

**TABLE 2.** Association Between Adaptation to Management Philosophy and RSMC Among Japanese Employees (N = 2791): The Results of Robust Poisson Regression Analysis

	n	No. Cases (%)	IRR (95% CI)		
			Model 1*	Model 2†	Model 3‡
Adaptation to management philosophy					
High (13–15)	452	186 (41.2)	1.00	1.00	1.00
Moderate (11–12)	1394	625 (44.8)	1.10 (0.97–1.24)	1.09 (0.96–1.24)	1.09 (0.96–1.23)
Low (3–10)	945	454 (48.0)	1.18 (1.03–1.35)	1.18 (1.03–1.36)	1.17 (1.03–1.35)
P for linear trend			0.012	0.012	0.015

CI, confidence interval; IRR, incidence rate ratio.

\*Adjusted for sex, age, medical history, household size, employee tenure, work shift, and working hours per week.

†Additionally adjusted for education, equivalent annual household income, occupational position, and employment status.

‡Additionally adjusted for smoking habits, drinking habits, and physical activity.

disagreement with behavioral involvement was significantly associated with RSMC, while cognitive understanding and emotional empathy were not.

The main analysis supported our hypothesis that the lack of adaptation to management philosophy was significantly associated with a higher risk of RSMC. Our finding is reasonable, considering that in a previous study of employees in a company with the management philosophy of “pursuing employees’ well-being,” the lack of adaptation to management philosophy predicted a subsequent reduction in work engagement<sup>17</sup> and that in other studies, quality of life (which was reported to be reduced by delayed access to medical care)<sup>6</sup> was associated with or predicted work engagement.<sup>20,21</sup> Given the previous finding that adaptation to management philosophy affected job involvement, as introduced earlier,<sup>13</sup> those who are less adapted to management philosophy may be more likely to have low job involvement and less willing to contribute to the company while maintaining their own health. Our finding suggests that even if a company adopts the management philosophy of “pursuing employees’ well-being,” if employees do not adapt to that philosophy, they are less likely to exercise their right to health when they feel unwell and more likely to refrain from seeking medical care.

In the subanalysis, only disagreement with behavioral involvement was significantly associated with a higher risk of RSMC, while

cognitive understanding and emotional empathy were not. This finding is also reasonable considering that Takao and Wang<sup>11</sup> have argued that behavioral involvement is particularly important when adapting to a management philosophy and is the deepest state of adaptation. Wang<sup>13</sup> has also reported that philosophy-oriented organizational practice promotes the adaptation to management philosophy among employees and leads to attitudinal and behavioral outcomes, such as job involvement and organizational citizenship behavior. Our finding suggests that even if employees understand and empathize with the management philosophy of “pursuing employees’ well-being,” this does not necessarily translate into the behavior of seeking medical care when they feel unwell. To encourage such behavior, the company needs to carry out practical activities based on such philosophy and to reach a level where it can be reflected in the actions and decisions of employees.

In the present study, those who refrained from seeking medical care were more likely to be male, be younger, have shorter employee tenure, work longer hours, have nonmanual or manual jobs, and have permanent employment. In the surveyed company, most of the men (98.9%: not shown in Table 1) had permanent employment. Because permanent employees have more responsibility in the company, it is possible that they tend to work longer hours<sup>22</sup> and find it difficult to take time off from work to seek medical care even when they feel unwell.<sup>7</sup> In addition, younger employees, employees with short tenure, and

**TABLE 3.** Association Between Each Item of Adaptation to Management Philosophy and RSMC Among Japanese Employees (N = 2791): The Results of Robust Poisson Regression Analysis

	n	No. Cases (%)	IRR (95% CI)		
			Model 1*	Model 2†	Model 3‡
Item #1 (cognitive understanding)					
Agree/moderately agree (4–5)	1946	868 (44.6)	1.00	1.00	1.00
NAND (3)	724	340 (47.0)	1.05 (0.95–1.15)	1.04 (0.95–1.15)	1.04 (0.95–1.15)
Disagree/moderately disagree (1–2)	121	57 (47.1)	1.02 (0.84–1.25)	1.01 (0.83–1.24)	0.99 (0.82–1.21)
P for linear trend			0.450	0.491	0.587
Item #2 (behavioral involvement)					
Agree/moderately agree (4–5)	1834	798 (43.5)	1.00	1.00	1.00
NAND (3)	794	380 (47.9)	1.13 (1.03–1.23)	1.13 (1.03–1.24)	1.12 (1.02–1.23)
Disagree/moderately disagree (1–2)	163	87 (53.4)	1.21 (1.03–1.41)	1.20 (1.02–1.40)	1.18 (1.01–1.38)
P for linear trend			0.002	0.003	0.005
Item #3 (emotional empathy)					
Agree/moderately agree (4–5)	1656	735 (44.4)	1.00	1.00	1.00
NAND (3)	940	431 (45.9)	1.04 (0.95–1.14)	1.05 (0.96–1.14)	1.05 (0.95–1.14)
Disagree/moderately disagree (1–2)	195	99 (50.8)	1.13 (0.97–1.31)	1.12 (0.97–1.30)	1.13 (0.97–1.30)
P for linear trend			0.108	0.118	0.110

CI, confidence interval; IRR, incidence rate ratio; NAND, neither agree nor disagree.

\*Adjusted for sex, age, medical history, household size, employee tenure, work shift, and working hours per week.

†Additionally adjusted for education, equivalent annual household income, occupational position, and employment status.

‡Additionally adjusted for smoking habits, drinking habits, and physical activity.

nonmanagerial employees may have less control over their work<sup>23,24</sup> and be more likely to report to work without seeking medical care if they are feeling a little sick.<sup>7</sup> Another interesting finding is that those who had no physical activity were more likely to refrain from seeking medical care. It is possible that those who have a habit of physical activity are more likely to view seeking medical care when feeling unwell as part of their health behavior. Although the present study adjusted for these variables as covariates, thus removing their influence on the association of low adaptation to management philosophy with RSMC, information on the attributes of those who are more likely to refrain from seeking medical care may be useful in understanding which employees should be encouraged to seek medical care as a priority when they feel unwell.

The present study has some limitations. First, some employees dropped out at follow-up because of sick leave. These employees may have been less adapted to management philosophy at baseline and may have refrained from seeking medical care until their illness became more severe, which may have underestimated the true associations. Second, because we wanted to diminish the burden on employees, the scale we used to measure the adaptation to management philosophy was a simple 3-item scale with 1 item extracted from each of the three subscales that comprise the 11-item scale; therefore, future studies should replicate the present findings using the full 11-item scale. Furthermore, RSMC was measured by simply asking the participants to recall their experience over the past year. Those who evaluated their adaptation to management philosophy as low may have been more likely to recall their experience of RSMC during the follow-up period, which may have overestimated the true association because of recall bias. Third, the present study did not obtain information about regular hospital visits because of chronic disease. Because those who visit the hospital regularly are less likely to refrain from seeking medical care regardless of their adaptation to management philosophy, our findings may have underestimated the true associations. Fourth, as noted previously, the present study used data obtained approximately 10 years ago for its analysis; therefore, our results may not fully reflect the current situation. Considering the increased interest in well-being management as well as health and productivity management over the past decade, more recent data may show a greater association of low adaptation to management philosophy with RSMC. Finally, our study sample comprised Japanese employees in one specific large-sized manufacturing company following the management philosophy of “pursuing employees’ well-being.” Therefore, the application of the present findings to employees in other industries or small- and medium-sized companies following the “pursuing employees’ well-being” or similar management philosophy is limited.

In conclusion, the present study provides evidence that adaptation to management philosophy is an important factor associated with the decision of employees working at a company following the “pursuing employees’ well-being” management philosophy to seek medical care for their perceived health issues. In particular, our findings suggest that it is essential for a company to reach a level where such a philosophy can be reflected in employees’ actions and decisions to encourage them to seek medical care when they feel unwell.

## ACKNOWLEDGMENTS

The authors thank Dr Gabriela Dye from ServiceScape (<https://www.servicescape.com>) for editing a draft of this manuscript.

## REFERENCES

1. Mizuochi M. Social capital and refraining from medical care among elderly people in Japan. *BMC Health Serv Res*. 2016;16:331.
2. Taber JM, Leyva B, Persoskie A. Why do people avoid medical care? A qualitative study using national data. *J Gen Intern Med*. 2015;30:290–297.
3. Weissman JS, Stern R, Fielding SL, Epstein AM. Delayed access to health care: risk factors, reasons, and consequences. *Ann Intern Med*. 1991;114:325–331.
4. Prentice JC, Pizer SD. Delayed access to health care and mortality. *Health Serv Res*. 2007;42:644–662.
5. Rutherford ME, Dockerty JD, Jasseh M, et al. Access to health care and mortality of children under 5 years of age in the Gambia: a case-control study. *Bull World Health Organ*. 2009;87:216–224.
6. Chen J, Rizzo JA, Rodriguez HP. The health effects of cost-related treatment delays. *Am J Med Qual*. 2011;26:261–271.
7. Tsuda K, Tsutsumi A, Kawakami N. Work-related factors associated with visiting a doctor for a medical diagnosis after a worksite screening for diabetes mellitus in Japanese male employees. *J Occup Health*. 2004;46:374–381.
8. Inoue A, Tsutsumi A, Eguchi H, Kawakami N. Organizational justice and refraining from seeking medical care among Japanese employees: a 1-year prospective cohort study. *BMJ Open*. 2019;26:76–84.
9. Inoue A, Tsutsumi A, Eguchi H, et al. Workplace social capital and refraining from seeking medical care in Japanese employees: a 1-year prospective cohort study. *BMJ Open*. 2020;10:e036910.
10. Pei L, Toyokawa S, Kobayashi Y. Labor factor barriers to seeking medical services among metropolitan workers: a cross-sectional analysis by sex using the J-SHINE study. *J Occup Health*. 2017;59:418–427.
11. Takao Y, Wang Y. *Management Philosophy and Individuals: Unpacking the Dynamics of Identity Processes [in Japanese]*. Tokyo, Japan: Yuhikaku; 2012.
12. Watanabe K, Inoue A, Eguchi H, Iwata N, Odagiri Y, Tsutsumi A. Suggestions for new organizational-level item pools for the national stress check program from management philosophy and mission statement: a qualitative study using unsupervised learning. *J Occup Health*. 2022;64:e12335.
13. Wang Y. Mission-driven organizations in Japan: management philosophy and individual outcomes. *J Bus Ethics*. 2011;101:111–126.
14. Cullen MDM, Calitz AP. Happiness—a business strategy. In: Merwe SP van der, Jordaan JA, eds. *International Business Conference Proceedings*. Mauritius: North-West University; 2018:1272–1282.
15. Scott WE. Activation theory and task design. *Organ Behav Hum Perform*. 1966;1:3–10.
16. Hatvany N, Pucik V. An integrated management system: lessons from the Japanese experience. *Acad Manage Rev*. 1981;6:469–480.
17. Eguchi H, Inoue A, Kachi Y, Tsutsumi A. Association between adaptation of management philosophy and mission statement, and work engagement among Japanese workers: a 1-year prospective cohort study in a Japanese company. *J Occup Environ Med*. 2021;63:e601–e604.
18. Wang Y. Examination on philosophy-based management of contemporary Japanese corporations: philosophy, value orientation and performance. *J Bus Ethics*. 2009;85:1–12.
19. Hanibuchi T. Inequalities in health and health care access: analysis of access to medical care using JGSS-2008 [in Japanese]. *JGSS Res Ser*. 2010;7:99–110.
20. Kanten S, Sadullah O. An empirical research on relationship quality of work life and work engagement. *Procedia Soc Behav Sci*. 2012;62:360–366.
21. Alqarni SAY. Quality of work life as a predictor of work engagement among the teaching faculty at King Abdulaziz University. *Int J Humanit Soc Sci*. 2016;6:118–135.
22. Ono H. Why do the Japanese work long hours? Sociological perspectives on long working hours in Japan. *Jpn Labor Issues*. 2018;2:35–49.
23. Kawakami N, Kobayashi F, Araki S, Haratani Y, Furui H. Assessment of job stress dimensions based on the job demands-control model of employees of telecommunication and electric power companies in Japan: reliability and validity of the Japanese version of the Job Content Questionnaire. *Int J Behav Med*. 1995;2:358–375.
24. Kawakami N, Fujigaki Y. Reliability and validity of the Japanese version of Job Content Questionnaire: replication and extension in computer company employees. *Ind Health*. 1996;34:295–306.



Article

# Usage of the Brief Job Stress Questionnaire: A Systematic Review of a Comprehensive Job Stress Questionnaire in Japan from 2003 to 2021

Kazuhiro Watanabe <sup>1</sup>, Kotaro Imamura <sup>2</sup>, Hisashi Eguchi <sup>3</sup>, Yui Hidaka <sup>4</sup>, Yu Komase <sup>4</sup>, Asuka Sakuraya <sup>2</sup>, Akiomi Inoue <sup>5</sup>, Yuka Kobayashi <sup>6</sup>, Natsu Sasaki <sup>4</sup>, Kanami Tsuno <sup>7</sup>, Emiko Ando <sup>8</sup>, Hideaki Arima <sup>4</sup>, Hiroki Asaoka <sup>9</sup>, Ayako Hino <sup>3</sup>, Mako Iida <sup>9</sup>, Mai Iwanaga <sup>10</sup>, Reiko Inoue <sup>1</sup>, Yasumasa Otsuka <sup>11</sup>, Akihito Shimazu <sup>12</sup>, Norito Kawakami <sup>2</sup> and Akizumi Tsutsumi <sup>1,\*</sup>

- <sup>1</sup> Department of Public Health, Kitasato University School of Medicine, 1-15-1 Kitazato, Minami-ku, Sagami-hara 252-0374, Japan
  - <sup>2</sup> Department of Digital Mental Health, Graduate School of Medicine, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan
  - <sup>3</sup> Department of Mental Health, Institute of Industrial Ecological Sciences, University of Occupational and Environmental Health, 1-1 Iseigaoka, Yahatanishi-ku, Kitakyushu 807-8555, Japan
  - <sup>4</sup> Department of Mental Health, Graduate School of Medicine, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan
  - <sup>5</sup> Institutional Research Center, University of Occupational and Environmental Health, 1-1 Iseigaoka, Yahatanishi-ku, Kitakyushu 807-8555, Japan
  - <sup>6</sup> Faculty of Social Policy & Administration, Hosei University, 4342 Aiharamachi, Machida, Tokyo 194-0298, Japan
  - <sup>7</sup> School of Health Innovation, Kanagawa University of Human Services, 3-25-10 Tonomachi, Kawasaki-ku, Kawasaki 210-0821, Japan
  - <sup>8</sup> Institute for Cancer Control, National Cancer Center, 5-1-1 Tsukiji, Chuo-ku, Tokyo 104-0045, Japan
  - <sup>9</sup> Department of Psychiatric Nursing, Graduate School of Medicine, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan
  - <sup>10</sup> Department of Community Mental Health & Law, National Center of Neurology and Psychiatry, National Institute of Mental Health, 4-1-1 Ogawahigashi, Kodaira, Tokyo 187-0031, Japan
  - <sup>11</sup> Faculty of Human Sciences, University of Tsukuba, 3-29-1 Otsuka, Bunkyo-ku, Tokyo 112-0012, Japan
  - <sup>12</sup> Faculty of Policy Management, Keio University, 5322 Endo, Fujisawa 252-0882, Japan
- \* Correspondence: akizumi@kitasato-u.ac.jp; Tel.: +81-42-778-9352



**Citation:** Watanabe, K.; Imamura, K.; Eguchi, H.; Hidaka, Y.; Komase, Y.; Sakuraya, A.; Inoue, A.; Kobayashi, Y.; Sasaki, N.; Tsuno, K.; et al. Usage of the Brief Job Stress Questionnaire:

A Systematic Review of a Comprehensive Job Stress Questionnaire in Japan from 2003 to 2021. *Int. J. Environ. Res. Public Health* **2023**, *20*, 1814. <https://doi.org/10.3390/ijerph20031814>

Academic Editor: Alicja Bortkiewicz

Received: 23 December 2022

Revised: 13 January 2023

Accepted: 16 January 2023

Published: 18 January 2023



**Copyright:** © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

**Abstract:** The Brief Job Stress Questionnaire (BJSQ) is used widely in occupational health studies and practice. Summarizing scientific production based on measurement is crucial. This study aimed to systematically review observational studies that used the BJSQ and the New BJSQ to show their usability. A systematic search was conducted for studies investigating relationships between the BJSQ or the New BJSQ subscales and other validated measurements on 13 September 2021, in various literature databases. The BJSQ subscales, scoring methods, and other validated measurements in the studies were qualitatively summarized. In total, 145 published reports between 2003 and 2021 were included. Among the BJSQ subscales, job stressors ( $n = 95$ ) such as quantitative job overload ( $n = 65$ ) and job control ( $n = 64$ ) were most often used. The subscales were utilized to investigate the relationships with several other measurements. Five reports used subscales from the New BJSQ. In the last two decades, the BJSQ and the New BJSQ help measure psychosocial factors (PF) at work and contribute to the publication of scientific papers in the occupational health field. This study would encourage the utilization of the questionnaires for future research and practice.

**Keywords:** questionnaire; psychometric; workplace; job demands; job control; social support

## 1. Introduction

### 1.1. Background and Previous Work

Conducting multidimensional identification, assessment, and control of psychosocial factors (PF) at work is important in psychosocial risk management for occupational safety and health. Exposure to psychosocial stressors at work leads to physical and mental health problems among workers. Scientific evidence has indicated that high job demands, low job control, low social support, effort–reward imbalance, and high job insecurity elevate the risk of coronary heart disease and mental disorders [1–3]. In practice, several countries and regions have guidance or standards, such as the Psychosocial Risk Management—European Framework (PRIMA-EF) [4], the United Kingdom (UK) Health and Safety Executive (HSE) management standards [5], the National Standard of Canada for Psychological Health and Safety [6], and standards by the International Organization for Standardization (ISO) [7], that emphasize the importance of assessing multidimensional risks related to PF at work.

Numerous questionnaires and scales are available to measure and identify multiple PF at work and used in both research and practice. For example, in UK HSE management standards [5], the indicator tool helps assess employee perceptions of six key stressor areas: demands, control, support, relationships, role, and organizational change. The Copenhagen Psychosocial Questionnaire (COPSOQ) [8–10] measures a broad range of PF, including stressors, health and well-being, and personality. The third version of COPSOQ covers eight domains and 26 dimensions using validated items [10]. The Generic Job Stress Questionnaire (GJSQ) from the United States of America National Institute for Occupational Safety and Health (USA NIOSH) also covers various job stressors, mental health, and personality [11]. The Korean Occupational Stress Scale (KOSS) was developed in Korea; it consists of eight subscales of job stressors: physical environment, job demand, insufficient job control, interpersonal conflict, job insecurity, organizational system, lack of reward, and occupational climate [12]. Multidimensional scales to measure PF at work in specific industries were also developed and reported such as for construction workers [13], teachers [14], nurses [15], and dentists [16].

### 1.2. Background in Japan

In Japan, the 57 items of the Brief Job Stress Questionnaire (BJSQ) was developed in 2000 [17] based on the GJSQ from the USA NIOSH [11], covering job stressors, stress responses, buffering factors (i.e., social support), and job satisfaction. Among job stressors, the BJSQ includes quantitative job overload (three items), qualitative job overload (three items), physical demands (one item), job control (three items), skill utilization (one item), interpersonal conflict (three items), poor physical environment (one item), suitable jobs (one item), and meaningfulness of work (one item). Stress responses include vigor (three items), anger-irritability (three items), fatigue (three items), anxiety (three items), depression (six items), and physical complaints (11 items). Buffering factors include support from supervisors (three items), coworkers (three items), and family and friends (three items). Job and life satisfaction are also measured by a single item for each. All items are rated on a four-point scale. The New BJSQ was developed in 2014, covering effort–reward imbalance, bullying, organizational factors, work–self balance, and positive outcomes [14]. Most subscales in the BJSQ and the New BJSQ showed acceptable levels of internal consistency, test–retest reliability, and structural validity [18].

In the last two decades, the BJSQ has been used widely for occupational health studies and practice and tests the associations with a broad range of outcomes, including biological markers. The New BJSQ has also been used in later studies. Recently, the Japanese government launched a new occupational health policy called the National Stress Check Program (NSCP); this policy mandates that workplaces with 50 or more employees conduct assessments of psychosocial stress in employees at least once a year [19]. This policy recommends the use of the BJSQ as a structured questionnaire for the assessment. Thereafter, the BJSQ has been used more frequently, and the publication of data measured by the BJSQ has increased rapidly.



### 1.3. Research Gaps and Objectives

However, no systematic review has reported on the usage of the BJSQ and the New BJSQ and the findings of studies that used these questionnaires. For the COPSOQ, systematic reviews for the usage of the measurements have already been reported [20,21], and the international scientific production was summarized. Moreover, a systematic review of the BJSQ and the New BJSQ is important to make a milestone of scientific production from these measurements. Additionally, the summary of published data measured using the BJSQ and the New BJSQ, including samples, subscales, and scoring methods, would be useful statistics for research and practice in occupational health in Japan. The correlates of the BJSQ and the New BJSQ would be useful for validating the questionnaires and accumulating scientific evidence of the association between PF at work and health. This study aimed to systematically review observational studies that used the BJSQ and the New BJSQ to show their usability. Published literature until 2021 was systematically reviewed using various databases. The BJSQ subscales, scoring methods, and other validated measurements were qualitatively summarized. This study significantly contributes to creating a new summary of the questionnaires and encouraging the utilization of the questionnaires in future research and practice in occupational health.

## 2. Materials and Methods

### 2.1. Study Design

This study was a systematic review of observational studies. The reporting in this study was conducted following the updated guideline for reporting systematic reviews (the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2020 statement) [22]. The study protocol was registered at the University Hospital Medical Information Network Clinical Trials Registry (UMIN-CTR, ID R000045091) in Japan.

### 2.2. Eligibility Criteria

For the systematic review, the authors included studies that (1) adopted observational study design; (2) sampled workers; (3) used at least one subscale of the BJSQ or the New BJSQ; (4) used other validated measurements and tested associations between the BJSQ or the New BJSQ subscales and other measurements; (5) were written in English or Japanese; and (6) were peer-reviewed. Studies were also included if they used the BJSQ and the New BJSQ subscales as non-primary variables and investigated the associations in preliminary analyses. Those studies that used other single-item measurements (e.g., smoking status), except for shift work, working hours, sleeping hours, subjective views of health, subjective well-being, and subjective satisfaction, were excluded.

### 2.3. Information Sources and Search Strategy

A systematic search of the literature on 13 September 2021 was conducted on databases such as MEDLINE (PubMed), EMBASE, PsycINFO/ARTICLES, and Japan Medical Abstract Society. For search terms, “brief job stress questionnaire” OR “BJSQ” was used, and no filter/limit was applied for any of the databases.

### 2.4. Study Selection and Data Collection Process

Identified records were managed in a Microsoft Excel (Washington, DC, USA) file. One investigator sorted the records by title and removed duplicates. Subsequently, each record was assigned to two reviewers from among 13 investigators. The investigators independently judged whether a record met the inclusion criteria of the systematic review. Records judged as not eligible by both of the two contributors were excluded, and other records were sought for retrieval of full texts. The full texts were judged by two independent reviewers, different from the initial screening, from 18 investigators. Reports assessed as eligible by both reviewers were included for review. When two investigators had inconsistent judgment at this full-text review stage, an agreement was reached through

discussions with the project directors. When a report was excluded at this stage, the primary reasons for exclusion were recorded.

One of the reviewers of each study collected data from that study. The data were then reviewed by KW. The collected data included the names of the first authors, study design (cross-sectional or longitudinal), samples, subscales of the BJSQ and the New BJSQ, scoring methods of the BJSQ and the New BJSQ, and other validated measurements.

### 2.5. Data Synthesis and Analysis

Since this study aimed to summarize the usage of the BJSQ and the New BJSQ, no statistical data synthesis was conducted. Assessments of risk of bias within individual studies, heterogeneity, reporting bias, and certainty of evidence were not required to be conducted either. The collected data in the text and tabulation were qualitatively summarized. In addition, the number of subscales of the BJSQ and the New BJSQ and other measurements used were counted and visually placed, classifying them into five categories according to the job stress model [11]: (1) job stressors or exposures that relate to work conditions which lead to stress responses; (2) health-related outcomes including physiological and psychological responses; (3) work-related outcomes such as job satisfaction, job performance, and burnout; (4) individual and behavioral factors that modify the associations between job stressors and outcomes; and (5) buffering and non-work factors such as social support.

## 3. Results

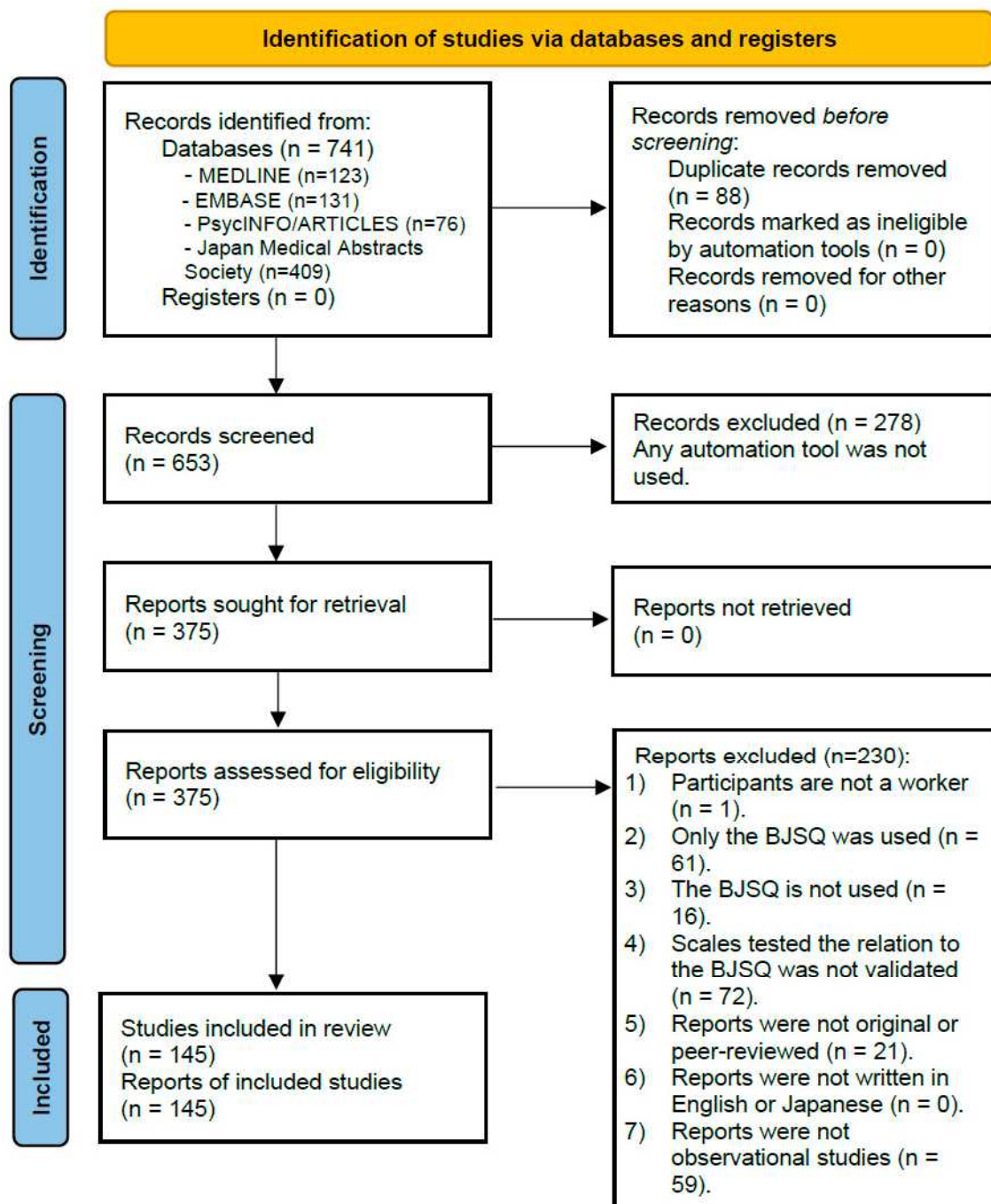
### 3.1. Study Selection

Figure 1 illustrates the selection process of this systematic review. A systematic search of databases resulted in 741 hits. After the initial screening and the full-text review by the independent reviewers, 145 reports published from 2003 to 2021 were included in this systematic review [23–167]. Of the included reports, 102 had digital object identifiers, and the main text of 52 reports was written in Japanese.

A total of 230 reports were excluded at the full-text review stage, although some of them might have met the inclusion criteria. For example, Eguchi et al. [168] investigated the association between psychological stress response measured by the BJSQ and workplace occupational mental health (OMH) and related activities. However, the items of OHM activities were derived from a paper by the Japanese government and were not psychometrically validated. Kawada and Otsuka [169] conducted a longitudinal study to examine changes in job stress and job satisfaction using the BJSQ. However, they only reported the associations among the subscales of the BJSQ, not with other validated measurements. Iguchi [170] examined the associations among job demands, job resources, and turnover intention among public health nurses using the BJSQ and the New BJSQ. However, this study conducted a factor analysis for the subscales and conceptualized new variables in the analysis. Some studies used the BJSQ overseas: China, India, and the USA [171–173]. These studies did not report the validity of the translated version of the BJSQ.

### 3.2. Study Characteristics

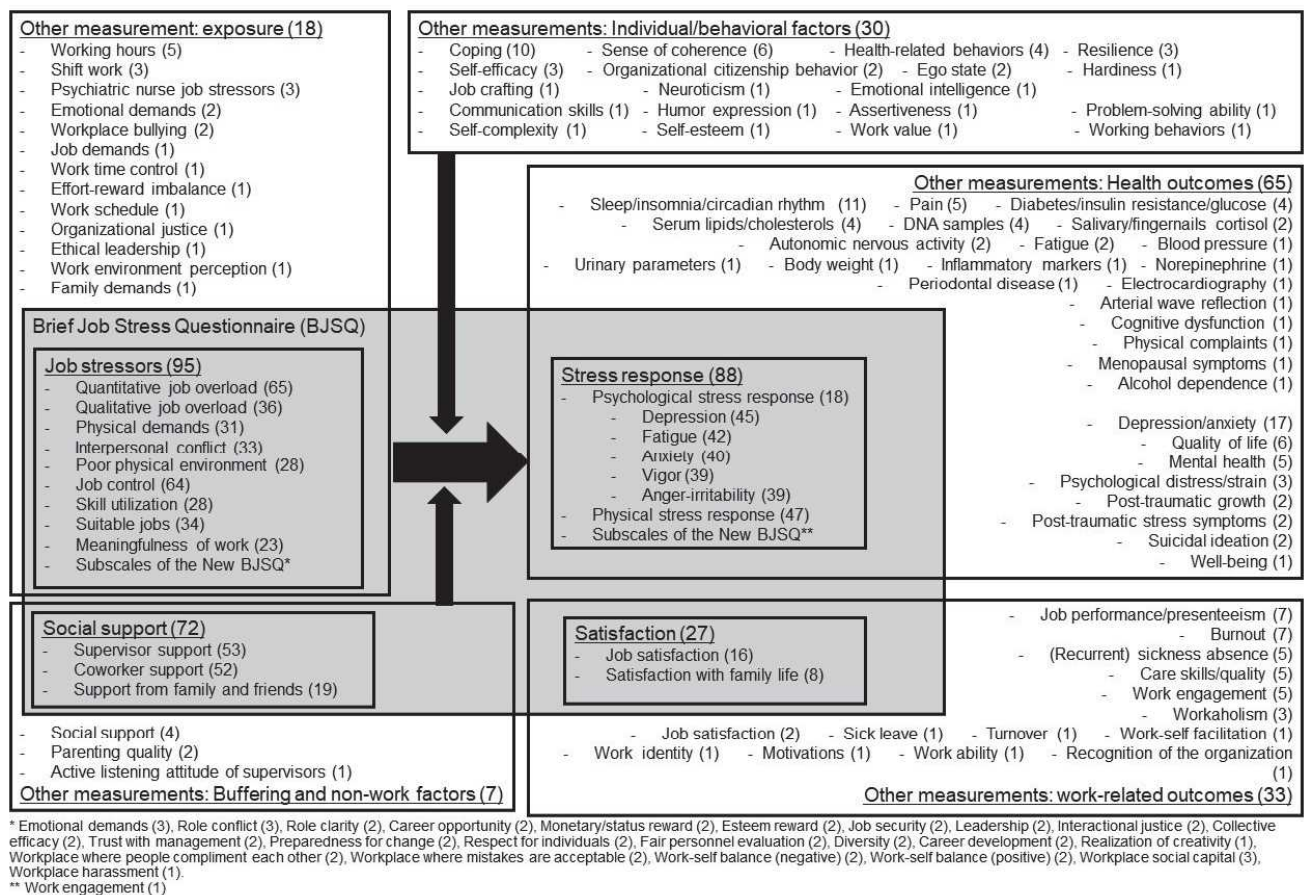
A summary of the included studies is shown in the Table A1. Most studies were conducted cross-sectionally ( $n = 116$ ) [52–167], while the remaining were longitudinal studies ( $n = 29$ ) [23–51]. The sample size ranged from 18 [83] to 69,805 [60]. In the included studies, recruitment of the participants was conducted from private companies ( $n = 59$ ), hospitals ( $n = 42$ ), nursing or welfare facilities ( $n = 13$ ), healthcare centers ( $n = 7$ ), web surveys ( $n = 5$ ), public sectors ( $n = 5$ ), existing cohorts ( $n = 4$ ), fire defense stations/headquarters ( $n = 4$ ), and a convenience sample of faculty staff members or alumni of universities ( $n = 6$ ).



**Figure 1.** PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only.

### 3.3. Used Subscales and Other Measurements

Figure 2 shows the list of used subscales from the BJSQ, the New BJSQ, and other measurements in the included studies. Parenthesis in each subscale shows the number of times the measurements have been used.



**Figure 2.** Used subscales from the BJSQ, the New BJSQ, and other measurements in the included studies. Note. Parenthesis in each subscale shows the number of times the measurements have been used.

For the subscales of the BJSQ, job stressors ( $n = 95$ ), especially quantitative job overload ( $n = 65$ ) and job control ( $n = 64$ ), were most often used; stress responses ( $n = 88$ ) and social support ( $n = 72$ ) were frequently used as well. Most of the studies referred to the job stress model from the US NIOSH [11] or the job demands–control model by Karasek [174,175]. For example, Izawa et al. [95] used the subscales of quantitative job overload and job control from the BJSQ, calculated the job strain index by dividing quantitative job overload by job control, and investigated an association with cortisol levels in fingernails. Hidaka et al. [54] also adopted job strain through quantitative job overload and job control and social support from supervisors and coworkers of the BJSQ. They indicated those significant associations with health-related quality of life among Japanese workers. Stress responses were often used as the health outcomes explained by PF at work. A two-year follow-up study by Taniguchi et al. [37] investigated the association between workplace bullying and harassment and stress responses of the BJSQ among care workers at welfare facilities for the elderly. They reported multiple types of bullying and harassment were positively associated with psychological stress response at the follow-up. Shimazu and de Jonge [48] also used stress responses from the BJSQ as an outcome of the effort–reward imbalance and reported the reciprocal associations in a three-wave panel survey. Satisfaction ( $n = 27$ ) was mainly utilized for examining associations with other health outcomes. Inoue et al. [28] investigated the prospective association between job satisfaction of the BJSQ and long-term sickness absence. They indicated that workers who perceived job dissatisfaction had a significantly higher risk of long-term sickness absence; however, after additionally adjust-



ing for the psychosocial work environment, this association was weakened and was no longer significant.

The subscales of the BJSQ were utilized for investigating the relationships among various kinds of other measurements: 13 job stressors and exposures, 28 health-related outcomes, 14 work-related outcomes, 19 individual and behavioral factors, and three buffering and non-work factors. For health outcomes, the most often used measurement was depression and anxiety ( $n = 17$ ). For instance, Tsuboi et al. [51] investigated the association between job stressors and depressive symptoms measured by the center for epidemiologic studies with a depression scale. They compared and categorized female nurses into the most stressful group and the least stressful group and reported a significant difference in depressive symptoms between the two groups. Sakamoto et al. [75] investigated the structural differences among factors for psychological job stress among healthcare workers and reported that job stressors from the BJSQ were positively associated with depression and anxiety measured by the hospital anxiety depression scale. In addition, sleep/insomnia/circadian rhythm ( $n = 11$ ) were frequently investigated for their association with job stressors. Toyoshima et al. [55] examined interrelationships among sleep reactivity, job-related stress, and subjective cognitive dysfunction and indicated that sleep reactivity significantly influenced subjective cognitive dysfunction directly and indirectly via job stressors and stress responses. Takahashi et al. [46] conducted a one-year longitudinal study to examine how a change in work time control was associated with sleep and health. They indicated that daytime sleepiness was positively associated with quantitative job overload and negatively associated with job control and social support from the BJSQ.

Physiological health outcomes were also tested using the subscales of the BJSQ, such as diabetes, insulin resistance, and blood glucose ( $n = 4$ ), serum lipid and cholesterol ( $n = 4$ ), salivary or fingernails cortisol ( $n = 2$ ), and inflammatory markers ( $n = 1$ ). For example, Sugito et al. [23] conducted a retrospective study with male workers to investigate the effects of job stressors on the onset of diabetes mellitus defined by HbA1c or using antidiabetic drugs. They indicated that low skill utilization from the BJSQ was associated with the risk of diabetes mellitus onset. Watanabe et al. [101] examined interrelationships between job resources, vigor, exercise habit, and serum lipids including triglyceride, high-density lipoprotein cholesterol, and low-density lipoprotein cholesterol. Multiple-group path analysis indicated that job resources and vigor from the BJSQ were inversely associated with triglyceride and low-density lipoprotein cholesterol and positively associated with high-density lipoprotein cholesterol through exercise habits in both sexes. Nakata et al. [121] investigated associations between job stressors and inflammatory markers including high-sensitive C-reactive protein, interleukin-6, tumor necrosis factor- $\alpha$ , monocyte, and leukocyte. The job strain index calculated by dividing quantitative job overload by job control was negatively associated with tumor necrosis factor- $\alpha$ .

For work-related outcomes, burnout ( $n = 7$ ) and presenteeism ( $n = 7$ ) were often investigated as those associations with PF at work. Saijo et al. [106] investigated the synergistic interaction of job demands, job control, and social support on mental health among local government employees. They indicated significant associations between these stressors from the BJSQ and burnout measured by the Japanese version of the Maslach Burnout Inventory-General Survey. Hayashida et al. [57] assessed the association between the irregularity of mealtimes and presenteeism measured by the Work Limitations Questionnaire. They indicated that the irregularity of mealtimes had a strong effect on presenteeism indirectly through psychological and physical stress responses from the BJSQ.

Coping ( $n = 10$ ) and sense of coherence ( $n = 6$ ) were frequently used as individual and behavioral factors. For instance, Shimazu et al. [49] examined the lagged effects of active coping on stress responses to explain the individual differences in the underlying mechanisms behind the association between job stressors and health outcomes. They measured active coping using the Brief Stress for Coping Scale and reported significant interactions of quantitative job overload, job control, and active coping on stress responses from the BJSQ. Urakawa et al. [45] examined the association between a sense of coherence

and psychological responses and reported that a sense of coherence was inversely associated with psychological and physical stress responses.

A total of five reports used subscales from the New BJSQ [30,36,81,94,111]. Morimoto et al. [30] investigated the adverse effects of role conflict on the psychological strain among employed family caregivers of people with dementia. They used the subscales of emotional demands and role conflict from the New BJSQ, in addition to the subscales from the BJSQ. They indicated that conflict between caregiving and work was positively associated with psychological strain and its association was moderated by formal support seeking and attentional control. Sakuraya et al. [36] used a three-item scale of workplace social capital and investigated its association with the onset of major depressive episodes through a three-year prospective cohort study. The study indicated that middle-level workplace social capital had the lowest risk of major depressive episodes. Inaba [81] and Inaba and Inoue [111] used multiple subscales from the short version of the New BJSQ and examined their associations with subjective well-being and burnout among female nurses. They indicated that burnout was significantly associated with role conflict, role clarity, and job security [111], and subjective well-being was significantly associated with career development [81]. Toyama and Mauno [94] used the three-item subscale of realization of creativity and reported a significant and positive association with emotional intelligence among eldercare nurses in special nursing homes.

#### 3.4. Scoring Methods

Concerning scoring methods, most studies used continuous scores of the subscales ( $n = 111$ ). Categorization using means, medians, tertiles, and quantiles was also adopted ( $n = 12$ ). Standardized scores on a five-point scale ( $n = 7$ ) were calculated based on the distribution of continuous scores in the representative sample [176]. For more practical and easier scoring, a simple scoring method was used ( $n = 9$ ) [177]. In this method, the respondents were dichotomized into stressed or not stressed, by counting how many items of the BJSQ were scored as undesirable. The definition of “high-stress” employees according to the Japanese NSCP was also used ( $n = 7$ ) [32]. This definition is conceptualized by the combination of high scores in stress response, high scores in job stressors, and low scores in social support. The predictive validity of the “high-stress” employees for long-term sickness absence at the one-year follow-up was confirmed in a previous study [32].

### 4. Discussion

#### 4.1. Main Findings

In the last two decades, over 140 observational studies using the BJSQ and/or the New BJSQ have been published. Since 2015, when the NSCP was launched, large-scale data from more than 60,000 people have been published, as the assessment of psychosocial stress in employees became mandatory. Although not all reports were written in English, more than two-thirds were readable, at least with abstracts that were in English, and more than 100 articles were identifiable by digital object identifiers. Associations were established between a wide variety of factors, including job stressors, health-related outcomes, work-related outcomes, individual and behavioral factors, and buffering factors. The relationship with physical biomarkers was also examined. Although not all studies observed significant associations between factors, and not all study hypotheses were supported, the reported associations were generally reasonable and consistent with existing findings about job stress models. This means that the mechanism that exposure to job stressors evokes deterioration of health- and work-related outcomes and that some of these associations are modified by individual and behavioral factors. Therefore, the BJSQ and the New BJSQ are questionnaires that have made substantial contributions to the research and practice of occupational stress in Japan.

#### 4.2. Theoretical Implications

The reasonable associations with validated measurements of health- and work-related outcomes were repeatedly observed in multiple subscales of the BJSQ. In particular, quantitative job overload, job control, supervisor and coworker support, and stress responses often had significant associations with depression and anxiety, quality of life, sleepiness, burnout, sickness absence, and physical biomarkers. These results may reflect the construct validity (concurrent and predictive) of the subscales, while the BJSQ is easy to answer because of the low number of items in each subscale (three at most). The subscales of quantitative job overload, job control, and social support at work can be used as the representative job stressors, referring to the job demands–control model [174,175] as the theoretical background. The subscales of the psychological and physical stress response may also be useful as the indicators of broad symptoms evoked by exposure to stressful PF at work. These subscales may be used as the outcomes of the intervention study. In contrast, compared to the subscales from the BJSQ, those from the New BJSQ were not much considered in the research. More studies are needed to confirm the psychometric validity using the subscales from the New BJSQ.

#### 4.3. Practical Implications

Scoring methods are inconsistent among studies, which is partly because these were developed so that the BJSQ can be used for both research and practice. The predictive validity of sickness absence has been confirmed for “high-stress” employees in the NSCP. It is necessary to use the appropriate method according to the purpose of use.

Translation into other languages is the next interest in research and practice. Several studies were conducted in other countries but were not included because the validity of the translated scales could not be verified [171–173]. Recently, the BJSQ and the New BJSQ have been translated into English, Chinese, Portuguese, Myanmar, Vietnamese, Spanish, Tagalog, Nepali, Persian, and Indonesian [178,179], and the use of these scales in other countries have already been reported in a peer-reviewed journal [180]. The translated version of the scales can be used as tools to promote not only research on foreign workers in each region of Japan but also job stress research in other countries and international job stress research.

#### 4.4. Limitations

There are several limitations to this study. The study quality and risk of bias of the included studies were not assessed because the objective of this study was limited to summarizing published information related to the BJSQ and the New BJSQ. Since most of the included studies were conducted cross-sectionally, the findings from each study could include substantial biases. Further, a body of evidence for the associations between the subscales from the BJSQ and other measurements could not be presented.

### 5. Conclusions

In conclusion, as a comprehensive questionnaire, the BJSQ and the New BJSQ have contributed to the measurement of PF at work and the publication of scientific papers in the occupational health field. The BJSQ can be one of the methodological tools to explore the mechanisms between job stress and several work-related disorders and can provide hints of intervention. Quantitative job overload, job control, and supervisor and coworker support were often used and may have the construct validity as the representative job stressors, referring to the job demands–control model. Regarding practical implication, using the appropriate scoring method according to the usage purpose is important. Prospective, interventional, and multilingual studies are expected to be published to accumulate more comprehensive and high-quality findings in the future.

**Author Contributions:** Conceptualization, K.W., K.I., A.S. (Akihito Shimazu), N.K. and A.T.; methodology, K.W., K.I., H.E., Y.H., Y.K. (Yu Komase), A.S. (Asuka Sakuraya), A.I., Y.K. (Yuka Kobayashi),

Y.O., N.S., K.T., E.A., H.A. (Hideaki Arima), H.A. (Hiroki Asaoka), A.H., M.I. (Mako Iida), M.I. (Mai Iwanaga) and R.I.; software, K.W.; writing—original draft preparation, K.W.; writing—review and editing, K.W., K.I., H.E., A.I., A.S. (Akihito Shimazu), N.K. and A.T.; supervision, A.S. (Akihito Shimazu), N.K. and A.T. All authors have read and agreed to the published version of the manuscript.

**Funding:** This study was supported by the Grant-in-Aid for Scientific Research from the Japan Society for the Promotion of Science (JP21K19672 and JP20K19671).

**Institutional Review Board Statement:** Ethical approval was not obtained because this study did not involve human subjects and only published and summarized data.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Since this study is a systematic review, no individual data is available. The summarized data for this systematic review can be obtained upon request.

**Acknowledgments:** We greatly thank Yumi Asai, Department of Mental Health, Graduate School of Medicine, The University of Tokyo, for shifting and full-text review.

**Conflicts of Interest:** The authors declare no conflict of interest for this study. The funder had no role in the study design, collection, analysis, and interpretation of data, the writing of the report, or the decision to submit this article for publication.



## Appendix A

Table A1. Summary of the included studies that used the Brief Job Stress Questionnaire.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
1 [23]	Sugito et al. (2021)	Longitudinal	Private companies	6620 male company workers aged 40 years or older who underwent routine annual health checkups and a stress check	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job and life satisfaction (2 items)	Standardized scores were calculated on a five-point scale, ranging from 1 (lowest) to 5 (highest).	Development of diabetes mellitus (HbA1c by blood sampling or using antidiabetic drugs)
2 [24]	Takahashi et al. (2020)	Longitudinal	Healthcare centers	6326 male workers who received annual health checkups	Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items)	Participants were dichotomized into positive or negative; points 1 and 2 received a score of 0, and points 3 and 4 received a score of 1. An individual was considered positive for depression when they scored at least 1 in each of the depression -related items.	Development of type 2 diabetes (HbA1c by blood sampling or diabetes medication)
3 [25]	Kachi et al. (2020)	Longitudinal	Private companies	9657 workers at a financial service company	Job stressors (17 items) Stress response (29 items) Social support (9 items)	Participants were categorized into high stress or not, as defined by the Stress Check Program in Japan.	Turnover (Human resource records)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
4 [26]	Shimazaki et al. (2020)	Longitudinal	Private companies	635 workers of small- to medium-sized enterprises	Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items)	Continuous score	Mental health promotion behaviors (Mental Health Promotion Behavior scale, MHPB)
5 [27]	Wang et al. (2020)	Longitudinal	Private companies	307 full-time and white-collar employees in wide-ranging occupations	Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items)	Continuous score	Ethical leadership (Ethical Leadership Scale) Mutual support (Self-developed, validated previously)
6 [28]	Inoue et al. (2019)	Longitudinal	Private companies	14,687 employees in a financial service company	Job satisfaction (1 item)	Participants who answered 1 or 2 were dichotomized into “dissatisfied” and those who answered 3 or 4 into “satisfied” groups.	Long-term sickness absence (Personnel records)
7 [29]	Hino et al. (2019)	Longitudinal	Private companies	922 workers in a manufacturing company in Japan	Depression (6 items)	Continuous score	Overtime work hours (Personnel records)
8 [30]	Morimoto et al. (2019)	Longitudinal	Nursing or welfare facilities	379 employed family caregivers of people with dementia	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (3 items) Emotional demands (1 item) Role conflict (1 item)	Continuous score	Psychological strain (Stress Response Scale, SRS)

Table A1. Contd.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
9 [31]	Ogawa et al. (2018)	Nested case-control study	Public sectors	382 public servants in the Kinki area	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job satisfaction (1 item) Satisfaction with family life (1 item)	Continuous score	Long-term sickness absence due to mental disorders (Doctor's medical certification)
10 [32]	BJSQ et al. (2018)	Longitudinal	Private companies	7356 male and 7362 female employees in a financial service company	Job stressors (17 items) Stress response (29 items) Social support (9 items)	Participants were categorized into high stress or not, as defined by the Stress Check Program in Japan.	Sickness absence (Human resources records)
11 [33]	Fukuda et al. (2018)	Longitudinal	Public sectors	16,032 public servants in the Kinki area	Job stressors (17 items) Stress responses (29 items) Social support (9 items)	Continuous score	Long-term sickness absence due to mental disorders in the same work unit (Medical certification)
12 [34]	Okita et al. (2017)	Longitudinal	Hospitals	42 female novice nurses at Kagoshima University Hospital	Psychological stress response (18 items) Physical stress response (11 items)	Continuous score	Physical examination parameters (Blood sampling) Urinary parameters (Urine sampling) One-year body weight change

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
13 [35]	Hino et al. (2016)	Longitudinal	Healthcare centers	1815 male workers who underwent health checkups at a healthcare center in the Kanto (east coast) region	Quantitative job overload (3 items) Job control (3 items) Supervisor support (3 items) Coworker support (3 items)	A four-category variable for each psychosocial work characteristic was created (1) stable low, (2) increased, (3) decreased, and (4) stable high group. The demands/control ratio was also calculated.	Insulin resistance (Blood sampling)
14 [36]	Sakuraya et al. (2016)	Longitudinal	Private companies	929 employees from a thinktank company	Workplace social capital (3 items)	Respondents were grouped into tertiles (high, middle, and low). Further, respondents were categorized into tertiles based on the distribution of each item score.	Onset of major depressive episode (World Health Organization's version of Composite International Diagnostic Interview 3.0, WHO-CIDI 3.0)
15 [37]	Taniguchi et al. (2016)	Longitudinal	Nursing or welfare facilities	543 workers at welfare facilities for the elderly.	Psychological stress response (18 items) Physical stress response (11 items)	The participants were dichotomized into high and low stress groups. For psychological stress response, >13 and >12 indicated a high score in men and women, respectively. For physical stress response, >4 or >5 indicated a high score in men or women, respectively.	Workplace bullying (Japanese version of the Negative Acts Questionnaire, NAQ)
16 [38]	Watanabe et al. (2016)	Longitudinal	Private companies	126 employees from 15 worksites	Psychological stress response (18 items)	Continuous score	Physical activity (Japanese version of the International Physical Activity Questionnaire, IPAQ)



Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
17 [39]	Endo et al. (2015)	Longitudinal	Private companies	540 employees from one of the biggest telecommunication companies	Quantitative job overload (3 items) Job control (3 items)	Based on the means of “organizational job demands” or “organizational job control” scores, the departments were dichotomized into two groups (high/low).	Recurrent sickness absence due to depression (Psychiatric certification)
18 [40]	Shimazu et al. (2015)	Longitudinal	Private companies	1196 employees in an industrial machinery company	Psychological stress response (18 items) Physical stress response (11 items) Job satisfaction (1 item) Satisfaction with family life (1 item)	Continuous score	Work engagement (Utrecht Work Engagement Scale, UWES) Workaholism (Dutch Workaholism Scale, DUWAS)
19 [41]	Matsudaira et al. (2014)	Longitudinal	Existing cohorts	3811 workers from a prospective cohort of the “The Japan epidemiological research of Occupation-related Back pain (JOB)” study.	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job satisfaction (1 item) Satisfaction with family life (1 item)	For each factor, standardized scores were developed on a five-point scale ranging from 1 (lowest) to 5 (highest) based on a sample of more than 10,000 Japanese workers. The five original responses were reclassified into “not feeling stressed,” where low, slightly low, and moderate were combined, and “feeling stressed,” where slightly high and high were combined.	Low back pain (Von Korf’s grading method)
20 [42]	Wada et al. (2013)	Longitudinal	Web surveys	1810 participants aged 20–70 years from a marketing survey	Stress responses (29 items)	The participants were divided into quartiles according to the total stress response score at baseline.	Sick leave due to depression (Medical certificates)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
21 [43]	Demerouti et al. (2013)	Longitudinal	Existing cohorts	471 Japanese employees with young children from the Tokyo Work-family INterface (TWIN) study	Supervisor support (3 items)	Continuous score	Work–self facilitation (Four items based on the Survey Work–home Interference Nijmegen, SWING)
22 [44]	Okuno et al. (2013)	Longitudinal	Hospitals	105 nurses in from a hospital	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Supervisor support (3 items) Coworker support (3 items)	Continuous score	Post-traumatic growth (Japanese version of Posttraumatic Growth Inventory, PTGI-J)
23 [45]	Urakawa et al. (2012)	Longitudinal	Private companies	299 employees in small enterprises	Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items)	Continuous score	Sense of coherence (Japanese version of Sense of Coherence Scale, SOC)
24 [46]	Takahashi et al. (2012)	Longitudinal	Web surveys	2382 daytime workers selected randomly from a market research panel	Quantitative job overload (3 items) Job control (3 items) Supervisor and coworker support (6 items)	Continuous score	Fatigue (An 11-item scale from the Checklist for Accumulated Fatigue due to Overwork) Depressive symptoms (Center for Epidemiologic Studies for Depression scale, CES-D) Work time control (A five-item scale from Takahashi et al. (2011)) Daytime sleepiness (Epworth Sleepiness Scale)

Table A1. *Contl.*

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
25 [47]	Sugimura and Thériault (2010)	Cross-sectional Longitudinal	Private companies	1157 male employees in an information technology company	Supervisor support (3 items)	Cross-sectional survey: supervisor support score was categorized into four groups for every quartile score. Longitudinal survey: supervisor support scores of each survey period were dichotomized based on the median score to create four dual categories that take into account the changes in supervisor support between the survey periods (i.e., low [T1]–low [T2], low [T1]–high [T2], high [T1]–low [T2], and high [T1]–high [T2]). Continuous score	Work ability (Work Ability Index, WAI)
26 [48]	Shimazu and de Jonge (2009)	Longitudinal	Private companies	211 employees in a construction machinery company	Psychological stress response (18 items) Physical stress response (11 items)	Continuous score	Effort–reward imbalance (Japanese version of Effort–Reward Imbalance Questionnaire, ERI-Q)
27 [49]	Shimazu et al. (2008)	Longitudinal	Private companies	193 employees working in a construction machinery company	Quantitative job overload (3 items) Job control (3 items) Psychological stress response (18 items) Physical stress response (11 items)	Continuous score	Active coping (Brief Stress for Coping Scale, BSCP)
28 [50]	Shimazu and Schaufeli (2007)	Longitudinal	Private companies	488 male employees in a construction machinery company	Job stressors (17 items) Stress responses (29 items)	Continuous score	Coping (Brief Stress for Coping Scale, BSCP) Job performance (World Health Organization Health and Work Performance Questionnaire, WHO-HPQ)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
29 [51]	Tsuboi et al. (2006)	Longitudinal	Hospitals	33 female nurses working in Fujita Health University Hospital	Job stressors (17 items)	Those who scored more “1”s were placed in a high job stress group and those who scored more “5”s were placed in a low job stress group, according to the manual of the BJSQ.	Cholesterol Lipid peroxidation antioxidants in the plasma (Blood sampling) Depressive symptoms (Center for Epidemiologic Studies for Depression scale, CES-D)
30 [52]	Hirokawa et al. (2022) (Epub was published in 2021)	Cross-sectional	Healthcare centers	766 healthy workers enrolled in mental health checkups	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Supervisor support (3 items) Coworker support (3 items) Job satisfaction (1 item)	Continuous score	Salivary cortisol (Saliva sampling)
31 [53]	Takaesu et al. (2021)	Cross-sectional	Private companies	4645 office workers from 29 companies	Job stressors (17 items) Stress response (29 items) Social support (9 items)	Participants were categorized into high stress or not, defined by the Stress Check Program in Japan.	Sleep duration (Self-reported)
32 [54]	Hidaka et al. (2021)	Cross-sectional	Web surveys	1986 workers from the Internet survey	Quantitative job overload (3 items) Job control (3 items) Supervisor support (3 items) Coworker support (3 items)	Job strain was calculated by dividing quantitative job overload by job control. Social support was used in continuous score.	Health-related quality of life (EQ-5D-5L)
33 [55]	Toyoshima et al. (2021)	Cross-sectional	Convenience sample of faculty staff members or alumni of universities	536 workers from the recruitment that performed through the word of mouth, using poster at the Tokyo Medical University	Job stressors (17 items) Stress response (29 items) Social support (9 items) Job and life satisfaction (2 items)	Continuous score	Sleep reactivity (The Ford Insomnia Response to Stress Test, FIRST) Cognitive dysfunction (The Cognitive Complaints in Bipolar Disorder Rating Assessment, COBRA)



Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
34 [56]	Adachi et al. (2021)	Cross-sectional	Healthcare centers	2739 university workers who underwent an annual health checkup at the Health and Counseling Center, Osaka University	Job stressors (17 items) Stress response (29 items) Social support (9 items)	Continuous score	Sleep duration (Self-reported)
35 [57]	Hayashida et al. (2021)	Cross-sectional	Private companies	2905 workers from 17 offices at companies	Stress response (29 items)	Continuous score	Presenteeism (Work Limitations Questionnaire, WLQ) Sleep quality (Pittsburgh Sleep Quality Index, PSQI)
36 [58]	Ôga and Chiba (2021)	Cross-sectional	Hospitals	765 nurses from eight hospitals that have 100 or more beds in Tohoku, Japan	Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Coworker support (3 items)	Continuous score	Humor expression (Humor Expression Scale)
37 [59]	Adachi (2021)	Cross-sectional	Private companies	114 workers in a manufacturing company	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job and life satisfaction (2 items)	Continuous score	Shift work (Self-reported)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
38 [60]	Ooka et al. (2021)	Cross-sectional	Healthcare centers	69,805 workers in 117 companies that conducted the national Stress Check Program through Public Health Research Center	Job stressors (17 items) Stress response (29 items) Social support (9 items)	Participants were categorized into high stress or not, as defined by the Stress Check Program in Japan.	Shift work (Self-reported) Overtime work hours (Self-reported)
39 [61]	Terada and Nagamine (2020)	Cross-sectional	Public sectors	326 male workers of the Japan Ground Self-Defense Force	Job stressors (17 items) Stress response (29 items)	Continuous score	Coping (Tri-Axial Coping Scale, TAC-24) Resilience (Japanese Short version of Resilience Competency Scale, RCS-JS) Hardiness (Validated scale)
40 [62]	Sameshima et al. (2020)	Cross-sectional	Convenience sample of faculty staff members or alumni of universities	528 nonclinical workers recruited by convenience sampling through our acquaintances at Tokyo Medical University	Job stressors (17 items) Stress response (29 items)	Continuous score	Parenting quality (Parental Bonding Instrument) Resilience (Connor-Davidson Resilience Scale)
41 [63]	Shimura et al. (2020)	Cross-sectional	Private companies	5640 workers from 29 companies in Tokyo	Job stressors (17 items) Social support (9 items)	Continuous score	Sleep schedule (Self-reported) Sleep quality (Pittsburgh Sleep Quality Index, PSQI)
42 [64]	Furuichi et al. (2020)	Cross-sectional	Private companies	2899 workers from 17 companies in Tokyo, Japan	Job stressors (17 items) Stress response (29 items) Social support (9 items)	Continuous score	Presenteeism (Work Limitation Questionnaire, WLQ) Sleep quality (Pittsburgh Sleep Quality Index, PSQI)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
43 [65]	Miyama et al. (2020)	Cross-sectional	Convenience sample of faculty staff members or alumni of universities	535 nonclinical workers recruited by convenience sampling through our acquaintances at Tokyo Medical University	Job stressors (17 items) Stress response (29 items) Social support (9 items) Job and life satisfaction (2 items)	Continuous score	Diurnal type (Diurnal Type Scale, DTS) Sleep quality (Pittsburgh Sleep Quality Index, PSQI)
44 [66]	Seki et al. (2020)	Cross-sectional	Convenience sample of faculty staff members or alumni of universities	528 workers recruited by convenience sampling through our acquaintances at Tokyo Medical University	Job stressors (17 items) Stress response (29 items)	Continuous score	Parenting quality (Parental Bonding Instrument) Neuroticism (Eysenck Personality Questionnaire-Revised, EPQ-R)
45 [67]	Kikuchi et al. (2020)	Cross-sectional	Healthcare centers	59,021 workers in 117 companies that implemented the national Stress Check Program	Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items)	Continuous score	Overtime work hours (Self-reported)
46 [68]	Taya et al. (2020)	Cross-sectional	Private companies	2905 workers from 17 worksites in Tokyo, Japan	Job stressors (17 items) Stress response (29 items) Social support (9 items)	Continuous score	Presenteeism (Work Limitation Questionnaire, WLQ)
47 [69]	Hayasaki et al. (2020)	Cross-sectional	Hospitals	284 nurses from 12 wards in a hospital	Job stressors (17 items) Stress response (29 items) Social support (9 items)	The participants were dichotomized into high and low groups. For each subscale, high stress was defined by counting the number of non-desirable answers.	Ethical behaviors of nurses (Validated scale)
48 [70]	Saito et al. (2020)	Cross-sectional	Nursing or welfare facilities	49 teachers who have been employed for 5–10 years by nursing schools in an area in Japan	Stress response (29 items)	Continuous score	Self-efficacy (Generalized Self-Efficacy Scale, GSES)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
49 [71]	Okamoto et al. (2020)	Cross-sectional	Nursing or welfare facilities	616 healthcare workers from 217 welfare facilities for the disabled in the Chugoku area, Japan	Supervisor support (3 items) Coworker support (3 items)	Respondents were grouped into tertiles (high, middle, and low).	Inappropriate care (Validated scale)
50 [72]	Nagata et al. (2019)	Cross-sectional	Private companies	2693 employees at a pharmaceutical company	Quantitative job overload (3 items) Qualitative job overload (3 items) Job control (3 items) Supervisor support (3 items) Coworker support (3 items)	Continuous score	Psychological distress (K6) Work engagement (Utrecht Work Engagement Scale, UWES)
51 [73]	Okawa et al. (2019)	Cross-sectional	Private companies	103 employees at 17 corporations in Kanagawa Prefecture, Japan	Job stressors (17 items) Stress response (29 items) Social support (9 items)	Participants were defined as high stress or not based on the Stress Check Program in Japan.	Autonomic nervous activity (Electrocardiography; photoplethysmography)
52 [74]	Maeda et al. (2019)	Cross-sectional	Web surveys	2000 female workers from an online research panel living with a partner	Quantitative job overload (3 items) Job control (3 items) Supervisor support (3 items) Coworker support (3 items)	Continuous score	Psychological health (mental health and vitality) (SF-36)
53 [75]	Sakamoto et al. (2019)	Cross-sectional	Hospitals	205 healthcare workers from a core hospital	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job and life satisfaction (2 items)	Continuous score	Depression and anxiety (Hospital Anxiety Depression Scale, HADS) Chronic pain (Pain Catastrophizing Scale, PCS)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
54 [76]	Matsumoto and Yoshioka (2019)	Cross-sectional	Hospitals	577 psychiatric nurses working at 13 psychiatric hospitals with more than 150 beds in the Chugoku area	Job stressors (17 items) Supervisor support (3 items) Coworker support (3 items) Job satisfaction (1 item)	Continuous score	Negative Feeling toward patient (Negative Feeling toward Patient Frequency scale) Emotional, evaluative, informative, and instrumental support (Support-in-workplace scale)
55 [77]	Kurebayashi (2019)	Cross-sectional	Hospitals	271 general and 316 psychiatric nurses from seven hospitals in Japan	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job and life satisfaction (2 items)	Continuous score	Nursing skills (Self-Evaluation Scale of Oriented Problem Solving Behavior, OPSN)
56 [78]	Watanabe and Yamauchi (2019)	Cross-sectional	Hospitals	1075 full-time nurses working in four hospitals in Japan	Fatigue (3 items)	Continuous score	Motivation for overtime work (Self-developed, validated in the study)



Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
57 [79]	Fukunaga et al. (2019)	Cross-sectional	Nursing or welfare facilities	312 teachers who intended to change occupations from nursing schools in eight prefectures	Quantitative job overload (3 items) Job control (3 items) Fatigue (3 items) Anxiety (3 items) Depression (3 items) Physical stress response (2 items) Supervisor support (3 items) Coworker support (3 items)	Continuous score	Identity of nurses and nursing teachers (Validated scale)
58 [80]	Yoneyama et al. (2019)	Cross-sectional	Hospitals	215 female nurses from advanced treatment hospitals in Kanto area, Japan	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job and life satisfaction (2 items)	Continuous score	Recognition of the organization (Validated scale)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
59 [81]	Inaba (2018)	Cross-sectional	Hospitals	318 female nurses working in a private hospital for one or more years	<p>Quantitative job overload (3 items)</p> <p>Qualitative job overload (3 items)</p> <p>Physical demands (1 item)</p> <p>Job control (3 items)</p> <p>Interpersonal conflict (3 items)</p> <p>Poor physical environment (1 item)</p> <p>Skill utilization (1 item)</p> <p>Suitable jobs (1 item)</p> <p>Meaningfulness of work (1 item)</p> <p>Emotional demands (1 item)</p> <p>Role conflict (1 item)</p> <p>Work–self balance (negative) (1 item)</p> <p>Role clarity (1 item)</p> <p>Career opportunity (1 item)</p> <p>Supervisor support (3 items)</p> <p>Coworker support (3 items)</p> <p>Support from family and friends (3 items)</p> <p>Monetary/status reward (1 item)</p> <p>Esteem reward (1 item)</p> <p>Job security (1 item)</p> <p>Leadership (1 item)</p> <p>Interactional justice (1 item)</p> <p>Workplace where people compliment each other (1 item)</p> <p>Workplace where mistakes are acceptable (1 item)</p> <p>Collective efficacy (1 item)</p> <p>Trust with management (1 item)</p> <p>Preparedness for change (1 item)</p> <p>Respect for individuals (1 item)</p> <p>Fair personnel evaluation (1 item)</p> <p>Diversity (1 item)</p> <p>Career development (1 item)</p> <p>Work–self balance (positive) (1 item)</p> <p>Vigor (3 items)</p> <p>Anger-irritability (3 items)</p> <p>Fatigue (3 items)</p> <p>Anxiety (3 items)</p> <p>Depression (6 items)</p> <p>Physical stress response (11 items)</p> <p>Job satisfaction (1 item)</p> <p>Satisfaction with family life (1 item)</p> <p>Workplace harassment (1 item)</p> <p>Workplace social capital (1 item)</p>	Continuous score	Subjective well-being (Single item)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
60 [82]	Sato (2018)	Cross-sectional	Private companies	109 workers from four worksites	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items)	Continuous score Participants were defined as high stress or not based on the Stress Check Program in Japan.	Risk of periodontal disease (Saliva sampling)
61 [83]	Horie et al. (2018)	Cross-sectional	Nursing or welfare facilities	18 faculty staff members from care worker schools	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items)	Continuous score	Burnout (Maslach Burnout Inventory, MBI)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
62 [84]	Nakamura and Mizukami (2018)	Cross-sectional	Nursing or welfare facilities	657 healthcare workers at nine elderly nursing homes	Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items)	Continuous score	Work value (Work value scale) Assertive mind (Assertive Mind Scale) Self-efficacy (Generalized Self-efficacy Scale, GSES) Sense of coherence (Japanese sense of coherence scale: SOC-13) Communication skills (ENDCOREs) Working behaviors (Working behavior scale) Problem solution ability (Problem solution ability scale)
63 [85]	Enoki et al. (2018)	Cross-sectional	Private companies	664 workers from a call center	Quantitative job overload (3 items) Job control (3 items) Supervisor support (3 items) Coworker support (3 items)	Continuous score	Sleeping time (Self-reported)
64 [86]	Okada et al. (2018)	Cross-sectional	Hospitals	108 female nurses who are wives or mothers from two general hospitals in Fukuoka Prefecture, Japan	Job stressors (17 items) Stress response (29 items) Social support (9 items)	Continuous score	Mental health (28-item General Health Questionnaire, GHQ-28)
65 [87]	Adachi and Inaba (2018)	Cross-sectional	Private companies	368 workers from a single worksite	Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items)	Continuous score	Depression (Center for Epidemiologic Studies for Depression scale, CES-D)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
66 [88]	Sakamoto et al. (2018)	Cross-sectional	Hospitals	38 workers of the rehabilitation department of a core hospital	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items)	Continuous score	Pain catastrophizing (The Pain Catastrophizing Scale, PCS) Depression and anxiety (Hospital Anxiety Depression Scale, HADS)
67 [89]	Yada et al. (2017)	Cross-sectional	Hospitals	68 psychiatric assistant nurses and 140 psychiatric registered nurses from six psychiatric hospitals.	Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items)	Continuous score	Psychiatric nurse job stressor (Psychiatric Nurse Job Stressor Scale, PNJSS)
68 [90]	Enoki et al. (2017)	Cross-sectional	Private companies	538 employees from a call center	Quantitative job overload (3 items) Job control (3 items) Supervisor support (3 items) Coworker support (3 items)	Continuous score	Electrocardiography (EDG-9130 electrocardiograph)
69 [91]	Tsutsumi et al. (2017)	Cross-sectional	Web surveys	1650 workers via an online survey	Job stressors (17 items) Stress response (29 items) Social support (9 items)	Participants were defined as high stress or not based on the Stress Check Program in Japan.	Psychological distress (K6 scale)
70 [92]	Saijo et al. (2017)	Cross-sectional	Public sectors	2535 employees in local government, Asahikawa city, Hokkaido	Quantitative job overload (3 items) Job control (3 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items)	Continuous score	Work impairment Work output (13-item Stanford Presenteeism Scale, SPS-13)
71 [93]	Sakuraya et al. (2017)	Cross-sectional	Private companies	894 employees from a manufacturing company	Psychological stress response, except vigor (15 items)	Continuous score	Job crafting (Japanese version of the Job Crafting Questionnaire)



Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
72 [94]	Toyama and Mauno (2017)	Cross-sectional	Nursing or welfare facilities	489 eldercare nurses in special nursing homes	Social support (9 items) Realization of creativity (3 items)	Continuous score	Emotional intelligence (Emotional Intelligence Scale, EQS)
73 [95]	Izawa et al. (2017)	Cross-sectional	Hospitals	123 middle-aged workers from hospitals and research institutes in Kanagawa prefecture	Quantitative job overload (3 items) Job control (3 items)	The job strain index was calculated by dividing job demands by job control.	Cortisol level in fingernails (Fingernail sampling)
74 [96]	Watanabe et al. (2017)	Cross-sectional	Existing cohorts	2502 parents (1251 couples) from the Tokyo Work-Family Interface (TWIN) study	Fatigue (3 items)	Continuous score	Job demands (Four items from Furda, 1995) Family demands (Five items from Peeters, 2005)
75 [97]	Yoshimoto et al. (2017)	Cross-sectional	Hospitals	203 workers from a single hospital	Quantitative job overload (3 items) Job control (3 items) Interpersonal conflict (3 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job satisfaction (1 item)	Standardized scores were developed with a five-point scale based on a representative sample of Japanese workers. In addition, the participants were dichotomized into “not stressed” and “stressed” groups.	Low back pain (Von Korf’s grading method)
76 [98]	Sakagami (2016)	Cross-sectional	Convenience sample of faculty staff members or alumni of universities	112 male researchers from two academic institutions	Qualitative job overload (3 items)	Continuous score	Ego aptitude (Tokyo University Egogram Version II, TEG-II)
77 [99]	Yamada et al. (2016)	Cross-sectional	Existing cohorts	1764 workers from a pain-associated cross-sectional epidemiological study	Supervisor support (3 items) Coworker support (3 items) Job satisfaction (1 item)	Social support was used in quartiles of scores. Job satisfaction was classified into four categories: dissatisfied, somewhat dissatisfied, relatively satisfied, or satisfied.	Chronic pain (11-point Numeric Rating Scale, NRS) Health-related quality of life (Euro Quality of Life, EQ-5D)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
78 [100]	Otsuka et al. (2016)	Cross-sectional	Private companies	42,499 workers from 61 organizations	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Job control (3 items) Interpersonal conflict (3 items) Poor physical environment (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Supervisor support (3 items) Coworker support (3 items)	Participants were divided by each mean subscale score.	Suicidal ideation (Single item)
79 [101]	Watanabe et al. (2016)	Cross-sectional	Private companies	4543 employees from a beverage manufacturing company	Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items)	Continuous score	Serum lipids (Blood sampling)
80 [102]	Adachi and Inaba (2016)	Cross-sectional	Private companies	368 workers from a single worksite	Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items)	Continuous score	Depression (K10 scale)
81 [103]	Kawahito (2016)	Cross-sectional	Private companies	34 middle-aged workers from a manufacturing company	Depression (6 items)	Continuous score	Self-complexity (Trait sort test)
82 [104]	Maruya and Tanaka (2016)	Cross-sectional	Nursing or welfare facilities	29 care workers in a facility for persons with intellectual disabilities	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job and life satisfaction (2 items)	Continuous score	Quality of life (26-item World Health Organization Quality of Life Questionnaire, WHO QOL26)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
83 [105]	Fujita et al. (2016)	Cross-sectional	Private companies	440 workers from 35 units of a health care corporation	Quantitative job overload (3 items) Job control (3 items) Supervisor and coworker support (6 items)	Continuous score	Work engagement (Utrecht Work Engagement Scale, UWES)
84 [106]	Saijo et al. (2015)	Cross-sectional	Public sectors	2121 employees in the local government of Asahikawa city, Hokkaido	Job demands (3 items) Job control (3 items) Supervisor support (3 items) Coworker support (3 items)	Scores were dichotomized based on the median values.	Depression (Japanese version of Patient Health Questionnaire, PHQ-9) Burnout (Japanese version of Maslach Burnout Inventory-General Survey, MBI-GS) Insomnia (Athens Insomnia Scale, AIS)
85 [107]	Morimoto et al. (2015)	Cross-sectional	Hospitals	189 healthcare professionals from three general hospitals.	Psychological stress response (18 items)	Continuous score	Coping orientation Appraisal of coping acceptability (Coping Scale for Task stressors and Job evaluation stressors, CSTJ); Coping Scale for Interpersonal stressors, CSI)
86 [108]	Kagata et al. (2015)	Cross-sectional	Hospitals	306 female hospital ward nurses in the Kanto region	Psychological stress response except for vigor (15 items) Physical stress response (11 items)	Continuous score	Emotional labor (Emotional Labor Inventory for Nurses, ELIN) Work engagement (Utrecht Work Engagement Scale, UWES)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
87 [109]	Lee et al. (2015)	Cross-sectional	Private companies	276 workers (126 high-skilled foreign workers and 150 Japanese workers)	Quantitative job overload (3 items) Qualitative job overload (3 items) Interpersonal conflict (3 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job satisfaction (1 item) Satisfaction with family life (1 item)	Continuous score	Anxiety Depression Physical complaints (Mutual Intercultural Relations in Plural Societies Questionnaire, MIKIP5Q)
88 [110]	Kato et al. (2015)	Cross-sectional	Hospitals	837 nurses from 5 general hospitals in Hokkaido	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Interpersonal conflict (3 items) Poor physical environment (1 item) Job control (3 items) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Job and life satisfaction (2 items)	Continuous score	Excessive daytime sleepiness (Japanese version of the Epworth Sleepiness Scale, JESS)

Table A1. Cont.

No.	Author	Study Design	Recruitment	Sample	Subscale Used	Scoring	Other Measurements
89 [111]	Inaba and Inoue (2015)	Cross-sectional	Hospitals	195 female nurses working in a general hospital for one or more years	Quantitative job overload (3 items) Qualitative job overload (3 items) Physical demands (1 item) Job control (3 items) Interpersonal conflict (3 items) Poor physical environment (1 item) Skill utilization (1 item) Suitable jobs (1 item) Meaningfulness of work (1 item) Emotional demands (1 item) Role conflict (1 item) Work–self balance (negative) (1 item) Role clarity (1 item) Career opportunity (1 item) Supervisor support (3 items) Coworker support (3 items) Support from family and friends (3 items) Monetary/status reward (1 item) Esteem reward (1 item) Job security (1 item) Leadership (1 item) Interactional justice (1 item) Workplace where people compliment each other (1 item) Workplace where mistakes are acceptable (1 item) Collective efficacy (1 item) Trust with management (1 item) Preparedness for change (1 item) Respect for individuals (1 item) Fair personnel evaluation (1 item) Diversity (1 item) Career development (1 item) Work–self balance (positive) (1 item) Vigor (3 items) Anger-irritability (3 items) Fatigue (3 items) Anxiety (3 items) Depression (6 items) Physical stress response (11 items) Job satisfaction (1 item) Satisfaction with family life (1 item) Workplace harassment (1 item) Workplace social capital (1 item) Work engagement (1 item)	Continuous Score	Burnout (Pine's burnout scale)