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Original article

Formulations of Job Strain and Psychological Distress: A Four-year Longitudinal Study in Japan

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A B S T R A C T

Background: Different job strain formulations based on the Job Demand-Control model have been developed. This study evaluated longitudinal associations between job strain and psychological distress and whether associations were influenced by six formulations of job strain, including quadrant (original and simplified), subtraction, quotient, logarithm quotient, and quartile based on quotient, in randomly selected Japanese workers.
Methods: Data were from waves I and II of the Survey of Midlife in Japan (MIDJA), with a 4-year follow-up period. The study sample consisted of 412 participants working at baseline and had complete data on variables of interest. Associations between job strain at baseline and psychological distress at follow-up were assessed via multivariable linear regression, and results were expressed as β coefficients and 95% confidence intervals including R^2 and Akaike information criterion (AIC) evaluation.
Results: Crude models revealed that job strain formulations explained 6.93–10.30% of variance. The AIC ranged from 1475.87 to 1489.12. After accounting for sociodemographic and behavioral factors and psychological distress at baseline, fully-adjusted models indicated significant associations between all job strain formulations at baseline and psychological distress at follow-up: original quadrant (β: 1.16, 95% CI: 0.12, 2.21), simplified quadrant (β: 1.01, 95% CI: 0.18, 1.85), subtraction (β: 0.39, 95% CI: 0.09, 0.70), quotient (β: 0.37, 95% CI: 0.08, 0.67), logarithm quotient (β: 0.42, 95% CI: 0.12, 0.72), and quartile based on quotient (β: 1.22, 95% CI: 0.36, 2.08).
Conclusion: Six job strain formulations showed robust predictive power regarding psychological distress over 4 years among Japanese workers.

1. Introduction

The Job-Demand-Control (JDC) model proposed by Karasek in 1979 has been widely used to measure occupational stress across various workplace cultures and professions [1]. The JDC model is derived from operational dimensions of psychological job demands and control over work. It postulates that job strain results from the joint effects of high job demands and low job control. Several approaches have been developed to evaluate job strain. For instance, the traditional quadrant job strain variable is based on median cutoffs of job demands and job control, including low strain, active, passive, and high strain [2–6]; a simplified form with binary

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categories by combining (low strain, active, passive) together [7,8]; quotient job strain in which job demand is divided by job control [2,3,5,6,8]; quotient job strain via logarithmic transformation of the ratio between job demands to job control in order to place inverse strain of the same magnitude in the same distance from 1 (when demands and control are equal) [2,9]; the tertile or quartile categorization according to the distribution of the quotient job strain [8,9]; and subtraction job strain by subtracting job control from job demand [2,3,5,8].

A few studies examined different job strain formulations in assessments of job strain with health outcomes [2,3,5,6,8]. Various health outcomes were investigated in these studies, including blood pressure (BP) [3,5], carotid intima-media thickness (IMT) [8], mental health [2,3], burnout [6], back pain leave, perceived physical health [2], and general health [3]. Most studies showed robust relationships: quadrant, quotient, and subtraction job strains were significantly associated with systolic BP [5]; quadrant and quotient job strains were significantly associated with burnout [6]; quadrant, quotient, logarithmic, and subtraction job strains were significantly associated with back pain leave, physical health, and mental health [2]; quadrant, quotient, and subtraction job strains were associated with general health, mental health, and diagnosed with hypertension [3]. On the other hand, a study from Finland reported significant associations of IMT with subtraction, quotient, and tertile job strains but not simplified job strain [8].

Internationally, it has been documented that job strain predicts a host of mental health indicators and psychiatric conditions [10,11]. In a typical Eastern country such as Japan, mental health among Japanese workers has been recognized as a concern of major public health significance, with 608 recognized cases of work-related mental illness with official compensation in 2020 [12]. Research evidence in Japan has clearly suggested that stress at work is associated with severe consequences, including the development of psychosomatic symptoms and depression [13]. Psychological distress is a widely used indicator of mental health status, especially in large epidemiological studies. It measures manifestations of psychological distress that have been shown to be significant predictors of severe psychiatric conditions [14]; specifically, the 6-item Kessler Psychological Distress (K6) has been applied in many countries, including Japan [15].

The JDC model and questionnaire were translated into Japanese and validated in 1995 [16,17]. Since then, job strain has been used to measure psychosocial job characteristics in Japan. Accordingly, several studies have been conducted in Japan to examine the potential impact of the JDC model and/or its components on psychological distress. Most studies used job demands as a single occupational stress variable [18–24], while three studies used job strain [25–27]. One cross-sectional [25] and two longitudinal [26,27] with restricted occupations, only used the ratio of job demand/control to create high and low job strain groups by median cut-off [25,27] or mean cut-off [26], and they all showed significant associations with psychological distress.

In the five above-mentioned methodological studies examining different formulations of job strain [2,3,5,6,8], all of them were conducted in non-Eastern countries, one from the U.S. [5], two from Finland [6,8], one from Switzerland [2], and one from Colombia [3]. One study used population-based samples [8], while the rest had restricted occupations [2,3,5,6]. Importantly, all these studies were based on cross-sectional data. To the best of our knowledge, such methodological studies on formulations of job strain have not yet been reported in Asia; and systematic investigation regarding the predictive power of different formulations of job strain on mental health using population-based samples with longitudinal research design is still lacking.

Therefore, the present study had two objectives. The first objective was to examine associations of job strain with psychological distress in randomly selected Japanese workers in Tokyo, Japan, with a longitudinal design and 4-years of follow-up. We hypothesize that workers with high job strain will exhibit increased levels of psychological distress after 4 years. The second objective was to test different formulations of job strain in association with psychological distress. We hypothesize that six formulations, including quadrant original, quadrant simplified, subtraction, quotient, logarithm quotient, and quartile based on quotient job strain, will demonstrate consistent performance if the associations between job strain and psychological distress are robust.

2. Materials and methods

2.1. Study population

Data were from waves I and II of the Survey of Midlife in Japan (MIDJA) [28,29]. MIDJA wave I was administered in 2008, and wave II was conducted in 2012. Two-stage stratified random sampling was used to select Japanese adults aged 30 to 80 from the Basic Resident Register Book in Tokyo, Japan. Data were collected via self-administered questionnaires and phone interviews, including sociodemographic, health, and occupational data.

Inclusion criteria were participants who were working for pay at baseline and answered all relevant questions regarding sociodemographics, job strain, and psychological distress. Participants who were not working at baseline did not participate in wave II or had missing data on variables of interest were excluded. In this study, 1,027 participants were enrolled at baseline. In these, 735 participants worked for pay, while 83 participants with missing data for job strain, psychological distress, and covariates in wave I were excluded. Among 652 workers with complete data, 422 individuals participated in the follow-up survey, representing a follow-up rate of 64.72%, which was comparable to the overall follow-up rate, i.e., 63.79% among all MIDJA study subjects. We compared the baseline characteristics of this sample of 422 participants with the sample available at baseline to identify bias due to attrition during follow-up ($N = 652-422 = 230$). The participants lost to follow-up were more likely to be younger, male, married, and experience psychological distress. However, baseline job strain was not significantly different between those followed-up and those lost to attrition. There were no differences in educational attainment, management position, smoking status, or physical exercise (for details, please see Supplemental Table 1). Furthermore, we excluded 10 participants with missing data for psychological distress in wave II. The process of sample size selection yielded a final analytic sample of 412 participants (Fig. 1).

This study was conducted according to the guidelines of the Declaration of Helsinki and reviewed and approved for exemption by the University of California, Los Angeles Institutional Review Board (IRB#22-000836).

2.2. Measures

2.2.1. Job strain

Job strain based on Karasek's JDC model [4,17] is the combination of high job demands with low job control. The five-item job demands scale assesses task interruptions, conflicting demands, time adequacy, and requirements for intensive concentration. Example items include: "How often do you have to work very intensively?" and "How often are too many demands made on you?" The nine-item job control scale measures skill discretion and decision authority. Example items include: "How often do you learn new things at work?" and "How often do you have a choice in

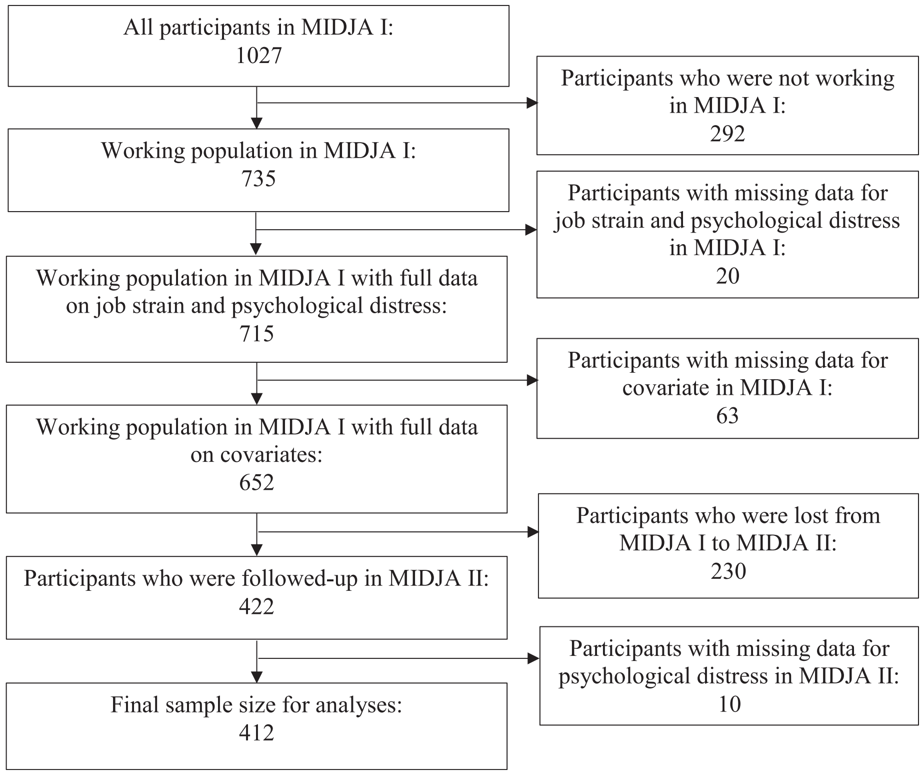

Fig. 1. Sample size selection.

deciding what tasks you do at work?" Responses were recorded on a five-point Likert scale (1 = none of the time, 5 = all the time). The items assessing job strain in the MIDJA study were comparable to Karasek's original Job Content Questionnaire [30]. Cronbach's alpha coefficients for job demands and control in the present study were 0.758 and 0.887, respectively.

We operationalized job strain at baseline using six approaches shown in Table 1. An original quadrant job strain variable was generated based on median cut-off points of job demands and job control, i.e., low strain (low demand + high control, reference group), active (high demand + high control), passive (low demand + low control), and high strain (high demand + low control) [2–6]. Simplified quadrant job strain was a binary variable generated by the high job strain and other strain groups (low job strain + passive + active, reference group) [7,8]. Subtraction job strain was produced by deducting the job control score from the job demand score after weighting by the item numbers of respective scales [2,3,5,8]. Quotient job strain was calculated by dividing the job demand score by the job control score, similarly after weighting by the item numbers of respective scales [2,3,5,6,8]. Additionally, the quotient of job demands to job control was logarithmically transformed to produce logarithm quotient job strain [2,9]. We also classified job strain into four groups by quartile cut-offs based on quotient job strain: low (reference group), medium–low, medium–high, and high job strain [8,9].

Table 1
Different job strain formulations

Approaches	Formulas
Quadrant (original)	Low strain: low job demand + high job control Active: high job demand + high job control Passive: low job demand + low job control High strain: high job demand + low job control
Quadrant (simplified)	Low strain: other combinations together High strain: high job demand + low job control
Subtraction	[(Job demand) × 9] − [(Job control) × 5]
Quotient	[(Job demand) × 9]/[(Job control) × 5]
Logarithm quotient	log{[(job demand) × 9]/[(Job control) × 5]}
Quartile (based on quotient)	Low quartile: 0–25% Medium–low quartile: 26–50% Medium–high quartile: 51–75% High quartile: 76–100%

2.2.2. Psychological distress

The outcome of interest was psychological distress, as determined by K6 [31] at follow-up. K6 contains six questions (any experiences of sadness, nervousness, restlessness, hopelessness, effort, or worthlessness) distinguishing psychological distress from non-psychological distress cases [31]. The Japanese version of K6 has been validated to effectively detect psychological distress [15]. Cronbach's alpha coefficients for K6 at baseline and follow-up in the present study were 0.872 and 0.868, respectively. Participants reported their experiences of each symptom in the past 30 days on 4-point Likert scale (0 = none of the time, 4 = all the time). K6 ranged from 0 to 24, with a high value indicating a high level of psychological distress.

2.2.3. Covariates

Covariates considered in this study were age (30–45, 46–55, and ≥ 56), sex (men and women), marital status (married, never married, and others), educational attainment (high school or less, some college, and university degree or more), management position (yes or no), smoking (current smoker, former smoker, and never smoker), alcohol consumption (number of drinks per week), and

Table 2
Characteristics of the study sample ($N = 412$)

Variables		N (%)
Age at baseline	30–45 years	148 (35.92%)
	46–55 years	115 (27.90%)
	≥56 years	149 (36.17%)
Sex at baseline	Men	225 (54.61%)
	Women	187 (45.39%)
Marital status at baseline	Married	293 (71.12%)
	Never married	73 (17.72%)
	Others	46 (11.16%)
Education at baseline	High school or less	143 (34.71%)
	Some college	106 (25.73%)
	University or more	163 (39.56%)
Management position at baseline	No	272 (66.02%)
	Yes	140 (33.98%)
Smoking at baseline	Current smoker	118 (28.64%)
	Former smoker	146 (35.44%)
	Never smoker	148 (35.92%)
Alcohol consumption (drinks per week) at baseline	Median (range)	3.00 (0.00–70.00)
Physical exercise at baseline	No	237 (57.52%)
	Yes	175 (42.48%)
Job strain – quadrant (original) at baseline	Low strain	82 (19.90%)
	Active	129 (31.31%)
	Passive	143 (34.71%)
	High strain	58 (14.08%)
Job strain – quadrant (simplified) at baseline	Low Strain	354 (85.92%)
	High strain	58 (14.08%)
Job strain – subtraction at baseline	Mean ± SD	−25.21 ± 39.39
Job strain – quotient at baseline	Mean ± SD	0.87 ± 0.30
Job strain – logarithm quotient at baseline	Mean ± SD	−0.20 ± 0.33
Job strain – quartile (based on quotient) at baseline	Low quartile	103 (25.00%)
	Medium–low quartile	103 (25.00%)
	Medium–high quartile	108 (26.21%)
	High quartile	98 (23.79%)
Psychological distress at baseline	Mean ± SD	3.95 ± 3.89
Psychological distress at follow-up	Mean ± SD	4.16 ± 3.81

physical activity (yes or no), in line with previous analyses of the MIDJA study [32].

2.3. Statistical analysis

First, descriptive statistics were generated. Means and standard deviations (SDs) were investigated for continuous variables, and relative frequencies and percentages were examined for categorical variables. Associations of job strain at baseline with psychological distress at follow-up were then evaluated by multivariable linear regression, with results expressed as β coefficients and 95% confidence intervals (CIs). Analyses were adjusted in 3 steps: Model 0 was crude and without adjustment; Model I adjusted for age, sex, marital status, educational attainment, management position, smoking, alcohol consumption (which was logarithmically transformed due to right-skewed distribution), and physical exercise at baseline. Model II included an additional adjustment for baseline psychological distress, in order to take ceiling/floor effect into account, given the highly correlated outcome measures at baseline and at follow-up in longitudinal study (correlation coefficient = 0.64, $p < 0.001$). To test the robustness of associations between job strain at baseline and psychological distress at follow-up, we examined six formulations of job strain: original quadrant, simplified quadrant, subtraction, quotient, logarithm quotient, and quartile. Due to the continuous measures of three job strain formulations (subtraction, quotient, and logarithm quotient), the β coefficients were reported for an increase by 1 SD. R^2 values were also reported in each regression model to indicate percentage of variance in the dependent variable (K6 at follow-up) that independent variables (job strain, covariates, and K6 at baseline) explain collectively. Moreover, Akaike information criterion (AIC) was employed to further compare the goodness of fit of regression models. Lower AIC scores indicate a better fit of the model [33]. SAS 9.4 was used for all statistical analyses.

3. Results

The characteristics of the sample population are shown in Table 2 ($N = 412$). Participants were aged 30 to 79, with similar age distributions across the three categories. The distribution of males (54.61%) and females (45.39%) was roughly equal. Most participants were married (71.12%) and had at least some college education. Most participants did not have a management position (66.02%) and were nonsmokers. Participants drank a median of three alcoholic drinks per week, and most did not engage in physical exercise (57.52%). The original and simplified job strain quadrant at baseline showed that 14.08% of workers were exposed to high strain. The means of continuous job strain, including subtraction, quotient, and logarithm quotient at baseline, were −25.21, 0.87, and −0.20, respectively. The high job strain quartile based on the quotient at baseline included 23.79% of workers. The mean values of psychological distress at baseline and follow-up were 3.95 and 4.16, respectively.

Longitudinal associations of baseline job strain with psychological distress at follow-up are presented in Table 3. From Model 0 to Model I, after adjusting for demographic variables, socioeconomic status, and health-related behaviors at baseline, associations were slightly attenuated. R^2 values increased, and AIC decreased from Model 0 to Model I. In the final adjustment for psychological

Table 3
Longitudinal associations of job strain at baseline with psychological distress at follow-up

Job strain approaches	Model 0			Model I			Model II		
	β and 95% CI	R^2	AIC	β and 95% CI	R^2	AIC	β and 95% CI	R^2	AIC
Quadrant (Original)		9.33%	1482.33		15.46%	1475.82		46.48%	1291.18
Low strain	0.00			0.00			0.00		
Active	1.24 (0.23, 2.25)*			1.16 (0.14, 2.18)*			−0.09 (−0.92, 0.74)		
Passive	1.64 (0.65, 2.63)**			1.25 (0.22, 2.28)*			0.45 (−0.38, 1.27)		
High strain	3.99 (2.76, 5.22)***			3.53 (2.28, 4.78)***			1.16 (0.12, 2.21)*		
Quadrant (Simplified)		6.93%	1489.12		14.02%	1479.65		46.16%	1291.18
Low Strain	0.00			0.00			0.00		
High Strain	2.88 (1.85, 3.90)***			2.58 (1.56, 3.61)***			1.01 (0.18, 1.85)*		
Subtraction		9.87%	1475.87		15.63%	1470.91		46.26%	1291.18
Increase per SD	1.20 (0.84, 1.55)***			1.06 (0.70, 1.43)***			0.39, (0.09, 0.70)*		
Quotient		8.27%	1483.12		14.42%	1477.39		46.24%	1291.18
Increase per SD	1.10 (0.74, 1.45)***			0.94 (0.58, 1.31)***			0.37 (0.08, 0.67)*		
Logarithm Quotient		9.74%	1476.49		15.76%	1470.59		46.39%	1286.69
Increase per SD	1.19 (0.84, 1.54)***			1.06 (0.70, 1.43)***			0.42 (0.12, 0.72)**		
Quartile (based on quotient)		10.30%	1477.89		15.98%	1471.10		46.79%	1291.18
Low quartile	0.00			0.00			0.00		
Medium−low quartile	1.31 (0.32, 2.30)**			1.17 (0.17, 2.17)*			0.06 (−0.74, 0.87)		
Medium−high quartile	1.80 (0.82, 2.78)***			1.61 (0.62, 2.61)**			0.40 (−0.41, 1.20)		
High quartile	3.46 (2.45, 4.46)***			3.04 (2.00, 4.07)***			1.22 (0.36, 2.08)**		

AIC, Akaike information criterion; CI, confidence interval; SD, standard deviation.
Linear regression, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
Model 0: no adjustment.
Model I: adjustment for age, sex, marital status, education, management position, smoking, alcohol consumption (log-transformed due to skewed distribution), and physical exercise at baseline.
Model II: Model I + additional adjustment for psychological distress at baseline.

distress at baseline, the strength of associations was clearly reduced, yet they remained significant. R^2 values in Model 0, ranging from 6.93% to 10.30%, were remarkably improved in Model 2, ranging from 46.16% to 46.79%. Additionally, the AIC improved from Model 0, ranging from 1475.87 to 1489.12, to Model 2, ranging from 1286.69 to 1291.18. All six operationalizations of job strain at baseline had significant associations with psychological distress at baseline in the fully adjusted models.

4. Discussion

This study examined 4-year longitudinal associations of job strain with psychological distress in randomly selected Japanese workers in Tokyo using six job strain formulations. All approaches, including quadrant (original and simplified), subtraction, quotient, logarithm quotient, and quartile job strain, showed robust significant associations between baseline job strain and increased level of psychological distress after 4-year follow-up.

There is a wide range of physiological and behavioral responses when workers experience job strain. Psychological stress increases the likelihood of engaging in unhealthy behaviors, such as smoking, increased alcohol consumption, increased food intake, and physical inactivity [34]. Alternatively, job strain also has been reported to influence sympathetic and parasympathetic nervous activities [35], thus increasing the risk of mental illnesses, such as depression, burnout, and anxiety [7,11].

Most methodological studies used quadrant job strain, which was significantly associated with health outcomes [2,3,5,6]. Quotient job strain was also used in all studies, indicating significant associations with health outcomes [2,3,5,6,8]. Logarithm job strain was examined in one study, reporting a significant association [2]. Subtraction job strain was tested in four studies, showing significant associations with various health outcomes [2,3,5,8]. Our results were consistent with these studies.

In crude Model 0, all the job strain formulations at baseline were significantly associated with psychological distress at follow-up, and job strain explained 6.9%−10.3% of variance in the outcome. In addition, the fitness of model analysis of AIC ranged from 1475.87 to 1489.12, which provides evidence that all job strain formulations at baseline similarly predicted psychological distress at follow-up. After adjustment for covariates at baseline, including demographic factors, socioeconomic status, and health-related behaviors (Model 1), the β coefficients were only slightly attenuated, and R^2 values and AIC were slightly improved. This suggests the contribution of covariates to the variance of the outcome variable was fairly small. However, when taking the psychological distress at baseline into account in Model 2, the strengths of associations between job strain at baseline and psychological distress at follow-up remained significant though they were obviously reduced, while R^2 values and AIC were remarkably improved, considering the longitudinal research design and highly correlated psychological distress at baseline and at follow-up (correlation coefficient = 0.64, $p < 0.001$). We also additionally adjusted for employment status at follow-up (87 % were still employed) in a sensitivity analysis (please see Supplementary Table 2, Model III). The significant association of all formulations of job strain at baseline with psychological distress at follow-up remained, suggesting continuous exposure to job strain and its long-term effects on mental health four years later. Thus, our results demonstrated consistent and robust impact of job strain, across different formulations of this widely used psychosocial risk factor in the workplace, on mental health. The predictive power of job strain was shown to be lower in longitudinal studies compared to cross-sectional studies in previously reported studies [36]. Our findings provided more evidence demonstrating that job strain has an impact on psychological distress in longitudinal data.

Since we employed internationally recognized measures of job strain, we could compare our findings with those of studies carried out internationally. For instance, a community-based longitudinal study from Canada employed a simplified quadrant approach using the top third of job demand and the lowest third of job control to determine job strain [37]. They reported that job strain was significantly associated with psychological distress after a 12-year follow-up. Furthermore, we may consider additional mental health outcomes. For example, a meta-analysis examining unpublished studies from Demark, France, the Netherlands, the United Kingdom (UK), and Canada associated increased risk of clinical depression with simplified quadrant job strain (hazard ratio [HR]: 1.27, 95% CI: 1.04–1.55) and original quadrant job strain (HR: 1.35, 95% CI: 1.08, 1.70) [7]. Our results were similar to their results. Additionally, a Japanese cross-sectional study [25] and longitudinal studies [26,27] using binary job strain using quotient job strain to create high or low groups reported significant associations between job strain and psychological distress. Moreover, a study from the UK reported that recurrent exposure to tertile job strain, which was created from a subtraction approach, was significantly associated with an increased risk of major depressive disorder [38]. Our results suggesting job strain exposure increases the level of psychological distress are supported by these studies. Moreover, our results revealed that all job strain formulations showed a significant relationship to psychological distress longitudinally, indicating the robustness and validity of these different approaches when examining the effects on workers' mental health.

Several merits of this study deserve mention. First, many studies have indicated notable association between job strain and mental health [11]. However, how to define the job strain varies. The five methodological studies to examine different formulations of job strain were restricted to cross-sectional data and in Western countries [2,3,5,6,8]. Our present study provides a new piece of evidence with longitudinal design from Japan. Second, a random sample, including men and women, was used for our analyses, expanding generalizability to Japanese workers who live in Tokyo, Japan. Furthermore, this study applied internationally established and validated scales of job strain and psychological distress, with potential comparability with other studies.

This study had several limitations. First, since both job strain and psychological distress were measured via self-report, common method variance might bias the associations in this study. However, it has been suggested that common method variance is less problematic when the study design is longitudinal [39]. Second, we must consider potential selection bias due to sample attrition over the 4-year follow-up period. The follow-up rate of this study in Japan was 64.72%, which was comparable to previous 4-year longitudinal studies in other countries in Asia, North America, and Europe [40–42]. Although participants lost to follow-up tended to be younger, male, married, and had higher baseline K6, there were no discernible differences in the baseline job strain between the follow-up group and those lost to follow-up, as well as no differences in the characteristics related to educational attainment, management position, smoking status, or physical exercise. Additionally, our sample size was relatively small. Third, other psychosocial work characteristics, such as psychosocial safety climate and harassment, were not considered in the present study, due to lack of data in the MIDJA study. Lastly, the outcome variable in our present study was subjective mental health. Longitudinal associations of different formulations of job strain with objective health outcomes warrant investigation. For instance, Japanese studies have shown significant associations between tertile of quotient job strain and consequent sickness absence [43] and original quadrant job strain and risk of stroke [44].

According to a Japanese government report, 58% of Japanese workers reported experiencing work-related stress [45]. Future research investigations of work stress may benefit from exploring bio-psycho-physiological mechanisms between job strain and employees' health, such as allostatic load, a well-established concept that refers to the cumulative burden due to prolonged neuroendocrine, cardiometabolic, and immune responses under chronic stress [46]. Since biomarkers are objective and assumed to be detected in the early phase, occupational health professionals may consider biomarker techniques to implement actions and to prevent the development of serious stress-related diseases.

In conclusion, this study demonstrated that in a randomized sample of Japanese workers in Tokyo, Japan, six job strain formulations at baseline showed significant associations with psychological distress over a 4-year follow-up. Our findings suggest that all the job strain formulations at baseline similarly predicted psychological distress at follow-up.

Data accessibility statement

The datasets used and/or analyzed in this current study are available from the corresponding author on reasonable request.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.shaw.2024.01.001.

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