

# Chapter 12

## Development of the New Brief Job Stress Questionnaire

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**Abstract** The present study aimed to investigate the reliability and construct validity of a new version of the Brief Job Stress Questionnaire (New BJSQ), which measures an extended set of psychosocial factors at work by adding new scales/items to the current version of the BJSQ. Additional scales/items were extensively collected from theoretical models of job stress and similar questionnaires in several countries. Scales/items were field-tested and refined through a pilot Internet survey. Finally, an 84-item standard version questionnaire, a 63-item recommended set, and a 23-item short version (141, 120, and 80 items in total when combined with the current 57-item BJSQ) were developed. A nationally representative survey was administered to employees in Japan ( $n = 1633$ ) in 2010/2011 to examine the reliability and construct validity. As a result, most scales showed acceptable levels of internal consistency (Cronbach's alpha) and test-retest reliability over one year. Principal component analyses showed that the first factor

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explained 50 % or greater proportion of the variance in most scales. A scale factor analysis and a correlation analysis showed that these scales fit the proposed theoretical framework. These findings provided a piece of evidence that the New BJSQ scales are reliable and valid. The New BJSQ can be a useful instrument to evaluate psychosocial work environment and positive mental health outcomes in the workplace.

**Keywords** New Brief Job Stress Questionnaire (New BJSQ) · Principal component analysis · Cronbach's alpha · Test-retest reliability · Scale factor analysis · Correlation analysis

## Introduction

In Japan, the number of workers with mental health problems is increasing (Ministry of Health, Labour and Welfare, Japan 2013) and thus primary prevention of mental health problems is a high priority for both employers and employees. Previous studies have shown that “assessing and improving work environment” effectively reduces mental health problems (Kawakami 2002; Semmer 2006); thus, the Brief Job Stress Questionnaire (BJSQ) (Shimomitsu et al. 2000) and Job Stress Assessment Diagram (JSAD) (Kawakami et al. 2000) have been developed with an aim to assess and improve work environment in Japan. The BJSQ and JSAD have been widely used in research and practice in the field of mental health in the Japanese workplace (e.g., Kobayashi et al. 2008; Umanodan et al. 2009).

However, more than 10 years have passed since the development of these tools; and since then, the field of prevention of job stress and workplace mental health has developed rapidly. First, in addition to the traditional Job Demands-Control (JD-C) model (Karasek 1979), the Effort-Reward Imbalance (ERI) model has been proposed (Siegrist 1996) and found to be associated with various health problems, such as poor mental health and cardiovascular diseases (CVD) (Kivimäki et al. 2006; Siegrist 2010; Tsutsumi and Kawakami 2004; van Vegchel et al. 2005). Second, recent research in this field has focused on higher level organizational factors, such as organizational justice (i.e., the extent to which employees perceive workplace decision-making procedures and interactions to be fair) (Greenberg 1987) and workplace social capital (i.e., shared values, attitudes, and norms of trust and

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reciprocity as well as practices of collective action in their work unit) (Kawachi 1999). These organizational factors were also found to be associated with poor mental health and CVD (Fujishiro and Heaney 2009; Kivimäki et al. 2006; Murayama et al. 2012; Ndjaboué et al. 2012; Robbins et al. 2012). Third, advancing research on work–family interface has indicated that both negative and positive spillovers from work life to non-work life are important factors in mental health among workers (Shimada et al. 2010; Shimazu et al. 2010, 2011). Fourth, with the introduction of the positive psychology to this field, positive attitude at work, such as work engagement (Schaufeli et al. 2002), has received an increased attention as an alternative mental health and well-being outcome among workers. Finally, workplace bullying or harassment at work has become a prominent problem in occupational health (Einarsen et al. 2003; Leymann 1996). However, these newly proposed factors and outcomes cannot be measured by the current BJSQ; thus, they should be measured with a short questionnaire that would easily assess psychosocial work environment as well as their employee (i.e., health-related) and organizational (i.e., business-related) outcomes in the practice.

Such multidimensional and comprehensive assessment of these traditional and newly proposed psychosocial factors and outcomes complies with psychosocial risk management framework in European countries, such as the Psychosocial Risk Management-European Framework (PRIMA-EF) (Leka et al. 2008) and the UK Health and Safety Executive’s (HSE) Management Standards for work-related stress (Cousins et al. 2004). PRIMA-EF is a part of the World Health Organization’s Healthy Workplaces Framework (Burton 2010) which proposes the healthy workplace model: a comprehensive way of thinking and acting that addresses work-related physical and psychosocial risks; promotion and support of healthy behaviors; and broader social and environmental determinants. On the other hand, the UK HSE Management Standards cover six primary sources of stress at work, such as demands, control, support (managerial support and peer support), relationship (conflict and unacceptable behavior), role (role ambiguity and role conflict), and change (preparedness for organizational changes), which are associated with poor health and well-being, lower productivity, and increased sickness absence.

We thus developed a new version of the Brief Job Stress Questionnaire (New BJSQ), which can assess “job demands” (i.e., physical, social, or organizational job aspects that require sustained physical and/or psychological effort and are associated with certain physiological and/or psychological costs) and “job resources” (i.e., physical, psychological, social, or organizational job aspects that may be functional in achieving work-related goals; reduce job demands and the associated physiological and psychological costs; and stimulate personal growth and development) as well as employee and organizational “outcomes” multidimensionally and comprehensively by adding its scales/items to the current version of the BJSQ.

## Methods

### *Development of an Item Pool*

#### Review of the Current BJSQ Scales

First, we reviewed the current BJSQ scales to assess what scales should be newly added. The BJSQ is a 57-item questionnaire developed in Japan (Shimomitsu et al. 2000). The items of the scales are measured on a four-point Likert-type response option and assess a wide range of “psychosocial work environment”, “stress reactions”, and “buffering factors” based on the job stress model proposed by the group of researchers from the US National Institute for Occupational Safety and Health (NIOSH) (Hurrell and McLaney 1988). Regarding “psychosocial work environment”, the BJSQ measures *quantitative job overload* (three items), *qualitative job overload* (three items), *physical demands* (one item), *interpersonal conflict* (three items), *poor physical environment* (one item), *job control* (three items), *suitable jobs* (one item), *skill (under)utilization* (one item), and *intrinsic reward* (one item). For “buffering factors”, *supervisor support* (three items) and *coworker support* (three items) as well as *support from family and friends* (three items) are measured. An 18-item scale measures five aspects of *psychological stress reaction*: *vigor* (three items), *anger-irritability* (three items), *fatigue* (three items), *anxiety* (three items), and *depression* (six items). Another 11-item scale is prepared to measure *physical stress reaction*. The BJSQ also measures *job satisfaction* and *family life satisfaction* (one item for each). All of these scales have been proven to show acceptable or high levels of internal consistency reliability and factor-based validity (Shimomitsu et al. 2000). We concluded that the current BJSQ measured basic elements of task-level psychosocial work environment based on the JD-C and Demand-Control-Support (DCS) models (Johnson and Hall 1988; Karasek 1979) as well as psychological and physical health outcomes while it did not measure workgroup- or organizational-level factors or positive mental health outcomes.

#### Collection of Scales and Items Based on Recent Theories on Job Stress

We collected scales and items related to “job demands”, “job resources”, or “outcomes” and evaluated suitability of these for the New BJSQ based on three sources: recent theories of job stress, already-established questionnaires of job stress, and a series of meetings with stakeholders. We first reviewed the relevant literature to find recent theories on job stress and their measures that were developed in the last 10 years but not used in the current BJSQ. This work identified several theories, including the ERI model (Siegrist 1996), emotional demands (Hochschild 1979), bullying or mobbing (Einarsen et al. 2003; Leymann 1996), organizational justice (procedural justice and interactional justice) (Bies and Moag 1986; Leventhal 1980; Thibaut and Walker 1975), and workplace social capital (Kawachi 1999) as “job

demands” or “job resources”; and work engagement (Schaufeli et al. 2002) as a potential “outcome”. Although a large part of these scales and items have been reported for their reliability and validity, our original items were partly included in the item pool. The established scales for these constructs were also reviewed and their items were included in the item pool of the New BJSQ. Each “job resources” scale was classified into three levels, i.e., “task-level”, “workgroup-level”, and “organizational-level” in order to indicate targets of a relevant intervention. Some proposed scales were combined because of their conceptual overlap (e.g., role ambiguity and role clarity).

### **Collection of Scales and Items from Existing Questionnaires**

We also reviewed questionnaires and/or published guidance of job stress and related variables, which have been used in practice. These included PRIMA-EF (Leka et al. 2008), which provides a list of a wide range of psychosocial work environment that can be related to workers’ mental health. The UK HSE Management Standards for work-related stress (Cousins et al. 2004) developed a questionnaire to measure six aspects of work environment mentioned earlier: demands, control, support, relationship, role, and change. The second version of the Copenhagen Psychosocial Questionnaire (COPSOQ II) (Pejtersen et al. 2010) is designed to measure a wide range of psychosocial factors, but the instrument is particularly unique in that it measures emotional demands, predictability, possibilities for development, quality of leadership, social community at work and trust (as a part of workplace social capital), justice and respect, and family-work (im)balance. The Korean Occupational Stress Scale (KOSS) (Chang et al. 2005), developed in an Asian country, was also used as a reference. It measures eight dimensions of psychosocial work environment: physical environment, job demand, insufficient job control, interpersonal conflict, job insecurity, organizational system, lack of reward, and occupational climate. We compared the scales included in these questionnaires to cover all these concepts in the New BJSQ.

### **Proposal of Additional Scales from Stakeholder Meetings**

We held a series of stakeholder meetings, which were held twice a year attended by researchers from five institutes/departments of occupational safety and health, occupational health staffs (physicians, nurses, and hygienists), and representatives of two employer associations and one employee association. Based on group discussions in the meetings, several new concepts of “job resources” were proposed. (1) *Workplace where people compliment each other* measures a workplace in which workers are appropriately appreciated and comprises items that may overlap with items of reward at work to some extent even though the reward scale did not specifically intend to measure this aspect of work. (2) *Workplace where mistakes are acceptable* assesses a workplace in which workers have a chance to recover

even if they failed or made a mistake at work. (3) *Diversity* concerns worker diversity, particularly in terms of psychological differences by gender, age, and employment status. These aspects of organizational characteristics were added to the scale/item pool to create the New BJSQ.

### ***Candidate Scales/Items for a Pilot Study***

Through the process described above, we developed a trial version of the New BJSQ comprising 34 scales (129 items). These were *quantitative job overload*, *emotional demands*, *role conflict*, *work-self balance (negative)*, and *workplace harassment* classified as “job demands” (five scales, 14 items); *job control*, *meaningfulness of work*, *role clarity*, *career opportunity*, *novelty*, and *predictability* classified as “task-level job resources” (six scales, 19 items); *monetary/status reward*, *esteem reward*, *job security*, *leadership*, *interactional justice*, *workplace where people compliment each other*, *workplace where mistakes are acceptable*, *collective efficacy* (i.e., team members’ belief that they can successfully organize and execute the courses of action required to accomplish given goals) (Bandura 1997), and *workplace social capital* classified as “workgroup-level job resources” (nine scales, 38 items); *trust with management*, *preparedness for change*, *procedural justice*, *respect for individuals*, *fair personnel evaluation*, *diversity*, *career development*, and *work-self balance (positive)* classified as “organizational-level job resources” (eight scales, 33 items); and *work engagement*, *performance of a duty*, *realization of creativity*, *active learning*, *job performance*, and *others* classified as “outcomes” (six scales, 25 items).

### ***A Pilot Internet Survey***

On March 17, 2010, Japanese employees aged 15 years or older who registered with Yahoo! Research monitors were invited to complete an anonymous Web-based self-administered questionnaire including the current BJSQ and the trial version of the New BJSQ. On the same day, the number of respondents reached 1000 (687 men and 313 women) and the survey was terminated. Based on the data from these 1000 respondents, we further reduced the number of items and developed a final standard version of the New BJSQ. We calculated Cronbach’s alpha coefficient and item-total correlation coefficient (ITC) for each candidate scale, and if possible, limited the number of items to two or three, five at maximum, in reference to opinions of occupational health staffs (e.g., occupational physicians, occupational health nurses, and clinical psychologists).

### ***Development of a Standard Version***

We fixed the final standard version of the New BJSQ comprising 30 scales and 84 items (49 scales and 141 items in total when combined with the current 57-item BJSQ). All New BJSQ scales are available at <http://www.jstress.net> (only in Japanese language).

### ***Development of a Recommended Set***

Not all New BJSQ scales are always necessary to assess the work environment: Users can select needed scales in accordance with occupation or feature of their company. Therefore, from May 2010 to February 2011, occupational health staffs and personnel/labor staffs who participated in conferences on occupational health (e.g., the Annual Meeting of the Japan Society for Occupational Health) were invited to complete an anonymous Web-based self-administered questionnaire, which asked them to choose “important scale(s)” and “unnecessary or hard-to-use scale(s)” from the newly added scales (multiple answers were possible). Based on 103 valid responses, we selected higher priority scales from the standard version and confirmed a recommended set of the New BJSQ. The final recommended set of the New BJSQ comprised 23 scales (63 items in total). When they are combined with the current 57-item BJSQ, the total number of scales (items) are 42 (120).

### ***Development of a Short Version***

Since the New BJSQ comprises a large number of scales and items, it may be a problem for users to complete it. If we used the New BJSQ in addition to the current BJSQ, which has already 57 items, it would be burdensome to use it in practice. To cope with this dilemma, we developed a short version of the New BJSQ. This short version can assess each higher priority scale, which is included in the recommended set, by one or two item(s). The development of the short version was based on the COPSOQ II (Pejtersen et al. 2010), which are used mainly in Denmark and its short version can assess each dimension by one or two item(s).

For the 15 scales comprising three or more items, the selection of items for the short version was based on ITC calculated for each scale. One item with highest ITC was selected from each scale. There were few exceptions. For the *role clarity* scale, the ITC was lower for the selected item (“I know what my duties and responsibilities are”) (0.478) than that for another item (“How much authority I have in my job is clear”) (0.481) among men. However, the ITC was better for selected item (0.453) than that for the other item (0.380) among women. Thus, we selected the former item. For the *diversity* scale, the ITC was lower for the selected item (“In my

workplace, all types of workers (regular full-time employees, non-regular employees, part-time workers, etc.) are respected equally as fellow members of the company or organization”) (0.504) compared to another item (“My workplace provides a pleasant working environment for young people”) (0.513). However, considering a current increasing concern about non-regular or precarious employment (Benach and Muntaner 2007; Inoue et al. 2010), we selected the former item. The average ITC for the new 15 single-item scales of the short version was 0.693, ranging from 0.478 to 0.882. For the *meaningfulness of work* scale, a three-item scale was constructed for the New BJSQ by adding two items to its one-item current BJSQ scale on *intrinsic reward*. However, for the short version, the one-item *intrinsic reward* scale was still used. For six of the seven two-item scales, i.e., *work-self balance (negative)*, *monetary/status reward*, *esteem reward*, *workplace where mistakes are acceptable*, *work-self balance (positive)*, and *workplace harassment*, one of the two items was selected for the short version based on a discussion among the authors, considering its content validity, representativeness of the items (i.e., applicable to most situations), and comprehensibility. We decided to keep two items to measure *work engagement* in the short version because the two items measure different dimensions of this concept (i.e., vigor and dedication).

### ***Mapping Scales onto a Theoretical Framework***

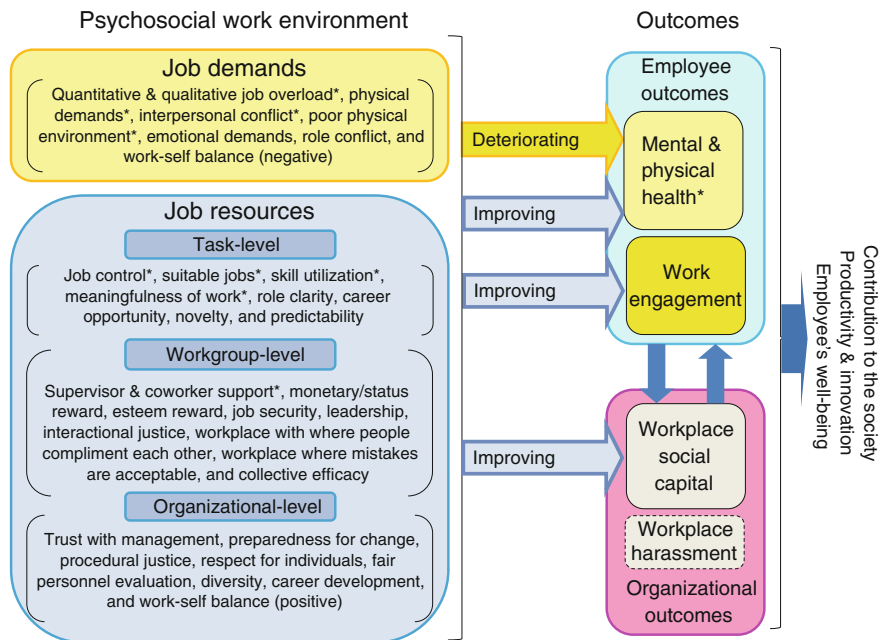
According to the discussions with and suggestions from the stakeholder meeting, we developed a new theoretical framework for a positive mental health at work, which is called the “*Kenko-Ikiiki (Healthy and Active) Workplace model*”, as a new Japanese framework for prevention of job stress and promotion of positive mental health (Fig. 12.1). The model was based on the Job Demands-Resources (JD-R) model (Schaufeli and Bakker 2004), in which “job demands” predict negative emotional reactions (such as burnout) while “job resources”, including “task-level”, “workgroup-level”, and “organizational-level”, predict both negative and positive emotional reactions (such as work engagement). Based on an extensive discussion, we included each scale of the New BJSQ onto the “*Kenko-Ikiiki Workplace model*” (see Fig. 12.1). In this model, *workplace social capital* and *workplace harassment*, as well as *mental and physical health* (measured as *psychological and physiological stress reactions* by the current BJSQ) and *work engagement*, were included as “outcomes” of the “job demands” and “job resources”. The decision was made because in the stakeholder meetings, a workplace with greater social capital and without workplace harassment was considered as one of current business goals of a company and also because the *workplace social capital* scale seemed to measure employees’ evaluation of connectedness in a workplace, which was considered to be an “outcome” of social capital rather than of work environment (Kouvonen et al. 2006). However, it should be noted that the “*Kenko-Ikiiki Workplace model*”



provides only a broader conceptual framework of relationships among its components, just like the US NIOSH job stress model (Hurrell and McLaney 1988).

In this model, *mental and physical health* and *work engagement* were included as “employee outcomes”, and *workplace social capital* and *workplace harassment* were included as “organizational outcomes”. The decision to add *workplace social capital* as “organizational outcomes” was made through an extensive discussion during the stakeholder meetings. *Workplace social capital* is an important psychosocial factor at work in a collective society like Japan; thus, it should be emphasized. It is similar to a concept of team work, which underlies the productivity of a workplace in Japan; hence, it can be an important intermediate outcome or goal of the organizational activity. While components of *workplace social capital*, such as trust and justice at workplace (Kouvonen et al. 2006), are measured separately in the New BJSQ, it would be useful to have an overall measure of perceived *workplace social capital* as a summary “outcome” of these “job resources”, as indicated by items of the current *workplace social capital* scale. Perceived *Workplace social capital* may affect “employee outcomes”, and vice versa, as shown in Fig. 12.1.

Scales and the number of items on the current BJSQ and New BJSQ are shown in Table 12.1.



**Fig. 12.1** A new framework of prevention of job stress and promotion of positive mental health in Japan, the “*Kenko-Ikiiki (Healthy and Active) Workplace model*”, which incorporates the current BJSQ/New BJSQ scales. \*Scales which are included in the current BJSQ

**Table 12.1** Scales and the number of items on the current Brief Job Stress Questionnaire (BJSQ) and New BJSQ

Scales	Current BJSQ (B) or New BJSQ (N)	Number of items (BJSQ + New BJSQ standard version)	Number of items (BJSQ + New BJSQ recommended set)	Number of items (BJSQ + New BJSQ short version)
<i>Job demands</i>				
1. Quantitative job overload	B	3	3	3
2. Qualitative job overload	B	3	3	3
3. Physical demands	B	1	1	1
4. Interpersonal conflict	B	3	3	3
5. Poor physical environment	B	1	1	1
6. Emotional demands	N	3	3	1
7. Role conflict	N	3	3	1
8. Work-self balance (negative)	N	2	2	1
<i>Task-level job resources</i>				
9. Job control	B	3	3	3
10. Suitable jobs	B	1	1	1
11. Skill utilization	B	1	1	1
12. Meaningfulness of work	B/N <sup>b</sup>	3	3	1
13. Role clarity	N	3	3	1
14. Career opportunity	N	3	3	1
15. Novelty	N	3	–	–
16. Predictability	N	3	–	–
<i>Workgroup-level job resources</i>				
17. Supervisor support	B	3	3	3
18. Coworker support	B	3	3	3
19. Support from family and friends <sup>a</sup>	B	3	3	3

(continued)

**Table 12.1** (continued)

Scales	Current BJSQ (B) or New BJSQ (N)	Number of items (BJSQ + New BJSQ standard version)	Number of items (BJSQ + New BJSQ recommended set)	Number of items (BJSQ + New BJSQ short version)
20. Monetary/status reward	N	2	2	1
21. Esteem reward	N	2	2	1
22. Job security	N	3	3	1
23. Leadership	N	3	3	1
24. Interactional justice	N	3	3	1
25. Workplace where people compliment each other	N	3	3	1
26. Workplace where mistakes are acceptable	N	2	2	1
27. Collective efficacy	N	3	–	–
<i>Organizational-level job resources</i>				
28. Trust with management	N	3	3	1
29. Preparedness for change	N	3	3	1
30. Procedural justice	N	3	–	–
31. Respect for individuals	N	3	3	1
32. Fair personnel evaluation	N	3	3	1
33. Diversity	N	3	3	1
34. Career development	N	5	5	1
35. Work-self balance (positive)	N	2	2	1
<i>Outcomes</i>				
36. Vigor	B	3	3	3
37. Anger-irritability	B	3	3	3
38. Fatigue	B	3	3	3

(continued)

**Table 12.1** (continued)

Scales	Current BJSQ (B) or New BJSQ (N)	Number of items (BJSQ + New BJSQ standard version)	Number of items (BJSQ + New BJSQ recommended set)	Number of items (BJSQ + New BJSQ short version)
39. Anxiety	B	3	3	3
40. Depression	B	6	6	6
41. Physical stress reaction	B	11	11	11
42. Job satisfaction	B	1	1	1
43. Family life satisfaction <sup>a</sup>	B	1	1	1
44. Workplace harassment	N	2	2	1
45. Workplace social capital	N	3	3	1
46. Work engagement	N	2	2	2
47. Performance of a duty	N	3	–	–
48. Realization of creativity	N	3	–	–
49. Active learning	N	3	–	–
Total number of items		141	120	80

– No scale

<sup>a</sup>Non-work environment or outcome

<sup>b</sup>A three-item scale was constructed for the New BJSQ by adding two items to its one-item BJSQ scale on intrinsic reward. However, for the short version of New BJSQ, the one-item intrinsic reward scale was still used

## *Evaluation of Reliability, Validity, and Normative Scores of the New BJSQ*

### **Participants**

To evaluate reliability and validity and obtain normative scores of the New BJSQ, we conducted cross-sectional and one-year prospective studies of a nationally representative sample of workers in Japan. In November 2010, a self-administered questionnaire was mailed to 5000 Japanese people aged 20–60 years selected by a two-stage random sampling. More specifically, we first selected 100 municipalities randomly by considering the population size and then selected 50 residents randomly from each municipality using the population registry. If the selected

municipality did not allow us to access population registry, we randomly selected another municipality. By February 2011, we received 2400 completed questionnaires, of which 2384 were valid (response rate, 47.7 %). Among the respondents, 1633 respondents (847 men and 786 women) were classified as being employed. Out of these 1633 employed respondents, 479 agreed to participate in a follow-up survey. In November 2011, the same questionnaires were sent to these participants and 417 questionnaires (202 men and 215 women) were returned by December 2011 (response rate, 87.1 %). Research Ethics Committee of the Graduate School of Medicine and Faculty of Medicine, The University of Tokyo reviewed and approved aims, designs, and procedures of the Internet-based pilot study, the cross-sectional and prospective studies, as well as the aforementioned pilot Internet survey (No. 2953).

## Measures

The self-administered questionnaires at baseline and a follow-up included all scales of the current BJSQ and New BJSQ.

## Statistical Analysis

Based on the baseline cross-sectional data (1633 employees), a national average and standard deviation of each scale of the current BJSQ and New BJSQ were calculated for the total sample. Unlike calculating a scale score as a sum of the item scores, in this analysis, a scale score was calculated as an average item score (i.e., a sum of the item scores divided by the number of items) ranging from 1 to 4 for all the scales of current BJSQ and New BJSQ after converting all item scores so that higher scores indicated better status (e.g., higher scores of “job demands” scales mean lower job demands and a higher score of *psychological stress reaction* means lower level of psychological distress; on the other hand, higher scores of “job resources” scales mean higher job resources; for the *novelty* scale, the score was transformed that the higher score means greater frequency of encountering new things at work). This procedure allowed us to standardize averages and ranges of scores across scales and to interpret scale scores easier, making the comparison of the scale scores more convenient.

Cronbach’s alpha coefficient for each scale was calculated to evaluate internal consistency reliability. A proportion of variance explained by the first factor was calculated for scales with more than one item to examine their factor-based validity. Polychoric correlation coefficients between scales (or items) of the short version and scales of the standard version were calculated to evaluate validity of the short version. Furthermore, based on the data from 417 respondents who completed the one-year follow-up, Pearson’s correlation coefficients were calculated to evaluate one-year test-retest reliability. For these analyses, a pair-wise deletion of cases rather than list-wise deletion was used when items had a missing response.

Using 1442 respondents who completed all the 34 “psychosocial work environment” scales (excluding the *support from family and friends* scale because of non-work environment), exploratory and confirmatory factor analyses were conducted for 34 scales to see whether the factor structure fit the JD-R model (Schaufeli and Bakker 2004), in which “psychosocial work environment” can be classified into “job demands” and “task-”, “workgroup-”, and “organizational-level job resources”. For the exploratory factor analysis, the principal factor method with Oblimin rotation was used to extract the number of factors based on the scree test criterion. The scree test involves plotting the eigenvalues in descending order of their magnitude against their factor numbers and determining where they level off. The break between steep slope and leveling off indicates the number of meaningful factors. For the confirmatory factor analysis, model fit was assessed using fit indices including the goodness of fit index (GFI), adjusted goodness of fit index (AGFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA) estimated by the maximum likelihood method. To examine whether the data fit the JD-R model (Schaufeli and Bakker 2004), in which “job demands” predict negative emotional reactions (such as burnout) while “job resources”, including “task-level”, “workgroup-level”, and “organizational-level”, predict both negative and positive emotional reactions (such as work engagement), polychoric correlation coefficients were calculated between 35 scales (including the *support from family and friends* scale) of “psychosocial work environment” and selected “outcomes” scales (i.e., *psychological stress reaction*, *physical stress reaction*, *work engagement*, *workplace social capital*, and *workplace harassment*) using 1398 respondents who completed all scales.

All the analyses were conducted using the IBM SPSS Statistics and Amos version 19.

## Results

### *National Average of the New BJSQ*

For the nationally representative sample of 1633 employees, average scores for most scales of the current BJSQ and New BJSQ fell between 2.0 and 3.0, with an average of 2.6. The average score was higher for *workplace harassment* (3.58), *depression* (3.27), and *physical stress reaction* (3.22) and lower for *work-self balance (positive)*, *respect for individuals*, *quantitative job overload*, and *fair personnel evaluation* (2.10–2.15). The pattern was similar for the short version scales. More detailed information about the national average scores by gender, occupation, employment type, and industry is available at <http://www.jstress.net> (only in Japanese language).

### ***Reliability of the New BJSQ***

Almost all scales showed high internal consistency reliability (Cronbach's  $\alpha \geq 0.70$ ). The Cronbach's alpha coefficients were moderate for *interpersonal conflict*, *role clarity*, *predictability*, *job security*, and *diversity* ( $0.60 < r < 0.70$ ). Furthermore, among 417 workers who completed one-year follow-up, one-year test-retest reliability as measured by Pearson's correlation coefficient was high ( $r \geq 0.50$ ) for most scales. Concerning the standard version, Pearson's correlation coefficient was slightly lower for *skill utilization*, *role clarity*, *predictability*, *workplace harassment*, and *performance of a duty*. Regarding the short version, the correlation was lower for *role clarity*, *preparedness for change*, and *workplace harassment* ( $0.34 < r < 0.50$ ).

### ***Factor-Based Validity of the New BJSQ***

For most scales, the variance explained by the first factor in the principal component analysis exceeded 50 %. The variance explained was lower (30–50 %) for the *psychological stress reaction* and *physical stress reaction* scales of the current BJSQ.

### ***Validity of the Short Version***

Polychoric correlation analyses showed that all scales (or items) in the short version correlated highly with scales of the standard version ( $r > 0.80$ ).

### ***Scale Factor Analysis***

We created a scree plot for the exploratory factor analysis of 34 scales of the current BJSQ and New BJSQ, which measure “psychosocial work environment”. According to the scree test criterion, three-factor structure was thought to be meaningful because the break between the steep slope and leveling off was between factor number three and four.

When we assumed the three-factor structure, most “organizational-level job resources” scales showed high loadings on Factor 1 ( $> 0.70$ ). Most scales from “workgroup-level job resources” also showed moderate factor loadings ( $> 0.50$ ) on this factor. Factor 1 could be interpreted as “workgroup- and organizational-level job resources”. Most “job demands” scales showed higher factor loading on Factor 2, possibly representing a “job demands” dimension. Three out of eight scales of

“task-level job resources” showed high loadings on Factor 3. *Skill utilization* and *role clarity* did not load on any factor ( $< 0.50$ ) while highest factor loadings were shown in Factor 3. Therefore, Factor 3 could be interpreted as “task-level job resources”. The inter-factor correlation between Factors 1 and 2 was 0.20; between Factors 1 and 3 was 0.56; and between Factors 2 and 3 was 0.09, respectively.

In the confirmatory factor analysis, assuming that there were four factors (i.e., “job demands” and “task-”, “workgroup-”, and “organizational-level job resources”), fit indices were 0.79, 0.76, 0.78, and 0.08 for GFI, AGFI, CFI, and RMSEA, respectively. Factor loading for each scale was all significant ( $p < 0.01$ ). When we conducted the same analysis assuming that there were three factors, based on the result of the exploratory factor analysis, these indices were 0.77, 0.74, 0.75, and 0.09, respectively. An additional analysis to compare the four-factor structure and the three-factor structure based on the result of the exploratory factor analysis indicated that the expected cross-validation index (ECVI) was 3.94 for the former model and 4.41 for the latter model, showing the former model had better fit.

### ***Correlations with “Outcomes”***

Polychoric correlation coefficients between “psychosocial work environment” scales and “outcomes” scales were calculated using the data from 1398 respondents who completed all scales (Table 12.2). In general, “job demands” scales correlated strongly with *psychological and physical stress reactions* but modestly with *work engagement* and *workplace social capital*. “Job resources” scales correlated with *psychological and physical stress reactions* to a similar extent. However, these scales, particularly “workgroup-” and “organizational-level job resources” scales, correlated with *work engagement* and *workplace social capital* more strongly than did “job demands” scales. These findings are consistent with the theoretical framework of the JD-R model (Schaufeli and Bakker 2004) in which “job demands” predict negative emotional reactions (such as burnout) while “job resources” predict both negative and positive emotional reactions (such as work engagement).

## **Discussion**

In the present study, we developed the New BJSQ, which can assess an extensive set of “job demands”, “job resources”, and “outcomes”, by adding items/scales to the current version of the BJSQ. Most scales of the New BJSQ as well as the current BJSQ showed acceptable levels of internal consistency and test-retest reliability over one year. Principal component analyses of scale items showed that the first factor explained 50 % or more of variance for most scales, suggesting factor-based validity of these scales. Correlation analyses also showed a certain level of validity



**Table 12.2** Polychoric correlation coefficients between psychosocial work environment (i.e., job demands and job resources) and outcomes measured by using the current BJSQ and New BJSQ scales: a national representative sample of employees of Japan in 2010/2011

Scales	Psychological stress reaction	Physical stress reaction	Work engagement	Workplace social capital	Workplace harassment
<i>Job demands</i>					
1. Quantitative job overload	0.361**	0.251**	-0.050	0.072**	0.207**
2. Qualitative job overload	0.240**	0.174**	-0.241**	-0.056*	0.147**
3. Physical demands	0.142**	0.103**	-0.110**	0.022	0.126**
4. Interpersonal conflict	0.494**	0.282**	0.305**	0.570**	0.531**
5. Poor physical environment	0.268**	0.179**	0.259**	0.337**	0.240**
6. Emotional demands <sup>a</sup>	0.583**/ 0.530**	0.384**/ 0.331**	0.172**/ 0.164**	0.251**/ 0.200**	0.419**/ 0.379**
7. Role conflict <sup>a</sup>	0.505**/ 0.448**	0.319**/ 0.286**	0.236**/ 0.195**	0.410**/ 0.376**	0.431**/ 0.420**
8. Work-self balance (negative) <sup>a</sup>	0.499**/ 0.503**	0.317**/ 0.305**	0.160**/ 0.167**	0.220**/ 0.226**	0.275**/ 0.298**
<i>Task-level job resources</i>					
9. Job control	0.329**	0.190**	0.290**	0.241**	0.219**
10. Suitable jobs	0.411**	0.171**	0.610**	0.361**	0.254**
11. Skill utilization	0.142**	0.092**	0.326**	0.193**	0.157**
12. Meaningfulness of work <sup>a</sup>	0.331**/ 0.386**	0.142**/ 0.166**	0.738**/ 0.742**	0.455**/ 0.479**	0.183**/ 0.220**
13. Role clarity <sup>a</sup>	0.245**/ 0.156**	0.103**/ 0.047	0.328**/ 0.329**	0.394**/ 0.278**	0.153**/ 0.130**
14. Career opportunity <sup>a</sup>	0.300**/ 0.329**	0.150**/ 0.162**	0.578**/ 0.594**	0.425**/ 0.402**	0.162**/ 0.158**
15. Novelty	-0.141**	-0.096**	0.151**	0.017	-0.098**
16. Predictability	0.208**	0.124**	0.229**	0.220**	0.091**
<i>Workgroup-level job resources</i>					
17. Supervisor support	0.360**	0.209**	0.395**	0.409**	0.314**
18. Coworker support	0.305**	0.180**	0.321**	0.459**	0.264**
19. Support from family and friends <sup>b</sup>	0.196**	0.105**	0.175**	0.210**	0.164**
20. Monetary/status reward <sup>a</sup>	0.337**/ 0.317**	0.241**/ 0.243**	0.331**/ 0.264**	0.427**/ 0.378**	0.223**/ 0.173**
21. Esteem reward <sup>a</sup>	0.390**/ 0.370**	0.237**/ 0.224**	0.438**/ 0.429**	0.511**/ 0.454**	0.341**/ 0.302**
22. Job security <sup>a</sup>	0.361**/ 0.237**	0.248**/ 0.154**	0.306**/ 0.181**	0.332**/ 0.239**	0.326**/ 0.215**

(continued)

**Table 12.2** (continued)

Scales	Psychological stress reaction	Physical stress reaction	Work engagement	Workplace social capital	Workplace harassment
23. Leadership <sup>a</sup>	0.299**/ 0.293**	0.170**/ 0.149**	0.429**/ 0.449**	0.461**/ 0.471**	0.184**/ 0.222**
24. Interactional justice <sup>a</sup>	0.376**/ 0.375**	0.211**/ 0.209**	0.420**/ 0.423**	0.503**/ 0.484**	0.362**/ 0.340**
25. Workplace where people compliment each other <sup>a</sup>	0.342**/ 0.326**	0.189**/ 0.189**	0.434**/ 0.429**	0.454**/ 0.437**	0.302**/ 0.301**
26. Workplace where mistakes are acceptable <sup>a</sup>	0.322**/ 0.314**	0.177**/ 0.180**	0.480**/ 0.413**	0.458**/ 0.414**	0.240**/ 0.256**
27. Collective efficacy	0.320**	0.165**	0.482**	0.518**	0.188**
<i>Organizational-level job resources</i>					
28. Trust with management <sup>a</sup>	0.366**/ 0.358**	0.200**/ 0.207**	0.421**/ 0.391**	0.547**/ 0.517**	0.329**/ 0.314**
29. Preparedness for change <sup>a</sup>	0.341**/ 0.292**	0.159**/ 0.153**	0.393**/ 0.365**	0.501**/ 0.465**	0.247**/ 0.207**
30. Procedural justice	0.303**	0.209**	0.354**	0.477**	0.245**
31. Respect for individuals <sup>a</sup>	0.373**/ 0.377**	0.246**/ 0.237**	0.514**/ 0.506**	0.510**/ 0.536**	0.235**/ 0.275**
32. Fair personnel evaluation <sup>a</sup>	0.307**/ 0.291**	0.193**/ 0.194**	0.396**/ 0.359**	0.505**/ 0.444**	0.205**/ 0.196**
33. Diversity <sup>a</sup>	0.285**/ 0.269**	0.156**/ 0.142**	0.342**/ 0.353**	0.447**/ 0.414**	0.222**/ 0.207**
34. Career development <sup>a</sup>	0.302**/ 0.301**	0.181**/ 0.176**	0.477**/ 0.489**	0.545**/ 0.513**	0.211**/ 0.194**
35. Work-self balance (positive) <sup>a</sup>	0.435**/ 0.486**	0.244**/ 0.259**	0.662**/ 0.677**	0.417**/ 0.435**	0.190**/ 0.204**

Based on data from 1398 respondents who completed all the scales. Note that all scale scores were converted so that higher scores indicate a better status. See text for more detail

\* $p < 0.05$ ; \*\* $p < 0.01$ . No asterisk means  $p > 0.05$

<sup>a</sup>Correlations between the standard version scale and outcomes are shown before the slash; correlations between the short version item and outcomes are shown after the slash

<sup>b</sup>Non-work environment

of the short version. Exploratory factor analysis of the current BJSQ/New BJSQ scales of “psychosocial work environment” indicated that the three-factor structure (i.e., “job demands”, “task-level job resources”, and combined factor for “work-group- and organizational-level job resources”) is meaningful while confirmatory factor analysis showed better mode fit for the firstly assumed four-factor structure rather than the three-factor structure based on the result of the exploratory factor analysis. A correlation analysis showed that “job demands” and “job resources” scales were associated with *psychological and physical stress reactions* while “job resources” scales were also associated with positive “outcomes” scales, such as

*work engagement* and *workplace social capital*, as predicted by the JD-R model (Schaufeli and Bakker 2004). These findings provided evidence that the New BJSQ scales are reliable and valid and fit a theoretical framework of the “*Kenko-Ikiiki Workplace model*” based on the JD-R model.

As introduced earlier, the principal aim of the New BJSQ is to assess “psychosocial workplace environment” and their employee (i.e., health-related) and organizational (i.e., business-related) “outcomes” in an extensive way. By using the national average scores as well as information about their distributions by gender, occupation, employment type, and industry, as norms, the New BJSQ scales can be used to assess “psychosocial work environment” and related “outcomes” to prevent stress at work and promote positive mental health at work. Newly added scales can be used to assess “psychosocial work environment” with a broader range of theoretical models of job stress, such as ERI (i.e., *monetary/status reward*, *esteem reward*, and *job security*) and organizational justice (i.e., *interactional justice* and *procedural justice*), and a boarder range of “outcomes”, such as *work engagement*, *workplace social capital*, and *workplace harassment*. The New BJSQ followed the tradition of the current BJSQ, assessing “psychosocial work environment” and “outcomes” simultaneously, which is also used in the PRIMA-EF approach (Cousins et al. 2004). An additional unique feature of the New BJSQ is that it includes the scale of *workplace social capital* as an “organizational outcome” summarizing influence of psychosocial “job resources”. This approach may have some merits. While “outcomes” are a primary indicator of the need for an intervention, measuring “psychosocial work environment” could provide information on components of work environment, which should be a target of the intervention. The information provided by this approach on the association between “psychosocial work environment” and “outcomes”, which may vary depending on workplace, occupation, and industry, could be also useful for planning an intervention. Furthermore, “outcomes” assessed by the New BJSQ are supposed to predict further distal “employee outcomes”, such as satisfaction and well-being, and “organizational outcomes”, such as productivity and innovation, which need to be addressed in the future research.

Another important feature of the New BJSQ is that it has the standard version, the recommended set, and the short version, which can assess work environment by fewer items. Especially for the recommended set, users can assess recommended “psychosocial work environment” and “outcomes” of which scales/items were selected based on the opinions of occupational health staffs and personnel/labor staffs. However, if users have interest in “psychosocial work environment” or “outcomes”, which are not included in the recommended set, they can add them freely to the recommended set. Furthermore, for the short version, users can assess the recommended set of “psychosocial work environment” and “outcomes” by only 80 items if combined with the current 57-item BJSQ, which may be easy-to-use in practice. On the other hand, because the short version may not have sufficient measurement accuracy, it may not be suitable for scientific research. The standard version may be more desirable for use in scientific research rather than the short version.

The present study has some limitations that should be considered. First, the response rate in the present study was only 47.7 %. In addition, out of these respondents ( $n = 1633$ ), only 479 participated in the follow-up survey. Although we calculated national average of each scale of the current BJSQ and New BJSQ using these 1633 respondents, it should be noted that the national average scores of the present study is only preliminary and may be affected by a selection bias to some extent. Further research using larger sample with higher response rate should be conducted to calculate more precise national average scores. Second, we exhaustively reviewed the relevant literature to find recent theories on job stress and their measures. Accordingly, we selected new scales/items according to the questionnaires and/or published job stress and related variables used in foreign studies, which may provide a piece of content validity of the New BJSQ. However, a more detailed content validity could not be examined. Similarly, the present study provided a partial support for construct validity of the New BJSQ by calculating a proportion of variance explained by the first factor and conducting factor analyses and correlation analyses between “psychosocial work environment” and “outcomes”. However, convergent and discriminant validities using other reliable and valid measurements (e.g., Job Content Questionnaire [JCQ] (Karasek 1985), General Health Questionnaire [GHQ] (Goldberg 1972), Center for Epidemiologic Studies Depression [CES-D] Scale (Radloff 1977), World Health Organization Health and Work Performance Questionnaire [WHO-HPQ] (Kessler et al. 2003), etc.) could not be examined. Thus, more detailed content and construct validities should be examined in a future study. Third, a few scales of the New BJSQ showed only modest internal consistency and test-retest reliability, particularly for the *role clarity* scale. Further review of these items is needed to achieve higher measurement accuracy. Fourth, since the confirmatory factor analysis did not reach the recommended acceptable level for model fit (i.e., GFI, AGFI, and CFI  $> 0.90$  and RMSEA  $< 0.05$ ) (Hu and Bentler 1999), further study on factor structure of the New BJSQ is needed. Finally, as mentioned earlier, the standard version has 141 items in total when combined with the current 57-item BJSQ, which may be hard-to-use in practice due to large number of items. However, the recommended set and the short versions were also developed. Future study should use item response theory (IRT) to further reduce the number of items.

## Conclusion

Although the New BJSQ remains a matter of further revisions, it can assess a broader set of psychosocial factors at work compared to the current BJSQ in accordance with a proposed Japanese framework of prevention of job stress, the “*Kenko-Ikiiki Workplace model*”.

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