

Buffering effects of job resources on the association of overtime work hours with psychological distress in Japanese white-collar workers

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Abstract

Purpose The purpose of the present study was to investigate the buffering effects of job resources, utilizing the job demands–control (or demand–control–support) and effort–reward imbalance models (i.e., job control, workplace social support, and extrinsic reward), on the association of overtime work hours with psychological distress in Japanese employees.

Methods A total of 1,198 participants (valid response rate = 93.7 %) from five branches of a manufacturing

company in Japan completed a self-administered questionnaire comprising the scales assessing job resources, psychological distress, and demographic characteristics. We obtained the information on working hours in the most recent month from the personnel records of the surveyed company. Multiple logistic regression analyses were conducted. In a series of analyses, interaction term of overtime work hours with each job resource was included in the model.

Results Significant interaction effect of overtime work hours with job control was observed. Among the low job control group, the long overtime (80 h or more) subgroup had a significantly higher prevalence odds ratio of psychological distress compared to the short overtime (44 h or less) subgroup. No significant association of overtime work hours with psychological distress was found among the high job control group. On the other hand, there was no significant interaction effect of overtime work hours with workplace social support or extrinsic reward.

Conclusions The present findings suggest that high job control has an effect on reducing psychological distress in relation to overtime work hours in Japanese employees.

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Introduction

A work-related problem of overtime, specifically, the effect of overtime work hours on employees' physical and mental health, has been discussed since the 1980s (Fujino et al. 2006; Spurgeon et al. 1997; van der Hulst 2003). “Karoshi” (death from overwork) is a symbolic word for the recent

hard workplace conditions. Nowadays, the overtime work is limited to 45 h per month in Japan, except in special circumstances, e.g., tight deadline, troubleshooting, and the like. Furthermore, the Japanese Industrial Safety and Health Law requires workplaces to conduct physician interviews with employees, who work overtime and feel accumulated fatigue, through employees' own application (more than 100 overtime hours per month as a legal obligation, and more than 80 overtime hours per month as a legal obligation to make effort). These legal policies assume that overtime work might be a risk factor for poor physical and mental health.

Some studies investigated the association of overtime work hours with physical health, such as hypertension and cardiovascular disease. Two cross-sectional studies showed the significant association of overtime work hours with hypertension (Hayashi et al. 1996; Nakamura et al. 2012), and two longitudinal studies showed the significant association of overtime work hours with cardiovascular disease (Liu and Tanaka 2002; Sokejima and Kagamimori 1998).

In addition to physical health, the association of overtime work hours with mental health has also been investigated, although this association has been found inconsistent and inconclusive in both domestic and foreign studies (Fujino et al. 2006; Spurgeon et al. 1997). For example, in Japan, two cross-sectional studies showed a significant association of overtime work hours with self-reported psychiatric morbidity (Nishikitani et al. 2005; Watanabe et al. 1993). On the other hand, another cross-sectional study showed a significant association of overtime work hours with self-reported psychiatric morbidity in women but not in men (Ezoe and Morimoto 1994). For longitudinal and nested case-control studies, five studies investigated the prospective association of overtime work hours with self-reported psychiatric morbidity (Tarumi and Hagihara 1999; Tokuyama et al. 2003), psychiatric visit (Sugisawa et al. 1994), or doctor-diagnosed depression (Kawakami et al. 1989; Ogasawara et al. 2011), but they failed to show the significant association.

For preceding studies in foreign countries (i.e., other than Japan), three cross-sectional studies showed a significant association of overtime work hours with self-reported psychiatric morbidity (Firth-Cozens 1987, 1990; Proctor et al. 1996), while three cross-sectional studies failed to show a significant association of overtime work hours with self-reported psychiatric morbidity (Baldwin et al. 1997; Hobson and Beach 2000; Stavem et al. 2003). For longitudinal studies, one study showed a significant association of overtime work hours with depression, diagnosed using the validated structured interview, in women but not in men (Shields 1999). On the other hand, three studies failed to show a significant association of overtime work hours with depression diagnosed using by the validated structured

interview or self-reported psychiatric morbidity (Bildt and Michelsen 2002; Michelsen and Bildt 2003; Tyssen et al. 2000). Therefore, the association of overtime work hours with mental health should be investigated further.

On the other hand, in the past decade, the job demands-resources (JD-R) model (Demerouti et al. 2001), which encompasses and extends the two well-known job stress models (Bakker and Demerouti 2007), i.e., the job demands-control (JD-C) (Karasek 1979) (or demand-control-support [DCS]) (Johnson and Hall 1988) and effort-reward imbalance (ERI) models (Siegrist 1996), has been proposed as a theoretical framework for improving employee well-being and performance in various occupations. According to the JD-R model, job demands (i.e., physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological [cognitive and emotional] effort or skills and are therefore associated with certain physiological and/or psychological costs) (Demerouti and Bakker 2011) exhaust employees' mental and physical resources, which might deplete the energy and cause health problems (i.e., health impairment process). In addition, the JD-R model also assumes that job resources (i.e., physical, psychological, social, or organizational aspects of the job that are functional in achieving work goals, reduce job demands and the associated physiological and psychological costs, and/or stimulate personal growth, learning, and development) (Demerouti and Bakker 2011) may buffer the effect of job demands on health problems (Bakker et al. 2003). In particular, among the components of the JD-C (or DCS) and ERI models, job control, workplace social support, and extrinsic reward are considered job resources. Job control is defined as a combination of autonomy on the job (i.e., decision authority) and discretion for using different skills (i.e., skill discretion). Workplace social support is defined as the degree to which individuals perceive that their well-being is valued by workplace sources, such as supervisors and coworkers. Extrinsic reward is distributed by three transmitter systems: money (adequate salary), esteem (e.g., respect and support), and security or career opportunities (e.g., promotion prospects, job security, and status consistency). Given the assumption of the JD-R model, it is reasonable to hypothesize that job resources buffer the association of overtime work hours with poor mental health because overtime work hours can be considered an objectively measurable indicator of job demands.

In addition to the JD-R model, the matching hypothesis, which considers a theoretical match between job stressors (or demands) and job resources, has been proposed (Viswesvaran et al. 1999). The matching hypothesis claims that if the type of available resources corresponds to the existing stressors, then those resources are best able to buffer the effects of those stressors, leading to less strain. Given the concept of the matching hypothesis, among job resources we focused on the present study,

job control and workplace social support may remarkably buffer the association of working hours with poor mental health. This is because job control includes control over whether, when, and how much one should work overtime, and greater workplace social support may reduce psychological demands caused by the long working hours, which may lead to employees' recuperation and reduced poor mental health. To the best of our knowledge, only few studies investigated the buffering effects of job resources on the association of working hours with poor mental health.

Thus, the purpose of the present study was to investigate (1) the association of overtime work hours with psychological distress and (2) the buffering effects of job resources based on the JD-C (or DCS) and ERI models (i.e., job control, workplace social support, and extrinsic reward) on the association of overtime work hours with psychological distress. We hypothesized that (1) employees with long overtime work hours would have higher prevalence of psychological distress compared to those with short overtime work hours and (2) overtime work hours would have weaker association with psychological distress in employees with higher levels of job resources (especially job control and workplace social support) compared to those with lower levels of job resources.

Methods

Participants

A cross-sectional study of employees from five branches of a manufacturing company in Japan was conducted in August 2009 using a self-administered questionnaire. All employees ($N = 1,279$) were invited to participate in this study, and 1,277 employees completed the questionnaire (response rate = 99.8 %). After excluding 79 employees who had at least one missing response on the questionnaires, the final number of respondents was 1,198 (457 men and 741 women). Detailed demographic and work-related characteristics of participants are shown in Table 1.

Study purposes and procedures were explained to the employees, and written informed consent was obtained from them prior to the initiation of the study. The Ethics Committee of the Graduate School of Medicine/Faculty of Medicine, The University of Tokyo reviewed and approved the study procedures (No. 2580).

Measures

Overtime work hours

We obtained the information on working hours in the most recent month from the personnel records of the surveyed

company. The choice was made because Fujino et al. (2006) indicated that most studies on the association of overtime work hours with mental health assessed overtime work hours using the self-administered questionnaires or personal interviews, which may decrease the validity of exposure assessment. Overtime work hours were defined as the total working hours over 160 h during the month [i.e., 40 h per week (the upper limit of working hours required by the Labor Standards Act in Japan) \times 4 weeks]. For example, if an employee worked a total of 200 h during the month, his/her overtime work hours were calculated as $200 - 160 = 40$ h. Based on the overtime work hours, the participants were classified into short (44 h or less), medium (45–79 h), and long (80 h or more) overtime groups, according to the law and the recommendation of the Ministry of Health, Labour and Welfare, Japan.

Job resources

Job resources included job control, workplace social support, and extrinsic reward. Job control and workplace social support were assessed using the Japanese version of the Job Content Questionnaire (JCQ) (Karasek 1985; Kawakami et al. 1995). Extrinsic reward was assessed using the Japanese version of the Effort–Reward Imbalance Questionnaire (ERIQ) (Siegrist et al. 2004; Tsutsumi et al. 2001). The JCQ includes a nine-item job control scale (response range 24–96, Cronbach's alpha in the present sample = 0.74) and an eight-item workplace social support scale (response range 8–32, Cronbach's alpha in the present sample = 0.85). To investigate more detailed buffering effect of job control, we further divided job control into decision authority (response range 12–48, Cronbach's alpha in the present sample = 0.73) and skill discretion (response range 12–48, Cronbach's alpha in the present sample = 0.64). The ERIQ includes an 11-item extrinsic rewards scale (response range 11–55, Cronbach's alpha in the present sample = 0.87). The participants were dichotomized (high and low groups) based on the median of each scale.

Psychological distress

Psychological distress was assessed using the six-item K6 scale (Furukawa et al. 2008; Kessler et al. 2002) (response range 0–24, Cronbach's alpha in the present sample = 0.89). This scale has been widely used in Japan as well as in foreign countries to measure the symptoms of psychological distress in the past 30 days. In the Japanese version of the K6 scale, the performance in detecting DSM-IV mood and anxiety disorders, as assessed by the areas under receiver operating characteristic curves (AUCs), was excellent, with values as high as 0.94 (95 % confidence

Table 1 Demographic and work-related characteristics, psychological distress, job demands, and job resources of participating employees

Demographic and work-related characteristics	<i>N</i> = 1,198	
	Average (SD)	<i>n</i> (%)
Age	37.0 (8.2)	
50 years old or more		82 (21.5)
40–49 years old		357 (29.8)
30–39 years old		502 (41.9)
29 years old or less		257 (21.5)
Gender		
Men		457 (38.1)
Women		741 (61.9)
Education	15.0 (1.6)	
More than 12 years		1,048 (87.5)
12 years or less		150 (12.5)
Marital status		
Currently married		611 (51.0)
Never married		513 (42.8)
Divorced/widowed		74 (6.2)
Chronic disease		
Yes		43 (3.6)
No		1,155 (96.4)
Occupation		
Administrator/clerk		265 (22.1)
Quality assurance/after service		40 (3.3)
Sales support staff		263 (22.0)
Sales/sales engineer		318 (26.5)
Call talker		296 (24.7)
Others		16 (1.3)
Employment contract		
Manager		210 (17.5)
Regular employee		373 (31.1)
Group business employee		37 (3.1)
Contract employee		264 (22.0)
Temporary employee		304 (25.4)
Others		10 (0.8)
Overtime work hours in the past month	20.9 (28.6)	
44 h or less		1,046 (87.3)
45–79 h		102 (8.5)
80 h or more		50 (4.2)
Scale scores ^a	Average (SD)	Cronbach's α
Psychological distress (K6)	5.0 (4.70)	0.89
Job demands (JCQ)	33.4 (5.44)	0.67
Job resources		
Job control (JCQ)	69.7 (9.97)	0.74
Decision authority	35.2 (6.62)	0.73
Skill discretion	34.5 (5.13)	0.64
Workplace social support (JCQ)	24.6 (3.43)	0.85
Extrinsic reward (ERIQ)	46.3 (7.18)	0.87

^a *JCQ* Job Content Questionnaire, *ERIQ* Effort–Reward Imbalance Questionnaire

intervals [CIs] 0.88–0.99) (Furukawa et al. 2008). Participants were dichotomized into those with psychological distress (a total K6 score of five or more) and those without psychological distress (0–4 score) using a cutoff point recommended for Japanese population (Sakurai et al. 2011).

Other covariates

Other covariates included demographic characteristics, such as age, gender, education, marital status, and chronic disease; work-related characteristics, such as occupation and employment contract; and perceived (or subjective) job demands. Demographic characteristics were assessed using the self-administered questionnaire. Age was classified into four groups: 50 years old or more, 40–49 years old, 30–39 years old, and 29 years old or less. Education was dichotomized into some college or higher (i.e., more than 12 years) and senior high school or less (i.e., 12 years or less). Marital status was classified into three groups: currently married, never married, and divorced or widowed. Chronic diseases were defined as the presence of any of the 22 chronic diseases, including circulatory, gastrointestinal, neurological, musculoskeletal, and malignant diseases.

Information on work-related characteristics was obtained from the personnel records of the surveyed company. Occupation was classified into six groups: administrator/clerk, quality assurance/after service, sales support staff, sales/sales engineer, call talker, and others. Employment contract was also classified into six groups: manager, regular employee, group business employee, contract employee, temporary employee, and others.

Perceived (or subjective) job demands were assessed using the JCQ (Karasek 1985; Kawakami et al. 1995). The JCQ includes a five-item job demands scale (response range 12–48). In the present sample, Cronbach's alpha coefficient was 0.67.

Statistical analysis

Because Hosmer–Lemeshow test for the association of overtime work hours with psychological distress showed that the fit for the logistic regression model was adequate ($p > 0.05$), we adopted to conduct multiple logistic regression analyses. In the analyses, prevalence odds ratios (ORs) and their 95 % CIs of psychological distress (defined as having a score of five or more on the K6 scale) were estimated. We first tested the main effects of overtime work hours (the short overtime group as a reference) and each job resource (i.e., job control, decision authority, skill discretion, workplace social support, and extrinsic reward) (each high job resource group as a reference) on psychological distress. We then tested the interaction effect of

overtime work hours with each job resource to assess the buffering effect of each job resource on the association of overtime work hours with psychological distress. When we observed the significant interaction effect, we conducted stratified analyses by the levels of job resource. In a series of the analyses, we first calculated the crude ORs (i.e., without any adjustment) (Model 1). We then adjusted for demographic and work-related characteristics (i.e., age, gender, marital status, chronic disease, occupation, and employment contract) (Model 2) and additionally for perceived (or subjective) job demands (Model 3). For the association of overtime work hours with psychological distress, a liner trend test was also conducted to assess its dose–response relationship. The level of significance was 0.05 (two tailed). Statistical analyses were performed using IBM SPSS Statistics version 22.

Results

The average overtime was 20.9 work hours. In total, 87.3 % of the participants worked 44 h or less, 8.5 % of the participants worked 45–79 h, and 4.2 % of the participants worked 80 h or more of overtime in the past month. The prevalence of employees with psychological distress was 43.3 % (519 employees).

Table 2 shows the results of the multiple logistic regression analyses. For the main effect, the long and medium overtime groups did not have significantly higher prevalence ORs of psychological distress compared to the short overtime group in any models, while the dose–response relationship was marginally significant in the crude model (p for linear trend = 0.057 in Model 1) and significant after adjusting for demographic and work-related characteristics (p for linear trend = 0.038 in Model 2). On the other hand, for job resources, the low job control, decision authority, workplace social support, and extrinsic reward groups had significantly higher prevalence ORs of psychological distress compared to their counterparts in any models. For skill discretion, significant prevalence OR of psychological distress was observed only in the fully adjusted model (Model 3). For the interaction effect, only interaction term of overtime work hours with job control was significant in any models (p for interaction = 0.022–0.032).

When we conducted stratified analyses by the levels of job control, among the low job control group, the long overtime subgroup had a significantly higher prevalence OR of psychological distress compared to the short overtime subgroup in any models (Table 3). On the other hand, there was no significant association of overtime work hours with psychological distress among the high job control group.

Table 2 Main effects of overtime work hours and each job resource and their interaction effects on psychological distress: multiple logistic regression analysis

Main effect	<i>n</i>	No. of cases (%)	Odds ratio (95 % confidence interval)		
			Model 1 ^a	Model 2 ^b	Model 3 ^c
Overtime work hours					
44 h or less	1,046	442 (42.3)	1.00	1.00	1.00
45–79 h	102	51 (50.0)	1.37 (0.91–2.05)	1.42 (0.91–2.22)	1.26 (0.80–1.98)
80 h or more	50	26 (52.0)	1.48 (0.84–2.61)	1.69 (0.91–3.15)	1.38 (0.73–2.60)
Test for linear trend			<i>p</i> = 0.057	<i>p</i> = 0.038	<i>p</i> = 0.208
Job control					
High	526	196 (37.3)	1.00	1.00	1.00
Low	672	323 (48.1)	1.56 (1.24–1.97)	1.52 (1.17–1.97)	1.77 (1.36–2.32)
Decision authority					
High	346	118 (34.1)	1.00	1.00	1.00
Low	852	401 (47.1)	1.72 (1.33–2.23)	1.68 (1.26–2.23)	1.79 (1.34–2.39)
Skill discretion					
High	568	234 (41.2)	1.00	1.00	1.00
Low	630	285 (45.2)	1.18 (0.94–1.48)	1.09 (0.85–1.40)	1.39 (1.07–1.82)
Workplace social support					
High	482	179 (37.1)	1.00	1.00	1.00
Low	716	340 (47.5)	1.53 (1.21–1.94)	1.61 (1.26–2.07)	1.76 (1.37–2.27)
Extrinsic reward					
High	556	136 (24.5)	1.00	1.00	1.00
Low	642	383 (59.7)	4.57 (3.56–2.59)	4.87 (3.73–6.35)	4.53 (3.46–5.92)
Interaction effect			<i>p</i> for interaction		
			Model 1 ^a	Model 2 ^b	Model 3 ^c
Overtime work hours × job control			0.028	0.032	0.022
Overtime work hours × decision authority			0.388	0.382	0.246
Overtime work hours × skill discretion			0.139	0.149	0.135
Overtime work hours × workplace social support			0.843	0.878	0.884
Overtime work hours × extrinsic reward			0.768	0.670	0.635

Psychological distress was defined as having a score of five or more on the K6 scale

^a Crude (i.e., without any adjustment)

^b Adjusted for age, gender, education, marital status, chronic disease, occupation, and employment contract

^c Additionally adjusted for job demands

Discussion

The present study demonstrated the significant main effects of job resources on psychological distress. For the main effect of overtime work hours on psychological distress, significant or marginally significant dose–response relationship was partially observed. Furthermore, the buffering effect of job control on the association of overtime work hours with psychological distress was demonstrated. On the other hand, the results revealed no significant buffering effect of workplace social support or extrinsic reward on the association of overtime work hours with psychological distress.

The present study found significant or marginally significant dose–response relationship between overtime work hours and psychological distress in the crude model (Model 1) as well as after adjusting for demographic and work-related characteristics (Model 2). This is in line with the health impairment process introduced earlier. After additionally adjusting for perceived (or subjective) job demands (Model 3), however, this dose–response relationship was attenuated and no longer significant. This is also reasonable because job demands scale of the JCQ includes items measuring quantitative workload (e.g., excessive work). Our findings suggest that the association of overtime work hours with psychological distress is partially explained by

Table 3 Association of overtime work hours with psychological distress by the levels of job control: multiple logistic regression analysis

Overtime work hours	<i>n</i>	No. of cases (%)	Odds ratio (95 % confidence interval)		
			Model 1 ^a	Model 2 ^b	Model 3 ^c
High job control group					
44 h or less	436	161 (36.9)	1.00	1.00	1.00
45–79 h	58	24 (41.4)	1.21 (0.69–2.11)	1.27 (0.69–2.33)	1.14 (0.62–2.10)
80 h or more	32	11 (34.4)	0.90 (0.42–1.90)	1.07 (0.48–2.40)	0.89 (0.39–2.04)
Test for linear trend			<i>p</i> = 0.930	<i>p</i> = 0.629	<i>p</i> = 0.972
Low job control group					
44 h or less	610	281 (46.1)	1.00	1.00	1.00
45–79 h	44	27 (61.4)	1.86 (0.99–3.48)	1.79 (0.89–3.61)	1.61 (0.77–3.34)
80 h or more	18	15 (83.3)	5.85 (1.68–20.4)	4.94 (1.29–18.9)	4.12 (1.05–16.1)
Test for linear trend			<i>p</i> = 0.001	<i>p</i> = 0.006	<i>p</i> = 0.024

Psychological distress was defined as having a score of five or more on the K6 scale

^a Crude (i.e., without any adjustment)

^b Adjusted for age, gender, education, marital status, chronic disease, occupation, and employment contract

^c Additionally adjusted for job demands

perceived (or subjective) job demands. However, it should be noted that the long and medium overtime groups did not have significant higher prevalence ORs of psychological distress compared to the short overtime group in any models. In the future, a larger-scale study is needed to investigate whether the health impairment process, in terms of overtime work hours, is supported not only by the linear trend tests but also by the ordinal logistic regression analyses. On the other hand, for the main effects of job resources, low job control, workplace social support, and extrinsic reward groups had significantly higher prevalence ORs of psychological distress compared to their counterparts. This is consistent with meta-analytic studies showing that the lack of these job resources was associated with poor mental health (Bonde 2008; Netterstrøm et al. 2008; Stansfeld and Candy 2006). The present study replicated the findings from the preceding studies in terms of psychological distress.

Furthermore, the results indicated a significant buffering effect of job control on the association of overtime work hours with psychological distress. This finding is consistent with the JD-R model, which hypothesizes that job resources buffer the association of job demands with poor mental health. From a perspective of the matching hypothesis, this finding may be explained by the concept of work-time control (WTC), which refers to the self-determination of worktime aspects, such as starting and ending times of the work day, breaks, days off, and vacations (Costa et al. 2004), and control over whether, when, and how much one should work overtime (Nijp et al. 2012). According to the effort–recovery model (Meijman and Mulder 1998), WTC can promote a favorable balance between effort and

recovery, as it stimulates internal recovery opportunities by means of control over breaks as well as external recovery, as employees can adjust their working and recuperation time to their current need for recovery (Beckers et al. 2012). Because job control includes the concept of WTC, employees with high job control can determine their working time by considering their own lives and/or physical conditions, even if they work long hours. Moreover, such employees may have a great deal of leeway in planning their own work contents within working hours, which may weaken the association of overtime work hours with psychological distress. Furthermore, the fact that job control scale of the JCQ measures skill discretion as well as decision authority may explain the present finding. If employees work with a feeling of turning on their own skills and/or knowledge at work, their psychological distress may not deteriorate even if they are exposed to long working hours. However, it should be noted that when we divided job control into decision authority and skill discretion, significant interaction effect with overtime work hours was not observed (see Table 2). Our findings appear to suggest that in workplace intervention that targets the effect of long working hours on psychological distress through improving job control, the buffering effect does not appear unless both components of job control are improved.

On the other hand, among the low job control group, significant association of overtime work hours with psychological distress was observed. The situation characterized by long working hours with low job control is considered as “high-strain job” in the JD-C model, which has been reported to be a risk factor for poor mental health (Bonde 2008; Netterstrøm et al. 2008; Stansfeld and Candy

2006). The present study replicated the empirical evidence for the JD-C model in terms of psychological distress using objectively measurable indicator of job demands, such as overtime work hours. However, since a small number of employees with long overtime fell into the low job control group (see Table 3), estimation of prevalence OR of psychological distress might have been less accurate (i.e., wide 95 % CI).

In the present study, workplace social support did not buffer the association of overtime work hours with psychological distress. This finding is not consistent with the JD-R model. From a perspective of the matching hypothesis, a mismatch between desired workplace social support and actual support, as measured in the present study might have occurred (Cohen and Wills 1985). Workplace social support, which was measured by the JCQ (e.g., supervisor good organizer, coworkers' interest in me, and friendly coworkers), could not buffer the association of overtime work hours with psychological distress. If we measured the aspect of workplace social support that directly reduces psychological distress due to long working hours (e.g., "If you have long working hours, do your supervisors/coworkers help your job?"), we could have observed clearer buffering effect of workplace social support. To understand the interaction effect of overtime work hours with workplace social support further, a future study should focus on specific components of workplace social support as well as its theoretical match.

Extrinsic reward did not buffer the association of overtime work hours with psychological distress. This finding is not consistent with the JD-R model or a preceding study, which reported that unpaid overtime could lead to mental harm (Shain 2010). From a perspective of the matching hypothesis, in contrast to job control, extrinsic reward captures a broader aspect, which is not necessarily linked to recovery from overtime, such as esteem and security or career opportunities. Therefore, buffering effect of extrinsic reward on the association of overtime work hours with psychological distress might not be observed. The present findings may also be explained by the ERI model, which claims that reward should outbalance the efforts to reduce stress or burnout (Siegrist 1996). In the present study, participants were dichotomized based on the median score of the extrinsic reward scale, which may not be enough to outbalance the efforts given by overtime. Further research on the role of extrinsic reward in employee mental health in relation to overtime work hours is needed.

The strength of the present study is that this is the first study on the buffering effect of job resources on the association of working hours with poor mental health while considering overtime work hours as an objectively measurable indicator of job demands. As introduced earlier, most studies measured overtime work hours using the self-administered questionnaires or personal interviews, which may lead to

lower validity (Fujino et al. 2006). To address this limitation, we obtained information on working hours from the personnel records of the surveyed company, which contains more objective and precise data on job demands. In addition, the response rate in the present study was relatively high compared to the earlier studies in Japan as well as in Western countries, which might diminish the effect of selection bias.

On the other hand, some possible limitations of the present study should also be considered. First, participants who had already suffered from mental health problems might have worked less overtime work hours. Such participants might have experienced higher levels of job resources (especially workplace social support) while assessing their own job resources as low. Future research should consider the effects of history of sickness and workplace consideration on the present findings. Second, as mentioned earlier, although the present study used relatively large sample, the number of employees in the long (80 h or more) overtime group was too small (only 4.2 %), which might have yielded less accurate estimation of prevalence OR (i.e., wide 95 % CI) of psychological distress. Therefore, the present findings should be replicated using a larger sample with long working hours. Third, we could only obtain the personnel records of working hours during the past month due to certain limitations. Therefore, the present study assessed the short-term effect of overtime work hours on psychological distress. In the further study, we need to acquire records that cover longer period (i.e., during half a year or longer) to assess the chronic effect of overtime work hours. Fourth, although we used personnel records to assess overtime work hours more precisely, some participants could have taken their work home. These working hours were not included in the personnel records, which might have masked the true buffering effect of job resources. Fifth, the present sample came from one particular manufacturing company in Japan, and all participants were white-collar workers. Therefore, generalization of the findings should be done with caution. Sixth, as mentioned above, the response rate in the present study was quite high while supervisors collected each questionnaire in sealed envelope. Even though all employees were told that their participation was voluntary and that supervisors cannot open the sealed envelopes, some participants might have felt forced to participate in the study and refrained from answering the questionnaire (especially supervisor support scale) honestly. This process of collecting the data may have masked the true buffering effect of workplace social support. Finally, due to the cross-sectional nature of the study, participants with greater psychological distress might have assessed their job resources as low. A prospective study needs to investigate more precise buffering effects of job resources on the association of overtime work hours with psychological distress.

In conclusion, we found the buffering effect of job control on the association of overtime work hours with psychological distress. It should be noted that making effort to reduce overtime work hours is a high priority for the maintenance and promotion of mental health among employees. However, especially among the recent hard workplace conditions in Japan, our present findings offer a valuable insight, suggesting that high job control has an effect on reducing psychological distress in relation to overtime work hours. Further research should examine the buffering effect of other kinds of job resources, such as civility, organizational justice, meaningfulness of work, and job aptitude.

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Conflict of interest The authors declare that they have no conflict of interest.

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