

Job Stress and Mental Health of Permanent and Fixed-term Workers Measured by Effort-reward Imbalance Model, Depressive Complaints, and Clinic Utilization

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Abstract: Job Stress and Mental Health of Permanent and Fixed-term Workers Measured by Effort-reward Imbalance Model, Depressive Complaints, and Clinic Utilization: Mariko INOUE, et al. Department of Hygiene and Public Health, School of Medicine, Teikyo University—Objectives: The number of workers with precarious employment has increased globally; however, few studies have used validated measures to investigate the relationship of job status to stress and mental health. Thus, we conducted

a study to compare differential job stress experienced by permanent and fixed-term workers using an effort–reward imbalance (ERI) model questionnaire, and by evaluating depressive complaints and clinic utilization.

Methods: Subjects were permanent or fixed-term male workers at a Japanese research institute (n=756). Baseline data on job stress and depressive complaints were collected in 2007. We followed up with the same population over a 1-year period to assess their utilization of the company clinic for mental health concerns.

Results: The ERI ratio was higher among permanent workers than among fixed-term workers. More permanent workers presented with more than two depressive complaints, which is the standard used for the diagnosis of depression. ERI scores indicated that the effort component of permanent work was associated with distress, whereas distress in fixed-term work was related to job promotion and job insecurity. Moreover, over the one-year follow-up period, fixed-term workers visited the on-site clinic for mental concerns 4.04 times more often than permanent workers even after adjusting

for age, lifestyle, ERI, and depressive complaints. **Conclusions:** These contrasting findings reflect the differential workloads and working conditions encountered by permanent and fixed-term workers. The occupational setting where employment status was intermingled, may have contributed to the high numbers of mental health-related issues experienced by workers with different employment status.

(J Occup Health 2011; 53: 93–101)

Key words: Effort–reward imbalance model, Depression, Fixed-term workers, Permanent workers, Precarious employment

Precarious employment is defined as employment by unstable contract or fixed-term status. This labor force is easily influenced by economic conditions because enterprises employ them as the need arises. Workers with precarious employment (precarious workers) can be divided into five categories based upon the nature of the employing enterprise: temporary workers, workers experiencing various forms of organizational change, contingent arrangement workers, part-time workers, and small business workers¹. In Japan, temporary workers, workers dispatched by labor agencies, contract workers including fixed-term workers, and part-time workers are considered to be engaged in precarious employment in national statistics: 33.7% of the entire employed population in 2009 was precarious workers². Despite the recent trend toward increased numbers of Japanese workers being engaged in precarious employment, conditions persist that are unfavorable to the health of precariously employed individuals³. Recently, the World Health Organization released a report on social determinants of health in the workplace, urging governments to enhance conditions for precarious workers through proactive regulations and policies⁴.

The potentially detrimental impact of precarious employment on mental health has been investigated, and

Received Jan 28, 2010; Accepted Jan 6, 2011

Published online in J-STAGE Feb 11, 2011

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Type of contribution: Mariko Inoue analysed the data and wrote the manuscript. Shinobu Tsurugano assisted the analysis and provided advices. Eiji Yano conducted this study and provided advices for the manuscript.

a relationship was identified between temporary employment and psychological morbidity⁵). Other studies, however, have yielded inconsistent findings, possibly due to differences in study regions and populations and the use of widely varying subjective measures. For example, some investigations have presented evidence showing no difference in stress levels experienced by permanent and precarious workers^{6, 7}), whereas other studies have found that temporary contract work is significantly associated with poor mental health⁸) and increased fatigue⁹). One study found an increased incidence of mental disorders in women who were engaged in non-standard employment¹⁰); on the other hand, part-time status in the male population and temporary or contract work in the female population are also related to greater psychological distress¹¹). Thus, we considered the differential methods used and populations studied in the overall body of literature on work-related stress and its affects, and we hypothesized that permanent and precarious workers are likely subject to distinct sources of job stress.

Precarious employment, typically limited-term contracts, is an established and common practice in the Japanese academic field, and this fixed-term workforce is most often represented by young adult researchers. In recent years, however, project manager positions or high faculty positions have increasingly been filled by fixed-term workers. Based on this trend, we recognized the academic field as a relevant and appropriate setting, since it has both permanent and fixed-term workers, in which to measure workers' health in relation to the stability of work status. To our knowledge, no published study has focused on the mental health of academic researchers as related to their precarious employment status, specifically with fixed-term contracts.

The evaluation of work-related mental health should be conducted using validated measurements of job stress. Unfortunately, to date, only a limited number of studies has investigated the mental health issues that are directly related to job stress among precarious workers¹²). One measurement approach to analyzing job stress is the effort-reward imbalance (ERI) questionnaire developed by Siegrist to measure whether work effort corresponds with reward¹³): A previous study reported that high effort combined with low reward increases the risk of poor health¹⁴). The ERI has been suggested to be applicable for comparisons of work-related distress experienced by permanent and precarious workers¹⁵). Therefore, we compared job stress in these two distinct worker populations to gain basic insights into the sources of stress for permanent and fixed-term workers. Besides ERI, the Depressive Complaints Questionnaire (DCQ), as recommended by the Ministry of Health, Labour and Welfare of Japan¹⁶) is used in our study because DCQ was used in Japanese occupational settings to identify depressive workers.

Additionally, we investigated the deterioration of mental health status over one year of work in permanent and precarious positions. When designing this portion of our study, we considered a Finnish study that analyzed differences in treatment-seeking behavior according to employment status¹⁷). Virtanen *et al.* traced the incidence of prescriptions for antidepressant medicines and found that temporary workers were more likely to experience mental distress and seek treatment for it than permanent workers. We also looked at on-site clinic visits specifically for mental health concerns to observe different attitudes to the mental health service provided by the institute between permanent and fixed-term workers.

By considering job stress, depressive complaints, and clinic visits over one year, we were able to investigate several dimensions of job stress and mental health effects related to fixed-term employment in the academic field.

Subjects and Methods

All aspects of our study procedure were designed and carried out according to the ethical guidelines for epidemiological research published by the Ministry of Health, Labour and Welfare of Japan. Approval was obtained from the Teikyo University School of Medicine Internal Review Board.

Study population

Study subjects were recruited from the employees of a governmental research institute located in a suburb of Tokyo. Upon enrolment, the individuals were divided into two groups according to employment status: permanent workers or fixed-term workers with limited-term contracts. The average term of the limited-term contracts was 5 yr.

As of April 1, 2007, the total number of researchers employed by the institute was 1,506 (1,093 males and 413 females). We excluded female workers from our study cohort because the number of permanent workers among them was excessively small ($n=38$, 9.0%) and not suitable for statistical comparison. Of the 1,093 male workers included in the study and the 1-year follow up, 265 (24%) had permanent employment and 828 (76%) had fixed-term contracts (Fig. 1).

Health examination

Under the Industrial Safety and Health Act, it is mandatory for all employees in Japan to submit to an annual health examination. We collected the baseline data from the annual health exams conducted in 2007, during which information on job stress indications and depressive complaints was collected. Information about smoking and alcohol use was also obtained by self-report at the same time. Smoking status was characterized as current smoker or non-smoker (including ex-smokers and never-smokers). Drinking status was defined as drinker (alcohol consumption on more than four days a week) or non-drinker four days

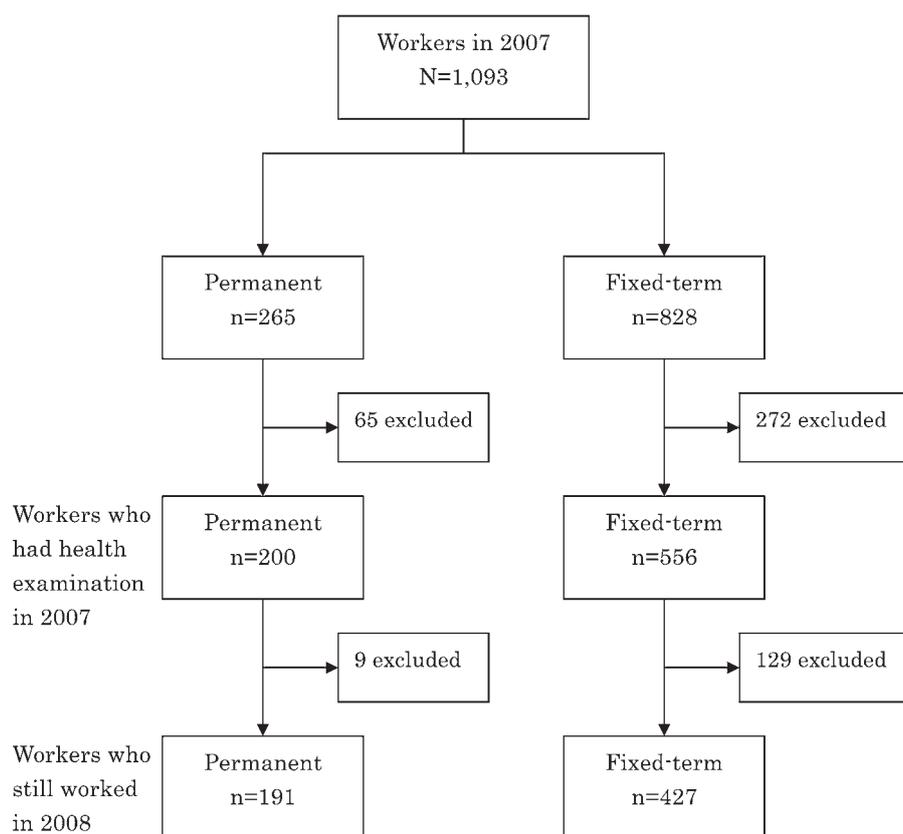


Fig. 1. Study subjects in the one-year follow up study for job stress and mental health between permanent and fixed-term workers from April 2007 to March 2008. The flow chart in Fig. 1 notes the dropouts from our study.

a week or less.

Job stress

To address whether job stress can affect mental health in the occupational setting, job stress was measured by an indirect indicator of unfairness of occupational conditions, the Japanese version of the ERI questionnaire¹⁸⁾. The questionnaire comprises 23 items related to work stress. Subjects were instructed to respond to each question by selecting from five scaled responses corresponding to various degrees of personal distress associated with the event described. The effort scale consisted of six items, and the reward scale of 11 items. The effort–reward ratio was then calculated as a continuous variable. The resultant value was dichotomized, with having an effort–reward ratio ≥ 1 , the high-risk group and the low-risk group having a ratio < 1 ¹⁹⁾. Overcommitment, characterized as a personal attitude or behavioral pattern, was also measured by the ERI questionnaire; six targeted questions are used to produce an overcommitment score that is then treated as a continuous variable. A score in the upper tertile on the overcommitment scale indicated the high-risk group.

Because our study aimed to identify and evaluate the sources of job stress, scores for each statement were compared between the permanent and fixed-term workers.

Depressive complaints

Subjective symptoms of mental problems were measured by the Depressive Complaints Questionnaire (DCQ). The DCQ comprises five targeted statements addressing recent mental status: (1) I cannot feel a sense of fulfillment; (2) I cannot enjoy what I could enjoy before; (3) I have difficulty doing things that I could easily do before; (4) I think that I am not valuable; (5) I become fatigued though there is no reason. Subject responses were recorded as “yes” or “no”. Persons who answered “yes” to at least two of these statements were considered to be in need of care for depression¹⁶⁾, in accordance with the accepted definition in community and occupational settings throughout Japan.

On-site clinic utilization

The study site had an established on-site half-day clinic

Table 1. Differences of age, lifestyles, and mental health indicators between permanent and fixed-term male workers

	Total (n=756)	Permanent (n=200)	Fixed-term (n=556)	<i>p</i> value
Age mean (SD) ^{a)}	37.2 (8.4)	43.4 (7.2)	35.0 (7.6)	<0.01 **
Life styles n (%) ^{b)}				
Smoker	116 (15.3)	32 (16.0)	84 (15.1)	0.40
Alcohol drink everyday	195 (25.8)	61 (30.5)	134 (24.1)	0.82
ERI scores mean (SD) ^{a)}				
Effort	11.5 (4.2)	12.8 (4.6)	11.0 (4.0)	<0.01 **
Reward	46.8 (7.6)	47.2 (7.2)	46.6 (7.8)	0.63
Effort/reward ratio	0.49 (0.33)	0.55 (0.38)	0.47 (0.31)	<0.01 **
Overcommitment	14.1 (3.0)	14.3 (2.9)	14.1 (3.0)	0.41
ERI risk groups n (%) ^{b)}				
Effort/reward ≥ 1	35 (4.9)	12 (6.6)	23 (4.4)	0.12
High overcommitment	212 (28.7)	59 (30.9)	153 (28.0)	0.50
Depressive complains n (%) ^{b)}				
At least one	377 (50.1)	117 (58.5)	262 (47.1)	0.05 *
More than two	250 (33.1)	79 (39.5)	171 (30.8)	0.04 *

SD: standard deviation. ERI: effort-reward imbalance model questionnaire.

The data on age, lifestyles, ERI scores, ERI risk groups, and depressive complains were measured in 2007 as the baseline data. ^{a)} Wilcoxon rank sum test * $p < 0.05$, ** $p < 0.01$. ^{b)} Chi-square test (Mantel-Haenszel method) adjusted for age (10-year age categories) * $p < 0.05$, ** $p < 0.01$. Due to missing values, effort/reward ≥ 1 was $n = 712$ and high overcommitment was $n = 738$.

Description of the scores: Effort score: Score ranges from 5 to 30. Higher scores signifies making more effort. Reward: Score ranges from 11 to 55. Higher scores signifies receiving higher reward. Overcommitment: Score ranges from 6 to 24. Higher score signifies more overcommitment.

to serve employees. Employees were given unrestricted access to consult with physicians specializing in internal medicine twice a week. Likewise, one psychiatrist and one physician specializing in psychosomatic medicine were available once a week for consultations on mental health concerns. Both permanent and fixed-term workers were allowed equal access to the clinic, physicians, and all services, and the institute was not informed of visits or the reasons for the visits. There was no charge for the consultations or for any drugs prescribed. Statistics on clinic utilization between April 2007 and March 2008 were obtained from clinic records. A clinic visit for mental concerns was defined as one in which a patient received a prescription for antidepressant medication. A person who received a prescription for antidepressant medication at the clinic during the study period was counted as one patient, regardless of the total numbers of prescriptions written for that individual. On-site clinic utilization was as an index of clinical consultation when the workers were on duty. The institute did not place any restrictions on employees' rights to consult with or obtain treatment from other physicians outside the institution; if employees had consulted other physicians, the health insurance would have paid 70% of the associated medical costs.

Statistical analysis

ERI scores were compared between permanent and fixed-term workers using the Wilcoxon rank-sum test. Percentages of high effort-reward ratio, overcommitment, depressive complaints, and lifestyle variables were compared using the chi-square test (Mantel-Haenszel method) after controlling for the effects of age. Clinic utilization by the ERI high risk group and depressive groups were compared using the chi-square test. Logistic regression analysis was performed to examine the association between clinic utilization and employment status, with adjustments for age, lifestyle, ERI score, and DCQ score.

Results

Table 1 shows that the effort scores ($p < 0.01$) and effort-reward ratio ($p < 0.01$) of job stress were higher among permanent workers than among fixed-term workers. The scores for reward and overcommitment were higher among permanent workers than among fixed-term workers, although the difference between the two groups was not statistically significant.

As shown in Table 2, the permanent workers had higher scores for each of the questions addressing job effort. Job promotion and job insecurity scores indicated high distress

Table 2. Detailed analysis of Effort-Reward Imbalance between permanent and fixed-term workers

No.	Question ⁽⁴⁾	ERI scores			p value
		Permanent (n=200)	Fixed-term (n=556)	Score (SD)	
Effort					
1	I have constant time pressure due to a heavy work load.	2.4 (1.0)	2.1 (1.0)	Score (SD)	<0.01**
2	I have many interruptions and disturbances in my job.	2.2 (1.0)	1.7 (0.9)		<0.01**
3	I have a lot of responsibility in my job.	2.3 (0.9)	2.0 (0.9)		<0.01**
4	I am often pressured to work overtime.	1.9 (0.9)	1.8 (0.8)		0.02*
6	Over the past few years, my job has become more and more demanding.	2.3 (1.0)	1.9 (0.9)		<0.01**
Reward					
7	I receive the respect I deserve from my superiors.	1.7 (1.0)	1.5 (0.9)		<0.01**
8	I receive the respect I deserve from my colleagues.	1.6 (0.8)	1.5 (0.8)		0.09
9	I experience adequate support in difficult situations.	1.5 (0.7)	1.4 (0.8)		<0.01**
10	I am treated unfairly at work.	1.6 (1.0)	1.4 (0.9)		0.01*
15	Considering all my efforts and achievements, I receive the respect and prestige I deserve at work.	1.6 (0.9)	1.5 (0.9)		0.19
Component job promotion					
11	My job promotion prospects are poor.	2.1 (1.0)	2.3 (1.2)		0.45
14	My current occupational position adequately reflects my education and training.	1.4 (0.7)	1.5 (0.9)		0.51
16	Considering all my efforts and achievements, my work prospects are adequate.	2.0 (1.1)	2.2 (1.3)		0.01*
17	Considering all my efforts and achievements, my salary/income is adequate.	1.6 (0.9)	1.9 (1.1)		0.04*
Component job security					
12	I have experienced or I expect to experience an undesirable change in my work situation.	2.3 (1.1)	1.8 (1.1)		<0.01**
13	My job security is poor.	1.4 (0.8)	2.5 (1.3)		<0.01**
Overcommitment					
1	I get easily overwhelmed by time pressures at work.	2.6 (0.8)	2.5 (0.8)		0.10
2	As soon as I get up in the morning, I start thinking about work problems.	2.6 (0.8)	2.5 (0.8)		0.16
3	When I get home, I can easily relax and “switch off” work.	2.2 (0.7)	2.3 (0.8)		0.35
4	People close to me say I sacrifice too much for my job.	2.2 (0.8)	2.2 (0.8)		0.38
5	Work rarely lets me go, it is still on my mind when I go to bed.	2.2 (0.7)	2.2 (0.7)		0.61
6	If I postpone something that I was supposed to do today, I'll have trouble sleeping at night.	2.0 (0.6)	1.9 (0.7)		0.08

Wilcoxon rank sum test * $p < 0.05$, ** $p < 0.01$. Each item of effort (5 items version), reward, job promotion, and job security is scored from 1 to 5. Each ERI score shown in the Table was raw score. Effort: Higher score signifies making higher efforts. Reward, job promotion, and job security (item no. 1–6, 10–13): Higher score signifies applicable to the sentence and distressed for the situation. Reward, job promotion, and job security (item no. 7–9, 14–17): Higher score signifies not applicable to the sentence and distressed for the situation. Score for each item on overcommitment scale ranges from 1 to 4. Higher score signifies greater stress (overcommitment item no.3 is reverse scored).

Table 3. Detailed analysis of depressive complaints between permanent and fixed-term workers

Depressive complaints questions	Workers who answered "applicable" to each question				
	Permanent (n=200)		Fixed-term (n=556)		p-value
	n	(%)	n	(%)	
1 I cannot feel a sense of fulfilment.	32	(16.0%)	117	(21.0%)	0.12
2 I cannot enjoy what I could enjoy before.	44	(22.0%)	110	(19.8%)	0.50
3 I have difficulty doing things that I could easily do before.	84	(42.0%)	135	(24.3%)	<0.01
4 I think that I am not valuable.	28	(14.0%)	76	(13.7%)	0.91
5 I become fatigued though there is no reason.	71	(35.5%)	171	(30.8%)	0.22

Chi-square test (Mantel-Haenszel method) adjusted for age.

Table 4. Differences of clinic visit for mental and physical concern between permanent and fixed-term male workers

	Total (n=756)	Permanent (n=200)	Fixed-term (n=556)	p value
Clinic visit n (%)	(n=756)	(n=200)	(n=556)	
Mental concern ^{a)}	35 (4.6)	4 (2.0)	31 (5.6)	0.05 *
Physical concern	258 (34.1)	72 (36.0)	186 (33.5)	0.54
Mental and physical concern ^{a)}	23 (3.0)	2 (1.0)	21 (3.8)	0.05 *
Clinic visit by workers in the ERI high risk group n (%)	(n=35)	(n=12)	(n=23)	
Mental concern ^{a)}	8 (22.9)	1 (8.3)	7 (30.4)	0.22
Physical concern	15 (42.9)	6 (50.0)	9 (39.1)	0.47
Mental and physical concern ^{a)}	5 (14.3)	1 (8.3)	4 (17.4)	0.64
Clinic visit by workers in the depressive group n (%)	(n=250)	(n=79)	(n=171)	
Mental concern ^{a)}	23 (9.2)	3 (3.8)	20 (11.7)	0.06
Physical concern	100 (40.0)	31 (39.2)	69 (40.4)	0.87
Mental and physical concern ^{a)}	12 (4.8)	1 (1.3)	11 (6.4)	0.11

The data on clinic visit was counted from April 2007 to March 2008, Japanese fiscal year 2007. Chi-square test (^{a)} Fisher's exact).
* $p < 0.05$.

about these matters among fixed-term workers. Scores for overcommitment, an indicator of personal attitude toward work, were not different between the permanent and fixed-term worker groups.

A higher number of permanent workers presented with more than two depressive complaints, the standard used in Japan for the diagnosis of depression, compared with the fixed-term workers (Table 1). Responses to only one question ("I have difficulty doing things that I could easily do before") showed a statistically significant difference after adjusting for age (Table 3).

At the end of one year, the total number of clinic visits and the percentage of clinic utilization for all participants were determined (Table 4). Fixed-term workers visited the clinic for mental health-related concerns ($p=0.05$) more often than did permanent workers. However, there was no difference between the two groups in clinic utilization for physical concerns. Among those in the ERI high risk and depressive groups, fixed-term workers visited the

clinic with mental concerns more than permanent workers, whereas fixed-term workers visited the clinic with physical concerns less than permanent workers. However, this result was not statistically significant. Logistic regression analysis was used to describe the clinic utilization rate for mental concerns by permanent and fixed-term workers during the 1-year study period (Table 5). Fixed-term workers visited the clinic 3.53 times more often than permanent workers (Confidence Interval, CI: 1.17 to 10.63) after adjustment for age. In addition, fixed-term workers visited the clinic four-fold more often than permanent workers after adjustment for age, smoking, alcohol, ERI scores, and DCQ scores (model 3). No difference was found between permanent and fixed-term workers in clinic utilization for physical concerns.

Discussion

We found that job stress, as measured by the ERI, and depressive complaints were higher among permanent

Table 5. Odds ratio of associations with clinic utilization among male fixed-term workers compared to permanent workers

	Fixed-term workers			
	Crude	Model 1	Model 2	Model 3
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Mental concern	2.89 (1.01 8.30)	3.53 (1.17 10.63)	3.73 (1.13 12.24)	4.04 (1.25 13.08)
Physical concern	0.89 (0.64 1.25)	0.95 (0.65 1.39)	0.91 (0.61 1.34)	0.92 (0.62 1.37)

OR: Odds Ratio; CI: Confidence Interval. Model 1 was adjusted for age. Model 2 was adjusted for age, smoking, alcohol, and ERI score. Model 3 was adjusted for age, smoking, alcohol, ERI score, and depressive complaints questionnaire score.

workers than among fixed-term workers at the baseline. However, the data obtained 1 yr later indicated that on-site clinic utilization for mental concerns was higher among fixed-term than among permanent workers. Thus, the relationship between job stress and mental-health treatment-seeking behavior among permanent and fixed-term workers is complex. The intermixed nature of the working environment at the institution itself might have contributed to the deterioration of the mental health of workers and to the high numbers of mental health-related issues experienced by those with different types of employment status.

One can theorize that interactions between the permanent workers, who had stable employment, and the precarious workers, who had fixed-term contracts, could serve to highlight the disadvantages of the less-stable employment status. In our detailed analysis, we found that sources of job stress might be different between permanent and fixed-term workers. The permanent workers showed greater distress about job pressure or unrewarded efforts in their job, whereas fixed-term workers were more distressed by job insecurity and the lack of job promotion.

Our baseline assessment indicated that the average score for effort and the effort–reward ratio were higher in permanent workers than in fixed-term workers. In our study subjects, no differences in overcommitment were found between permanent and fixed-term workers. The effort–reward imbalance may have been influenced by their work rather than by personality dimensions such as overcommitment. Although permanent workers may be bolstered by the commitment that the employer has made to them by entering into a permanent employment agreement, they may be subject to more pressure to achieve. The item “I have a lot of responsibility in my job” was identified as a source of distress by 41.5% of permanent workers, whereas only 27.2% of fixed-term workers gave the same response. In contemporary Japan, the number of permanent workers continues to decline, resulting in relatively heavier responsibilities being placed on the remaining permanent workers.

One of the most serious stresses for fixed-term workers is widely believed to be job insecurity. Previous studies

have shown that job insecurity is associated with poor mental health²⁰. One item on the ERI used in this study, “My job security is poor”, was identified as a source of distress by 51.3% of fixed-term workers, whereas only 13.0% of permanent workers responded in the same way. This finding could be explained by the fact that fixed-term workers are inherently at greater risk of losing their jobs than are permanent workers²¹. In Japan, men are often the breadwinners of the household; therefore, male workers with fixed-term employment might feel a higher degree of stress regarding job insecurity.

A comparison of depressive complaints among our study cohort also indicated that permanent workers had a higher frequency of depressive symptoms than did fixed-term workers. Our findings with regard to depressive complaints by workers are contrary to those of previous studies, which concluded that temporary workers experienced poorer mental health as a result of their employment status⁵. Even after we controlled for the effects of age and lifestyle, one item (“I have difficulty doing things that I could easily do before”) remained a significant indicator of stress for permanent workers. This finding may be explained by the fact that permanent workers tend to work in the same place for longer periods, so they might be able to more easily compare their own capacities over time.

Although the prevalence of self-reported job stress and depressive complaints among fixed-term workers was lower than that among permanent workers at the baseline in our study, their mental health problems may have been more serious, as suggested by their higher rates of consultation with a physician at the on-site clinic. Consultation with a psychiatrist or physician specializing in psychosomatic medicine at the on-site clinic during the 1-year follow-up period of this study was significantly associated with fixed-term employment after controlling for age, lifestyle, ERI, and depressive complaints at the baseline.

In evaluating the clinic utilization data, we had to consider that there may be psychological barriers against visiting the company clinic for mental health concerns, such as the negative image or stigma associated with mental disorders. Such attitudes may have affected the

differences in on-site clinic visits between fixed-term and permanent workers, especially because the clinic-utilization rates for physical concerns were not different between permanent and fixed-term workers. Since permanent workers did not avoid visiting the company clinic itself, they may have refrained from visiting for mental health-related problems. Although the company clinic is conveniently accessible and free of charge, these incentives may have been insufficient to overcome the perceived stigma and persuade permanent workers to visit the company clinic for mental health concerns. Therefore, permanent workers might visit off-site hospitals or clinics more often to address their mental health concerns, or simply take advantage of longer paid holidays, and data on such visits were not included in our analysis. Conversely, fixed-term workers' presence at work, despite their being sick, is a common occurrence known as presenteeism²²: This is not a result of contractual pressures, but of the temporary workers' sense of being disposable employees and their anxiety over potentially losing their jobs. Therefore, visiting the company clinic regarding their mental health concerns would be considered preferable to an absence from work to attend other off-site hospitals or clinics. These possibilities remain speculative because we did not investigate employee visits to other hospitals. Our result is in accordance with the results of a previous Finnish study, which found that more prescriptions for antidepressant medication were given to temporary manual workers¹⁶, although cultural differences and/or attitudes toward work should be taken into account when comparing these findings with those presented herein for Japanese workers.

During our one-year follow-up, several subjects dropped out, as shown in Fig. 1. These dropouts occurred mainly due to retirement, contract completion, or departure for another position. Our analysis without these dropouts might underestimate our results regarding job stress.

Some limitations of the present study should be noted. First, this study focused only on one institution. Therefore, it may be difficult to generalize these findings to all organizations in Japan. However, it may capture the experiences of populations whose work activity and environment are the same, and who differ only in employment status. Previous studies of large samples have used national data or included workers from different organizations^{23,24}. However, to understand differences in health purely as a factor of employment status, it is necessary to compare the health of workers within an identical working environment, as was the case in this study. Sampling bias in the targeted work place represents the second limitation of this study. The targeted institution allowed both permanent and fixed-term workers equal access to the clinic, but such access might be less available in other work places. The third limitation is the difference in the mean age between permanent and fixed-term

workers. Although both permanent and fixed-term workers held management positions, younger researchers tended to work as fixed-term workers. Thus, our result might be affected more by the different age groups rather than the different contract types. This effect may not have been completely eliminated in spite of the adjustments for differences in age. Fourth, clinic utilization for mental concerns included only on-site clinic visits. These data were used as an alternative way to identify the portion of clinic utilization for mental concerns because the strict privacy rules of the health insurance system did not allow us to obtain full clinic utilization data for the study subjects. In addition, we measured job stress only by ERI and counted clinic utilization for mental concern by prescriptions for antidepressant medication. Other indices of job stress, such as job strain, were not measured, and other health symptoms or prescriptions for other medication were not counted as indices of clinic utilization. Therefore, some residual confounding factors could exist.

Other socioeconomic factors, such as educational attainment, income, and marital status, were not controlled because the data were not available. The workers targeted in this study had at the minimum completed university-level education, but we could not obtain further data on educational level. Moreover, the workers' positions within the hierarchical employment structure of the institute were not identified, and it was impossible to clearly determine which subjects had higher or lower positions. Another limitation is that our data did not include information on the duration of employment at the institute or in the field itself. Fixed-term workers in our sample included those whose job contracts had just started and those whose job terms were soon to expire. This range of fixed-term workers' experience may have resulted in different perceptions about job security. Regarding the healthy-worker effect, a previous study conducted in the same institution found no evidence to support differences in the physical health index (body mass index and blood pressure) between permanent and fixed-term workers after controlling for the effects of age⁹. Thus, the physical health of both permanent and fixed-term workers was presumed to be sufficiently similar in the study population used here. Furthermore, the paucity of studies on precarious workers might be a consequence of the fact that this is a hard-to-reach population, making it difficult to construct an effective study design to understand their behaviors²⁵.

Despite the limitations mentioned above, our study highlights the differential pattern of job stress experienced by permanent and fixed-term workers. Our results indicate that fixed-term workers experienced lower job stress and fewer depressive complaints than their permanently employed counterparts at baseline, but they were more often clinically treated for depression on-site. Our study

reveals complex associations between job stress and mental health in permanent and fixed-term workers.

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