (Yamada et al. 2002). A study using Health-Related Quality-of Life (HRQL) revealed that obesity decreases physical activities and quality of life (Hellerstedt and Jeffery 1997 ; Fontaine et al. 1996). Also, obesity is related to tiredness, breathlessness, back pain, arthritis, sweatiness, poor sleeping, depression and menstrual disorders (Barofsky 1997). Overweight and obesity increase the risk for developing many serious chronic diseases such as cardiovascular disease, type 2 diabetes, and hypertension.

In the present study, relationship between job stress and obesity is studied, considering gender differences, by the use of Brief Questionnaire for Job Stress (BQJS) developed by the Research Group for Prevention of Work-related Diseases sponsored by Japan Ministry of Labour (1995-99) (Study Group on Stress Assessment, 2000).

Subjects and Methods

A questionnaires containing BQJS, Profile of Mood States (POMS) (Yokoyama et al.1990; Yokoyama and Araki 1994), and explanation of nature of the study, asking for informed consent, was distributed among 228 workers at a office-supply production factory. One-hundred and twenty two (53.5%, 84 males and 38 females) agreed to participated in the study, approved us to use their regular health-check records, and returned the answer sheet. As the remaining workers did not consent to use the health check record, no information was available for them.

BQJS, consisting 19 scales (57 items) (Table 1), assesses work stressors, psychological and somatic responses, social support, and job satisfaction. Seventeen items were produced for work stressors, which referred to the Japanese version of the Job Content Questionnaire (Karasek et al.1998), and the Generic Job Stress Questionnaire. Twenty-nine items were developed for psychological and somatic stress response, which referred to the Japanese version of the POMS, State-Trait Anxiety Inventory (STAI) (Spielberger et al. 1970), Center for Epidemiologic Studies for Depression Scale (CES-D) (Radloff 1977), Screener for the Somatoform Disorders and the Subjective Wellbeing Inventory. One buffer factor (9 items): social support from supervisors, coworkers, and family/friends and 3 items for the degree of satisfaction to their work/home life were also included (Shimomitsu et al. 2000).

Table 1. Differences in BMI, age, and BQJS and POMS scores between males and females

	Males(n=84)	Females(n=38)	Difference (p)
BMI(kg/m/m)	23.18(3.11) ^a	21.38(2.53) ^b	
Age(year)	36.2(7.93)	41.3(11.85)	
BQJS score (number of items)			
Quantitative work load (3)	6.38(1.89)	6.66(2.52)	
Qualitative work load (3)	6.89(2.79)	6.66(2.18)	
Perceived physical load (1)	2.75(0.96)	2.76(1.05)	
Interpersonal conflict (3)	8.76(1.48)	8.24(1.82)	
Environmental stress (1)	2.60(1.0)	2.50(0.98)	
Low job control (3)	6.74(1.58)	7.13(1.88)	
Skill underutilization(1)	2.83(0.82)	2.39(0.92)	<0.01
Low job fitness(1)	2.40(0.81)	2.70(0.81)	
Low job worth working(1)	2.33(0.83)	2.61(1.05)	
Vigor (3)	6.15(1.81)	5.87(2.45)	
Anger (3)	6.83(2.24)	7.29(2.48)	
Fatigue (3)	7.24(2.03)	7.87(2.55)	
Anxiety (3)	6.43(1.92)	6.74(2.20)	
Depression (6)	11.13(3.84)	12.32(5.24)	
Somatic symptoms (11)	14.60(4.74)	17.62(4.17)	<0.01
Low support from supervisors (3)	7.24(2.20)	8.71(2.24)	<0.01
Low support from coworkers (3)	6.92(1.98)	7.42(1.87)	
Low support from family/friends (3)	5.13(1.92)	5.21(1.70)	
Dissatisfaction of own work/home life (2)	4.74(1.19)	5.00(1.43)	
POMS (number of items)			
Tention-Anxiety (9)	7.29(4.01)	7.14(4.49)	
Depression-Dejection (15)	4.33(4.23)	4.43(4.51)	
Anger-Hostility (12)	5.94(4.13)	6.00(3.92)	
Vigor (8)	7.24(3.74)	4.66(4.19)	
Fatigue (7)	7.23(4.29)	8.71(5.48)	
Confusion (7)	7.49(2.30)	8.06(2.86)	

^a n=2 (2.4 %), 59 (70.2%), 21(25.0 %), and 2 (2.4%) for BMI <18.5, 18.6-24.9, 25.0-29.9, and 30.0-, respectively.

^b n=5 (13.5 %), 28(75.7 %), 4 (10.8 %), and 0 (0%) for BMI <18.5, 18.6-24.9, 25.0-29.9, and 30.0-, respectively.

POMS Japanese version has been developed by Yokoyama et al. (Yokoyama et al.1990; Yokoyama and Araki 1994). BMI was taken from the records of regular health checks. Relationships of BMI to BQJS scores were examined by a multiple regression analysis using scores on BQJS scales together with age as independent variables as covariates. Similarly, those of BMI to POMS scores were also analyzed. These analyses were also performed for BMI categorized and scored 1, 2, 3 and 4, i.e. less than 18.5 (underweight), 18.5-24.9 (standard), 25.0-29.9 (overweight) and 30.0 or over (obese), respectively. SPSS 11.0 for Windows was used for the analysis.

Results

Age, BMI, scores on BQJS and POMS are shown in Table 1 for males and females. Scores on skill underutilization was higher in males than in females whereas those on somatic symptoms and low support from supervisors are higher in females. Table 2 shows relationships of BMI (dependent variable) to BQJS or POMS scores (independent

Table 2. Relationships of BMI (dependent variable) to BQJS or POMS scores (independent variables): stepwise multiple regression analysis^a

Independent variables selected		
R ² (standardized regression coefficient, p)		
Males		
	0.077	Low support from supervisors (BQJS) (-0.297, p<0.01)
	0.052	<i>same as above</i> (-0.252, p<0.05)
Females		
	0.137	depression(BQJS) (0.404, p<0.05)
	0.122	<i>same as above</i> (0.384, p<0.05)
	0.137	depression (POMS) (0.401, p<0.05)
	0.187	<i>depression (POMS) (0.458, p<0.05)</i>

^a Age with scores on 19 scales of BQJS or on 6 scales of POMS were included and excluded at p<0.05 as independent variables. Results are *italicized* when BMI was categorized (see methods).

variables): stepwise multiple regression analysis. For BQJS, the multiple regression analysis showed that in males BMI was negatively related to low support from supervisors. In females, BMI was positively related to scores on depression. For POMS, No significant correlations were observed between POMS scores and BMI in males whereas BMI was positively related to depression of POMS in females. Same results were observed when BMI was categorized.

Discussion and Conclusions

Physiological and psychological responses to stress are modified by age, gender, coping, and social support of individuals besides job contents and work conditions. In males, BMI inversely related to low support from supervisors; this means that BMI can increase under good support from supervisors. It seems that in males conflict with supervisors may increase tension and anxiety whereas they are relaxed by good relation with supervisor, changing eating behaviors. There are common beliefs about the relationship between body size and emotional well-being; for example, in patients with major depression higher body weight is likely to be associated with less reduction in appetite and less pessimistic thoughts (Berlin and Lavergne 2003). As relationships between individuals are important for Japanese workers, good relationship to the supervisor should affect motivations for job and life style of the worker. Good relationship to supervisors may set the individual's mind at rest, resulting in the increase in BMI.

In contrast to no effects of mood on BMI in males, BMI was positively related to depression of POMS in females. Thus, females may become overeating due to depressive mood. As eating behavior is affected by mood in females, adequate stress coping behavior is important for prevention of obesity in females. From the view point of behavioral science, overeating is one of the avoidance behaviors for stress management. If the individual cannot take other way of management, overeating can be dependence such as smoking and drinking. Thus, control for body weight should be based on cognitive behavior therapy.

However, as it was reported that in female patients with major depression, those with BMI was 18.5 kg/m or below showed higher scores on the Montgomery-Asberg depression rating scale than those with higher BMI, overeating is not always related to depressive mood (Berlin and Lavergne 2003). As emotional reactions to stressors are based on neurological, immunological and endocrinological changes, researches with biological aspects are necessary. A study on the relationship between BMI and negative mood symptoms (i.e., depression and negative affect scale scores) in women who were not taking oral contraceptives revealed the positive relationship between estrogen levels and body fat, suggesting that estrogen has an effect on both body fat storage and negative affect (Oinonen and Mazmanian 2001). Thus, relationships between depressive mood and BMI should be investigated further in relation to the role of hormones in the regulation of mood.

The present study showed gender differences in the effects of job stress on BMI. Effective measures considering

gender for stress management is necessary, to promote physiological and psychological health of employees. As previous studies have stressed on the relationships between obese and life style, e.g. Ishizaki et al reported that BMI is positively related to shift-work, marriage and desk-work in males and to custom of sports in females (Ishizaki 2004), whereas no significant relationships between BMI and shift-work was observed by Ha et al (Ha and Park 2005). Further studies on the effects of perceived stress and emotion on body weight should be carried out.

However, the present study has some flaws. First, number of subjects were relatively small. Second, for the workers did not consent to use the health check record, no information was available for them; the results on the participants might have been suffered from a bias. Third, other variables such as social-economic status, smoking, alcohol consumption and physical activity were not included. Thus, a further study will be necessary to confirm the findings of the present study.

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