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Original Article

Multidimensional analysis of schoolteachers' occupational stress by the New Brief Job Stress Questionnaire: focusing on gender differences

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Abstract: This study investigated teachers' occupational stress using a comprehensive job stress questionnaire, or the New Brief Job Stress Questionnaire, while considering gender differences. A total of 1,825 elementary and junior high school teachers participated in the study. The results revealed that female teachers significantly exhibited more psychological and physical stress reactions and perceived less job resource availability than did male teachers. Moreover, multiple regression analyses demonstrated that support from family and friends was a larger factor associated with mental health outcomes among female teachers than among male teachers. The impacts of marital status also differed between male and female teachers. Job demands were strongly associated with psychological and physical stress reactions among teachers. Meanwhile, job resources were more strongly associated with positive workplace outcomes, such as workplace engagement and social capital, than were job demands. Administrators should consider the distinctive nature of teachers' occupational stress in addition to its gender specific influence. Organizational support, such as securing teachers' autonomy, encouraging their career development, and acknowledging diversity, should be considered to foster teachers' work engagement and create a cohesive environment in the school workplace.

Key words: Teachers, Occupational stress, New Brief Job Stress Questionnaire, Gender differences, Job demands, Job resources, Family support

Introduction

Teaching is considered one of the most stressful and demanding jobs worldwide. Previous studies have reported that schoolteachers experience high rates of mental concerns such as anxiety, depression, and burnout[1, 2]. Extended working hours among teachers have been a long-standing issue globally[3, 4]. The major factors leading to teachers' occupational stress include students' misbehavior, demanding parents, interpersonal conflicts between coworkers, and high quantitative workload[5].

Teachers in Japan also experience substantial psycho-

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logical and physical distress due to long working hours, as well as strict teacher evaluation systems, bullying among students, parental complications, and conflicts with coworkers[6]. Moreover, Japanese teachers have additional duties to their essential educational work, such as school management work, preparation of school events, clerical tasks, extracurricular club activities, and Parent-Teacher Association (PTA) activities[7]. In Japan, the percentage of schoolteachers taking leave due to mental illness increased more than fivefold from 0.11% in 1992 to 0.59% in 2019[8].

Gender plays an important role in workers' mental health. Studies indicate that women have greater difficulty in managing workplace stress than do men[9, 10]. Women are affected by work-related stressors that are common to both genders as well as by those unique to them. These female-specific stressors include the glass ceiling effect, role stereotyping, and inequality in decision-making positions[10]. This situation is also true for the school workplace setting. The proportion of female teachers in administrative positions is low in Japanese educational institutions compared to that in other Organization for Economic Co-operation and Development (OECD) participating countries[4]. Female teachers have reported stress-related symptoms more often than have male counterparts[3].

Family support should be considered an important factor for the mental health of working people. Social support from family and/or friends reduces depressive symptoms among workers[11]. Because of this, work-family conflict (i.e., incompatible demands between work and family roles) is a major risk factor for workers' mental problems regardless of gender[12]. However, the effects of work-family conflict have been reported as different between men and women[13]. The finding that working women are more susceptible to work-family conflict than are men can be extended to the teaching profession[13]. Female teachers experience difficulties with work-family conflict more strongly than do male teachers[14].

The effects of occupational stress are considered to differ depending on the age of working people[15]. The shrinking labor force accompanying rapid population aging has been an urgent issue for many developed countries. Japan is one of the fastest-aging societies in the world. As a countermeasure, the government has encouraged companies to raise the mandatory retirement age along with the extension of the pension eligibility age[16]. Recently, the government enacted a law to gradually raise the mandatory retirement age of local government workers, including public school teachers, from 60 to 65 yr[17]. Concurrently, Japanese public schools are facing a serious teacher shortage. A government survey reported that 5.8% of public schools (1,897 schools) in Japan lacked a sufficient number of teachers at the beginning of the 2021 school year[18]. To address this shortage of teachers, boards of education nationwide are planning to not only enhance the recruitment of teacher candidates, but also eliminate their age limit[18]. Nowadays, candidates in their 40s or 50s can apply for tenured teacher positions in many Japanese districts. Considering this context, a workforce of middle-aged (from mid 40s to early 60s) teachers is expected to become increasingly important in the Japanese school workplace. Accordingly, focusing on their mental health will be indispensable.

In Japan, the Stress Check Program was initiated by the government in 2015 to prevent mental health problems among workers. It requires implementation once a year in workplaces with 50 or more employees[19]. The Stress Check Program gathers data on employees' job stressors and stress-related psychological and physical symptoms. In this program, the Brief Job Stress Questionnaire (BJSQ) is used to evaluate workers' stress levels. The BJSQ has been widely used in the field of occupational health in Japan[19].

The BJSQ is based on the Job Demands-Control (JDC) model developed by Karasek and its extended model, known as the Job Demand-Control-Support (JDCS) model[20]. However, the occupational mental health field has developed continuously, and new models have been proposed. One of them is the Effort-Reward Imbalance (ERI) model, which associates workers' effort-reward imbalance with poor mental health and cardiovascular diseases (CVD)[21]. More recently, higher-level organizational factors have been identified, such as organizational justice (i.e., the extent to which employees perceive workplace decision-making processes and interactions to be fair) and social capital (i.e., employees' perception of trust, reciprocity, and norms within the workplace)[21, 22]. These organizational environmental factors were associated with mental and physical health conditions among workers[22]. A positive attitude or state of mind at work, such as work engagement, has garnered attention as a significant mental health outcome among workers[23]. Workplace harassment is a crucial component of occupational mental health[24]. To address these newly proposed occupational mental health factors, Inoue et al. developed a new version of the BJSQ (New BJSQ) in 2014 by adding new scales to the original version[21]. The New BJSQ contains questionnaires related to a wider range of job stress models and outcomes, such as the JDCS, ERI, organizational justice, work engage-

ment, workplace social capital, and harassment at work.

The New BJSQ consists of job demand scales; three-level job resource scales (task-level, workgroup-level, and organizational-level); and five outcome scales (psychological and physical stress reactions, work engagement, workplace social capital, and workplace harassment)[21]. According to Schaufeli *et al.*[25], job demands predict negative stress reactions (such as burnout and psychosomatic symptoms) while job resources predict both negative stress reactions and positive emotional outcomes (such as work engagement). Halbesleben's meta-analytic study identified that job resources such as autonomy and social support were positively associated with work engagement, and that job resources were more strongly related to work engagement than were job demands[26]. The results of a nationally representative survey in Japan found that job demand scores correlated strongly with psychological and physical stress reactions among workers but correlated modestly with positive psychological outcomes (such as work engagement and workplace social capital)[21]. Job resource scores correlated with psychological and physical stress reactions to a similar extent as did job demand scores. However, job resources, particularly workgroup- and organizational-level resources, correlated with work engagement and workplace social capital more markedly than did job demands[21].

Based on this foundation, the present study investigated school teachers' work-related stress using a comprehensive job stress questionnaire, or the New BJSQ, while considering gender specific influence. To the best of our knowledge, no studies have assessed teachers' occupational stress using the New BJSQ with an adequately large sample size of schoolteachers. Considering the increasing importance of middle-aged teachers' labor in the Japanese school workplace, we planned to recruit study participants at our hospital's health checkup center (Tokai Central Hospital, Kakamigahara, Japan), where a relatively large number of teachers of this generation visit. Based on the context described above, we propose the following hypotheses:

Hypothesis 1 − Female teachers exhibit psychological and physical stress reactions more strongly than do male teachers.

Hypothesis 2 − Female teachers are affected by family factors such as social support from family (and friends) more strongly than are male teachers.

Hypothesis 3 − Job demands and job resources are significantly associated with psychological and physical stress reactions among teachers to a similar extent.

Hypothesis 4 − Job resources, especially workgroup- and organizational-level resources, correlate with positive workplace outcomes (such as work engagement and workplace social capital) more strongly than do job demands.

Subjects and Methods

Sample and data collection procedure

This study used a cross-sectional survey with public school teachers visiting Tokai Central Hospital for a health checkup between April 2019 and March 2021. Questionnaires were distributed to 2,001 public elementary and junior high school teachers who had visited the hospital during the study period. Informed consent was obtained from 1,825 participants (response rate: 91.2%). Those who did not consent to the study were excluded.

All procedures in this study were performed in accordance with the ethical standards of the responsible committee on human experimentation and the latest version of the Declaration of Helsinki. Informed consent was obtained from all the participants included in the study. This study was approved by the Institutional Review Board of Tokai Central Hospital (Approval No.2020040101).

Measurements

Sociodemographic and work-related variables

The following variables were measured and used in the analysis: age (20–29, 30–39, 40–49, 50–59, ≥60 yr); gender (man or woman); marital status (never married, currently married, and others [currently unmarried after divorce or the death of a spouse]); living with children (yes or no); living with one's own parents (yes or no); living with parents-in-law (yes or no); type of school (elementary or junior high school); work experience as a teacher (yr); job position (principal, vice-principal, senior teacher, teacher, nursing teacher, nutrition teacher, and others); overtime work hours on weekdays (hours [h] per week); working overtime on weekends (yes or no); and bringing work home (yes or no).

New Brief Job Stress Questionnaire

To assess work-related stress factors, we used the New BJSQ. The standard version of the New BJSQ has 30 scales and 84 items (49 scales and 141 items in total when combined with the original BJSQ), which are not fully suitable for practical use in the common workplace. Inoue et al. created a 63-item recommended version and a 23-item short version of the New BJSQ (120 and 80 items in total when combined with the original 57-item BJSQ,

respectively)[27]. This study used the recommended version of the New BJSQ (42 scales and 120 items in total). The New BJSQ can assess job demands and job resources, as well as individual and organizational outcomes multidimensionally by adding new scales to the original version. Table 1 shows all of the New BJSQ scales with their internal consistency reliability. Cronbach's α coefficient for each scale was calculated to evaluate internal consistency reliability. Almost all of the scales showed an acceptable level of reliability (Cronbach's α >0.70).

All items were rated on a 4-point Likert scale. In this analysis, a scale's score was calculated as an average item score (i.e., a sum of the item scores divided by the number of items) ranging from 1 to 4 for each scale after converting all item scores so that higher scores indicated better status (i.e., a higher job demands scores means lower job demands; a higher psychological stress reaction score means a lower level of psychological distress; and a higher job resources score means richer job resources). The score for each job demand and job resources summary scale (job demands summary, task-level job resources summary, workgroup-level job resources summary, and organizational-level job resources summary) was calculated as the average score of its component subscales.

Statistical analysis

Continuous variables are expressed as means (*M*) with standard deviation (*SD*) and medians (*Mdn*) with interquartile range (*IQR*), and categorical variables are expressed as number of cases with percentages. The normality of distribution was assessed using the Kolmogorov–Smirnov test, and all continuous variables deviated significantly from the normal distribution ($p<0.001$). Differences in continuous variables were compared using the Mann–Whitney U test for two independent datasets. The effect size *r* was calculated by dividing the *z* value by the square root of the total observations for these two tests. As for the scales which included a question item relating to supervisor support or organizational management, such as supervisor support (e.g., "How reliable is your supervisor when you are troubled?"), esteem reward (e.g., "I am evaluated appropriately by my supervisor"), leadership (e.g., "Our supervisor encourage us to have the chance to improve job skill"), internal justice (e.g., "Our supervisor treats us with a sincere attitude"), trust with management (e.g., "The information from the management is reliable"), and preparedness for change (e.g., "We have the opportunity to ask our supervisor about any change at the workplace"), the data of principals were excluded for the analysis.

A multiple linear regression model was used to assess the relationship between four summary-level scales (job demands summary, task-level job resource summary, workgroup-level job resource summary, and organizational-level job resources summary) and five outcome scales of the New BJSQ ("psychological stress reaction [an average score of six psychological stress symptom scales]", "physical stress reaction", "work engagement", "workplace social capital", and "workplace harassment") after adjusting for demographic variables (gender, years of experience as a teacher, marital status, living together with children or parents, type of school, overtime work hours on weekdays, working on holidays, and bringing work home). "Support from family and friends" was treated as an independent predictor variable because of its non-work environment. A previous study reported that the effects of job demand on workers' occupational stress outcomes are moderated by job control and workplace social support[28]. Therefore, we investigated the interaction between job demands and job resources by including two-way interaction terms in the regression model (job demands × task-level, workgroup-level, and organizational-level job resources). These variables were centered on their means before conducting the analysis. We also performed another multiple regression analysis by using each subscale of the New BJSQ (e.g., "job control", "coworker support", "leadership") as a predictor variable instead of summary-level scales, and examined its relationship with the outcome scales (Appendices 1 and 2).

In the multiple regression analysis, principal teachers' data were not used. To investigate possible associations and multicollinearity between variables, we first assessed the correlation coefficients for each pair of predictor variables. If the correlation coefficients for two variables were 0.8 or above, only one was used in the regression analysis. Multicollinearity was assessed using the variance inflation factor (VIF). We considered a VIF exceeding 5.0 as an indicator of multicollinearity.

Among the eligible population, 818 participants (44.8%) had at least one missing data point for the variables used in the analysis. We imputed these missing data using multiple imputation techniques with chained equations under the assumption that missing values were missing at random. All analyzed variables were included in the model. Imputation was performed using fully conditional specifications. Twenty imputed datasets were created for each analysis, and each parameter was combined using Rubin's rule. All statistical analyses were performed using the SPSS version 28 (IBM Corp., Armonk, NY, USA). The level of significance for each test was set at $p<0.05$.

Table 1. The number of items and Cronbach's α coefficient of the recommended version of New Brief Job Stress Questionnaire (BJSQ) scales

Scales	Number of items	Cronbach's α coefficient
Job demands		
1. Quantitative job overload	3	0.780
2. Qualitative job overload	3	0.740
3. Physical demands	1	NC
4. Interpersonal conflict	3	0.762
5. Poor physical environment	1	NC
6. Emotional demands	3	0.880
7. Role conflict	3	0.758
8. Work-self balance (negative)	2	0.899
Job resources: task-level		
9. Job control	3	0.757
10. Suitable jobs	1	NC
11. Skill utilization	1	NC
12. Meaningfulness of work	3	0.784
13. Role clarity	3	0.693
14. Career opportunity	3	0.825
Job resources: workgroup-level		
15. Supervisor support	3	0.902
16. Coworker support	3	0.847
17. [Support from family and friends] [a]	3	0.913
18. Monetary/status reward	2	0.584
19. Esteem reward	2	0.748
20. Job security	3	0.528
21. Leadership	3	0.923
22. Interactional justice	3	0.961
23. Workplace where people compliment each other	3	0.909
24. Workplace where mistakes are acceptable	2	0.799
Job resources: organizational-level		
25. Trust with management	3	0.954
26. Preparedness for change	3	0.827
27. Respect for individuals	3	0.837
28. Fair personnel evaluation	3	0.862
29. Diversity	3	0.733
30. Career development	5	0.865
31. Work-self balance (positive)	2	0.807
Outcomes		
32. Vigor	3	0.929
33. Anger-irritability	3	0.916
34. Fatigue	3	0.888
35. Anxiety	3	0.816
36. Depression	6	0.880
37. Physical stress reaction	11	0.822
38. Job satisfaction	1	NC
39. [Satisfaction with family life] [a]	1	NC
40. Workplace harassment	2	0.788
41. Workplace social capital	3	0.863
42. Work engagement	2	0.710
Total number of items	120	

[a] [ ] indicates non-work environment or outcome.

NC: Not calculated because of one-item scale.

Results

Participants characteristics

Participants' descriptive statistics by gender are shown in Table 2. The proportion of men was slightly higher than that of women (57.1% and 42.7%, respectively). Among both genders, participants aged 50–59 yr were the largest among all age groups (58.3% of men and 59.6% of women). Most of the individuals were married (84.7%), and 57.2% lived with their children. Approximately 20% of the participants lived with their parents (21.4% of men and 17.5% of women). A smaller percentage of them lived together with parents-in-law (a higher percentage of female teachers [17.8%] than male teachers [4.0%]). The percentage of teachers in administrative positions (principals and vice-principals) was higher for males than for females (38.8% of men and 10.5% of women), and all nursing or nutrition teachers were females. Approximately 40% of participants worked overtime on weekdays for more than 15 h per week (45.3% of men and 35.6% of women). More than half of the participants worked on holidays (66.4% of men and 59.3% of women), and approximately 40% of them brought work home (33.4% of men and 51.5% of women).

Participants' scores on the new BJSQ scales by gender

Table 3 presents participants' New BJSQ scores by gender. Almost all job demand scores except interpersonal conflict and role conflict were significantly lower in female teachers than in male counterparts. As for task-level job resource scores, the scores of job control and role clarity in female teachers were significantly lower than those in male teachers. Almost all workplace-level job resource scores (except support from family and friends, monetary/status reward, and esteem reward) were significantly lower in female teachers than in male teachers. Almost all organizational-level job resource scores (except fair personnel evaluation and positive work-self balance) were significantly lower in female teachers. Almost all outcome scale scores except workplace social capital and workplace harassment were significantly lower in female teachers than in male teachers.

Multiple regression analysis examining the relationship between a participant's demographic variables, the new BJSQ summary-level scales, and outcome scales with the interaction terms

Tables 4 and 5 present the multiple regression analysis between participant's demographic variables, the New BJSQ summary-level scales (job demands summary and task-level, workgroup-level, and organizational-level job resources summary), and five outcome scales (Table 4 for male teachers and Table 5 for female teachers) including the two-way interaction terms (job demands × task-level, workgroup-level, and organizational-level job resources). First, we assessed the correlation coefficients for each pair of predictor variables, and none of them were 0.8 or above. All VIF scores were below 5.0. Therefore, multicollinearity was ruled out. For both models, the scatterplots of the standardized predicted values with standardized residuals showed that the data met the assumptions of homogeneity of variance and linearity. The histograms showed that the residuals were approximately normally distributed.

Years of experience as a teacher had no positive significant association with any of the outcome scales in both genders (except with workplace social capital in male teachers). In male teachers, marital status had no significant association with any of the outcome scales. By contrast, marital status (others [currently unmarried after divorce or the death of a spouse]) was negatively and significantly associated with physical stress reactions and workplace harassment in female teachers ($\beta = -0.088$, $p=0.003$ and $\beta = -0.074$, $p=0.018$, respectively).

Whether a participant lived with children, their own parents, or parents-in-law had no significant association with any of the outcome scales in either gender. Almost all styles of overtime work (overtime work hours on weekdays, working on holidays, and bringing work home) had no significant negative association with any of the outcome scales (except between overtime work hours on weekdays and physiological stress reactions in male teachers).

In female teachers, support from family and friends was positively and significantly associated with several outcome scales: psychological and physical stress reactions and work engagement ($\beta=0.130$, $p<0.001$; $\beta=0.187$, $p<0.001$; $\beta=0.079$, $p=0.007$, respectively). In male teachers, support from family and friends was positively and significantly associated only with work engagement ($\beta=0.063$, $p=0.015$).

In both genders, job demands and task-level job resources were positively and significantly associated with psychological and physiological stress reactions ($\beta=0.257$–0.459 in men and $\beta=0.202$–0.518 in women). For both genders, task- and organizational-level job resources were positively and significantly associated with work engagement. The largest regression coefficients were those of task-level job resources in both genders ($\beta =$

Table 2. Participants' demographics (*N*=1,825, Men: 57.1%, Women: 42.7%, missing: 0.2%)

Variables	Men (*N*=1,042) *n* (%)	Women (*N*=779) *n* (%)
Age (yr)		
≤39	81 (7.8%)	35 (4.5%)
40–49	207 (19.9%)	193 (24.8%)
50–59	608 (58.3%)	464 (59.6%)
≥60	145 (13.9%)	87 (11.2%)
missing	1 (0.1%)	0 (0.0%)
Marital status		
Never married	70 (6.7%)	157 (20.2%)
Currently married	953 (91.5%)	590 (75.7%)
Others[a]	15 (1.4%)	31 (4.0%)
missing	4 (0.4%)	1 (0.1%)
Living with children		
No	407 (39.1%)	373 (47.9%)
Yes	634 (60.8%)	406 (52.1%)
missing	1 (0.1%)	0 (0.0%)
Living with one's own parents		
No	819 (78.6%)	643 (82.5%)
Yes	223 (21.4%)	136 (17.5%)
Living with parents-in-law		
No	1,000 (96.0%)	640 (82.2%)
Yes	42 (4.0%)	139 (17.8%)
Type of school		
Elementary school	597 (57.3%)	595 (76.4%)
Junior high school	444 (42.6%)	182 (23.4%)
missing	1 (0.1%)	2 (0.3%)
Job position		
Principal	223 (21.4%)	33 (4.2%)
Vice-principal	181 (17.4%)	49 (6.3%)
Senior teacher	18 (1.7%)	11 (1.4%)
Teacher	616 (59.1%)	550 (70.6%)
Nursing teacher	0 (0.0%)	103 (13.2%)
Nutrition teacher	0 (0.0%)	26 (3.3%)
Others	1 (0.1%)	4 (0.5%)
missing	3 (0.3%)	3 (0.4%)
Overtime work hours on weekdays (hours per week)		
<5 h	131 (12.6%)	96 (12.3%)
5–10 h	135 (13.0%)	109 (14.0%)
10–15 h	283 (27.2%)	265 (34.0%)
≥15 h	472 (45.3%)	277 (35.6%)
missing	21 (2.0%)	32 (4.1%)
Working on holidays		
No	342 (32.8%)	308 (39.5%)
Yes	692 (66.4%)	462 (59.3%)
missing	8 (0.8%)	9 (1.2%)
Bringing work home		
No	692 (66.4%)	376 (48.3%)
Yes	348 (33.4%)	401 (51.5%)
missing	2 (0.2%)	2 (0.3%)

The number of participants with their percentage is shown in each category.

[a] Currently unmarried after divorce or the death of a spouse.

Table 3. A comparison of participants' New Brief Job Stress Questionnaire (BJSQ) scores between male and female teachers by the Mann–Whitney U test

Scales	Study participants (*N*=1,825)				*p*	*r* [a]
	Men		Women			
	M (*SD*)	*Mdn* (*IQR*)	*M* (*SD*)	*Mdn* (*IQR*)		
Quantitative job overload	2.07 (0.70)	2.00 (1.67–2.33)	1.89 (0.62)	2.00 (1.33–2.33)	<0.001***	0.133
Qualitative job overload	2.10 (0.59)	2.00 (1.67–2.33)	2.02 (0.55)	2.00 (1.67–2.33)	0.002**	0.072
Physical demands	2.65 (0.81)	3.00 (2.00–3.00)	2.37 (0.76)	2.00 (2.00–3.00)	<0.001***	0.175
Interpersonal conflict	3.10 (0.58)	3.00 (2.67–3.67)	3.08 (0.58)	3.00 (2.67–3.67)	0.488	0.016
Poor physical environment	3.14 (0.77)	3.00 (3.00–4.00)	3.02 (0.82)	3.00 (3.00–4.00)	0.002**	0.072
Emotional demands	2.66 (0.80)	2.67 (2.00–3.33)	2.39 (0.76)	2.33 (2.00–3.00)	<0.001***	0.164
Role conflict	2.66 (0.69)	2.67 (2.33–3.00)	2.66 (0.67)	2.67 (2.33–3.00)	0.670	0.010
Work-self balance (negative)	2.64 (0.81)	3.00 (2.00–3.00)	2.47 (0.80)	2.50 (2.00–3.00)	<0.001***	0.103
Job demands summary	2.63 (0.72)	2.63 (2.33–2.92)	2.49 (0.70)	2.50 (2.21–2.75)	<0.001***	0.158
Job control	2.84 (0.62)	3.00 (2.33–3.00)	2.72 (0.57)	2.67 (2.33–3.00)	<0.001***	0.104
Suitable jobs	3.03 (0.69)	3.00 (3.00–3.00)	3.07 (0.61)	3.00 (3.00–3.00)	0.420	0.019
Skill utilization	3.22 (0.67)	3.00 (3.00–4.00)	3.22 (0.64)	3.00 (3.00–4.00)	0.953	0.001
Meaningfulness of work	3.44 (0.52)	3.53 (3.00–3.98)	3.41 (0.49)	3.35 (3.00–3.78)	0.121	0.043
Role clarity	3.27 (0.53)	3.33 (3.00–3.67)	3.14 (0.50)	3.00 (3.00–3.33)	<0.001***	0.115
Career opportunity	3.04 (0.60)	3.00 (2.67–3.33)	3.32 (0.56)	3.00 (2.67–3.33)	0.798	0.006
Task-level job resources summary	3.13 (0.61)	3.12 (2.89–3.42)	3.10 (0.56)	3.08 (2.89–3.33)	0.028*	0.052
Supervisor support[b]	2.90 (0.74)	3.00 (2.3–3.33)	2.67 (0.73)	2.67 (2.00–3.00)	<0.001***	0.150
Coworker support	2.88 (0.67)	3.00 (2.33–3.33)	2.82 (0.66)	3.00 (2.33–3.33)	0.034*	0.050
[Support from family and friends][c]	3.28 (0.75)	3.33 (3.00–4.00)	3.26 (0.73)	3.33 (3.00–4.00)	0.532	0.015
Monetary/status reward	2.73 (0.62)	3.00 (2.50–3.00)	2.87 (0.56)	3.00 (2.50–3.00)	<0.001***	0.121
Esteem reward[b]	2.96 (0.54)	3.00 (3.00–3.00)	2.96 (0.51)	3.00 (3.00–3.00)	0.729	0.009
Job security	2.91 (0.64)	3.00 (2.33–3.33)	2.81 (0.60)	3.00 (2.33–3.33)	0.002**	0.073
Leadership[b]	2.76 (0.64)	3.00 (2.33–3.00)	2.66 (0.66)	3.00 (2.33–3.00)	0.013*	0.063
Interactional justice[b]	3.02 (0.64)	3.00 (2.67–3.33)	2.94 (0.65)	3.00 (2.67–3.00)	0.012*	0.064
Workplace where people compliment each other	2.91 (0.67)	3.00 (2.67–3.00)	2.75 (0.74)	3.00 (2.33–3.00)	<0.001***	0.102
Workplace where mistakes are acceptable	2.83 (0.66)	3.00 (2.50–3.00)	2.71 (0.68)	3.00 (2.50–3.00)	<0.001***	0.091
Workgroup-level job resources summary[b]	2.85 (0.66)	2.87 (2.59–3.11)	2.80 (0.66)	2.81 (2.57–3.07)	0.088	0.040
Trust with management[b]	3.03 (0.59)	3.00 (3.00–3.33)	2.93 (0.58)	3.00 (2.67–3.00)	0.001**	0.084
Preparedness for change[b]	3.01 (0.57)	3.00 (2.67–3.33)	2.90 (0.60)	3.00 (2.67–3.00)	<0.001***	0.087
Respect for individuals	2.82 (0.58)	3.00 (2.52–3.00)	2.70 (0.59)	2.67 (2.33–3.00)	<0.001***	0.103
Fair personnel evaluation	2.77 (0.64)	3.00 (2.33–3.00)	2.70 (0.65)	3.00 (2.33–3.00)	0.069	0.043
Diversity	3.02 (0.53)	3.00 (2.67–3.33)	2.95 (0.53)	3.00 (2.67–3.00)	0.004**	0.068
Career development	2.79 (0.53)	2.80 (2.40–3.00)	2.71 (0.57)	2.80 (2.40–3.00)	0.002**	0.070
Work-self balance (positive)	2.53 (0.70)	2.50 (2.00–3.00)	2.52 (0.69)	2.50 (2.00–3.00)	0.887	0.003
Organizational-level job resources summary[b]	2.81 (0.59)	2.84 (2.54–3.00)	2.76 (0.60)	2.78 (2.53–3.00)	0.072	0.046
Vigor	2.44 (0.73)	2.33 (2.00–3.00)	2.40 (0.74)	2.33 (2.00–3.00)	0.170	0.032
Anger-irritability	3.06 (0.78)	3.00 (2.67–3.67)	2.93 (0.74)	3.00 (2.33–3.67)	<0.001***	0.089
Fatigue	2.90 (0.84)	3.00 (2.33–3.67)	2.67 (0.85)	2.67 (2.00–3.33)	<0.001***	0.141
Anxiety	2.99 (0.76)	3.00 (2.67–3.67)	3.02 (0.74)	3.00 (2.67–3.67)	0.502	0.016
Depression	3.36 (0.62)	3.50 (3.00–3.83)	3.34 (0.60)	3.50 (3.00–3.83)	0.091	0.040
Psychological stress reaction (total)	3.02 (0.59)	3.06 (2.67–3.50)	2.95 (0.56)	3.00 (2.61–3.33)	0.002**	0.073
Physical stress reaction	3.31 (0.50)	3.36 (3.00–3.72)	3.15 (0.49)	3.18 (2.81–3.55)	<0.001***	0.182
Job satisfaction	3.03 (0.75)	3.00 (3.00–4.00)	2.98 (0.68)	3.00 (3.00–3.00)	0.042*	0.048
[Satisfaction with family life][c]	3.30 (0.72)	3.00 (3.00–4.00)	3.16 (0.75)	3.00 (3.00–4.00)	<0.001***	0.097
Workplace harassment	3.70 (0.54)	4.00 (3.50–4.00)	3.65 (0.61)	4.00 (3.50–4.00)	0.259	0.027
Workplace social capital	3.09 (0.57)	3.00 (3.00–3.33)	3.03 (0.59)	3.00 (3.00–3.33)	0.065	0.043
Work engagement	2.99 (0.62)	3.00 (2.50–3.50)	2.93 (0.60)	3.00 (2.50–3.50)	0.020*	0.055

A scale's score was calculated as an average item score (i.e., a sum of the item scores divided by the number of items) ranging from 1 to 4 for each scale after converting all item scores so that higher scores indicated better status (i.e., a higher score of job demands means lower job demands, and a higher score of psychological stress reaction means lower level of psychological distress; while, a higher score of job resources means richer job resources).

[a] The effect size *r* was calculated by dividing the *z* value by the square root of the total number of cases

[b] Principal's data were excluded when calucalating scores of these scales.

[c] [ ] indicates non-work environment or outcome.

*p<0.05, **p<0.01, ***p<0.001.

N: Number of cases; *M*: Mean; *SD*: Standard deviation; *Mdn*: Median; *IQR*: Interquartile range.

Table 4. Multiple regression analysis examining relationship between a participant's demographic variables, the New Brief Job Stress Questionnaire (BJSQ) summary-level scales, and outcome scales with interaction terms among male teachers (*N*=821, principals' data were excluded)

Scales	Psychological stress reactions	Physiological stress reactions	Work engagement	Workplace social capital	Workplace harassment
Years of experience	−0.009	−0.079*	−0.004	0.057*	−0.008
Working at junior high school (reference: Elementary school)	−0.022	−0.077*	−0.003	−0.038	−0.015
Marital status (reference: Never married)					
Currently married	0.073	0.056	0.000	0.013	0.032
Others[a]	0.065	0.069	−0.036	0.012	−0.011
Living with children (reference: No)	−0.003	−0.010	−0.046	0.004	0.023
Living with one's own parents (reference: No)	0.025	0.049	0.035	−0.005	0.040
Living with parents-in-law (reference: No)	−0.006	−0.012	0.020	0.024	−0.010
Overtime work hours on weekdays (hours per week)	−0.052	−0.085*	0.020	0.004	−0.015
Working on holidays (reference: No)	−0.000	0.016	0.084**	0.064*	−0.039
Bringing work home (reference: No)	0.012	−0.011	0.025	0.022	−0.027
Support from family and friends[b]	0.067	0.060	0.063*	−0.001	−0.047
Job demands[c]	0.459***	0.304***	0.048	0.163***	0.211***
Task-level job resources[c]	0.257***	0.086*	0.536***	0.093**	0.023
Workgroup-level job resources[c]	0.042	0.028	0.002	0.162**	0.312***
Organizational-level job resources[c]	−0.015	−0.036	0.217***	0.391***	0.052
Job demands × task-level job resources	−0.047	−0.024	−0.079*	0.129***	0.010
Job demands × workgroup-level job resources	−0.002	−0.010	0.095	−0.002	−0.037
Job demands × organizational-level job resources	−0.049	−0.079	0.003	−0.110*	−0.165*
R^2	0.431	0.152	0.550	0.501	0.282

Standardized regression coefficient (β) is shown in each category. R^2: Adjusted R square.

[a] Currently unmarried after divorce or the death of a spouse.

[b] Support from fammily and friends was treated independently as a predictor variable because of its non-work environment.

[c] The score of each summary-level scale was calculated as an average score of its component subscales.

*p<0.05, **p<0.01, ***p<0.001.

0.536, p<0.001 in men and β=0.492, p<0.001 in women). For both genders, workgroup- and organizational-level job resources were positively and significantly associated with workplace social capital. The largest regression coefficients were those of organizational-level job resources for both genders (β=0.391, p<0.001 in men and β=0.408, p<0.001 in women). In male teachers, job demands and task-level job resources were also positively and significantly associated with workplace social capital (β=0.163, p<0.001 and β=0.093, p=0.003, respectively).

For the workplace social capital scores in male teachers, positive and significant interaction effects between job demands and task-level job resources were observed (β=0.129, p<0.001). By contrast, negative and significant interaction effects between job demands and organizational-level job resources were observed for workplace social capital and workplace harassment scores among male teachers (β=−0.110, p=0.048 and β=−0.165, p=0.016, respectively). For the work engagement scores of male teachers, negative and significant interaction effects between job demands and task-level job resources were observed (β=−0.079, p=0.022).

In female teachers, positive and significant interaction effects between job demands and organizational-level job resources were observed for psychological stress reactions (β=0.123, p=0.037). For the workplace harassment scores of female teachers, negative and significant interaction effects between job demands and work-level job resources were observed (β=−0.157, p=0.016). No other significant interaction effects were observed for either gender.

Discussion

The present study evaluated teachers' work-related stress using a comprehensive, multidimensional job-stress scale called the New BJSQ. The effects of gender on teachers' stress outcomes were also investigated. This study elucidated the gender difference in teachers' occupational stress levels and the impacts of family factors on stress outcomes among them. In addition, as far as we

Table 5. Multiple regression analysis examining relationship between a participant's demographic variables, the New BJSQ summary-level scales, and outcome scales with interaction terms among female teachers (*N*=746, principals' data were excluded)

Scales	Psychological stress reactions	Physiological stress reactions	Work engagement	Workplace social capital	Workplace harassment
Years of experience	−0.005	−0.029	−0.038	−0.008	0.042
Working at junior high school (reference: Elementary school)	−0.004	0.014	−0.006	−0.077*	−0.074
Marital status (reference: Never married)					
Currently married	−0.071*	−0.055	0.024	0.032	0.001
Others[b]	−0.045	−0.088**	0.015	0.022	−0.074*
Living with children (reference: No)	−0.016	−0.031	−0.039	0.029	0.019
Living with one's own parents (reference: No)	−0.052	−0.061	−0.026	0.020	0.033
Living with parents-in-law (reference: No)	0.028	−0.042	0.016	0.019	−0.035
Overtime work hours on weekdays (hours per week)	0.016	0.003	0.023	0.009	−0.022
Working on holidays (reference: No)	0.003	0.007	−0.018	−0.004	−0.029
Bringing work home (reference: No)	0.029	−0.023	0.041	0.013	−0.014
Support from family and friends[b]	0.130***	0.187***	0.079**	−0.025	0.062
Job demands[c]	0.518***	0.383***	0.013	0.054	0.062
Task-level job resources[c]	0.202***	0.087	0.492***	0.044	0.003
Workgroup-level job resources[c]	−0.071	−0.127*	−0.059	0.257***	0.405***
Organizational-level job resources[c]	0.099*	0.080	0.302***	0.408***	0.063
Job demands × task-level job resources	−0.054	−0.013	0.001	−0.002	−0.045
Job demands × workgroup-level job resources	−0.106	−0.140	−0.019	0.028	−0.157*
Job demands × organizational-level job resources	0.123*	0.101	0.001	−0.110	0.009
R^2	0.461	0.225	0.476	0.509	0.293

Standardized regression coefficient (β) is shown in each category. R^2: Adjusted R square.

[a] Currently unmarried after divorce or the death of a spouse.

[b] Support from fammily and friends was treated independently as a predictor variable because of its non-work environment.

[c] The score of each summary-level scale was calculated as an average score of its component subscales.

*p<0.05, **p<0.01, ***p<0.001.

know, this was the first study to clarify noticeable differences between job demands and job resources in their degree of contribution to occupational stress outcomes using the New BJSQ with an adequately large sample size of schoolteachers.

The results showed that almost all job demand scores were significantly lower (i.e., higher level of job demands) in female teachers than in male counterparts (Table 3). Moreover, compared to the nationally representative survey data of Japanese employees in 2020–2021[21, 29], almost all job demand scores for female participants were noticeably lower than women's national average scores. Furthermore, almost all female teachers' job resource scores were lower than those of male teachers. Thus, Hypothesis 1 was fully supported. These findings agreed with those of our previous study, which investigated the occupational stress levels of approximately 70,000 primary school teachers, revealing that female teachers' stress levels were significantly higher than those of male teachers[30].

A previous study reported that female teachers experienced significantly higher levels of occupational stress relating to emotional exhaustion and interaction with colleagues[31]. In addition, female teachers are more likely to experience role problems, unfair group or political pressure, and poor peer relationships than are male teachers[32]. As described, working women are affected by stressors unique to their lives, such as the glass ceiling effect, gender stereotyping, and inequality in decision-making positions, causing various mental health problems[10]. Teachers' occupational stress has been discussed as a serious social problem in Japan. The results of this study suggest that teachers' heavy job demands, especially those among female teachers, greatly contribute to this long-standing social problem in Japan.

In female teachers, support from family and friends was positively and significantly associated with several outcome scales (psychosocial and physiological stress reactions and work engagement). By contrast, support from family and friends was significantly associated with only one outcome scale (work engagement) among male teachers. This study clarified that female teachers were affected

by family factors, such as support from family, more prominently than were male teachers. Thus, Hypothesis 2 was also fully supported.

Family support plays an integral role in workers' mental health as well as in workplace environments; it alleviates occupational stresses and improves job satisfaction among working people[33]. However, a study indicated that vulnerability to work-family interaction problems differed between men and women; female workers were more susceptible to work-family conflicts than were male workers[13]. Family-to-work enrichment (FWE) represents the extent to which positive mood, behavior, and support received or generated at home favorably affect employees' well-being at work[34]. A study demonstrated that FWE was a more influential factor for female workers than for working men[35]. The same study also found that supervisor support contributed significantly to FWE in working people[35], suggesting that workplace support from a supervisor enhances workers' satisfaction and well-being not only at work but also at home. School organizations should make efforts to provide supervisors and administrative staff with training opportunities to effectively deal with teachers' work-family interaction issues, especially those among female teachers.

The results showed that having a divorced or widowed marital status (currently unmarried) was negatively and significantly associated with physical stress reactions in female teachers, but not in male teachers. Moreover, this status was negatively (and significantly) correlated with workplace harassment only among female teachers. Previous studies found that separated, divorced, or widowed workers had higher odds of reporting workplace bullying than did married or never-married ones[36, 37]. A US national survey reported that the risk of workplace harassment was significantly higher among divorced or separated women than among those who were not[36]. Prejudice, stigma, and negative stereotypes toward single parents exist throughout society, including the workplace[37]. They are more likely to experience denial of employment opportunities and exclusion from promotion and career-development opportunities[37]. The findings of the present study suggest that divorced or widowed female teachers may be in severely stressful situations and might be confronted with unfair treatment in the school workplace in Japan. Administrators and organizations should be mindful of the distinct struggles, experiences, and situations among them.

Multiple regression analysis showed that both job demands and job resources (task-level) were significant predictors of psychological and physiological stress reactions for male and female teachers. By contrast, significant predictors of positive outcomes such as work engagement and workplace social capital were job resources (task-, workgroup- and organizational-level). Moreover, organizational job resources were the most significant contributing factor to workplace social capital in both male and female teachers. Our findings are consistent with those of a previous study[21], and also with the proposed framework of the JD-R model in which job demands mainly predict negative emotional reactions (such as burnout) while job resources predict both negative and positive emotional reactions (such as work engagement)[25]. Therefore, Hypotheses 3 and 4 were also fully supported.

A significant factor relating to teachers' attrition is burnout, which might result in them leaving the workplace[38]. Alarcon's meta-analytic study demonstrated that higher job demands and lower job resources were significantly associated with burnout among workers in various sectors[39]. Another systematic review elucidated the harmful effects of various job demands on occupational burnout[40]. School organizations must implement measures to reduce teachers' job demands such as quantitative workloads and provide appropriate job resources to prevent teachers' sick leave and maximize their job performance.

Among the New BJSQ job demand scales, emotional demands were the most salient factor leading to psychological stress reactions in both male and female teachers (Appendices 1 and 2). Emotional demands were also highly associated with work engagement and workplace social capital for both genders. Teaching involves exposure to situations in which they experience various types of intense emotions. Successful interactions with students, colleagues, administrators, and parents require teachers to control their emotional reactions. To address teachers' emotional demands, school administrators and supervisors should recognize the distinct aspects of emotional burdens that teachers are likely to experience and provide organizational opportunities to encourage them to develop effective emotional management skills. Moreover, providing emotional support to teachers will be essential for protecting their mental health.

Work engagement, which is defined as a positive and fulfilling work-related state of mind characterized by vigor, dedication, and absorption[41], is reported to have positive impacts on creativity and task performance among workers[42]. In addition, engaged employees are more prone to help others and exhibit organizational citizenship behavior[42]. Thus, enhancing an employee's work

engagement is one of the crucial components for fostering successful workplace environment. Halbesleben's meta-analytic study identified that job resources, such as autonomy, social support, and task significance, were significant predictors of work engagement among working people[26]. In another meta-analytic study, all levels of job resources were positively associated with work engagement; however, organizational-level resources (i.e., how the work is organized, designed, and managed) contributed more strongly to work engagement than did other job resources[43]. Mazzetti *et al.* demonstrated that developmental resources (i.e., career development opportunities) had a significant impact on employees' work engagement[44]. Organizational support, such as securing teachers' autonomy, providing proper social support, and encouraging their career development, should be considered to enhance work engagement among teachers.

Workplace social capital is defined as a workplace resource related to employees' perceptions concerning trust, reciprocity, shared values, and network interactions among individual workers[45]. It may benefit organizations by encouraging employees to engage in collective behavior and providing access to further resources[46]. Workplace social capital positively relates to job performance, psychological well-being, and work engagement among working people[47]. Several workplace interventions were reported to strengthen the social capital in work teams[48]. Meng *et al.* investigated the effects of a participatory workplace improvement program aimed at enhancing workplace social capital[48]. They found that teams that had developed action plans through an employee's active participation exhibited a larger increase in workplace social capital than did other teams[48]. This participatory style of program was also identified as an effective and practical method for promoting comprehensive risk management among both workers and employers[49]. Offering a workplace improvement program, in which an individual teacher actively participates in the planning process, should be considered to foster a cohesive workplace environment and the consequent positive mental health among individual teachers.

Regarding the interaction effects between job demands and job resources, positive and significant interaction effects were observed only in the workplace social capital of male teachers (job demands × task-level job resources) and in the psychological stress reactions of female teachers (job demands × organizational-level job resources). No other positive significant interaction effects were observed for either gender. The positive synergistic effects between job demands and job resources, which are proposed in the JDC and JDCS models, were not fully supported in this study. Meanwhile, negative interaction effects between job demands and job resources were found in several outcomes, such as work engagement, workplace social capital, and workplace harrasment. These negative interaction effects between job demands and resources may relate to the 'boosting' effect of the JD-R theory, which refers to the way in which job resources become particularly important for employees' work engagement when job demands are high[42]. Bakker *et al.* demonstrated that job resources influenced work engagement especially when teachers are confronted with high levels of job demands such as pupil misconduct[50]. The multifaceted aspects of interaction between job demands and job resources are worthy of further study.

This study did not demonstrate significant negative impacts of overtime work on the outcome scales among participants (except on physiological stress reactions in male teachers), however, the results showed that approximately 70% of participants worked overtime for more than 10 h (per week) on weekdays. In addition, approximately 40% of them worked overtime for more than 15 h (per week) on weekdays, and approximately 60% reported working on holidays. In Japan, new legislation on work-style reforms was passed in 2018[51]. Under this amended law, the legal limit on overtime working hours is capped at 45 h per month and 360 h per year in principle, with penalties imposed for employers that violate these regulations. In addition, 80 h or more of overtime per month is regarded as a criterion for sudden death from overwork because it significantly increases the risk of cardiovascular disease[51]. The present study revealed that a substantial proportion of teachers worked over this legal limit, suggesting the possibility of some developing serious health problems. This study elucidated that long working hours remain a common problem in the school workplace in Japan. Measures against this issue need to be taken promptly.

Although this study provides several important insights, it has some limitations. First, many participants were middle-aged teachers (older than 40 yr old). Considering the growing importance of this labor force in the Japanese school workplace, we recruited participants at the hospital's health checkup center, which is visited by a relatively large number of teachers in this age group. However, to evaluate teachers' occupational stress more comprehensively and unbiasedly, the recruitment of younger teachers (in their 20s to 30s) and a subsequent comparative analysis between different generations will be required. Second, a few scales such as monetary/status reward and job security

showed poor internal consistency. The reliability of these scales was demonstrated in a nationally representative survey of 1,398 Japanese employees[21]; however, further study is needed to confirm measurement reliability. Third, several different teachers' job positions exist in Japanese public schools; however, we analyzed their data together (except principals). This may not have been feasible because teachers' occupational stress is expected to differ depending on their job positions (e.g., between classroom teachers, nursing teachers, and nutrition teachers). Finally, this study investigated occupational stress among teachers who worked at public elementary and junior high schools. The results may be different in different school settings, such as high schools, special education schools, and private schools. Further well-designed prospective studies incorporating these variables are required to address the possible biases.

Conclusions

The present study investigated teachers' occupational stresses using a comprehensive job stress questionnaire called the New BJSQ, while considering the influence of gender. This study elucidated the gender difference in teachers' occupational stress levels and the impacts of family factors on their stress outcomes. The results also demonstrated noticeable differences between job demands and job resources in their degree of contribution to occupational stress outcomes among schoolteachers. The results found that female teachers exhibited significantly more psychological and physical stress reactions and perceived less job resource availability than did male teachers. Moreover, support from family or friends affected stress outcomes among female teachers more strongly than those among male counterparts. The impacts of marital status also differed between male and female teachers. Teachers' job demands were strongly associated with psychological and physical stress reactions. By contrast, perceived job resources contributed strongly to positive workplace outcomes such as workplace engagement and workplace social capital. Administrators should be mindful of the distinctive emotional burdens of teachers and pay attention to their mental health, while considering the influence of gender. Organizational support, such as securing teachers' autonomy, providing proper social support, encouraging their career development, and acknowledging diversity, should be considered to enhance teachers' work engagement and create a cohesive school workplace.

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Appendix 1. Multiple regression analysis examining relationship between a participant's demographic variables, the New Brief Job Stress Questionnaire (BJSQ) job demand and job resource scales, and outcome scales among male teachers (*N*=821, principals' data were excluded)

Scales	Psychological stress reactions	Physiological stress reactions	Work engagement	Workplace social capital	Workplace harassment
Years of experience	0.009	−0.056	0.01	0.048	−0.010
Working at junior high school (reference: Elementary school)	−0.028	−0.083*	−0.005	−0.021	−0.022
Marital status (reference: Never married)					
Currently married	0.064	0.055	−0.006	0.002	0.015
Others[a]	0.059	0.067	−0.031	0.002	−0.002
Living with children (reference: No)	−0.008	−0.018	−0.061*	−0.008	0.017
Living with one's own parents (reference: No)	0.020	0.045	0.031	−0.016	0.037
Living with parents-in-law (reference: No)	−0.024	0.003	0.007	0.021	−0.001
Overtime work hours on weekdays (hours per week)	−0.043	−0.074*	0.032	−0.015	−0.025
Working on holidays (reference: No)	−0.006	0.033	0.062*	0.052	−0.056
Bringing work home (reference: No)	0.017	−0.018	0.002	0.020	−0.030
Quantitative job overload	0.185***	0.034	−0.043	−0.002	0.022
Qualitative job overload	−0.024	0.025	−0.022	−0.003	−0.003
Physical demands	0.043	−0.002	0.004	0.000	0.010
Interpersonal conflict	0.136***	0.107*	0.014	0.211***	0.314***
Poor physical environment	0.027	0.079*	−0.030	0.002	−0.044
Emotional demands	0.253***	0.047	0.069*	0.084*	0.012
Role conflict	−0.007	0.115*	0.085*	0.011	0.078
Work-self balance (negative)	0.082*	0.109**	0.013	0.010	−0.034
Job control	0.035	−0.045	0.069*	−0.003	0.020
Suitable jobs	0.079*	0.015	0.185***	0.023	−0.039
Skill utilization	0.087**	0.038	0.008	0.015	0.017
Meaningfulness of work	0.062	−0.047	0.286***	0.012	0.011
Role clarity	−0.039	0.036	0.007	0.054	0.000
Career opportunity	0.036	0.027	0.047	−0.021	0.016
Supervisor support	0.041	−0.032	−0.062	−0.126**	−0.041
Coworker support	0.060	0.032	0.035	0.168***	0.048
Support from family and friends	0.032	0.057	0.062*	−0.026	−0.063
Monetary/status reward	−0.047	0.035	0.028	0.011	0.016
Esteem reward	0.003	0.011	0.018	0.030	0.058
Job security	0.061	0.053	−0.005	−0.006	0.188***
Leadership	−0.014	−0.023	−0.033	−0.057	−0.048
Interactional justice	−0.086	−0.067	−0.011	0.106	0.200*
Workplace where people compliment each other	−0.001	−0.100	0.023	−0.028	−0.011
Workplace where mistakes are acceptable	0.026	0.054	0.082*	0.043	−0.046
Trust with management	−0.055	0.061	0.009	0.164*	0.272**
Preparedness for change	0.059	0.066	−0.030	0.040	−0.058
Respect for individuals	0.031	0.014	0.077	0.037	−0.018
Fair personnel evaluation	0.006	0.004	−0.014	−0.001	−0.007
Diversity	−0.008	−0.130**	0.050	0.151***	0.105**
Career development	−0.048	−0.059	−0.027	0.195***	−0.053
Work-self balance (positive)	0.094**	0.094*	0.233***	−0.014	−0.069
R^2	0.463	0.163	0.626	0.550	0.353

Standardized regression coefficient (β) is shown in each category. R^2: Adjusted R square.

[a] Currently unmarried after divorce or the death of a spouse.

*p<0.05, **p<0.01, ***p<0.001.

Appendix 2. Multiple regression analysis examining relationship between a participant's demographic variables, the New Brief Job Stress Questionnaire (BJSQ) job demands and job resource scales, and outcome scales among female teachers (*N*=746, principals' data were excluded)

Scales	Psychological stress reactions	Physiological stress reactions	Work engagement	Workplace social capital	Workplace harassment
Years of experience	−0.008	−0.030	−0.021	0.009	0.035
Working at junior high school (reference: Elementary school)	−0.008	0.006	−0.019	−0.046	−0.040
Marital status (reference: Never married)					
Currently married	−0.038	−0.048	0.018	0.026	−0.005
Others[a]	−0.036	−0.091**	0.015	0.027	−0.068*
Living with children (reference: No)	−0.028	−0.025	−0.056*	0.036	0.032
Living with one's own parents (reference: No)	−0.032	−0.049	−0.013	0.018	0.018
Living with parents-in-law (reference: No)	0.031	−0.037	0.005	0.015	−0.020
Overtime work hours on weekdays (hours per week)	0.005	0.002	−0.019	−0.010	−0.046
Working on holidays (reference: No)	0.009	0.010	−0.015	−0.031	−0.043
Bringing work home (reference: No)	0.001	−0.036	0.008	−0.005	−0.032
Quantitative job overload	0.157***	0.071	−0.013	−0.071	−0.042
Qualitative job overload	0.086*	0.06	−0.074*	−0.001	−0.038
Physical demands	0.023	0.049	0.035	0.007	−0.030
Interpersonal conflict	0.090**	0.035	−0.001	0.267***	0.250***
Poor physical environment	0.020	0.057	−0.022	0.014	0.054
Emotional demands	0.240***	0.089	0.098**	0.112**	0.018
Role conflict	0.057	0.092	0.041	−0.066	−0.003
Work-self balance (negative)	0.067*	0.100*	−0.038	−0.028	0.019
Job control	0.025	−0.006	−0.048	−0.035	−0.033
Suitable jobs	0.117***	0.049	0.132***	0.011	−0.052
Skill utilization	0.001	−0.023	0.028	−0.020	0.019
Meaningfulness of work	0.058	0.001	0.299***	−0.005	−0.018
Role clarity	0.001	0.061	0.001	0.034	0.102*
Career opportunity	0.036	−0.007	0.053	0.006	−0.081
Supervisor support	0.085	0.072	−0.047	−0.050	0.074
Coworker support	−0.089*	−0.090	−0.008	0.125**	−0.007
Support from family and friends	0.139***	0.193***	0.061*	−0.041	0.081*
Monetary/status reward	−0.053	−0.018	−0.045	−0.114***	−0.085*
Esteem reward	0.073	0.015	0.054	0.112**	0.247***
Job security	0.057	0.018	0.019	0.053	0.164***
Leadership	−0.079	−0.125	0.056	0.012	−0.054
Interactional justice	0.027	0.025	0.054	0.084	0.094
Workplace where people compliment each other	−0.047	−0.022	−0.031	−0.069	−0.116*
Workplace where mistakes are acceptable	0.041	0.055	0.067	0.059	0.051
Trust with management	0.014	−0.078	−0.028	0.140	0.378***
Preparedness for change	−0.031	−0.007	0.071	0.076	−0.116*
Respect for individuals	0.041	0.027	0.027	0.051	0.098
Fair personnel evaluation	0.053	0.026	−0.065	0.031	0.005
Diversity	0.006	0.008	−0.013	0.112***	0.043
Career development	−0.096*	−0.018	0.018	0.158***	0.007
Work-self balance (positive)	0.105**	0.085	0.392***	0.070*	−0.078
R^2	0.508	0.217	0.623	0.578	0.375

Standardized regression coefficient (β) is shown in each category. R^2: Adjusted R square.

[a] Currently unmarried after divorce or the death of a spouse.

*p<0.05, **p<0.01, ***p<0.001.