

Psychosocial Mechanisms of Psychological Health Disparity in Japanese Workers

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Abstract: Recent epidemiologic research has shown that people with higher socioeconomic status (SES) (e.g., educational attainment) have better psychological health than those with lower SES. However, the psychosocial mechanisms of underlying this relationship remain unclear. To fill this gap, the current study examines the mediating effects of job demands and job resources in the relationship between educational attainment and psychological distress. The hypothesized model was tested using large data sets from two different studies: a cross-sectional study of 9,652 Japanese employees from 12 workplaces (Study 1), and a longitudinal study of 1,957 Japanese employees (Study 2). Structural equation modeling revealed that (1) educational attainment was positively related to psychological distress through job demands, (2) educational attainment was negatively related to psychological distress through job resources, and (3) educational attainment was not directly related to psychological distress. These results suggest that educational attainment has an indirect effect, rather than a direct one, on psychological distress among workers; educational attainment had both a positive and a negative relationship to psychological distress through job demands and job resources, respectively.

Key words: Educational attainment, Job demands, Job resources, Job demands-resources model, Mediator, Psychological distress, Social inequity, Socioeconomic status

Introduction

There is an increasing interest in the relationship between health and socioeconomic status (SES), which

includes education, employment, and income variables. Recent epidemiologic research has shown that people with higher SES have fewer psychological health problems, compared to those with lower SES¹. A systematic review in Japan supported those relationships among Japanese people². These results suggest that people with higher educational attainment enjoy better health. However, these epidemiologic studies do not reveal the underlying

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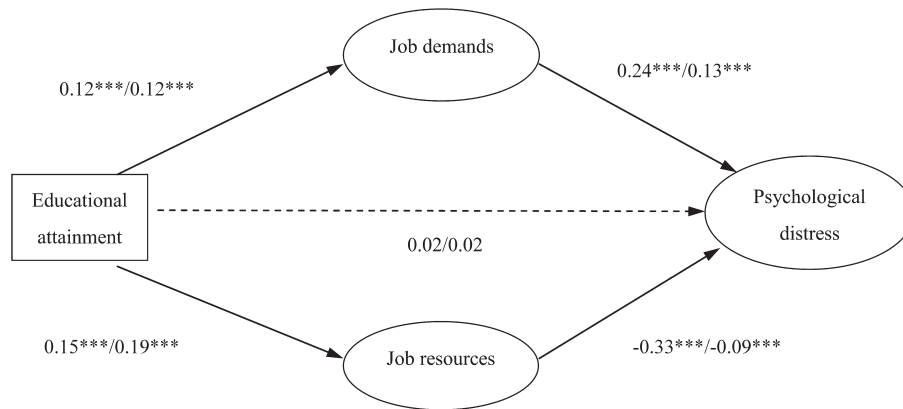


Fig. 1. Standardized solution (maximum likelihood estimates) of the hypothesized model. Standardized coefficients for Study 1 (J-HOPE) and Study 2 are displayed before and after slash, respectively. Dotted line represents nonsignificant path ($p>0.05$). Observational variables and error terms were omitted for clarity. *** $p<0.001$.

mechanisms of the relationship between SES and health. Therefore, the process of how a disparity in SES leads to a disparity in health status remains unclear.

The purpose of the current study is to examine how SES is related to psychological health in Japanese workers. We focused on educational attainment as an indicator of SES. The main advantages of using educational attainment as such an indicator are that it is easily recorded and that it remains stable over an individual’s lifetime³. Further, educational attainment is strongly associated with occupational class in Japan⁴.

The following four factors are shown to play a mediating role in the relationship between educational attainment and health⁵⁻⁷: (1) working conditions (e.g., employment status, job position, job demands, and job resources), (2) economic conditions (e.g., living environment), (3) health literacy and lifestyles, and (4) psychosocial resources (e.g., coping ability, self-efficacy, and self-esteem). This study focused on the working conditions as potential mediators, following the research of Hakanen and his colleagues⁸, which longitudinally showed a relationship between educational attainment and burnout in terms of the Job Demands-Resources (JD-R) model⁹⁻¹¹.

The JD-R model assumes that regardless of the type of job, psychosocial working conditions can be categorized into two broad categories: job demands and job resources⁹⁻¹¹. Job demands refer to the aspects of a job that require sustained effort and, therefore, are associated with certain psychological and physiological costs. Job resources refer to the aspects of the job that may reduce job demands, assist in achieving work goals, and even lead to personal growth and development. The JD-R model

proposes that psychological distress is the result of high job demands and lack of job resources⁹⁻¹¹.

Our hypothesized model is graphically presented in Fig. 1 (which also presents the results of structural equation modeling). In regard to the process linking educational attainment to psychological distress through job demands, we expected a positive relationship between educational attainment and job demands (Hypothesis 1). This is because those with higher educational attainment are more likely to have jobs with more responsibility and, therefore, a heavier workload and greater time pressures^{8, 12, 13}. In addition, we expected that job demands would have a positive relationship with psychological distress (Hypothesis 2) due to the previously mentioned workload and pressure. In regard to the process linking educational attainment to psychological distress through job resources, we expected a positive relationship between educational attainment and job resources (Hypothesis 3). This is because those with higher educational attainment are more qualified and, therefore, may have more opportunities to choose between jobs or to find a meaningful job with more resources^{8, 12-15}. We also expected that job resources would have a negative relationship with psychological distress (Hypothesis 4) due to the previously mentioned opportunities and resources. In addition to these two mediating processes, our model included the direct effect of educational attainment on psychological distress because there are potential mediators in addition to job demands and job resources.

The general hypothesized model was tested with large data sets from two different studies. In Study 1, data were obtained from a cross-sectional study of 9,652 Japanese employees from 12 workplaces. In Study 2, data were

Table 1. Demographic characteristics of participants in Study 1 (J-HOPE) and Study 2

Demographic characteristics	Study 1 (J-HOPE) N=9,652				Study 2 N=1,957			
	Mean	(SD)	n	(%)	Mean	(SD)	n	(%)
Age	40.8	(10.6)			45.3	(12.5)		
Gender								
Men			7,473	(77.4)			1,002	(51.2)
Women			2,179	(22.6)			955	(48.8)
Educational attainment								
High school or below			3,797	(39.3)			608	(31.1)
Junior college			1,419	(14.7)			474	(24.2)
College or above			4,436	(46.0)			875	(44.7)

obtained from a longitudinal study of 1,957 Japanese employees, in which data were collected via the Internet.

Study 1

Aim

The aim of Study 1 was to examine the mediating roles of job demands and job resources in the relationship between educational attainment and psychological distress in a large set of cross-sectional data.

Research design

We used cross-sectional data from the baseline survey of an occupational cohort study on social class and health in Japan (Japanese Study of Health, Occupation, and Psychosocial Factors Related Equity; J-HOPE) that was conducted during October 2010 and December 2011 (J-HOPE 1st wave data set ver. 20120601). The study population consisted of employees representing a number of different industries and a wide variety of occupations. The primary industry sectors represented were hospitals and medical facilities, transportation (a railway company), manufacturing, information technology, pharmaceutical, and service. The original sample was composed of 10,807 workers from 12 companies (range of workers employed per company: 8–3,462; mean=901). The response rate was 77.4%. We analyzed the data of 8,994 respondents (7,473 men and 2,179 women; 83.2% of the original sample), after excluding the respondents with missing data. The characteristics of the participants are summarized in Table 1. The ethics review board of The University of Tokyo approved the procedures before the study began.

Measures

The measures and variables used in this study were (1) job demands, (2) job resources (i.e., job control, role clar-

ity, workplace support, interpersonal justice, and procedural justice), (3) psychological distress, and (4) demographic characteristics.

Job demands

Job demands were assessed using the corresponding subscale of the Japanese version of the Job Content Questionnaire (JCQ)^{16, 17)}, consisting of 5 items (e.g., My job requires working very fast). Each item was scored on a four-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). Responses for the 5 items were summed to create the scale score (range: 12–48) according to the weights established by Karasek (1985)¹⁶⁾.

Job resources

Job control was assessed using the corresponding subscale of the Japanese version of the JCQ^{16, 17)}, consisting of 9 items (e.g., On my job, I am given a lot of freedom to decide how I do my work). Each item was scored on a four-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). Responses for the 9 items were summed to obtain a scale score (range: 24–96) according to the weights established by Karasek (1985)¹⁶⁾.

Workplace support from supervisor and coworkers was assessed using the corresponding subscale of the Japanese version of the JCQ^{16, 17)}, consisting of 8 items (e.g., People I work with are helpful in getting the job done). Each item was scored on a four-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). Responses for the 8 items were summed to obtain a single index of workplace support (range: 8–32).

Role clarity was assessed using the scale of Rizzo and his colleagues (1970)¹⁸⁾, consisting of 6 items (e.g., I know exactly what is expected of me). Each item was scored on a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Responses for the 6 items

Table 2. Means, SD, internal consistencies (Cronbach’s alpha on the diagonal) and correlations between the variables in Study 1 (J-HOPE), N=9,652

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 Age	40.75	10.58	(na.)									
2 Gender ^{a)}	1.23	0.42	-0.11***	(na.)								
3 Educational attainment ^{b)}	2.07	0.92	-0.12***	-0.09***	(na.)							
4 Job demands	32.82	5.43	-0.19***	-0.10***	0.15***	(0.69)						
5 Job control	66.33	10.22	-0.07***	-0.23***	0.28***	0.24***	(0.78)					
6 Workplace support	22.53	3.60	-0.17***	-0.02*	0.14***	-0.01	0.35***	(0.88)				
7 Role clarity	30.02	5.84	0.11***	-0.11***	0.09***	-0.05***	0.36***	0.44***	(0.87)			
8 Interpersonal justice	3.53	0.83	-0.07***	-0.05***	0.16***	-0.07***	0.31***	0.75***	0.49***	(0.94)		
9 Procedure justice	3.20	0.71	0.02*	-0.07***	0.03**	-0.13***	0.27***	0.54***	0.53***	0.63***	(0.86)	
10 Psychological distress	5.59	4.75	-0.13***	0.03**	0.01	0.26***	-0.11***	-0.23***	-0.33***	-0.24***	-0.25***	(0.89)

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. ^{a)} Gender was coded as 1 (Men) and 2 (Women), ^{b)} Educational attainment was coded as 1 (High school or below), 2 (Junior college) and 3 (College or above).

were summed to create a scale score (range: 6–42).

Interpersonal justice and procedural justice were assessed using the corresponding subscales of the Japanese version of the Organizational Justice Questionnaire (OJQ)^{19–21}, consisting of 6 items (e.g., Our supervisor treats us with kindness and consideration) and 7 items (e.g., The concerns of all those affected by the decision are heard before decision making), respectively. Each item was scored on a four-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Responses for these items were summed and averaged to obtain an average score (range: 1–5).

Psychological distress

Psychological distress was assessed using the Kessler 6 (K6)^{22, 23}. It includes six items that assess the frequency of symptoms of psychological distress (e.g., feeling so sad that nothing can cheer you up) in the preceding 30 days. Each item is scored on a five-point Likert scale, ranging from 0 (none of the time) to 4 (all of the time). Responses for the 6 items were summed to obtain a scale score (range: 0–24).

Demographic characteristics assessed were age, gender, and years of education. Years of education was classified into three groups: high school or below, junior college, and college or above.

Statistical analyses

The responses of participants were analyzed with structural equation modeling (SEM), using the AMOS 19 software package. Besides the chi-square statistic, the analysis assessed the goodness-of-fit index (GFI), the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). Latent factors of job demands and psychological distress had only one indicator. To control

for random measurement error for those factors, the error variances of job demands and psychological distress were set to equal the product of the variance of each and one minus the internal consistency²⁴. The model controlled for demographic variables (i.e., age and gender) as potential confounders. Each control variable was included in the model as a manifest variable simultaneously and was allowed to predict all model variables. Because our hypothesized model included some non-normally distributed variables (i.e., age, gender and education), we used bootstrap procedure^{25–27} for evaluating the model. We created 1,000 bootstrap samples to test whether the hypothesized relationships were significant. The Sobel z test was used to examine the significance of the mediating effects.

Results and discussion

The means, standard deviations, internal consistencies (Cronbach’s alpha), and correlations between the study variables are displayed in Table 2. As can be seen, all measures have satisfactory internal consistency reliability with Cronbach’s alpha coefficients of 0.69 or higher.

SEM-analysis showed that the proposed model (Fig. 1) fits the data ($\chi^2(21)=3029.14$, GFI= 0.94, CFI= 0.88, RMSEA= 0.12) although the values of CFI and RMSEA were slightly below the desired values²⁵. In relation to the process connecting educational attainment through job demands to psychological distress, educational attainment was positively related to job demands ($\beta= 0.12$, $p < 0.001$), which was positively associated with psychological distress ($\beta= 0.24$, $p < 0.001$). Conversely, with regard to the path from educational attainment through job resources to psychological distress, educational attainment was positively related to job resources ($\beta= 0.15$, $p < 0.001$), which was negatively associated with psychological distress ($\beta= -0.33$, $p < 0.001$). There was no significant direct relation-

ship between educational attainment and psychological distress ($\beta = 0.02, p > 0.05$). The total effect of educational attainment on psychological distress, which included both mediating and direct effects, was negligible and non-significant ($\beta = -0.01, p > 0.05$).

In a final step, we examined the mediating effects of job demands and job resources in the relationship between educational attainment and psychological distress. The Sobel test on the hypothesized model showed that the mediating effect of job demands was significant in the relationship between educational attainment and psychological distress ($z = 10.65, p < 0.001$). The mediating effect of job resources was also significant in this relationship ($z = 12.90, p < 0.001$).

In sum, educational attainment was positively related to job demands and job resources (Hypotheses 1 and 3 supported). Job demands was positively related to psychological distress (supporting Hypothesis 2), whereas job resources was negatively related to psychological distress (supporting Hypothesis 4). However, educational attainment was not directly related to psychological distress. ($\beta = 0.02, p > 0.05$).

Study 2

Aim

The aim of Study 2 was to examine the mediating roles of job demands and job resources in the relationship between educational attainment and future psychological distress after controlling for initial level of psychological distress, by using two-wave longitudinal data.

Research design

A prospective survey was conducted among registered monitors of an Internet survey company in Japan. The Internet survey system did not allow missing values; therefore, respondents had to answer all of the questions. In first wave of the survey, a total of 13,564 employed monitors, who corresponded in age, gender, and area of residence to a Japanese representative sample, were randomly invited to participate (October 2010). The recruitment stopped after the number of participants exceeded 2,520 due to the budgetary constraints of the project. In May 2011, the respondents who completed the first-wave survey ($N = 2,520$) were invited to complete the second-wave of the survey. Overall, 2,061 answered the questionnaire (follow-up response rate: 81.8%). Duration between T1 and T2 was almost same among samples because both the first- and the second-wave surveys were completed about two

days after our invitation. A total of 563 respondents were excluded from the analyses for the following reasons: (1) answered the questionnaire only at Time 1 ($n = 458$), (2) not employed at Time 1 ($n = 2$), (3) not employed at Time 2 ($n = 93$), and (4) missing data for the study variables ($n = 10$). Thus, we analyzed the data of 1,957 respondents (1,002 men and 955 women). The characteristics of the participants are summarized in Table 1. The participants were more highly educated than the Japanese working population^{28, 29}.

In order to examine potential selection bias, we compared eligible respondents ($N = 1,957$) with ineligible respondents ($N = 563$) with respect to their baseline demographic characteristics and their scores on the study variables. The eligible respondents were significantly older (Mean 45.3, $SD = 12.5$ vs. Mean 41.5, $SD = 13.7$; Welch's $t(848.43) = -5.79, p < 0.001$), reported higher levels of job control (Mean = 8.0, $SD = 2.0$ vs. Mean = 7.7, $SD = 2.2$; Welch's $t(854.63) = -2.36, p < 0.05$), and reported lower levels of anxiety (Mean = 6.1, $SD = 2.4$ vs. Mean = 6.3, $SD = 2.4$; $t(2518) = 2.09, p < 0.05$) than ineligible respondents. There were also differences between the two groups regarding gender ($\chi^2(1) = 6.10, p < 0.05$); there were more men in the eligible group (51.2%) than in the ineligible group (45.3%). The ethics review board of The University of Tokyo approved the procedures before the study began.

Measures

The measures and variables used in this study were (1) job demands (i.e., quantitative demands and qualitative demands), (2) job resources (i.e., job control, skill utilization, opportunity for development, workplace support, and welfare system), (3) psychological distress (i.e., anger, fatigue, anxiety, and depression), and (4) demographic characteristics. Although all measures were evaluated both at T1 and at T2, we did not use measures for job demands and job resources at T2 in the analyses (see also *statistical analyses* section).

Job demands

Job demands were assessed using the corresponding subscales of the Brief Job Stress Questionnaire (BJSQ)³⁰. This study used the subscales for quantitative demands (3 items: e.g., I am asked to do an excessive amount of work) and qualitative demands (3 items: e.g., I have to pay very careful attention). Each item was scored on a four-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). Responses for these items were summed to obtain the scale scores of quantitative demands (range:

3–12) and qualitative demands (range: 3–12).

Job resources

Job control and skill utilization were assessed using the corresponding subscales of the BJSQ³⁰, consisting of 3 items (e.g., I have the freedom to decide the order and way of my work) and 1 item (i.e., My knowledge and skills are rarely used at work (reversed)), respectively. Each item was scored on a four-point Likert scale, ranging from 1 (disagree) to 4 (agree). Responses for the 3 items of job control were summed to obtain a scale score (range: 3–12).

Workplace support was assessed using the corresponding subscales of the BJSQ³⁰, consisting of 6 items (e.g., How freely can you talk with the following people). Items were scored on a four-point Likert scale, ranging from 1 (disagree) to 4 (agree), with 3 items each for the supervisor and the coworkers. Responses for the 6 items were summed to obtain a single index of workplace support (range: 6–24).

Opportunities for development and the welfare system were assessed using the corresponding subscales of the Organizational Wellness Questionnaire^{31, 32}, consisting of 3 items (e.g., I have opportunities to learn new things at work) and 2 items (e.g., It is easy to leave for child care and nursing care), respectively. Each item was scored on a four-point Likert scale, ranging from 1 (disagree) to 4 (agree). Responses for these items were summed to obtain scale scores of opportunities for development (range: 3–12) and welfare system (range: 2–8).

Psychological distress

Psychological distress was assessed using the corresponding subscales of the BJSQ³⁰. This study used the subscales for anger (3 items: e.g., I feel angry), fatigue (3 items: e.g., I am tired completely), anxiety (3 items: e.g., I feel ill at ease), and depression (6 items: e.g., I feel depressed). Each item was scored on a four-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). Responses for these items were summed to obtain scale scores of anger (range: 3–12), fatigue (range: 3–12), anxiety (range: 3–12), and depression (range: 6–24).

Statistical analyses

We tested a model in which the T1–T2 change scores of outcomes (i.e., anger, fatigue, anxiety and depression) were included. Change scores were measured as residual scores³³ because we were interested in changes greater or lower than expected on the basis of corresponding

baseline scores³⁴. Following the recommendations of Smith and Beaton (2008)³⁴, change scores were obtained by regressing T2 scores of anger, fatigue, anxiety, and depression on the corresponding T1 scores. The differences between the predicted scores (calculated on the basis of simple regression equation) and the observed scores of T2 anger, fatigue, anxiety, and depression became the standardized residual scores used in the analyses. Positive residual scores indicated an increase, and negative scores, a decrease, in anger, fatigue, anxiety, and depression.

Results and discussion

The means, standard deviations, internal consistencies (Cronbach's alpha), and correlations between the study variables are displayed in Table 3. All measures have satisfactory internal consistency reliability, with Cronbach's alpha coefficients of 0.73 or higher.

SEM analysis showed that the proposed model (Fig. 1) fits the data ($\chi^2(53)=760.49$, GFI= 0.95, CFI= 0.87, RMSEA= 0.08) although the values of CFI and RMSEA were slightly below desirable levels²⁵). In terms of the process connecting educational attainment through job demands to change in psychological distress, educational attainment was positively related to job demands ($\beta= 0.12$, $p<0.001$), which was positively associated with change in psychological distress ($\beta= 0.13$, $p<0.001$). Conversely, with regard to the path from educational attainment through job resources to psychological distress, educational attainment was positively related to job resources ($\beta= 0.19$, $p<0.001$), which was negatively associated with change in psychological distress ($\beta= -0.09$, $p<0.001$). There was no significant direct relationship between educational attainment and change in psychological distress ($\beta= 0.02$, $p>0.05$). The total effect of educational attainment on the change in psychological distress was negligible and non-significant ($\beta= 0.02$, $p>0.05$).

In a final step, we examined the mediating effects of job demands and job resources in the relationship between educational attainment and change in psychological distress. The Sobel test showed that the mediating effect of job demands was significant in the relationship between educational attainment and change in psychological distress ($z=2.97$, $p<0.01$). The mediating effect of job resources was also significant in this relationship ($z=2.75$, $p<0.01$).

In sum, educational attainment was positively related to job demands and job resources (supporting Hypotheses 1 and 3). Job demands was positively related to change in psychological distress (supporting Hypothesis 2), whereas job resources was negatively related to it (supporting

Table 3. Means, SD, internal consistencies (Cronbach's alpha on the diagonal) and correlations between the variables in Study 2, N=1,957

Variables	Mean	SD	1	2	3	4	5	6	7	8
1 Age	45.26	12.49	(na.)							
2 Gender ^{a)}	1.49	0.50	-0.01	(na.)						
3 Educational attainment ^{b)}	2.14	0.86	-0.11***	-0.20***	(na.)					
4 Quantitative demands	7.61	2.28	-0.18***	-0.16***	0.09***	(0.81)				
5 Qualitative demands	7.85	2.12	-0.02	-0.22***	0.16***	0.61***	(0.75)			
6 Job control	7.99	2.04	0.15***	-0.15***	0.08***	-0.09***	-0.03	(0.73)		
7 Skill utilization	2.86	0.86	0.04	-0.15***	0.12***	0.10***	0.25***	0.17***	(na.)	
8 Workplace support	13.86	4.04	-0.06*	0.00	0.06*	0.02	0.04	0.23***	0.13***	(0.87)
9 Opportunity for development	8.00	2.34	0.01	-0.08***	0.16***	0.21***	0.37***	0.29***	0.42***	0.36***
10 Welfare system	4.73	1.87	0.04	0.02	0.10***	-0.12***	-0.03	0.19***	0.06**	0.27***
11 T1 Anger	6.54	2.47	-0.22***	-0.01	-0.03	0.28***	0.14***	-0.18***	-0.11***	-0.24***
12 T1 Fatigue	6.66	2.63	-0.28***	0.03	-0.01	0.44***	0.30***	-0.19***	-0.04	-0.14***
13 T1 Anxiety	6.07	2.35	-0.21***	-0.06**	0.01	0.42***	0.35***	-0.17***	-0.02	-0.21***
14 T1 Depression	10.62	4.39	-0.25***	-0.02	0.01	0.28***	0.17***	-0.17***	-0.10***	-0.30***
15 T2 Anger	6.44	2.45	-0.26***	-0.02	-0.03	0.23***	0.11***	-0.11***	-0.06*	-0.19***
16 T2 Fatigue	6.49	2.66	-0.30***	0.04	0.00	0.36***	0.22***	-0.18***	-0.02	-0.13***
17 T2 Anxiety	5.99	2.39	-0.21***	-0.07**	0.04	0.34***	0.29***	-0.14***	0.00	-0.17***
18 T2 Depression	10.66	4.43	-0.26***	-0.02	0.05*	0.24***	0.15***	-0.14***	-0.05	-0.22***

Variables	9	10	11	12	13	14	15	16	17	18
1 Age										
2 Gender ^{a)}										
3 Educational attainment ^{b)}										
4 Quantitative demands										
5 Qualitative demands										
6 Job control										
7 Skill utilization										
8 Workplace support										
9 Opportunity for development	(0.89)									
10 Welfare system	0.24***	(0.84)								
11 T1 Anger	-0.18***	-0.17***	(0.92)							
12 T1 Fatigue	-0.05*	-0.17***	0.59***	(0.90)						
13 T1 Anxiety	-0.03	-0.18***	0.58***	0.66***	(0.80)					
14 T1 Depression	-0.19***	-0.19***	0.62***	0.64***	0.75***	(0.92)				
15 T2 Anger	-0.14***	-0.15***	0.55***	0.41***	0.39***	0.43***	(0.92)			
16 T2 Fatigue	-0.06**	-0.17***	0.43***	0.59***	0.45***	0.45***	0.60***	(0.91)		
17 T2 Anxiety	-0.02	-0.13***	0.43***	0.47***	0.58***	0.53***	0.57***	0.67***	(0.81)	
18 T2 Depression	-0.12***	-0.14***	0.44***	0.47***	0.52***	0.61***	0.60***	0.65***	0.78***	(0.92)

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. ^{a)} Gender was coded as 1 (Men) and 2 (Women), ^{b)} Educational attainment was coded as 1 (High school or below), 2 (Junior college) and 3 (College or above).

Hypothesis 4). However, educational attainment was not directly related to change in psychological distress.

General Discussion

This study examined how educational attainment was related to psychological distress among Japanese workers, using large data sets from two different studies: a cross-sectional study of 9,652 Japanese employees from 12 workplaces (Study 1) and a longitudinal study of 1,957 Japanese employees (Study 2). We focused on job

demands and job resources as possible mediators in the relationship between educational attainment and psychological distress, on the basis of the JD-R model⁹⁻¹¹. This study contributes to the literature on the socioeconomic and health disparities by identifying the psychosocial mechanisms between them.

SEM revealed no direct effect of educational attainment on psychological distress, but identified two mediating pathways between them: educational attainment → job demands → psychological distress and educational attainment → job resources → psychological distress. It is

likely that former pathway indicates that those with higher educational attainment have jobs with more responsibility and, therefore, more workload and time pressure^{8, 12, 13}. In turn, they experienced higher psychological distress. Conversely, it is likely that the latter pathway indicates that those with higher educational attainment are more qualified and, therefore, may have more opportunities to choose between jobs and to find a meaningful job with more resources^{8, 12-15}. In turn, they experience lower psychological distress. These findings are consistent with the JD-R model⁹⁻¹¹, which emphasizes that higher job demands and a lack of job resources are the main precursors of psychological distress.

These findings help explain why previous studies have found mixed results regarding the relationship between educational attainment and psychological distress^{35, 36}. Specifically, higher educational attainment results in higher levels of both job demands and job resources, which have an opposite association with psychological distress: higher job demands are associated with higher psychological distress, whereas higher job resources are associated with lower psychological distress. These findings suggest that the focus on multiple aspects of job characteristics (i.e., not only job demands but also job resources) is important to the understanding of the psychosocial mechanisms between educational attainment and psychological distress.

The present study has several limitations. First, this study is based on survey data that used self-reported measures. The common method variance might have caused overestimation of the associations between variables, owing to a self-report bias (due to negative affect, for example). Our findings should be replicated with objective measures. Second, the hypothesized model was examined using data from Japanese workers only; hence, caution is required while generalizing our findings. Thus, further research is needed to determine whether these findings can be generalized across countries. Third, we focused only on psychological distress as the outcome variable in order to avoid complexity in the hypothesized model. However, many previous studies testing the JD-R model have also included some positive outcomes, typically work engagement¹¹. Thus, further research is needed to determine whether the hypothesized model can be applicable to positive outcomes. Fourth, although Study 2 was based on a longitudinal design, the interval between Time 1 and Time 2 was relatively short (7 months), which may not be long enough to detect any change in the outcome variable. Additional research on the longer-term mediating effects of job demands and job resources is needed. However, it is

not clear what constitutes an adequate time lag³⁷. A multi-wave design may more fully capture the developmental aspects of the processes of interest³⁷. Fifth, the models did not fit as well as could be expected. One explanation might be provided from the statistical viewpoint: the ratio between χ^2 and df was over 2.5 for each model, which indicates that there are paths missing in Fig. 1. Because we tested a hypothesized model rather than conducting exploratory research, we were not inclined to add or delete paths. Finally, this study did not examine the role of psychosocial factors at home. Since recent research on work-family balance have claimed that not only work but also home factors have effects on workers' well-being³⁸, future research needs to test the role of both work and home factors.

A major strength of the current study is that the use of large data sets from two different studies. Study 1 used data from 9,652 employees from 12 different workplaces, and Study 2 used data from 1,957 employees, supplied via the Internet. This made it possible to cross-validate the hypothesized model across the different study samples. Furthermore, the use of longitudinal data (although limited to Study 2) contributes to identifying the causal relationship from educational attainment to psychological distress.

Our results may have relevant implications for practice in the field of occupational mental health. The present study found indirect effects of educational attainment on psychological distress, but no direct effect was observed. Educational attainment was both positively and negatively related to psychological distress through job demands and job resources. This suggests that creating appropriate working conditions for all employees may compensate for other adverse life conditions, such as low levels of education⁸. Worksite interventions, such as those intended to decrease or stabilize job demands and increase job resources, appear to be a useful starting point for improving workers' psychological health. Since adequate diagnoses and risk analyses are important factors for successful interventions³⁹, periodical surveys should be conducted to detect the effects of job characteristics on employee health.

In conclusion, educational attainment has an indirect effect, rather than direct effect, on psychological distress. Educational attainment has both a positive and a negative relationship with psychological distress through job demands and job resources, respectively. These working conditions should be considered in examining the psychosocial mechanisms underlying the relationship between educational attainment and psychological health.

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