Development of a Short Questionnaire to Measure an Extended Set of Job Demands, Job Resources, and Positive Health Outcomes: The New Brief Job Stress Questionnaire

Akiomi INOUE1†, Norito KAWAKAMI2†*, Teruichi SHIMOMITSU3,4, Akizumi TSUTSUMI5, Takashi HARATANI6, Toru YOSHIKAWA7, Akihito SHIMAZU2 and Yuko ODAGIRI4

1Department of Mental Health, Institute of Industrial Ecological Sciences, University of Occupational and Environmental Health, Japan
2Department of Mental Health, Graduate School of Medicine, The University of Tokyo, Japan
3Japan Health Promotion Fitness Foundation, Japan
4Department of Preventive Medicine and Public Health, Tokyo Medical University, Japan
5Department of Public Health, Kitasato University School of Medicine, Japan
6Health Administration and Psychosocial Factor Research Group, National Institute of Occupational Safety and Health, Japan
7Department of Research, The Institute for Science of Labour, Japan

Received September 20, 2013 and accepted January 22, 2014
Published online in J-STAGE February 4, 2014

Abstract: This 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 job stress models and similar questionnaires in several countries. Scales/items were field-tested and refined through a pilot internet survey. Finally, an 84-item questionnaire (141 items in total when combined with the current BJSQ) was developed. A nationally representative survey was administered to employees in Japan (n=1,633) to examine the reliability and construct validity. Most scales showed acceptable levels of internal consistency and test-retest reliability. Principal component analyses showed that the first factor 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 theoretical expectations. These findings provided a piece of evidence that the New BJSQ scales are reliable and valid. Although more detailed content and construct validity should be examined in future study, the New BJSQ is a useful instrument to evaluate psychosocial work environment and positive mental health outcomes in the current workplace.

Key words: Job stress, Primary prevention, Psychosocial risk management, Reliability, Stress assessment, Validity

Introduction

In Japan, the number of workers with mental health problems is increasing1) 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; thus, the Brief Job Stress Questionnaire (BJSQ) and Job Stress Assessment Diagram (JSAD) 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 workplace in Japan.

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 model, the effort-reward imbalance (ERI) model has been proposed and found to be associated with various health problems, such as poor mental health and cardiovascular diseases (CVD). 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) and workplace social capital (i.e., shared values, attitudes, and norms of trust and reciprocity as well as practices of collective action in their work unit). These organizational factors were also found to be associated with poor mental health and CVD. Third, advancing research on work-family interference has indicated that both negative and positive spillovers from work life to non-work life are important factors in worker mental health. Fourth, with the introduction of the positive psychology to this field, positive attitude at work, such as work engagement, 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. 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 workplace environments as well as their employees (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 Psychosocial Risk Management-European Framework (PRIMA-EF) and the UK Health and Safety Executive’s (HSE) Management Standards for work related stress. PRIMA-EF is a part of the World Health Organization’s Healthy Workplaces Framework 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 to organizational changes), which are associated with poor health and well-being, lower productivity, and increased sickness absence.

Therefore, the purpose of the present study was to develop a new version of the Brief Job Stress Questionnaire (New BJSQ), which can assess job demands and job resources 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

1) 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. The items of the scales are measured on a four-point Likert-type response option and assess a wide range of psychosocial work environments, 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). Regarding job stressors, the instrument measures quantitative job overload (three items), qualitative job overload (three items), physical demands (one item), job control (three items), skill (under) utilization (one item), interpersonal conflict (three items), poor physical environment (one item), suitable jobs (one item), and intrinsic rewards (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 distress or mood: 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 complaints or physical stress reactions. The BJSQ also measures job satisfaction and 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. We concluded that the current BJSQ measured basic elements of task-level psychosocial work environment based on the job demands-control and demand-control-support models, as well as psychological and physical health outcomes while it did not measure workgroup- or organizational-level factors or positive mental health outcomes.

2) Collection of scales and items based on recent theories on job stress

We collected scales and items related to “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), “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), 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 ERI model, emotional demands, emotional resources, and organizational justice (procedural justice and interactional justice), and workplace social capital as job demands and resources; and work engagement as a potential outcome. Although a large part of these scales and items have been reported 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).

3) Collection of scales and items from previous questionnaires

We also reviewed questionnaires and/or published guidance of job stress and related variables, which were used in practice. These included PRIMA-EF, which provided a list of wide range of psychosocial work environments that could be related to worker mental health. The UK HSE Management Standards for work related stress 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) was designed to measure a wide range of psychosocial factors, but the instrument was 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), 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.

4) Proposal of additional scales from stakeholder meetings

We held a series of stakeholder meetings 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 the pilot study

Through the process described above, we developed the 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); “meaningfulness of work”, “job control”, “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’ believe that they can successfully organize and execute the courses of action required to accomplish given goals)”36, 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”, “work performance”, and “others” classified as “outcomes” (six scales, 25 items).

A pilot internet survey

On March 17, 2010, Japanese employees aged 15 yr or older who registered with Yahoo! Research monitors were invited to complete an anonymous web-based self-administered questionnaire including the current BJSQ and a trial version of the New BJSQ. On the same day, the number of respondents reached 1,000 (687 men and 313 women) and the survey was terminated. Based on the data from these 1,000 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 coefficients (ITCs) for each candidate scale, and if possible, limited the number of items to two or three, five at maximum, in reference to opinion of occupational health staffs (e.g., occupational physicians, occupational health nurses, and clinical psychologists). Finally, the final “standard” version of the New BJSQ comprised 30 scales and 84 items (49 scales and 141 items in total when combined with the current 57-item BJSQ) (Table 1). All New BJSQ scales are available at http://www.jstress.net (only in Japanese language).
Table 1. Scales and the number of items on the Brief Job Stress Questionnaire (BJSQ) and New BJSQ

| Scales † | BJSQ (B) or New BJSQ (N) | Number of items (BJSQ + New BJSQ) |
|----------|---------------------------|-----------------------------------|
| **Job demands** | | |
| 1. Quantitative job overload | B | 3 |
| 2. Qualitative job overload | B | 3 |
| 3. Physical demands | B | 1 |
| **Interpersonal conflict** | B | 3 |
| 4. Interpersonal conflict | B | 3 |
| 5. Poor physical environment | B | 1 |
| 6. Emotional demands | N | 3 |
| **Role conflict** | N | 3 |
| 7. Role conflict | N | 3 |
| 8. Work-self balance (negative) | N | 2 |
| **Job resources: task-level** | | |
| 9. Job control | B | 3 |
| 10. Suitable jobs | B | 1 |
| 11. Skill utilization | B | 1 |
| 12. Meaningfulness of work | B/N ‡ | 3 |
| 13. Role clarity | N | 3 |
| 14. Career opportunity | N | 3 |
| 15. Novelty | N | 3 |
| 16. Predictability | N | 3 |
| **Job resources: workgroup-level** | | |
| 17. Supervisor support | B | 3 |
| 18. Coworker support | B | 3 |
| 19. [Support from family and friends] | B | 3 |
| 20. Monetary/status reward | N | 2 |
| 21. Esteem reward | N | 2 |
| 22. Job security | N | 3 |
| 23. Leadership | N | 3 |
| 24. Interactional justice | N | 3 |
| 25. Workplace where people compliment each other | N | 3 |
| 26. Workplace where mistakes are acceptable | N | 2 |
| 27. Collective efficacy | N | 3 |
| **Job resources: organizational-level** | | |
| 28. Trust with management | N | 3 |
| 29. Preparedness for change | N | 3 |
| 30. Procedural justice | N | 3 |
| 31. Respect for individuals | N | 3 |
| 32. Fair personnel evaluation | N | 3 |
| 33. Diversity | N | 3 |
| 34. Career development | N | 5 |
| 35. Work-self balance (positive) | N | 2 |
| **Outcomes** | | |
| 36. Vigor | B | 3 |
| 37. Anger-irritability | B | 3 |
| 38. Fatigue | B | 3 |
| 39. Anxiety | B | 3 |
| 40. Depression | B | 6 |
| 41. Physical stress reaction | B | 11 |
| 42. Job satisfaction | B | 1 |
| 43. [Satisfaction with family life] | B | 1 |
| 44. Workplace harassment | N | 2 |
| 45. Workplace social capital | N | 3 |
| 46. Work engagement | N | 2 |
| 47. Performance of a duty | N | 3 |
| 48. Realization of creativity | N | 3 |
| 49. Active learning | N | 3 |
| **Total number of items** | 141 |

† [ ] indicates non-work environment or outcome. ‡ A three-item scale was constructed for the New BJSQ by adding two items to its one-item BJSQ scale on intrinsic reward.
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. 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 1,442 respondents who completed all the 34 psychosocial work environment scales (excluding “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

| Demographic characteristics | Baseline                  | One-year follow-up                   |
|-----------------------------|---------------------------|--------------------------------------|
|                             | n (%) | Average (SD) | n (%) | Average (SD) |
| **Gender**                  |       |              |       |              |
| Men                         | 847 (51.9) | 202 (48.4) |       |              |
| Women                       | 786 (48.1) | 215 (51.6) |       |              |
| **Age**                     |       |              |       |              |
| 29 yr old or less           | 254 (15.6) | 41 (9.8)   |       |              |
| 30–39 yr old                | 450 (27.6) | 107 (25.7) |       |              |
| 40–49 yr old                | 464 (28.4) | 129 (30.9) |       |              |
| 50–59 yr old                | 426 (26.1) | 129 (30.9) |       |              |
| 60 yr old or more           | 39 (2.4)   | 11 (2.6)   |       |              |
| **Occupation**              |       |              |       |              |
| Managers                    | 152 (9.3)   | 42 (10.1)   |       |              |
| Professionals and Technicians | 363 (22.2) | 95 (22.8)   |       |              |
| Clerks                      | 301 (18.4) | 75 (18.0)   |       |              |
| Sales workers               | 171 (10.5) | 40 (9.6)    |       |              |
| Service workers             | 165 (10.1) | 50 (12.0)   |       |              |
| Transportation and telecommunication | 70 (4.3)    | 14 (3.4)    |       |              |
| Production workers and laborers | 252 (15.4) | 55 (13.2)   |       |              |
| Others                      | 147 (9.0)   | 45 (10.8)   |       |              |
| Unknown                     | 12 (0.7)    | 1 (0.2)     |       |              |
| **Employment contract**     |       |              |       |              |
| Company president and executives | 37 (2.3)     | 7 (1.7)     |       |              |
| Permanent employees         | 1,051 (64.4) | 256 (61.4) |       |              |
| Temporary employees         | 39 (2.4)    | 7 (1.7)     |       |              |
| Contract employees          | 99 (6.1)    | 29 (7.0)    |       |              |
| Part-time workers           | 383 (23.5) | 113 (27.1)  |       |              |
| Others                      | 20 (1.2)    | 5 (1.2)     |       |              |
| Unknown                     | 4 (0.2)     | – (0.0)     |       |              |
| **Working hours in the past month** |       |              |       |            |
| 172.3 (55.9)               |       |              | 168.0 (53.7) |       |
| **Company size (number of employees)** |       |              |       |              |
| 1–20                        | 282 (17.3) | 64 (15.3)   |       |              |
| 21–49                       | 156 (9.6)  | 39 (9.4)    |       |              |
| 50–99                       | 134 (8.2)  | 46 (11.0)   |       |              |
| 100–299                     | 243 (14.9) | 50 (12.0)   |       |              |
| 300–499                     | 106 (6.5)  | 33 (7.9)    |       |              |
| 500–999                     | 126 (7.7)  | 39 (9.4)    |       |              |
| 1,000 or more               | 441 (27.0) | 100 (24.0)  |       |              |
| Civil service               | 113 (6.9)  | 39 (9.4)    |       |              |
| Unknown                     | 32 (2.0)   | 7 (1.7)     |       |              |
DEVELOPMENT OF THE NEW BJSQ

structure fit the job demands-resources (JD-R) model 37), in which psychosocial work environment can be classified into job demands and task-, workgroup-, and organizational-level job resources. For 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 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 37), 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 "support from family and friends" scale) of psychosocial work environment and selected outcomes (psychological and physical stress reactions, work engagement, workplace social capital, and workplace harassment) using 1,398 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 scores

For a nationally representative sample of 1,633 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 (Table 3). The average score was higher for workplace harassment (3.58), depression (3.27), and physical stress reactions (3.22) and lower for work-self balance (positive), respect for individuals, quantitative job overload, and fair personnel evaluation (2.10–2.15). 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 > 0.70) (Table 4). The Cronbach’s alpha coefficients were moderate for interpersonal conflict, role clarity, predictability, job security, and diversity (0.60–0.69). Furthermore, among 417 workers who completed one-year follow-up, one-year test-retest reliability as measured by Pearson’s correlation coefficient was high (0.50 or greater) for most scales while it was slightly lower for skill utilization, role clarity, predictability, workplace harassment, and performance of a duty.

Scale factor analysis

Figure 1 shows the 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) (Table 5). 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 re-
Table 3. Averages (and standard deviations, SDs) of the BJSQ and New BJSQ scores obtained from a nationally representative survey of employees of Japan in 2010/2011 †

| Scales ‡ | Number of items | Average (SD) |
|----------|-----------------|--------------|
| 1. Quantitative job overload | 3 | 2.14 0.76 |
| 2. Qualitative job overload | 3 | 2.16 0.71 |
| 3. Physical demands | 1 | 2.49 1.08 |
| 4. Interpersonal conflict | 3 | 2.88 0.66 |
| 5. Poor physical environment | 1 | 2.78 0.99 |
| 6. Emotional demands | 3 | 2.65 0.82 |
| 7. Role conflict | 3 | 2.78 0.77 |
| 8. Work-self balance (negative) | 2 | 2.78 0.86 |
| Job demands summary | | 2.58 0.51 |
| 9. Job control | 3 | 2.53 0.74 |
| 10. Suitable jobs | 1 | 2.92 0.80 |
| 11. Skill utilization | 1 | 3.00 0.85 |
| 12. Meaningfulness of work | 3 | 3.09 0.67 |
| 13. Role clarity | 3 | 3.16 0.59 |
| 14. Career opportunity | 3 | 2.68 0.81 |
| 15. Novelty | 3 | 2.78 0.80 |
| 16. Predictability | 3 | 2.46 0.73 |
| Task-level job resources summary | | 2.90 0.49 |
| 17. Supervisor support | 3 | 2.37 0.75 |
| 18. Coworker support | 3 | 2.68 0.70 |
| 19. [Support from family and friends] | 3 | 3.31 0.68 |
| 20. Monetary/status reward | 2 | 2.41 0.79 |
| 21. Esteem reward | 2 | 2.72 0.67 |
| 22. Job security | 3 | 2.46 0.75 |
| 23. Leadership | 3 | 2.18 0.77 |
| 24. Interactional justice | 3 | 2.55 0.80 |
| 25. Workplace where people compliment each other | 3 | 2.42 0.82 |
| 26. Workplace where mistakes are acceptable | 2 | 2.26 0.78 |
| 27. Collective efficacy | 3 | 2.49 0.74 |
| Workgroup-level job resources summary | | 2.45 0.54 |
| 28. Trust with management | 3 | 2.53 0.71 |
| 29. Preparedness for change | 3 | 2.48 0.72 |
| 30. Procedural justice | 3 | 2.27 0.73 |
| 31. Respect for individuals | 3 | 2.12 0.72 |
| 32. Fair personnel evaluation | 3 | 2.15 0.77 |
| 33. Diversity | 3 | 2.52 0.70 |
| 34. Career development | 5 | 2.19 0.74 |
| 35. Work-self balance (positive) | 2 | 2.10 0.78 |
| Organizational-level job resources summary | | 2.29 0.56 |
| 36. Vigor | 3 | 2.26 0.79 |
| 37. Anger-irritability | 3 | 2.70 0.85 |
| 38. Fatigue | 3 | 2.70 0.88 |
| 39. Anxiety | 3 | 2.87 0.80 |
| 40. Depression | 6 | 3.27 0.67 |
| Psychological stress reaction (total) | 18 | 2.85 0.61 |
| 41. Physical stress reaction | 11 | 3.22 0.54 |
| 42. Job satisfaction | 1 | 2.60 0.85 |
| 43. [Satisfaction with family life] | 1 | 3.06 0.81 |
| 44. Workplace harassment | 2 | 3.58 0.67 |
| 45. Workplace social capital | 3 | 2.74 0.69 |
| 46. Work engagement | 2 | 2.52 0.77 |
| 47. Performance of a duty | 3 | 2.98 0.57 |
| 48. Realization of creativity | 3 | 2.67 0.72 |
| 49. Active learning | 3 | 2.55 0.72 |

† The number of respondents varied from 1,590 to 1,627 because of missing values. ‡ [ ] indicates non-work environment or outcome. Each scale score was converted so that the higher score indicates better state and ranges from 1 to 4. See text for more details on scoring.
Table 4. Internal consistency, one-year test-retest reliability, and factor based validity of the BJSQ and New BJSQ scales

| Scales † | n   | Cronbach's alpha coefficient | Proportion explained by the first factor (%) | One-year test-retest (Pearson’s correlation coefficient) |
|---------|-----|-------------------------------|---------------------------------------------|----------------------------------------------------------|
| **Job demands** |     |                               |                                             |                                                          |
| 1. Quantitative job overload | 1,621 | 0.770                         | 69.0                                        | 0.655***                                                  |
| 2. Qualitative job overload | 1,617 | 0.741                         | 66.3                                        | 0.716***                                                  |
| 3. Physical demands | –     | NC                            | –                                          | –                                                        |
| 4. **Interpersonal conflict** | 1,610 | 0.690                         | 61.8                                        | 0.563***                                                  |
| 5. Poor physical environment | –     | NC                            | –                                          | –                                                        |
| 6. Emotional demands | 1,624 | 0.860                         | 78.2                                        | 0.628***                                                  |
| 7. **Role conflict** | 1,623 | 0.791                         | 70.6                                        | 0.633***                                                  |
| 8. Work-self balance (negative) | 1,624 | 0.885                         | 89.7                                        | 0.616***                                                  |
| **Job resources: task-level** |     |                               |                                             |                                                          |
| 9. Job control | 1,618 | 0.717                         | 63.9                                        | 0.653***                                                  |
| 10. Suitable jobs | –     | NC                            | –                                          | –                                                        |
| 11. Skill utilization | –     | NC                            | –                                          | –                                                        |
| 12. Meaningfulness of work | 1,624 | 0.813                         | 74.0                                        | 0.720***                                                  |
| 13. Role clarity | 1,626 | 0.646                         | 59.4                                        | 0.426***                                                  |
| 14. Career opportunity | 1,618 | 0.848                         | 76.8                                        | 0.691***                                                  |
| 15. Novelty | 1,621 | 0.781                         | 69.5                                        | 0.575***                                                  |
| 16. Predictability | 1,625 | 0.691                         | 62.0                                        | 0.424***                                                  |
| **Job resources: workgroup-level** |     |                               |                                             |                                                          |
| 17. Supervisor support | 1,612 | 0.808                         | 72.3                                        | 0.611***                                                  |
| 18. Coworker support | 1,615 | 0.781                         | 69.6                                        | 0.541***                                                  |
| 19. [Support from family and friends] | 1,619 | 0.832                         | 74.9                                        | 0.590***                                                  |
| 20. Monetary/status reward | 1,622 | 0.728                         | 78.8                                        | 0.633***                                                  |
| 21. Esteem reward | 1,618 | 0.706                         | 77.4                                        | 0.613***                                                  |
| 22. Job security | 1,620 | 0.639                         | 58.1                                        | 0.620***                                                  |
| 23. Leadership | 1,607 | 0.787                         | 70.6                                        | 0.654***                                                  |
| 24. Interactional justice | 1,616 | 0.905                         | 84.3                                        | 0.566***                                                  |
| 25. Workplace where people complement each other | 1,624 | 0.905                         | 84.2                                        | 0.595***                                                  |
| 26. Workplace where mistakes are acceptable | 1,619 | 0.774                         | 81.6                                        | 0.588***                                                  |
| **27. Collective efficacy** | 1,616 | 0.913                         | 85.2                                        | 0.524***                                                  |
| **Job resources: organizational-level** |     |                               |                                             |                                                          |
| 28. Trust with management | 1,618 | 0.851                         | 77.2                                        | 0.693***                                                  |
| 29. Preparedness for change | 1,615 | 0.771                         | 68.7                                        | 0.555***                                                  |
| 30. Procedural justice | 1,611 | 0.792                         | 70.7                                        | 0.584***                                                  |
| 31. Respect for individuals | 1,609 | 0.845                         | 76.4                                        | 0.616***                                                  |
| 32. Fair personnel evaluation | 1,606 | 0.859                         | 78.2                                        | 0.626***                                                  |
| 33. Diversity | 1,611 | 0.685                         | 61.5                                        | 0.654***                                                  |
| 34. Career development | 1,609 | 0.889                         | 69.6                                        | 0.733***                                                  |
| 35. Work-self balance (positive) | 1,623 | 0.796                         | 83.1                                        | 0.625***                                                  |
| **Outcomes** |     |                               |                                             |                                                          |
| 36. Vigor | 1,616 | 0.899                         | 83.3                                        | 0.614***                                                  |
| 37. Anger-irritability | 1,618 | 0.910                         | 84.7                                        | 0.547***                                                  |
| 38. Fatigue | 1,624 | 0.891                         | 82.2                                        | 0.541***                                                  |
| 39. Anxiety | 1,623 | 0.773                         | 69.1                                        | 0.603***                                                  |
| 40. Depression | 1,618 | 0.885                         | 63.9                                        | 0.630***                                                  |
| 41. Psychological stress reaction (total) | 1,590 | 0.929                         | 46.4                                        | 0.692***                                                  |
| 42. Job satisfaction | –     | NC                            | –                                          | –                                                        |
| 43. [Satisfaction with family life] | –     | NC                            | –                                          | –                                                        |
| 44. Workplace harassment | 1,624 | 0.707                         | 78.7                                        | 0.478***                                                  |
| 45. Workplace social capital | 1,626 | 0.852                         | 77.2                                        | 0.620***                                                  |
| 46. Work engagement | 1,622 | 0.752                         | 80.2                                        | 0.664***                                                  |
| 47. Performance of a duty | 1,617 | 0.781                         | 70.2                                        | 0.480***                                                  |
| 48. Realization of creativity | 1,620 | 0.869                         | 79.3                                        | 0.603***                                                  |
| 49. Active learning | 1,620 | 0.839                         | 75.7                                        | 0.547***                                                  |

*** p<0.001. NC: Not calculated because of one-item scale. † [ ] indicates non-work environment or outcome.
sources 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 Factor 1 and 2 was 0.20; between Factor 1 and 3 was 0.56; and between Factor 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

### Table 5. Exploratory factor analysis of 34 BJSQ and New BJSQ psychosocial work environment scales †

| Scales | Factor 1 (Workgroup- and organizational-level job resources) | Factor 2 (Job demands) | Factor 3 (Task-level job resources) |
|--------|-------------------------------------------------------------|------------------------|-----------------------------------|
| Job demands | | | |
| 1. Quantitative job overload | 0.067 | 0.712 | -0.080 |
| 2. Qualitative job overload | -0.064 | 0.686 | -0.274 |
| 3. Physical demands | 0.089 | 0.318 | -0.032 |
| 4. **Interpersonal conflict** | 0.494 | 0.501 | 0.452 |
| 5. Poor physical environment | 0.363 | 0.250 | 0.291 |
| 6. Emotional demands | 0.255 | 0.673 | 0.247 |
| 7. **Role conflict** | 0.414 | 0.654 | 0.330 |
| 8. Work-self balance (negative) | 0.222 | 0.589 | 0.208 |
| Job resources: task-level | | | |
| 9. Job control | 0.383 | 0.296 | 0.371 |
| 10. Suitable jobs | 0.348 | 0.184 | 0.634 |
| 11. Skill utilization | 0.232 | -0.078 | 0.451 |
| 12. Meaningfulness of work | 0.483 | -0.102 | 0.808 |
| 13. Role clarity | 0.407 | 0.156 | 0.422 |
| 14. Career opportunity | 0.579 | -0.093 | 0.674 |
| 15. Novelty | -0.172 | 0.431 | -0.121 |
| 16. Predictability | 0.292 | 0.111 | 0.288 |
| Job resources: workgroup-level | | | |
| 17. Supervisor support | 0.608 | 0.183 | 0.492 |
| 18. Coworker support | 0.410 | 0.156 | 0.432 |
| 20. Monetary/status reward | 0.588 | 0.252 | 0.379 |
| 21. Esteem reward | 0.654 | 0.244 | 0.506 |
| 22. Job security | 0.482 | 0.199 | 0.343 |
| 23. Leadership | 0.754 | 0.005 | 0.426 |
| 24. Interactional justice | 0.747 | 0.210 | 0.424 |
| 25. Workplace where people compliment each other | 0.727 | 0.166 | 0.420 |
| 26. Workplace where mistakes are acceptable | 0.692 | 0.056 | 0.490 |
| 27. **Collective efficacy** | 0.546 | 0.117 | 0.455 |
| Job resources: organizational-level | | | |
| 28. Trust with management | 0.712 | 0.221 | 0.382 |
| 29. Preparedness for change | 0.763 | 0.154 | 0.367 |
| 30. Procedural justice | 0.714 | 0.140 | 0.304 |
| 31. Respect for individuals | 0.760 | 0.141 | 0.476 |
| 32. Fair personnel evaluation | 0.765 | 0.116 | 0.320 |
| 33. Diversity | 0.603 | 0.174 | 0.372 |
| 34. Career development | 0.792 | 0.027 | 0.435 |
| 35. Work-self balance (positive) | 0.528 | 0.141 | 0.521 |

† Data from 1,442 respondents who completed 34 scales from a national representative survey of employees of Japan in 2010/2011. “19. Support from family and friends” scale was excluded from the analysis because of non-work environment. Principal factor method was used to extract factors with scree test criterion, and a rotated factor structure with Oblimin method is shown. Factor loadings over 0.50 are underlined.
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 ($p<0.001$) (Table 6). 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.

**Correlation with outcomes**

Polychoric correlation coefficients between psychosocial work environment and outcomes were calculated
using the data from 1,398 respondents who completed all scales (Table 7). 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, correlated with work engagement and workplace social capital more strongly than did job demands. These findings are consistent with the theoretical framework of the JD-R model in which job demands predict negative emotional reactions (such as burnout).

### Table 7. Polychoric correlation coefficients between psychosocial work environment (job demands and job resources) and outcomes measured by using the BJSQ/New BJSQ scales: a national representative sample of employees of Japan in 2010/2011

| Scales ‡ | Psychological stress reactions | Physical stress reactions | Work engagement | Workplace social capital | Workplace harassment |
|----------|-------------------------------|---------------------------|----------------|-------------------------|---------------------|
| **Job demands** | | | | | |
| 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** |
| **Interpersonal conflict** | | | | | |
| 4. Interpersonal conflict | 0.494** | 0.282** | 0.305** | 0.570** | 0.531** |
| **Poor physical environment** | | | | | |
| 5. Poor physical environment | 0.268** | 0.179** | 0.250** | 0.337** | 0.240** |
| **Emotional demands** | | | | | |
| 6. Emotional demands | 0.583** | 0.384** | 0.172** | 0.251** | 0.419** |
| **Role conflict** | | | | | |
| 7. Role conflict | 0.505** | 0.319** | 0.236** | 0.410** | 0.431** |
| **Work-self balance (negative)** | | | | | |
| 8. Work-self balance (negative) | 0.499** | 0.317** | 0.160** | 0.220** | 0.275** |
| **Job resources: task-level** | | | | | |
| 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 | 0.331** | 0.142** | 0.738** | 0.455** | 0.183** |
| 13. Role clarity | 0.245** | 0.103** | 0.328** | 0.394** | 0.153** |
| 14. Career opportunity | 0.300** | 0.150** | 0.578** | 0.425** | 0.162** |
| 15. Novelty | –0.141** | –0.096** | 0.151** | 0.017 | –0.098** |
| 16. Predictability | 0.208** | 0.124** | 0.229** | 0.220** | 0.091** |
| **Job resources: workgroup-level** | | | | | |
| 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] | 0.196** | 0.105** | 0.175** | 0.210** | 0.164** |
| 20. Monetary/status reward | 0.337** | 0.241** | 0.331** | 0.427** | 0.223** |
| 21. Esteem reward | 0.390** | 0.237** | 0.438** | 0.511** | 0.341** |
| 22. Job security | 0.361** | 0.248** | 0.306** | 0.332** | 0.326** |
| 23. Leadership | 0.299** | 0.170** | 0.420** | 0.461** | 0.184** |
| 24. Interactional justice | 0.376** | 0.211** | 0.420** | 0.503** | 0.362** |
| 25. Workplace where people compliment each other | 0.342** | 0.189** | 0.434** | 0.454** | 0.302** |
| 26. Workplace where mistakes are acceptable | 0.322** | 0.177** | 0.480** | 0.458** | 0.240** |
| **Collective efficacy** | | | | | |
| 27. Collective efficacy | 0.320** | 0.165** | 0.482** | 0.518** | 0.188** |
| **Job resources: organizational-level** | | | | | |
| 28. Trust with management | 0.366** | 0.200** | 0.421** | 0.547** | 0.329** |
| 29. Preparedness for change | 0.341** | 0.159** | 0.393** | 0.501** | 0.247** |
| 30. Procedural justice | 0.303** | 0.209** | 0.354** | 0.477** | 0.245** |
| 31. Respect for individuals | 0.373** | 0.246** | 0.514** | 0.510** | 0.235** |
| 32. Fair personnel evaluation | 0.307** | 0.193** | 0.396** | 0.505** | 0.205** |
| 33. Diversity | 0.285** | 0.156** | 0.342** | 0.447** | 0.222** |
| 34. Career development | 0.302** | 0.181** | 0.477** | 0.545** | 0.211** |
| 35. Work-self balance (positive) | 0.435** | 0.244** | 0.662** | 0.417** | 0.190** |

*p < 0.05, ** p < 0.01. No asterisk means p > 0.05. † Based on data from 1,398 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. ‡ [ ] indicates non-work environment.
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. 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 workgroup- 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 were associated with mental and physical health while job resources were also associated with positive outcomes, such as work engagement and workplace social capital, as predicted by the JD-R model\(^{37}\). These findings provided evidence that the New BJSQ scales are reliable and valid and fit expectations from the JD-R model.

As introduced earlier, the principal aim of the New BJSQ is to assess psychosocial workplace environments 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 and organizational justice, and a broader range of theoretical models of job stress, such as productivity and innovation.

An additional unique feature of the New BJSQ is that it includes a scale of perceived 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.

The present study has some limitations that should be considered. First, the response rate in the present study was only 47.7% and employees engaged in large-sized enterprises (number of employees≥1,000) seemed over-represented (Table 2). In addition, out of these respondents (n=1,633), 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 1,633 respondents, it should be noted that the national average scores of the present study (Table 3) 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]\(^{39}\), General Health Questionnaire [GHQ]\(^{40}\), Center for Epidemiologic Studies Depression [CES-D] Scale\(^{41}\), World Health Organization Health and Work Performance Questionnaire [WHO-HPQ]\(^{42}\), 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 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)\(^{43}\), further study on factor structure of the New BJSQ is needed. Finally, as mentioned earlier, the standard version of the New BJSQ has 141 items in total when combined with the current 57-item BJSQ, which may be acceptable in practice due to large number of items. However, a recommended set of scales and a short version were also developed. A future study should examine the reliability and validity of these versions. 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.

**Acknowledgements**

The present study was supported by a Health Labour Sciences Research Grant 2009–2011 “Study on the dissemination of primary prevention of mental health problems among workers” (H21-rodo-ippan-001) from the Ministry of Health Labour and Welfare, Japan. The preparation of the manuscript was partially supported by a Health Labour Sciences Research Grant 2013 “Study on risk assessment methods in promoting mental health measures in the workplace” (H25-rodo-ippan-009) from the Ministry of Health Labour and Welfare, Japan.

**References**

1. Ministry of Health Labour and Welfare, Japan (2013) Survey on State of Employees' Health 2012, Ministry of Health, Labour and Welfare, Tokyo. (in Japanese).
2. Kawakami N (2002) [Improvement of work environment]. Sangyo Eiseigaku Zasshi 44, 95–9 (in Japanese). [Medline]
3. Semmer NK (2006) Job stress interventions and the organization of work. Scand J Work Environ Health 32, 515–27. [Medline] [CrossRef]
4. Shimomitsu T, Haratani T, Nakamura K, Kawakami N, Hayashi T, Hiro H, Arai M, Miyazaki S, Furuki K, Ohyo Y, Odagiri Y (2000) Final development of the Brief Job Stress Questionnaire mainly used for assessment of the individuals. In: The Ministry of Labor sponsored grant for the prevention of work-related illness, FY 1999 report, Kato M (Ed.), 126–64, Tokyo Medical University, Tokyo. (in Japanese).
5. Kawakami N (2000) Final development of the Job Stress Assessment Diagram and investigation of its usefulness in practice. In: The Ministry of Labor sponsored grant for the prevention of work-related illness, FY 1999 report, Kato M (Ed.), 12–26, Tokyo Medical University, Tokyo. (in Japanese).
6. Kobayashi Y, Kaneyoshi A, Yokota A, Kawakami N (2008) Effects of a worker participatory program for improving work environments on job stressors and mental health among workers: a controlled trial. J Occup Health 50, 455–70. [Medline] [CrossRef]
7. Umanodan R, Kobayashi Y, Nakamura M, Kitaoka-Higashiguchi K, Kawakami N, Shimazu A (2009) Effects of a worksite stress management training program with six short-hour sessions: a controlled trial among Japanese employees. J Occup Health 51, 294–302. [Medline] [CrossRef]
8. Karasek RA (1979) Job demands, job decision latitude and mental strain: implications for job redesign. Adm Sci Q 24, 285–308. [CrossRef]
9. Siegrist J (1996) Adverse health effects of high-effort/low-reward conditions. J Occup Health Psychol 1, 27–41. [Medline] [CrossRef]
10. Tsutsumi A, Kawakami N (2004) A review of empirical studies on the model of effort-reward imbalance at work: reducing occupational stress by implementing a new theory. Soc Sci Med 59, 2335–59. [Medline] [CrossRef]
11. van Vegchel N, de Jonge J, Bosma H, Schaufeli W (2005) Reviewing the effort-reward imbalance model: drawing up the balance of 45 empirical studies. Soc Sci Med 60, 1117–31. [Medline] [CrossRef]
12. Kivimäki M, Virtanen M, Elovingo M, Kouvonen A, Väänänen A, Vahtera J (2006) Work stress in the etiology of coronary heart disease—a meta-analysis. Scand J Work Environ Health 32, 431–42. [Medline] [CrossRef]
13. Siegrist J (2010) Effort-reward imbalance at work and cardiovascular diseases. Int J Occup Med Environ Health 23, 279–85. [Medline] [CrossRef]
14. Greenberg J (1987) A taxonomy of organizational justice theories. Acad Manage Rev 12, 9–22.
15. Kawachi I (1999) Social capital and community effects on population and individual health. Ann N Y Acad Sci 896, 120–30. [Medline] [CrossRef]
16. Fujishiro K, Heaney CA (2009) Justice at work, job stress, and employee health. Health Educ Behav 36, 487–504. [Medline] [CrossRef]
17. Murayama H, Fujiwara Y, Kawachi I (2012) Social capital and health: a review of prospective multilevel studies. J Epidemiol 22, 179–87. [Medline]
18. Ndjaboué R, Brisson C, Vézina M (2012) Organisational justice and mental health: a systematic review of prospective studies. Occup Environ Med 69, 694–700. [Medline] [CrossRef]
19. Shimazu A, Bakker AB, Demerouti E, Peeters MC (2010) Work-family conflict in Japan: how job and home demands affect psychological distress. Ind Health 48, 766–74. [Medline] [CrossRef]
20) Shimazu A, Demerouti E, Bakker AB, Shimada K, Kawakami N (2011) Workaholism and well-being among Japanese dual-earner couples: a spillover-crossover perspective. Soc Sci Med 73, 399–409. [Medline] [CrossRef]

21) Shimada K, Shimazu A, Bakker AB, Demerouti E, Kawakami N (2010) Work-family spillover among Japanese dual-earner couples: a large community-based study. J Occup Health 52, 335–43. [Medline] [CrossRef]

22) Schaufeli WB, Salanova M, González-Romá V, Bakker AB (2002) The measurement of engagement and burnout: a confirmative analytic approach. J Happiness Stud 3, 71–92. [CrossRef]

23) Leymann H (1996) The content and development of mobbing at work. Eur J Work Organ Psychol 5, 165–84. [CrossRef]

24) Einarsen S, Hoel H, Zapf D, Cooper CL (2003) The concept of bullying at work: the European tradition. In: Bullying and emotional abuse in the workplace: international perspectives in research and practice, Einarsen S, Hoel H, Zapf D, Cooper CL (Eds.), 3–30, Taylor & Francis, London.

25) Leka S, Cox T, Zwetsloot G (2008) The European Framework for Psychosocial Risk Management (PRIMA-EF). In: The European Framework for Psychosocial Risk Management: PRIMA-EF, Leka S and Cox T (Eds.), 1–16, I-WHO Publications, Nottingham.

26) Cousins R, Mackay CJ, Clarke SD, Kelly C, Kelly PJ, McCaig RH (2004) ‘Management Standards’ and work-related stress in the UK: practical development. Work Stress 18, 113–36. [CrossRef]

27) Burton J (2010) WHO Healthy Workplace Framework and Model: Background and Supporting Literature and Practices, World Health Organization, Geneva.

28) Hurrell JJ Jr, McLaney MA (1988) Exposure to job stress—a new psychometric instrument. Scand J Work Environ Health 14 Suppl 1, 27–8. [Medline]

29) Johnson JV, Hall EM (1988) Job strain, workplace social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. Am J Public Health 78, 1336–42. [Medline] [CrossRef]

30) Hochschild AR (1979) Emotion work, feeling rules, and social structure. Am J Sociol 85, 551–75. [CrossRef]

31) Thibaut J, Walker L (1975) Procedural justice: a psychological analysis, Erlbaum, Hillsdale.

32) Leventhal GS (1980) What should be done with equity theory? New approaches to the study of fairness in social relationships. In: Social exchange: advances in theory and research, Gergen K, Greenberg M, Willis R (Eds.), 27–55, Plenum Press, New York.

33) Bies RJ, Moag JS (1986) Interactional justice: communication criteria of fairness. In: Research on negotiation in organizations, vol. 1, Lewicki RJ, Sheppard BH, Bazerman MH (Eds.), 43–55, JAI Press, Greenwich.

34) Pejtersen JH, Kristensen TS, Borg V, Björner JB (2010) The second version of the Copenhagen Psychosocial Questionnaire. Scand J Public Health 38 Suppl, 8–24. [Medline] [CrossRef]

35) Chang SJ, Koh SB, Kang D, Kim SA, Kang MG, Lee CG, Chung JJ, Cho JJ, Son M, Chae CH, Kim JW, Kim JI, Kim HS, Roh SC, Park JB, Woo JM, Kim SY, Kim JY, Ha M, Park J, Rhee KY, Kim HR, Kong JO, Kim IA, Kim JS, Park JH, Huyun SJ, Son DK (2005) Developing an occupational stress scale for Korean employees. Korean J Occup Environ Med 17, 297–317.

36) Bandura A (1997) Self efficacy: the exercise of control, W.H. Freeman and Company, New York.

37) Schaufeli WB, Bakker AB (2004) Job demands, job resources, and their relationship with burnout and engagement: a multi-sample study. J Organ Behav 25, 293–315. [CrossRef]

38) Evenett B, Hothorn T (2011) Confirmatory factor analysis and structural equation models. In: An introduction to applied multivariate analysis with R, Everitt B and Hothorn T (Eds.), 201–24, Springer, New York.

39) Karasek R (1985) Job Content Questionnaire and User’s Guide, University of Massachusetts at Lowell, Lowell.

40) Goldberg D (1972) The detection of psychiatric illness by questionnaire: a technique for the identification and assessment of non-psychotic psychiatric illness, Oxford University Press, London.

41) Radloff LS (1977) The CES-D scale: a self-report depression scale for research in the general population. Appl Psychol Meas 1, 385–401. [CrossRef]

42) Kessler RC, Barber C, Beck A, Berglund P, Cleary PD, McKenras D, Pronk N, Simon G, Stang P, Üstün TB, Wang P (2003) The World Health Organization Health and Work Performance Questionnaire (HPQ). J Occup Environ Med 45, 156–74. [Medline] [CrossRef]

43) Hu L, Bentler PM (1999) Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct Equ Modeling 6, 1–55. [CrossRef]