

Job Demands, Job Resources, and Job Performance in Japanese Workers: A Cross-sectional Study

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Received February 4, 2014 and accepted June 19, 2014

Published online in J-STAGE July 11, 2014

Abstract: This study investigated the cross-sectional association of job demands (i.e., psychological demands) and job resources (i.e., decision latitude, supervisor support, co-worker support, and extrinsic reward) with job performance. A total of 1,198 workers (458 males and 740 females) from a manufacturing company in Japan completed a self-administered questionnaire that included the Job Content Questionnaire, Effort-Reward Imbalance Questionnaire, World Health Organization Health and Work Performance Questionnaire, and demographic survey. Hierarchical multiple regression analyses were conducted. After adjusting for demographic characteristics, decision latitude ($\beta=0.107$, $p=0.001$) and extrinsic reward ($\beta=0.158$, $p<0.001$) were positively and significantly associated with job performance while supervisor support ($\beta=-0.102$, $p=0.002$) was negatively and significantly associated with job performance. On the other hand, psychological demands or co-worker support was not significantly associated with job performance. These findings suggest that higher decision latitude and extrinsic reward enhance job performance among Japanese employees.

Key words: Psychological demands, Decision latitude, Supervisor support, Co-worker support, Extrinsic reward, Productively, Cross-sectional study, Japan

Introduction

Definition of occupational health adopted by the Joint ILO/WHO Committee on Occupational Health (1950) states that occupational health focuses mainly on the

“development of work organizations and working cultures in a direction, which supports health and safety at work and in doing so also promotes a positive social climate and smooth operation and may enhance productivity of the undertakings”¹⁾. Increased performance of workers associated with healthy and safe work environment and a possible gain from reduced medical cost and business success may motivate employers to promote such work environment^{2, 3)}. However, a limited number of occupational health studies have focused on the characteristics of

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work organizations and other work environment that could enhance the productivity of workers.

One of the most critical predictors of job performance is psychosocial work environment⁴, which is represented by the two well-known psychosocial job stress models⁵, such as the job demands-control (JD-C) (or demand-control-support [DCS])^{6, 7} and effort-reward imbalance (ERI) models⁸. For example, a study based on the JD-C (or DCS) model revealed that job control (or decision latitude) and co-worker support improved job performance independently of job demands⁹. Furthermore, the other studies in the US and Europe showed positive and significant association of supervisor support with job performance^{10–12}. On the other hand, a study based on the ERI model revealed that extrinsic reward enhances job performance¹³. However, these studies focused on either JD-C (or DCS) or ERI model. Although these two job stress models are complementary and the stressful aspects of work measured by the models are different¹⁴, the number of studies that have measured each component of the JD-C (or DCS) and ERI models simultaneously and investigated the association between both of these models (or their components) and job performance is limited¹⁵.

The purpose of the present study was to investigate the cross-sectional association of each component of the JD-C (or DCS) and ERI models (i.e., psychological demands, decision latitude, supervisor support, co-worker support, extrinsic effort, and extrinsic reward) with job performance, which may enrich the theoretical and practical value of the two well-known psychosocial job stress models. Recently, these two job stress models were integrated and developed into the job demands-resources (JD-R) model^{5, 16}. According to the JD-R model, job demands are defined as “physical, psychological, social, or organizational job aspects that require sustained physical and/or psychological effort and are associated with certain physiological and/or psychological costs”¹⁶. On the other hand, job resources are defined as “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”¹⁶. The JD-R model influences organizational outcomes, including job performance, through two different underlying processes¹⁷. One process suggests that high job demands reduce job performance through reduced health or energy (i.e., health impairment process), and the other process suggests that high job resources enhance job performance through increased work motivation (i.e., motivational process).

Based on the JD-R model, we categorized psychological demands, which overlap conceptually with extrinsic effort, as the components of job demands; and decision latitude, supervisor support, co-worker support, and extrinsic reward as the components of job resources. Consistent with the health impairment and motivational processes, we hypothesized that job demands would be negatively associated with job performance whereas the components of job resources would be positively associated with job performance. Furthermore, because a preceding study reported that job resources enhance positive aspects of employee’s outcomes, particularly when job demands are high¹⁸, we also examined the interaction terms of psychological demands with each job resources component in the present study.

Methods

Participants

A cross-sectional study of employees from a manufacturing company located in Japan was conducted in August 2009. All employees ($N=1,279$) were invited to participate in this study and 1,277 agreed to participate. The data were collected using a self-administered questionnaire, which included scales on job demands, job resources, job performance, and demographic characteristics. After excluding 79 employees who had at least one missing entries on the questionnaire, the data from 1,198 employees (458 males and 740 females) were analyzed. Detailed characteristics of participants and average scale scores are shown in Table 1.

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

Measures

1) Job demands and job resources

Although the JD-R model captures a wide range (i.e., task, interpersonal, and organizational levels) of job demands and job resources, no measure can assess overall job demands or job resources comprehensively. We thus focused mainly on the components of job demands and job resources included in the JD-C (or DCS) and ERI models. In the present study we used the 22-item Japanese version of the Job Content Questionnaire (JCQ)^{19, 20} and the Japanese version of the Effort-Reward Imbalance Question-

Table 1. Demographic characteristics, job demands, job resources, and job performance of participating employees

Demographic characteristics	Average (SD)	<i>n</i> (%)
Gender		
Male		458 (38.2)
Female		740 (61.8)
Age (yr)	36.9 (8.2)	
Education (yr)		
More than 12 yr		1047 (87.4)
12 yr or less		151 (12.6)
Marital status		
Currently married		611 (51.0)
Never married		513 (42.8)
Divorced/widowed		74 (6.2)
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		
Permanent employee		619 (51.7)
Non-permanent employee		579 (48.3)
Scale scores †	Average (SD)	Cronbach's α
Job demands and resources		
Psychological demands (JCQ)	33.4 (5.4)	0.68
Decision latitude (JCQ)	69.6 (10.0)	0.74
Supervisor support (JCQ)	12.1 (2.2)	0.90
Co-worker support (JCQ)	12.4 (1.8)	0.79
Extrinsic reward (ERIQ)	46.2 (7.2)	0.88
Job performance (HPQ)	6.2 (1.7)	—

† JCQ: Job Content Questionnaire, ERIQ: Effort-Reward Imbalance Questionnaire, HPQ: World Health Organization Health and Work Performance Questionnaire

naire (ERIQ)^{21, 22}.

The JCQ comprises a five-item psychological demands 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) measured on a four-point Likert type scale ranging from 1 = *strongly disagree* to 4 = *strongly agree*.

The ERIQ comprises a six-item extrinsic effort scale (response range 6–30) and an 11-item extrinsic reward scale (response range 11–55), both measured on a five-point Likert type scale ranging from 1 = *I agree* (or *I disagree*) to 5 = *I disagree* (or *I agree*) and *I am very distressed*. In the present study, extrinsic effort was not included as an independent variable to avoid multicoll-

inearity, since psychological demands and extrinsic effort overlap with each other conceptually.

2) Job performance

Job performance was assessed using the World Health Organization Health and Work Performance Questionnaire (WHO-HPQ)²³. WHO-HPQ is a self-report instrument designed to estimate the workplace costs of health problems in terms of self-reported sickness absence (absenteeism) and reduced job performance (presenteeism). We used the Japanese version of the “HPQ short form”. The HPQ measures presenteeism using the following question: “On a scale from 0 to 10 where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker, how would you rate your overall job

performance on the days you worked during the past 4 weeks?"

3) Demographic characteristics

Demographic characteristics included gender, age, education, marital status, occupation, and employment contract. 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 yr) and senior high school or less (i.e., 12 yr 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 currently married group as a reference. Information on occupation and employment contract was obtained from the personnel data of the company under the study. Occupation was classified into six groups (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 administrator/clerk group as a reference. Employment contract was dichotomized into permanent employee and non-permanent employee. Pearson's correlation coefficients among the study variables are shown in Table 2.

Statistical analysis

Using job performance (i.e., WHO-HPQ score) as a dependent variable, hierarchical multiple regression analyses were conducted. The analyses were expanded in the following manner. First, demographic characteristics (i.e., gender, age, education, marital status, occupation, and employment contract) were entered in the first step of the analyses (Step 1) because these variables were used as covariates in the preceding study⁹). Second, to examine the association of job demands with job performance while

adjusting for demographic characteristics, psychological demands were added to Step 1 (Step 2). Third, to examine the association of job resources with job performance while adjusting for demographic characteristics, decision latitude, supervisor support, co-worker support, and extrinsic reward were added to Step 1 (Step 3). Fourth, to examine the association of job demands with job performance independently of job resources and vice versa, psychological demands, decision latitude, supervisor support, co-worker support, and extrinsic reward were entered in the model simultaneously (Step 4). Finally, to determine whether the association of job resources with job performance differed by the levels of job demands, interaction terms of psychological demands with each job resources component were additionally entered in the model (Step 5). In a series of analyses, each scale score was centered by subtracting it from the mean score to avoid multicollinearity. Furthermore, R^2 , adjusted R^2 , and ΔR^2 (i.e., increase in R^2 compared to the previous one) were calculated in each step to assess the model fit. The level of significance was set at 0.05 (two-tailed). The statistical analyses were conducted using SPSS 17 for Windows.

Results

Reliability of each scale

In this study, Cronbach's α coefficients were 0.68, 0.74, 0.90, 0.79, and 0.88 for psychological demands, decision latitude, supervisor support, co-worker support, and extrinsic reward scale, respectively (Table 1).

Hierarchical multiple regression analyses

Standard partial regression coefficients (β), R^2 , adjusted R^2 , and ΔR^2 in each step are shown in Table 3. After adjusting for demographic characteristics and additionally for job resources (Steps 2 and 4), psychological demands

Table 2. Pearson's correlation coefficients among the study variables (458 males and 740 females)

Variables	1	2	3	4	5	6	7
1. Gender †							
2. Age	-0.450**						
3. Psychological demands	-0.076**	-0.101**					
4. Decision latitude	-0.339**	0.140**	0.208**				
5. Supervisor support	-0.121**	-0.067*	-0.024	0.297**			
6. Co-worker support	0.054	-0.156**	0.089**	0.223**	0.430**		
7. Extrinsic reward	-0.006	-0.057*	-0.220**	0.185**	0.430**	0.406**	
8. Job performance	-0.088**	0.282**	-0.037	0.108**	-0.037	-0.006	0.117**

* $p < 0.05$, ** $p < 0.01$. † Male = 0, Female = 1

Table 3. Association of demographic variables, job demands, and job resources with job performance: hierarchical multiple regression analysis (458 males and 740 females)

Variables	Standard partial regression coefficients (β)				
	Step 1	Step 2	Step 3	Step 4	Step 5
Demographic characteristics					
Gender ^a	-0.008	-0.008	-0.001	0.000	-0.007
Age (years)	0.242**	0.243**	0.241**	0.244**	0.242**
Education ^b	0.027	0.027	0.033	0.032	0.033
Marital status (reference = currently married)					
Never married	-0.129**	-0.128**	-0.116**	-0.116**	-0.112**
Divorced/widowed	-0.018	-0.018	-0.016	-0.016	-0.015
Occupation (reference = administrator/clerk)					
Quality assurance/after service	-0.014	-0.014	-0.009	-0.011	-0.017
Sales support staff	-0.004	-0.005	-0.008	-0.013	-0.005
Sales/sales engineer	-0.106**	-0.106**	-0.096*	-0.099**	-0.096*
Call talker	0.001	0.000	0.020	0.016	0.021
Others	0.006	0.006	0.022	0.022	0.021
Employment contract ^c	-0.028	-0.028	-0.047	-0.050	-0.046
Job demands ^d					
Psychological demands		0.003		0.021	0.018
Job resources ^d					
Decision latitude			0.107**	0.102**	0.103**
Supervisor support			-0.102**	-0.101**	-0.104**
Co-worker support			-0.010	-0.013	-0.016
Extrinsic reward			0.158**	0.165**	0.175**
Interaction (job demands \times job resources)					
Psychological demands \times decision latitude					0.049
Psychological demands \times supervisor support					-0.015
Psychological demands \times co-worker support					0.007
Psychological demands \times extrinsic reward					-0.039
R^2	0.101**	0.101**	0.132**	0.132**	0.135**
Adjusted R^2	0.093**	0.092**	0.121**	0.120**	0.120**
ΔR^2	0.101**	0.000	0.030** ^e	0.000	0.003

* $p < 0.05$, ** $p < 0.01$ ^a Male = 0, Female = 1. ^b 12 yr or less = 0, more than 12 yr = 1. ^c Non-permanent employee = 0, permanent employee = 1. ^d Each component of job demands and job resources was mean-centered. ^e The difference between Step 1 and Step 3

were not significantly associated with job performance ($p > 0.05$) (Table 3). For job resources, after adjusting for demographic characteristics (Step 3), decision latitude ($\beta = 0.107$, $p = 0.001$) and extrinsic reward ($\beta = 0.158$, $p < 0.001$) were positively and significantly associated with job performance while supervisor support ($\beta = -0.102$, $p = 0.002$) was negatively and significantly associated with job performance. After additionally adjusting for psychological demands (Step 4), the associations of decision latitude ($\beta = 0.102$, $p = 0.002$), extrinsic reward ($\beta = 0.165$, $p < 0.001$), and supervisor support ($\beta = -0.101$, $p = 0.002$) with job performance were still significant. On the other hand, co-worker support was not significantly associated with job performance in Steps 3 or 4 ($p > 0.05$). When we

additionally included interaction terms of psychological demands with each job resources component in the model (Step 5), none of the interaction effects on job performance were significant ($p > 0.05$).

Because our results showed that age had the strongest association with job performance at all steps (Table 3), we classified participants into four groups according to their age (i.e., 20's or less, 30's, 40's, and 50's or more groups) and conducted the age-stratified analyses. As a result, decision latitude was positively and significantly associated with job performance only among participants in the 40's age group; supervisor support was negatively and significantly associated with job performance among participants in the 30's and younger age groups; and extrinsic

reward was positively and significantly associated with job performance among participants in the 30's and older age groups (data available upon request). Neither psychological demands nor co-worker support showed significant association with job performance in any age groups. For the interaction term, significant interaction of psychological demands with decision latitude was observed only among participants in the 30's age group ($\beta=0.136$, p for interaction <0.01). More specifically, simple slope of decision latitude for the high psychological demands subgroup (i.e., one standard deviation above the mean) ($\beta=0.189$, $p=0.002$) was greater than that for the low psychological demands subgroup (i.e., one standard deviation below the mean) ($\beta=0.009$, $p=0.888$).

Discussion

The present study demonstrated significantly positive associations of decision latitude and extrinsic reward; and a significantly negative association of supervisor support with job performance, even after adjusting for demographic characteristics and psychological demands. However, the association of job demands or co-worker support with job performance was not significant.

In the present study, decision latitude was positively and significantly associated with job performance after adjusting for demographic characteristics and psychological demands. This finding is consistent with the theoretical prediction of the JD-R model^{5, 16}, which claims that job resources enhance positive outcomes, such as job performance. Furthermore, this finding is also consistent with preceding studies which tested the theoretical hypothesis that providing employees control over their work improves their mental health, job satisfaction, and performance^{7, 24, 25}. The present study provided the evidence that this theoretical model and/or hypothesis are true for Japanese employees. Because preceding studies revealed that decision latitude promotes maximal motivation and leads to optimal job performance^{26, 27}, providing greater decision latitude to employees may increase their job performance through enhanced work motivation. When we conducted the age-stratified analyses, the association of decision latitude with job performance was stronger among participants in the 40's and older groups than among participants in the 30's and younger age groups. Because younger employees have less work experience compared to middle-aged employees, they may consider higher levels of decision latitude as qualitative demands, which may lead to unclear association of decision latitude

with job performance among participants in 30's and younger age groups.

Extrinsic reward was also positively and significantly associated with job performance, even after adjusting for demographic characteristics and psychological demands. This finding is consistent with a study conducted in Bangladesh¹³. Furthermore, the present study revealed that extrinsic reward had a stronger association with job performance compared to any job resources. This is also consistent with a Canadian study, which showed a stronger association of ERI with presenteeism (i.e., lower levels of job performance) rather than that of high job strain (i.e., the combination of high psychological job demands and low decision latitude), low supervisor support, and low co-worker support¹⁵. The present findings suggest that higher extrinsic reward at work predicts a greater job performance. Fair and appropriate evaluation of employees' work may increase their motivation to develop new behaviors and improve performance in their workplace. When we conducted the age-stratified analyses, positive and significant association of extrinsic reward with job performance was observed especially among participants in 30's and older age groups. Since the present study used a cross-sectional design, the association of work conditions (e.g., wage progression or promotion) with the performance among employees may explain this finding, especially among participants in 30's and younger age groups. Further prospective study is needed to clarify the causal and/or reciprocal association of extrinsic reward with job performance.

Interestingly, supervisor support was negatively and significantly associated with job performance even after adjusting for demographic characteristics and psychological demands. It is consistent with a prospective study of Japanese employees⁹ but inconsistent with the studies in the US and Europe¹⁰⁻¹². These discrepancies may be explained by the typical Japanese culture characterized by vertical collectivism²⁸. In Japanese corporate culture, greater support from supervisors may make subordinates feel that they do not perform sufficiently, which may lead to lower levels of self-rated job performance and thus to negative association of supervisor support with job performance in the present study. Furthermore, due to the cross-sectional nature of the study design, the present finding may also indicate that low-performance employees who had failed at their job might receive more support from supervisors compared to high-performance employees. To clarify cross-culture difference in terms of the association of supervisor support with job performance, international

comparative research is promising. When we conducted the age-stratified analyses, negative and significant association of supervisor support with job performance was observed only among participants in the 30's or younger age groups. It may be easy for younger employees to receive supervisor support because supervisors provide them with work; assess their progress regularly; and know what cannot be done. On the other hand, among middle-aged employees, supervisor support may not be directly associated with job performance because middle-aged employees tend to have more than a little managerial task which is not necessarily provided by supervisors.

In contrast, psychological demands were not significantly associated with job performance after adjusting for demographic characteristics and job resources. Furthermore, psychological demands did not predict job performance (Table 3, ΔR^2 of Steps 2 and 4). This finding is consistent with the preceding study⁹⁾ but not with the theoretical prediction of the JD-R model^{5, 16)}. According to the activation theory²⁹⁻³¹⁾, however, job demands have an inverted U-shaped with job performance, that is, increase in job demands is assumed to be beneficial for job performance and job satisfaction to a certain level. After attaining optimal level of job demands, job performance and job satisfaction should start to decline. In the present study, we estimated the association of psychological demands with job performance using linear regression model, which may lead to the unclear association. Further study should try to evaluate the association by considering non-linear regression model.

After adjusting for demographic characteristics and psychological demands, the association of co-worker support with job performance was not significant. This finding is inconsistent with a Japanese study⁹⁾, which was conducted with both white-collar and blue-collar workers. However, in the present study, all participants were white-collar workers. Because white-collar workers generally engage in individualistic job, greater support from their co-workers may be less effective in enhancing job performance, which may lead to weaker association of co-worker support with job performance among white-collar workers than among blue-collar workers. Further studies should examine the difference in the association of co-worker support with job performance across various occupations.

The present study showed no significant interaction effects on job performance when we included interaction terms of psychological demands with each job resources component in the model. This finding is not consisted with a Finnish study, which showed a significant interaction

effect of high job demands with high job resources on work engagement¹⁸⁾. However, the Finnish study included school teachers and measured pupil misbehavior as a type of job demands. The differences in the study population and measures may explain the differences in the interaction effects between the Finnish study and the present one. On the other hand, when we conducted the age-stratified analyses, the interaction effect of psychological demands with decision latitude was significant only among participants in the 30's age group. Especially, simple slope of decision latitude was greater for the high psychological demands subgroup than for the low psychological demands subgroup. This finding is consistent with the JD-C model, which assumes that the situation characterized by high psychological demands and high decision latitude, called as "active job", is most productive⁷⁾. This productivity appears to be particularly pronounced among participants in the 30's age group because they are used to their job and have much energy to work. Given the present findings, the interaction effect of psychological demands with decision latitude may be an age-specific phenomenon. Further analyses are needed to clarify the mechanism underlying the interaction of psychological demands with decision latitude while accounting for age.

The present study has several strengths. This is the first study to measure each component of the JD-C (or DCS) and ERI models and investigate the association of these components with job performance simultaneously among Japanese working populations, which enabled to compare the strength of unique association with job performance among components of the two well-known psychosocial job stress models. Furthermore, due to strongest association of age with job performance, we also conducted the age-stratified analyses and showed different pattern in the association of each component of the JD-C (or DCS) and ERI models with job performance among age groups. Our findings may provide a suggestion that a workplace intervention that targets job performance through improving psychosocial work environment should take into account the age of employees.

Some possible limitations in the present study should also be considered. First, our sample was one particular manufacturing company in Japan, and all participants were white-collar workers. Therefore, generalization of the findings should be done cautiously. Second, job demands, job resources, and job performance were measured using self-administrated questionnaires, which may result in bias due to a common response style. Third, the job performance measure asks responders to report their overall job perfor-

mance using only one item, which may induce a common method bias. Fourth, as mentioned earlier, a causal relationship cannot be determined due to the cross-sectional nature of the study. Fifth, consistent with the previous study, Cronbach's α coefficients for the psychological demands and decision latitude scales were moderate in the present study, which may have influenced the association with job performance²⁰. Sixth, due to large sample size in the present study, some standardized coefficients were too small but considered "statistically" significant even if they were not necessarily "practically" significant. Therefore, the present findings should be interpreted with caution. Finally, adjusted R^2 of the hierarchical multiple regression analysis was much lower in the present study. This means additional variables that were not included in the present study could predict job performance, e.g., work-family conflict¹⁵). To address these limitations, further prospective study should include other variables that may predict job performance and use employees in various types of occupations.

Acknowledgements

The present study was supported by a Grant-in-Aid for Scientific Research (A) (No. 20240062) from the Ministry of Education, Culture, Sports, Science and Technology, Japan. Preparation of the manuscript was partially supported by a Grant-in-Aid for Young Scientists (B) (No. 24790599 and 26860448) from the Ministry of Education, Culture, Sports, Science and Technology, Japan.

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