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Job demands, job resources, and work engagement of Japanese employees: a prospective cohort study

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Abstract

Purpose Research on the prospective association of job demands and job resources with work engagement is still limited in Asian countries, such as Japan. The purpose of the present study was to investigate the prospective association of job demands (i.e., psychological demands and extrinsic effort) and job resources (i.e., decision latitude, supervisor support, co-worker support, and extrinsic reward), based on the job demands-control (JD-C) [or demand-control-support (DCS)] model and the effort-reward imbalance (ERI) model, with work engagement among Japanese employees.

Methods The participants included 423 males and 672 females from five branches of a manufacturing company in Japan. Self-administered questionnaires, including the Job Content Questionnaire (JCQ), the Effort-Reward Imbalance Questionnaire (ERIQ), the nine-item Utrecht Work Engagement Scale (UWES-9), and demographic characteristics, were administered at baseline (August 2009). At one-year follow-up (August 2010), the UWES-9 was used again to assess work engagement. Hierarchical multiple regression analyses were conducted.

Results After adjusting for demographic characteristics and work engagement at baseline, higher psychological demands and decision latitude were positively and significantly associated with greater work engagement at follow-up ($\beta = 0.054$, $p = 0.020$ for psychological demands and $\beta = 0.061$, $p = 0.020$ for decision latitude).

Conclusions Having higher psychological demands and decision latitude may enhance work engagement among Japanese employees.

Keywords Job demands-resources model · Work engagement · Longitudinal studies · Japan

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Introduction

In the past decade, research on mental health among employees has shifted its focus from negative emotions, such as burnout or psychological distress, to positive emotions at work (e.g., Demerouti et al. 2001a), such as work engagement, which is defined as "a positive, fulfilling, work-related state of mind characterized by vigor, dedication, and absorption" (Schaufeli et al. 2002) and could influence employee health (Demerouti et al. 2001a; Shirom 2003).
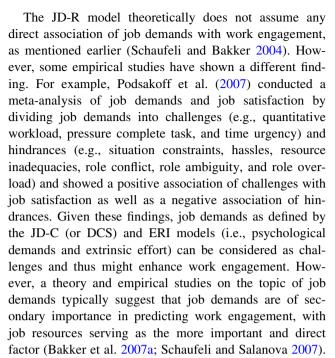
Work engagement has been frequently studied within a theoretical framework of the job demands-resources (JD-R) model (Demerouti et al. 2001b), which encompasses and

extends the two well-known psychosocial job stress models (Bakker and Demerouti 2007), such as the job demands-control (JD-C) [or demand-control-support (DCS)] model (Johnson and Hall 1988; Karasek 1979) and the effort-reward imbalance (ERI) model (Siegrist 1996). According to the JD-R model, job resources (i.e., physical, psychological, social, or organizational job aspects that may be functional in achieving work-related goals; reduce job demands and the associated physiological and psychological costs; and stimulate personal growth and development) (Demerouti et al. 2001b) enhance work engagement while the effect of job demands (i.e., physical, social, or organizational job aspects that require sustained physical and/or psychological effort and are associated with certain physiological and/or psychological costs) (Demerouti et al. 2001b) on work engagement is not expected (Schaufeli and Bakker 2004).

Additionally, a number of cross-sectional epidemiological research studies have shown positive and significant association of wide range of job resources with work engagement. These job resources include job control (or decision latitude) (e.g., Bakker et al. 2007a; Demerouti et al. 2001a; Hakanen et al. 2006; Llorens et al. 2006), social support at work (e.g., Hakanen et al. 2006; Llorens et al. 2006; Schaufeli and Bakker 2004), reward at work (e.g., Koyuncu et al. 2006), feedback, and supervisory coaching (e.g., Schaufeli and Bakker 2004).

In addition to these cross-sectional studies, eight two-wave studies (de Lange et al. 2008; Dikkers et al. 2010; Hakanen et al. 2008a, b; Lorente et al. 2008; Mauno et al. 2007; Schaufeli et al. 2009; Xanthopoulou et al. 2009b) and two diary studies (Xanthopoulou et al. 2008, 2009a) investigated a prospective association of job resources with work engagement (Mauno et al. 2010). Except for one study (Dikkers et al. 2010), these studies reported that higher level of job resources at baseline (or increase in job resources during follow-up period) was prospectively associated with greater work engagement. However, all of these prospective studies sampled European employees and most of them focused on special occupations, such as government employees (Dikkers et al. 2010), dentists (Hakanen et al. 2008a, b), teachers (Lorente et al. 2008), health care personnel (Mauno et al. 2007), telecom managers (Schaufeli et al. 2009), and flight attendants (Xanthopoulou et al. 2008). Moreover, about half of these studies used a single composite index of job resources (Hakanen et al. 2008a, b; Schaufeli et al. 2009; Xanthopoulou et al. 2009b) rather than specific components of job resources. A prospective study should be conducted to replicate the findings and expand them to Asian countries, such as Japan, as well as other occupations, such as clerks and manufacturing, while taking into account specific components of job resources.

The JD-R model theoretically does not assume any direct association of job demands with work engagement, as mentioned earlier (Schaufeli and Bakker 2004). However, some empirical studies have shown a different finding. For example, Podsakoff et al. (2007) conducted a meta-analysis of job demands and job satisfaction by dividing job demands into challenges (e.g., quantitative workload, pressure complete task, and time urgency) and hindrances (e.g., situation constraints, hassles, resource inadequacies, role conflict, role ambiguity, and role overload) and showed a positive association of challenges with job satisfaction as well as a negative association of hindrances. Given these findings, job demands as defined by the JD-C (or DCS) and ERI models (i.e., psychological demands and extrinsic effort) can be considered as challenges and thus might enhance work engagement. However, a theory and empirical studies on the topic of job demands typically suggest that job demands are of secondary importance in predicting work engagement, with job resources serving as the more important and direct factor (Bakker et al. 2007a; Schaufeli and Salanova 2007).

The purpose of the present study was to investigate the prospective association of each component of job demands and job resources, based on the JD-C (or DCS) and the ERI models, with work engagement among employees of a manufacturing company in Japan. It was hypothesized that higher level of job demands (i.e., psychological demands and extrinsic effort) and job resources (i.e., decision latitude, supervisor support, co-worker support, and extrinsic reward) at baseline would be positively associated with greater work engagement at follow-up (Podsakoff et al. 2007; Schaufeli and Bakker 2004) while the association of job demands with work engagement at follow-up would be smaller than that of job resources (Bakker et al. 2007a; Schaufeli and Salanova 2007).

Methods

Participants

A prospective study of employees from five branches of a manufacturing company located in the Kanto (east coast) region of Japan was conducted from August 2009 to August 2010. The data were collected using a self-administered questionnaire, which included scales on job demands (i.e., psychological demand and extrinsic effort), job resources (i.e., decision latitude, supervisor support, co-worker support, and extrinsic reward), work engagement, and demographic characteristics.

At baseline (August 2009), all employees ($N = 1,279$) were invited to participate in this study. Before collecting the data using the self-administered questionnaire,

participants were assured that their participation is voluntary and the information they provide is confidential. A total of 1,277 questionnaires were returned in sealed envelopes. Because 118 out of 1,277 employees were transferred out of the Kanto region, took a leave of absence (i.e., sick leave, maternity leave, or childcare leave), retired, or died during the one-year follow-up period, 1,159 employees were eligible for a follow-up survey (August 2010). Out of 1,159 employees, 1,157 follow-up questionnaires were returned in sealed envelopes (follow-up rate, 90.5%). After excluding 62 employees who had at least one missing response for variables relevant to this study, the data from 1,095 employees (423 males and 672 females) were analyzed. Detailed characteristics of participants are shown in Table 1.

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

Measures

Job demands and job resources

The 22-item Japanese version of the Job Content Questionnaire (JCQ) (Karasek 1985; Kawakami et al. 1995)

and the Japanese version of the Effort-Reward Imbalance Questionnaire (ERIQ) (Siegrist et al. 2004; Tsutsumi et al. 2001) assessed job demands and job resources based on the JD-C (or DCS) and the ERI models. The JCQ consists of a five-item psychological demand scale (response range 12–48), a nine-item decision latitude scale (response range 24–96), a four-item supervisor support scale (response range 4–16), and a four-item co-worker support scale (response range 4–16). The ERIQ consists of a six-item extrinsic effort scale (response range 6–30) and an 11-item extrinsic reward scale (response range 11–55). These variables were measured only at baseline.

Work engagement

The nine-item Japanese version of the Utrecht Work Engagement Scale (UWES-9) (Schaufeli et al. 2006; Shimazu et al. 2008) was used to assess work engagement at baseline and one-year follow-up. The UWES-9 developed by Schaufeli et al. (2006) includes scales measuring vigor (three items), dedication (three items), and absorption (three items) on a seven-point response option from $0 = never$ to $6 = always$ (everyday). A total score for the UWES-9 (range 0–6) was calculated by averaging item scores. The UWES-9 was translated into Japanese with acceptable internal consistency reliability as well as factor and construct validities (Shimazu et al. 2008).

Table 1 Demographic characteristics among employees who participated in the study by gender

Demographic characteristics	Male (N = 423)		Female (N = 672)	
	Average (SD)	n (%)	Average (SD)	n (%)
Age (years)	41.3 (8.1)		34.2 (6.7)	
Education	15.3 (1.7)		14.8 (1.6)	
More than 12 years		348 (82.3)		607 (90.3)
12 years or less		75 (17.7)		65 (9.7)
Marital status				
Currently married		326 (77.1)		220 (32.7)
Never married		80 (18.9)		405 (60.3)
Divorced or widowed		17 (4.0)		47 (7.0)
Occupation				
Administrator/clerk		112 (26.5)		124 (18.5)
Quality assurance/after service		19 (4.5)		5 (0.7)
Sales support staff		2 (0.5)		242 (36.0)
Sales/sales engineer		261 (61.7)		48 (7.1)
Call talker		27 (6.4)		244 (36.3)
Others		2 (0.5)		9 (1.3)
Employment contract				
Permanent employee		399 (94.3)		179 (26.6)
Non-permanent employee		24 (5.7)		493 (73.4)

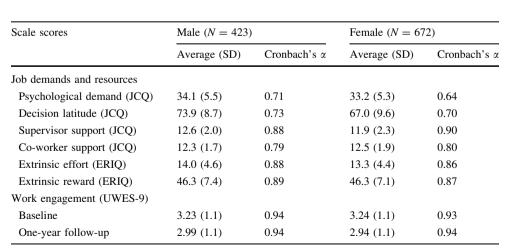### Demographic characteristics

Demographic characteristics included gender, age, education, marital status, occupation, and employment contract at baseline, which were used as covariates for the adjustment in previous studies (e.g., Mauno et al. 2007). Gender, age, education, and marital status were assessed using the self-administered questionnaire. Age was used as a continuous variable. 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 (i.e., currently married, never married, and divorced or widowed), and dummy variables were created using the divorced or widowed group as a reference. Information about occupation and employment contract was obtained from the personnel data of the company under the survey. Occupation was classified into six groups using the original classification (i.e., administrator/clerk, quality assurance/after service worker, sales support staff, sales/sales engineer, call talker, and others), and dummy variables were created using the others group as a reference. Based on the information on employment, the employment contract was classified into six groups: manager, regular employee, group business employee, contract employee, temporary employee, and others. These categories were further dichotomized into permanent employee (i.e., manager, regular employee, and group business employee) and non-permanent employee (i.e., contract employee, temporary employee, and others). Average scale scores and Pearson's correlation coefficients among the study variables are shown in Tables 2 and 3, respectively.

Statistical analysis

Taking work engagement at one-year follow-up as a dependent variable, hierarchical multiple regression analyses were conducted in the following manner:

demographic characteristics, i.e., gender, age, education, marital status (dummy variables with the divorced or widowed group as a reference), occupation (dummy variables with the others group as a reference), and employment contract were entered in the analyses first (Step 1) followed by job resources (i.e., decision latitude, supervisor support, co-worker support, and extrinsic reward) (Step 2), job demands (i.e., psychological demands) (Step 3), and work engagement at baseline (Step 4). When including job demands as the independent variable (Steps 3 and 4), extrinsic effort was not included as a proposed independent variable to avoid multicollinearity because psychological demands and extrinsic effort overlapped conceptually (Ostry et al. 2003) and statistically, as indicated by a strong correlation between the two constructs ($r = 0.589$, see Table 3). In a series of analyses, R-squared (R^2), adjusted R^2, and ΔR^2 (i.e., increase in R^2 compared from the previous one) were calculated in each step to assess the model fit. In addition, Durbin-Watson statistic was calculated to test whether a residual was distributed normally. Furthermore, an alternative model, which included extrinsic effort instead of psychological demands, was also tested in additional analyses. The level of significance was 0.05 (two-tailed). The statistical analyses were conducted using SPSS 19 for Windows.

Results

After adjusting for demographic characteristics (Step 2), decision latitude ($\beta = 0.279$, $p < 0.001$), co-worker support ($\beta = 0.074$, $p = 0.026$), and extrinsic reward ($\beta = 0.140$, $p < 0.001$) were positively and significantly associated with work engagement at follow-up (Table 4). After additionally adjusting for psychological demands (Step 3), the association of decision latitude ($\beta = 0.250$, $p < 0.001$) and extrinsic reward ($\beta = 0.178$, $p < 0.001$) with work engagement at follow-up was still significant

Table 2 Job demands, job resources, and work engagement at baseline and one-year follow-up among employees who participated in the study by gender

Scale scores	Male ($N = 423$)		Female ($N = 672$)	
	Average (SD)	Cronbach's α	Average (SD)	Cronbach's α
Job demands and resources				
Psychological demand (JCQ)	34.1 (5.5)	0.71	33.2 (5.3)	0.64
Decision latitude (JCQ)	73.9 (8.7)	0.73	67.0 (9.6)	0.70
Supervisor support (JCQ)	12.6 (2.0)	0.88	11.9 (2.3)	0.90
Co-worker support (JCQ)	12.3 (1.7)	0.79	12.5 (1.9)	0.80
Extrinsic effort (ERIQ)	14.0 (4.6)	0.88	13.3 (4.4)	0.86
Extrinsic reward (ERIQ)	46.3 (7.4)	0.89	46.3 (7.1)	0.87
Work engagement (UWES-9)				
Baseline	3.23 (1.1)	0.94	3.24 (1.1)	0.93
One-year follow-up	2.99 (1.1)	0.94	2.94 (1.1)	0.94

JCQ Job Content Questionnaire, *ERIQ* Effort-Reward Imbalance Questionnaire, *UWES* Utrecht Work Engagement Scale

Table 3 Pearson's correlation coefficients among the study variables (423 males and 672 females)

Variables	1	2	3	4	5	6	7	8	9
1. Gender[a]									
2. Age	−0.430**								
3. Education[b]	0.117**	−0.131**							
4. Currently married[c]	−0.432**	0.448**	−0.039						
5. Never married[c]	0.405**	−0.494**	0.072*	−0.889**					
6. Administrator/clerk[d]	−0.095**	0.196**	0.054	0.117**	−0.110**				
7. Quality assurance/after service[d]	−0.125**	−0.003	0.020	0.038	−0.046	−0.078**			
8. Sales support staff[d]	0.416**	−0.281**	0.034	−0.240**	0.243**	−0.281**	−0.080**		
9. Sales/sales engineer[d]	−0.590**	0.148**	−0.088**	0.231**	−0.208**	−0.329**	−0.094**	−0.336**	
10. Call talkers[d]	0.338**	−0.087**	0.010	−0.144**	0.111**	−0.301**	−0.086**	−0.307**	−0.360**
11. Employment contract[e]	−0.660**	0.294**	0.010	0.303**	−0.276**	0.260**	0.104**	−0.500**	0.512**
12. Decision latitude	−0.340**	0.137**	−0.044	0.178**	−0.158**	0.171**	0.070*	−0.126**	0.237**
13. Supervisor support	−0.133**	−0.071*	−0.036	0.053	−0.029	0.031	−0.032	−0.057	0.098**
14. Co-worker support	0.068*	−0.182**	0.053	−0.061*	0.080**	−0.121**	0.024	0.137**	−0.023
15. Extrinsic reward	0.005	−0.074*	−0.018	0.030	−0.020	0.006	−0.082**	0.043	0.000
16. Psychological demands	−0.073*	−0.092**	0.056	0.017	−0.007	−0.141**	0.083**	0.050	0.111**
17. Extrinsic effort	−0.074*	−0.114**	0.062*	−0.002	0.021	−0.159**	0.097**	0.139**	0.152**
18. Work engagement at baseline	−0.104**	0.131**	−0.043	0.106**	−0.110**	0.032	0.004	0.018	0.054
19. Work engagement at one-year follow-up	−0.131**	0.137**	0.004	0.133**	−0.127**	0.070*	0.000	−0.009	0.087**

Variables	10	11	12	13	14	15	16	17	18
1. Gender[a]									
2. Age									
3. Education[b]									
4. Currently married[c]									
5. Never married[c]									
6. Administrator/clerk[d]									
7. Quality assurance/after service[d]									
8. Sales support staff[d]									
9. Sales/sales engineer[d]									
10. Call talkers[d]									
11. Employment contract[e]	−0.314**								
12. Decision latitude	−0.284**	0.364**							
13. Supervisor support	−0.066*	0.105**	0.315**						
14. Co-worker support	0.004	−0.088**	0.218**	0.451**					
15. Extrinsic reward	−0.009	−0.004	0.199**	0.436**	0.416**				
16. Psychological demands	−0.040	0.086**	0.193**	−0.005	0.091**	−0.205**			
17. Extrinsic effort	−0.165**	0.090**	0.070*	−0.115**	−0.052	−0.412**	0.589**		
18. Work engagement at baseline	−0.120**	0.071*	0.380**	0.313**	0.271**	0.320**	0.089**	−0.127**	
19. Work engagement at one-year follow-up	−0.160**	0.124**	0.352**	0.223**	0.197**	0.239**	0.117**	−0.027	0.717**

* $p < 0.05$, ** $p < 0.01$

[a] Male = 0, Female = 1

[b] 12 years or less = 0, more than 12 years = 1

[c] Divorced or widowed group is a reference

[d] Others group is a reference

[e] Non-permanent employee = 0, permanent employee = 1

Table 4 Association of demographic variables, job demands, job resources, and work engagement at baseline with work engagement at one-year follow-up: hierarchical multiple regression analysis (423 males and 672 females)

Variables	Standardized coefficient (β)			
	Step 1	Step 2	Step 3	Step 4
Demographic characteristics				
Gender[a]	−0.012	−0.040	0.045	0.019
Age (years)	0.082*	0.125**	0.141**	0.029
Education[b]	0.020	0.034	0.029	0.036
Marital status (reference = divorced or widowed)				
Currently married	0.047	0.017	0.014	0.034
Never married	−0.019	−0.022	−0.018	0.010
Occupation (reference = others)				
Administrator/clerk	−0.173	−0.335**	−0.337**	−0.066
Quality assurance/after service	−0.080	−0.125**	−0.134**	−0.043
Sales support staff	−0.149	−0.309**	−0.338**	−0.097
Sales/sales engineer	−0.197	−0.357**	−0.377**	−0.082
Call talkers	−0.297*	−0.408**	−0.433**	−0.138
Employment contract[c]	0.058	0.003	−0.009	0.021
Job resources				
Decision latitude		0.279**	0.250**	0.061*
Supervisor support		0.050	0.052	−0.028
Co-worker support		0.074*	0.058	0.006
Extrinsic reward		0.140**	0.178**	0.034
Job demands				
Psychological demands			0.120**	0.054*
Work engagement				
Work engagement at baseline				0.673**
R^2	0.049	0.189	0.200	0.532
Adjusted R^2	0.039	0.177	0.189	0.524
ΔR^2	0.049**	0.140**	0.011**	0.332**

* $p < 0.05$, ** $p < 0.01$

[a] Male = 0, female = 1

[b] 12 years or less = 0, more than 12 years = 1

[c] Non-permanent employee = 0, permanent employee = 1

while the association of co-worker support with work engagement was no longer significant ($p > 0.05$). After additionally adjusting for work engagement at baseline (Step 4), these associations were attenuated while the association of decision latitude remained significant ($\beta = 0.061$, $p = 0.020$). Supervisor support was not significantly associated with work engagement at follow-up ($p > 0.05$).

For job demands, after adjusting for demographic characteristics and job resources (Step 3), psychological demands were positively and significantly associated with work engagement at follow-up ($\beta = 0.120$, $p < 0.001$). After additionally adjusting for work engagement at baseline (Step 4), this association was attenuated but remained significant ($\beta = 0.054$, $p = 0.020$). When we included extrinsic effort instead of psychological demands in the model, extrinsic effort was positively but not significantly associated with work engagement at follow-up after adjusting for demographic characteristics and job resources (Step 3) ($\beta = 0.036$, $p = 0.273$) (data available upon request). However, after additionally adjusting for work engagement at baseline (Step 4), this positive association became significant ($\beta = 0.075$, $p = 0.003$).

Table 4 shows R^2, adjusted R^2, and ΔR^2 in each step. Furthermore, Durbin-Watson statistic of 1.997 indicated that the residual was almost normally distributed. In our data, no significant interaction effect between any pair of variables of job demands and job resources on work engagement at follow-up was observed ($p > 0.05$, data available upon request).

Discussion

The present study demonstrated that decision latitude was positively and significantly associated with work engagement at one-year follow-up, even after adjusting for demographic characteristics, psychological demands, and work engagement at baseline (Step 4). This finding is consistent with the theoretical prediction of the JD-R model, which claims that job resources lead to high work engagement (Bakker et al. 2007b; Schaufeli and Bakker

2004). It is also consistent with previous prospective studies of Belgian employees and Finnish health care personnel, which showed that job control or autonomy was positively and significantly associated with work engagement at follow-up, after adjusting for work engagement at baseline (de Lange et al. 2008; Mauno et al. 2007). The present study expanded this prospective evidence to Japanese employees and suggests that decision latitude is a predictor of subsequent work engagement. When employees experience greater decision latitude at work, they may be more likely to find a way to make their work more pleasant, participate in their workplace decision in order to increase their involvement in their work and workplace, and thus increase their commitment to their work.

Psychological demands were also positively and significantly associated with work engagement at one-year follow-up, even after adjusting for demographic characteristics, job resources, and work engagement at baseline (Step 4). Similar pattern was observed when we included extrinsic effort instead of psychological demands. This pattern is inconsistent with the theory of the JD-R model, which does not expect the effect of job demands on work engagement (Schaufeli and Bakker 2004). However, it is consistent with a previous meta-analytic study, which showed that challenge component of job demands (e.g., quantitative workload, pressure complete task, and time urgency) was positively associated with job satisfaction (Podsakoff et al. 2007). Another prospective study of Finnish health care personnel also showed that time demand predicted higher scores on absorption component of work engagement (Mauno et al. 2007). Higher psychological demands or extrinsic effort, if it is not too much, may create a feeling of contributing to their workplace, which may enhance work engagement.

After adjusting for work engagement at baseline, in addition to demographic characteristics and job demands (Step 4), the association of supervisor support, co-worker support, and extrinsic reward with work engagement at follow-up was not significant. These findings are inconsistent with the theoretical prediction of the JD-R model (Schaufeli and Bakker 2004) and findings from many cross-sectional studies (e.g., Bakker et al. 2007a; Hakanen et al. 2006; Llorens et al. 2006). Work engagement at baseline seemed to explain the associations of social support at work and extrinsic reward with work engagement at follow-up. Because both job demands and job resources (not measured at follow-up in the present study) as well as work engagement could be quite stable during one year in stable circumstances, it may be difficult to identify the lagged effects between these work characteristics and work engagement. It is also possible that cross-sectional associations of social support at work and extrinsic reward with work engagement are due to a reverse causality. For

instance, some previous prospective studies revealed that initial work engagement predicts an increase in job resources (de Lange et al. 2008; Hakanen et al. 2008a, b; Schaufeli et al. 2009; Xanthopoulou et al. 2009b). Those who had higher levels of work engagement at baseline might receive job resources that are more visible, such as social support at work and extrinsic reward. Further prospective study using a shorter-term repeated surveys or a diary study is needed to clarify the mechanism underlying the association of job resources with work engagement.

Some possible limitations of the present study should be considered. First, although the response rate in the present study was relatively high, 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 questionnaires may mask the true association of supervisor support with work engagement. Moreover, because the response rate of the present study was much higher than that of previous studies conducted in European countries, comparing the results of the present study with previous ones should be done with caution. Second, during one-year follow-up period, organizational restructuring, which has been reported to have negative effects on employees' psychological well-being (Probst 2003), was executed in one of the five branches of the company under the survey. This may result in underestimated association of each job resource with work engagement at follow-up. Third, because the distribution of demographic characteristics (especially age, marital status, occupation, and employment contract) was different between males and females (see Table 1), these demographic characteristics may have confounded the present findings even though these factors were statistically adjusted. Fourth, the present sample came from one particular manufacturing company in Japan. In addition, all participants were white-collar workers. Thus, generalization of the findings should be done with caution. Fifth, job demands, job resources, and work engagement were assessed by a self-administered questionnaire, which may result in a common response bias, while this bias was relatively controlled since the present study assessed independent and dependent variables separately (Podsakoff et al. 2003). Sixth, the present study tested only traditional causality (i.e., from job demands and job resources to work engagement) while some previous studies tested not only traditional but also reverse or reciprocal causality (de Lange et al. 2008; Hakanen et al. 2008a, b; Schaufeli et al. 2009; Xanthopoulou et al. 2009b). Future research should also consider reverse or reciprocal causality to examine the

association of job demands and job control with work engagement comprehensively. Finally, it should be noted that the effect of decision latitude and psychological demands on work engagement at follow-up was greatly reduced by adjusting for work engagement at baseline (β = 0.250 and 0.120 for Step 3; β = 0.061 and 0.054 for Step 4, respectively), while it remained statistically significant. These findings suggest that work engagement at baseline explains a large part of work engagement at follow-up. This is consistent with the fact that work engagement is relatively stable over time (Schaufeli et al. 2002). Greater decision latitude or psychological demands may have only a modest effect on work engagement during a one-year follow-up.

Since we focused only on the job demands and job resources based on the JD-C (or DCS) and the ERI models, which capture task- and interpersonal-level job demands and job resources, future research should consider organizational-level job demands and job resources, such as job insecurity, career opportunities, and supervisory coaching (Bakker and Demerouti 2007; Schaufeli and Bakker 2004), to provide more concrete evidence for a stronger effect of work engagement.

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

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