A Prospective Study on the Influences of Workplace Stress on Mental Health

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Abstract: A Prospective Study on the Influences of Workplace Stress on Mental Health: Akira BABAZONO, *et al.* Institute of Health Science, Kyushu University—The purpose of this study was to clarify the influences of subjective stress in the workplace on mental health according to work contents in subjects without mental health problems. In a survey in fiscal 1997, 1,246 (84.6%) of all 1,363 workers of a manufacturing company in Japan, responded to a questionnaire including questions on subjective stress and GHQ60, and 1,135 workers answered all questions (effective response rate, 83.3%). In fiscal 1997, there were 705 “mentally healthy” workers with a GHQ score of ≤ 16 . Of the 705 workers, 603 (85.5%) could be followed up by another survey 2 yr later (fiscal 1999). According to the contents of the work, multiple logistic regression analysis was performed using the status of mental health in fiscal 1999 as a dependent variable and subjective workplace stress, sex, age, smoking, and alcohol usage in fiscal 1997 as explanatory variables. The statistically significant items relating to problematic mental health for “factory work” were “too much competition”, “feel pressed for time”, and “cannot keep up with new technology” (Table 4). For “too much competition”, the odds ratios (95% CI) of “always” and “sometimes” to “do not feel” were 4.04 (1.39–11.76) and 1.85 (0.92–3.70), respectively. For “feel pressed for time”, the odds ratios (95% CI) of “always” and “sometimes” to “do not feel” were 2.40 (1.08–5.35) and 0.98 (0.46–2.06), respectively. For “cannot keep up with new technology”, the odds ratio (95% CI) of “always” and “sometimes” to “do not feel” were 6.54 (0.37–116.36) and 2.52 (1.34–4.77), respectively. The statistically significant items relating to problematic

mental health for “research and development or office work” were “too much trouble at work” and “feel pressed for time”. For “too much trouble at work”, the odds ratios (95% CI) of “always” and “sometimes” to “do not feel” were 3.92 (1.41–10.93) and 1.44 (0.67–3.09), respectively. For “feel pressed for time”, the odds ratios (95% CI) of “always” and “sometimes” to “do not feel” were 2.69 (1.04–6.93) and 2.09 (0.94–4.67), respectively. Our study suggests that subjective stress items aggravating mental health are different among work contents. If we could identify items of workplace stress influencing mental health by work contents, we could utilize the results for a mental health promotion program.

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Key words: Subjective stress, Mental health, GHQ, Workplace

Workplace stress is a major risk factor of work-associated disorders, and studies on and measures against workplace stress have become important. Studies have shown an association between workplace stress and mental health, and have suggested that workplace stress is an important risk factor of mental disorders represented by depression^{1–14}. Labor loss due to mental disorders such as depression and their economic effects have also been reported^{16, 17}. Therefore, it is important to clarify the items of workplace stress affecting mental health and take appropriate measures. There have been many studies showing an association between subjective stress in the workplace and the status of mental health. However, items of workplace stress were not clarified in some studies^{2, 6, 12}, and the items of stress were not the same in others^{4, 5, 9, 13}. In addition, only a few were cohort studies^{3, 5, 8, 9, 15}, and many studies were cross-sectional surveys^{1, 3, 6, 13, 14}, and whether workplace stress caused poor mental health, or poor mental health caused marked workplace stress was not determined. We performed a

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prospective study on the influences of subjective stress in the workplace on mental health according to work contents in subjects without mental health problems.

Subjects and Methods

We perform health management in a manufacturing enterprise in Japan and have carried out surveys of workplace stress and mental health at 2-yr intervals. The questionnaire on subjective workplace stress consists of the following 13 items based on Uehata's questionnaire¹⁸⁾: "too much competition", "too much work", "too little work", "schedule is too tight", "too much trouble at work", "too much responsibility", "work hours too long", "poor relationship with superiors", "feel pressed for time", "are not allowed to make mistakes", "shortage of workers", "labor too strenuous", and "cannot keep up with new technology". For each item, one of "always", "sometimes", and "do not feel" is selected. For the survey of the status of mental health, GHQ60¹⁸⁾ developed by Goldberg is used. The subjects were all full-time employees. Temporary or part-time workers were excluded. In the survey in fiscal 1997, 1,246 (84.6%) of all 1,363 workers, responded to the questionnaire, and 1,135 workers answered all questions (effective response rate, 83.3%). In fiscal 1997, there were 705 "mentally healthy" workers with a GHQ score of ≤ 16 : 538 "males" (76.3%) and 167 "females" (23.7%): 192 workers aged "<30 yr" (27.2%), 188 aged "30–39 yr" (26.7%), 182 aged "40–49 yr" (25.8%), and 143 aged " ≥ 50 yr" (20.3%). The content of work was "factory work" for 361 workers (51.2%) and "research and development or office work" for 344 (48.8%). Of the 705 workers, 603 (85.5%) could be followed up by the survey 2 yr later (fiscal 1999). In

this study, these workers were the subjects of analysis. According to the contents of work, multiple logistic regression analysis was performed using the status of mental health in fiscal 1999 as a dependent variable and subjective workplace stress, sex, age, smoking, and alcohol usage in fiscal 1997 as explanatory variables. We estimated the odds ratio and its confidence interval. The status of mental health was categorized into "mentally healthy workers" (score ≤ 16) and "workers with mental problems" (score ≥ 17), and age into "< 30 yr", "30–39 yr", "40–49 yr" and " ≥ 50 yr", and work contents into "factory work" and "research and development or office work". Smokers were defined as subjects who used any kind of tobacco product at the time of the study. Those who used alcohol every day were regarded as drinkers.

Results

Table 1 shows the attributes of the 705 subjects at the initiation of the follow up. There were 538 "males" (76.3%) and 167 "females" (23.7%): 192 workers (27.2%) aged "< 30 yr", 188 workers aged "30–39 yr" (26.7%), 182 aged "40–49 yr" (25.8%), and 143 aged " ≥ 50 yr" (20.3%). The average age of male workers was 36.9, while that of female workers was 44.3. The content of work was "factory work" for 361 workers (51.2%) and "research and development or office work" for 344 (48.8%). For "smoking", the numbers of smokers, non-smokers, and not response were 340 (48.2%), 363 (51.5%), and 2 (0.3%). For "drinking", the numbers of drinkers, non-drinkers, and not response were 244 (34.6%), 459 (65.1%), and 2 (0.3%). The 603 workers, subjects of the analysis, consisted of 474 "males" (78.6%) and 129 "females" (21.4%): 155 workers aged "<30 yr"

Table 1. Gender, age and work distribution of initial cohort and analyzed subjects

		Initial cohort	Analyzed subjects
Gender	Male	538 (76.3%)	474 (78.6%)
	Female	167 (23.7%)	129 (21.4%)
Age	Under 30	192 (27.2%)	155 (25.7%)
	Thirties	188 (26.7%)	167 (27.7%)
	Forties	182 (25.8%)	173 (28.7%)
	Fifties and over	143 (20.3%)	108 (17.9%)
Work	Factory	361 (51.2%)	312 (51.7%)
	R&D or Office	344 (48.8%)	291 (48.3%)
Smoking	Smokers	340 (48.2%)	291 (48.3%)
	Non-smokers	363 (51.5%)	311 (51.6%)
	No response	2 (0.3%)	1 (0.2%)
Alcohol	Drinkers	244 (34.6%)	217 (36.0%)
	Non-drinkers	459 (65.1%)	384 (63.7%)
	No response	2 (0.3%)	2 (0.3%)
Total		705 (100%)	603 (100%)

Table 2. The distribution of subjective stress by work

	Factory	R&D or office		Factory	R&D or office
too much competition			poor relationship with superiors		
“always”	22 (7.3%)	12 (4.2%)	“always”	11 (3.6%)	11 (3.8%)
“sometimes”	97 (32.2%)	86 (30.2%)	“sometimes”	76 (24.7%)	82 (28.7%)
“do not feel”	182 (60.5%)	187 (65.6%)	“do not feel”	221 (71.8%)	193 (67.5%)
too much work			feel pressed for time		
“always”	72 (23.5%)	51 (17.8%)	“always”	67 (21.9%)	53 (18.6%)
“sometimes”	172 (58.0%)	160 (55.9%)	“sometimes”	143 (46.7%)	154 (54.0%)
“do not feel”	63 (20.5%)	75 (26.2%)	“do not feel”	96 (31.4%)	78 (27.4%)
too little work *			are not allowed to make mistakes ***		
“always”	22 (7.3%)	1 (0.4%)	“always”	150 (48.9%)	90 (31.5%)
“sometimes”	97 (32.2%)	51 (18.0%)	“sometimes”	110 (35.8%)	142 (49.7%)
“do not feel”	182 (60.5%)	232 (81.7%)	“do not feel”	47 (15.3%)	54 (18.9%)
schedule is too tight ***			shortage of workers		
“always”	76 (24.8%)	61 (21.3%)	“always”	91 (29.6%)	64 (22.4%)
“sometimes”	149 (48.5%)	181 (63.3%)	“sometimes”	138 (45.0%)	128 (44.8%)
“do not feel”	82 (26.7%)	44 (15.4%)	“do not feel”	78 (25.4%)	94 (32.9%)
too much trouble at work			labor too strenuous ***		
“always”	24 (7.8%)	29 (10.1%)	“always”	53 (17.3%)	4 (1.4%)
“sometimes”	168 (54.7%)	176 (61.5%)	“sometimes”	160 (52.3%)	58 (20.3%)
“do not feel”	115 (37.5%)	81 (28.3%)	“do not feel”	93 (30.4%)	224 (78.3%)
too much responsibility			cannot keep up with new technology		
“always”	32 (10.4%)	23 (8.0%)	“always”	2 (0.7%)	1 (0.3%)
“sometimes”	140 (45.6%)	135 (47.2%)	“sometimes”	81 (26.6%)	100 (35.0%)
“do not feel”	135 (44.0%)	128 (44.8%)	“do not feel”	221 (72.7%)	185 (64.7%)
work hours too long					
“always”	57 (18.6%)	43 (15.0%)			
“sometimes”	132 (43.0%)	112 (39.2%)			
“do not feel”	118 (38.4%)	131 (45.8%)			

*: $p < 0.05$, ***: $p < 0.001$ by chi-square test.

(25.7%), 167 aged “30–39 yr” (27.7%), 173 aged “40–49 yr” (28.7%), and 108 aged “≥50 yr” (17.9%). The content of work was “factory work” for 312 workers (51.7%) and “research and development or office work” for 291 (48.3%). For smoking, the numbers of smokers, non-smokers, and no response were 291 (48.3%), 311 (51.6%), and 1 (0.2%). For drinking, the numbers of drinkers, non-drinkers, and no response were 217 (36.0%), 384 (63.7%), and 2 (0.3%).

Table 2 shows the distribution of subjective stress for “factory work” and “research and development or office work”. The items that showed differences in distribution between “factory work” and “research and development or office work” were “too little work”, “schedule is too tight”, “are not allowed to make mistakes”, and “labor too strenuous”. In “too little work”, the reply proportion of “always” or “sometimes” was higher than that of “do not feel” for “factory work” compared with “research and development or office work”. In “schedule is too

tight”, the reply proportion of “sometimes” was higher than that of “do not feel” for “factory work” compared with “research and development or office work”. In “are not allowed to make mistakes”, the reply proportion of “always” was higher than that of “sometimes” or “do not feel” for “factory work” compared with “research and development or office work”. In “labor too strenuous”, the reply proportion of “always” or “sometimes” was higher than that of “do not feel” for “factory work” compared with “research and development or office work”.

Table 3 shows the mental health states at the time of the 2-yr follow-up (fiscal 1999). Among the subjects, 110 workers (18.2%) had mental problems (GHQ score ≥17). They consisted of 87 “males” (18.4%) and 23 “females” (17.8%): 27 workers aged “<30 yr” (17.4%), 38 aged “30–39 yr” (22.8%), 25 aged “40–49 yr” (14.5%), and 20 aged “≥50 yr” (18.5%). The “content of work” was “factory work” for 53 workers (17.0%) and “research

Table 3. Mental health states at the time of the 2-yr follow-up by gender, age, and works

		With mental problem	Without mental problem	Total
Gender	Male	87 (18.4%)	387 (81.6%)	474 (100%)
	Female	23 (17.8%)	106 (82.2%)	129 (100%)
Age	Under 30	27 (17.4%)	128 (82.6%)	155 (100%)
	Thirties	38 (22.8%)	129 (77.2%)	167 (100%)
	Forties	25 (14.5%)	148 (85.5%)	173 (100%)
	Fifties and over	20 (18.5%)	88 (17.8%)	108 (100%)
Work	Factory	53 (17.0%)	259 (83.0%)	312 (100%)
	R&D or Office	57 (19.6%)	234 (80.4%)	291 (100%)
Total		110 (18.2%)	493 (81.8%)	603 (100%)

Table 4. Subjective stress relating to problematic mental health for factory work (adjusted by gender, age, smoking, and alcohol usage)

Subjective stress	Odds ratio (95% CI)
too much competition	
“always”	4.04 (1.39–11.76)*
“sometimes”	1.85 (0.92–3.70)
“do not feel”	referent
feel pressed for time	
“always”	2.40 (1.08–5.35)*
“sometimes”	0.98 (0.46–2.06)
“do not feel”	referent
cannot keep up with new technology	
“always”	6.54 (0.37–116.36)
“sometimes”	2.52 (1.34–4.77)*
“do not feel”	referent

*: $p < 0.05$.

and development or office work” for 57 (19.6%).

As a result of multiple logistic regression analysis, the statistically significant items relating to problematic mental health for “factory work” were “too much competition”, “feel pressed for time”, and “cannot keep up with new technology” (Table 4). For “too much competition”, the odds ratios (95% CI) of “always” and “sometimes” to “do not feel” were 4.04 (1.39–11.76) and 1.85 (0.92–3.70), respectively. For “feel pressed for time”, the odds ratios (95% CI) of “always” and “sometimes” to “do not feel” were 2.40 (1.08–5.35) and 0.98 (0.46–2.06), respectively. For “cannot keep up with new technology”, the odds ratio (95% CI) of “always” and “sometimes” to “do not feel” were 6.54 (0.37–116.36) and 2.52 (1.34–4.77), respectively. The statistically significant items relating to problematic mental health for “research and development or office work” were “too much trouble at work” and “feel pressed for time” (Table 5). For “too much trouble at work”, the odds ratios (95%

Table 5. Subjective stress relating to problematic mental health for research and development or office work (adjusted by gender, age, smoking, and alcohol usage)

Subjective stress	Odds ratio (95% CI)
too much trouble at work	
“always”	3.92 (1.41–10.93)*
“sometimes”	1.44 (0.67–3.09)
“do not feel”	referent
feel pressed for time	
“always”	2.69 (1.04–6.93)*
“sometimes”	2.09 (0.94–4.67)
“do not feel”	referent

*: $p < 0.05$.

CI) of “always” and “sometimes” to “do not feel” were 3.92 (1.41–10.93) and 1.44 (0.67–3.09), respectively. For “feel pressed for time”, the odds ratios (95% CI) of “always” and “sometimes” to “do not feel” were 2.69 (1.04–6.93) and 2.09 (0.94–4.67), respectively.

Discussion

In this study, the statistically significant items for “factory work” were “too much competition”, “feel pressed for time”, and “cannot keep up with new technology”, and those for “research and development or office work” were “too much trouble at work” and “feel pressed for time”. The “work requirement degree-control model”, which is the most highly regarded of the workplace stress theories, shows that stress responses more often develop for work with a higher degree of requirement and lower degree of work control²⁰. Subsequently, this model has been expanded to a social support model, which shows the highest risk of disorders

occurs in an isolated state under high stress without support from superiors or colleagues. For factory workers who assemble car seats in line work, the subjective stresses “too much competition” and “feel pressed for time” may reflect a high degree of work requirement and low work control. In recent years, computer control has also been introduced to factories, and even workers at the site of manufacturing are required to cope with problems. It is possible that workers who have difficulty in coping with problems felt that they “cannot keep up with new technology”. Workers in “research and development or office work” often cope with problems with businesses to which goods are delivered. Marked stress may develop when problems occur because of shipping of inferior goods, or the demands of businesses for a reduction in cost which is too high. That subjective stress “feel pressed for time” may reflect a high degree of work requirement and low work control as was also observed in “factory work”.

Some studies report the relationship between items of workplace stress and mental health. Margolis *et al.*, who performed a cross-sectional study, reported a marked association between the absence of participation in decision-making in the workplace and mental health¹⁾. Billing *et al.* concluded that high work pressure, high supervisor control, lack of autonomy, and lack of clearness are associated with mental symptoms such as anxiety and depression⁴⁾. Yamada *et al.* also reported associations between mental health and “too much trouble” as well as “poor relationship with superiors”, and “cannot keep up with new technology”¹⁴⁾. A case-control study by Chevalier suggested that changes in work and managerial positions are risk factors¹²⁾. A cohort study by Kawakami *et al.* showed associations between depression and stress caused by feelings of the inappropriateness of the occupation as well as poor relationships in the workplace^{8,9)}. Bromet *et al.* suggested that the interaction between work requirement and support by colleagues is an important factor of mental symptoms⁴⁾. Shigemitsu *et al.* performed a study using the questionnaire of Uehata *et al.* for the assessment of subjective stress and the GHQ score as a parameter of mental health, and showed that the subjective stresses “too much trouble”, “too much responsibility”, “are not allowed to make mistakes”, “poor relationship with superiors”, and “cannot keep up with new technology” are associated with mental health even after adjustment for confounding factors¹³⁾. Mino *et al.*¹⁵⁾ showed significant influences of “too much trouble”, “too much responsibility”, “poor relationship with superiors”, “are not allowed to make mistakes”, and “cannot keep up with new technology” on mental health. The items of workplace stress were different among those previous studies. Our study suggests that subjective stress items that aggravate mental health are different among work contents. If we can identify definitive items of

workplace stress influencing mental health by work contents, we could utilize the results for a mental health promotion program.

This study has the following limitations. First, since data on stress and the status of mental health were obtained by a self-administrated questionnaire survey, an information bias could not be excluded although it is a non-differential misclassification which induces bias towards the null. Second, the status of mental health was categorized into “mentally healthy workers” (score ≤ 16) and “workers with mental problems” (score ≥ 17) according to the validity study by Nakagawa *et al.* However, the time and the subjects were different between their study and our study. In addition, we evaluated the status of mental health only once, although the status could change in a short time¹⁹⁾. Third, we did not consider potential confounding factors including exercise, marital status, personality, familial stress and economical condition because our sample size was limited. As categorized, those who used alcohol every day were regarded as drinkers and the others as non-drinkers in the logistic regression model. We tried three categories including daily drinkers, occasional drinkers and non-drinkers as a sensitivity analysis. We obtained all the same results in each analysis. Finally, there was a 2-yr difference in the data collection times between data on stress and that on the status of mental health; cases of aggravation of mental health and subsequent recovery were not evaluated. However, this was a cohort study, and volunteers with mental health problems were excluded from the subjects. Therefore, there is no possibility of the reversal of the cause and the effect.

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