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# The Impact of Psychological Symptoms on Return to Work in Workers After Occupational Injury

**Kuan-Han Lin · Nai-Wen Guo · Shu-Chu Shiao · Shih-Cheng Liao · Pei-Yi Hu · Jin-Huei Hsu · Yaw-Huei Hwang · Yue Leon Guo**

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**Abstract** *Introduction* This study aimed to investigate the impact of psychological symptoms on return to work (RTW) in workers after occupational injuries. *Methods* Our study candidates were injured workers who were hospitalized for 3 days or longer and received hospitalization benefits from the Labor Insurance. A self-reported questionnaire including Brief Symptom Rating Scale (BSRS-50) and RTW was sent to workers at 12 weeks after injury. At 1 year, all participants were contacted again to determine whether or not they had RTW. *Results* A total of 2001 workers completed the questionnaire (response rate 45.5 %) at 12 weeks after injury, among them, 1,149 had returned to work. Among the 852 who were unable to return to work at 12 weeks after injury, 225 reportedly returned to work by 1 year. A proportional hazards regression indicated that after adjusting for all possible risk factors, higher scores in BSRS-50 and BSRS-5 at 12 weeks after injury were significant risk factors for not return to work (NRTW) at 1 year after injury. Other risk factors were gender, education level, length of hospitalization, affected physical appearance, and injury type. Among 10 psycho-physiological symptoms of BSRS-50, a proportional hazards regression indicated that high score in phobic-anxiety scale was a risk factor for NRTW. *Conclusions* After considering all other factors, psychological symptoms further predicted poorer probability of returning to work after occupational injury, and phobic-anxiety was the most significant symptom predicting poor RTW. Development of preventive measures among injured workers according to the risk factors identified in this study is warranted.

**Keywords** Occupational injury · Post-traumatic stress disorder (PTSD) · Psychological symptom · Return to work (RTW)

K.-H. Lin · Y.-H. Hwang · Y. L. Guo
Institute of Occupational Medicine and Industrial Hygiene, National Taiwan University School of Public Health, Taipei, Taiwan

K.-H. Lin · Y. L. Guo (✉)
Department of Environmental and Occupational Medicine, National Taiwan University College of Medicine (NTU) and NTU Hospital, Rm. 339, No. 17, Xuzhou Rd., Taipei, Taiwan
e-mail: leonguo@ntu.edu.tw

N.-W. Guo
Institute of Behavioral Medicine, National Cheng Kung University, Tainan, Taiwan

S.-C. Shiao
Department of Nursing, College of Medicine, National Taiwan University (NTU) and NTU Hospital, Taipei, Taiwan

S.-C. Liao
Department of Psychiatry, National Taiwan University Hospital, Taipei, Taiwan

P.-Y. Hu · J.-H. Hsu
Institute of Occupational Safety and Health, Councils of Labor Affairs, Taipei, Taiwan

## Introduction

Injury, particularly occupational injury, could severely influence work ability, leading to the issue of return to work (RTW). Return to work outcome is defined as a return to paid work or not within a defined period of time [1]. Many studies reported that the rates of RTW after physical injury varied widely from 26 to 72 % [2–6]. Only few studies examined the rate of RTW following occupational injury [7–10].

Several determinants related to RTW after injury have been reported in the previous studies. These factors included age, gender, education level, marital status, person income, hospital length of stay, social support, injury severity, and injury locus [2, 4, 5, 9, 11]. Other than demographic and injury-related variables, psychosocial factors after injury, such as social support, social functioning, role-emotional function, mental health, and cognitive function, also have been reported as important factors influencing RTW [4]. A significant number of studies have highlightened the negative impact of physical impairment and symptoms on RTW after injuries. However, the psychological symptoms developed after injuries may also complicate RTW after injuries [12].

Although psychological symptoms after occupational injury have been recognized in the previous studies [13, 14], its significant relationship with RTW has been paid less attention in the occupational health. Also, the relative importance of psychological factors in explaining RTW has not been investigated in workers following occupational injuries. Therefore, the main objective of this study was to investigate the impact of psychological symptoms on RTW in workers after their sustaining occupational injuries. We hypothesized that psychological symptoms would predict RTW 1 year after occupational injury.

## Methods

The study subjects were injured workers who were hospitalized for 3 days or longer and received Inpatient Hospitalization Benefit of Occupational Accident Medical Benefits from Labor Insurance between February 1 and August 31, 2009. The subjects were recruited consecutively. This study was approved by the Institutional Review Board of the National Taiwan University Medical Center.

Injured workers were assessed by a self-reported questionnaire [15] including demographics, Brief Symptom Rating Scale (BSRS-50), and return to work. The self-reported questionnaire was sent to all subjects at 12 weeks after injury. If a subject did not respond to the questionnaire, we tried to make contact by phone and invited the subject to participate. At least 3 tries were made to encourage the study subjects before giving up. When the questionnaire was incompletely answered, a phone interview was performed to complete all questions. The demographic part was designed by psychiatrists, a psychologist, and public health professionals to inquire risk factors, including gender, age, education, and marital status as well as injury-related variables such as injury severity, length of hospital stay, loss of consciousness as a result of the injury, whether this injury affected physical appearance and injury type.

The BSRS-50 was used as the instrument for measuring psychological symptoms. It consists of a 50-item self-report rating scale that is used to measure 10 psycho-physiological symptom groups. BSRS-50 has been tested in Taiwan [16], with test–retest reliability coefficients ranged from 0.73 to 0.91. The rate of accurate classification for psychiatric and nonpsychiatric cases was 75.8 %, with a sensitivity of 66.7 % and a specificity of 86.7 %. In addition, a short version of BSRS-50 called BSRS-5 was also developed for quick screening of psychiatric morbidity. It comprises 5 items selected from BSRS-50, each of which has the highest correlation with the corresponding psycho-physiological symptom groups of anxiety, depression, hostility, interpersonal sensitivity, and additional symptoms in the BSRS-50. The cut-off score for psychiatric cases is greater than or equal to 6. Internal consistency (Cronbach $\alpha$) coefficients of the BSRS-5 ranged from 0.77 to 0.99. The test–retest reliability coefficient was 0.82. The rate of accurate classification for psychiatric and nonpsychiatric cases was 76.3 %, with a sensitivity of 78.9 % and a specificity of 74.3 % [17].

In this study, return to work was defined as being able to return to paid work after injury, and time to return to work in the study was defined as the duration of all days lost from work starting with the date of injury. At 1 year after injury, all participants were contacted again to determine whether or not they had returned to work and their time to return to work.

All statistical analyses were conducted with JMP 5.0 (SAS Institute Inc., Cary, NC, USA). The descriptive statistics including means, standard deviations (SDs), and percentages were computed for all relevant variables. Chi-square and ANOVA testing were used to determine differences between groups. The main outcome variable is the time (in weeks) from injury to the first time participants returned to work. Kaplan–Meier estimates of the proportion of participants not returning to work were computed. A Cox proportional hazards regression model was used to estimate the combined effect of multiple factors while accounting for the effect of psychological symptoms. Differences were considered significant if the $p$ value was smaller than 0.05.

The psychological factors with $p$ values $< 0.05$ in proportional hazards regression analysis would be included in the predictive model for not return to work. The effects of classic factors (e.g., gender, age, education, length of hospital stay, injury affected physical appearance, injury type, and loss of consciousness; model 1) and further added psychological factors (model 2) for not return to work were evaluated by multiple logistic regression. The area under the curve (AUC) of a receiver operating characteristic (ROC) curve used to evaluate the fit of models is based on the simultaneous measure of sensitivity (true positive) and

specificity (true negative) for all possible cutoff points. Models with AUC statistics equal to 0.5 were considered not better than chance alone, whereas models with higher AUC statistics were considered better than chance [18]. We then compared AUC in different models by the Wilcoxon–Mann–Whitney U test, which was performed using MedCalc for Windows version 9.2.1.0 [19].

To examine the severity of psychological symptoms in injured workers, an adjusted T score was determined according to previous study [20]. A T score of 50 was considered identical to the mean of the reference group, and the SD was set at 10. A general severity index (GSI) score of greater than or equal to two SDs higher than the mean score of the reference group was considered with psychological severity, i.e., GSI $\geq$ 70. On the other hand, significant severity of each psycho-physiological symptom score was defined as greater than or equal to the mean score of the reference group plus three SDs (adjusted T score $\geq$ 80). In this study, we'd like to investigate the relationship between psychological symptoms and the rate of not return to work 1 year after the occupational injury. The cut-off of GSI score of BSRS-50 $\geq$ 70, psycho-physiological symptoms score of BSRS-50 $\geq$ 80 and BSRS $\geq$ 6 were used to divide the participants into two groups based on their psychological condition: severe and non-severe. The cut-off for the analysis could determine the impact of psychological severity on RTW.

## Results

Between February 1 and August 31, 2009, a total 4,403 workers who were hospitalized for 3 days or longer due to occupational injuries and received Labor Insurance occupational accident payments were utilized as subjects. At the time of the survey, 12 weeks after occupational injury, 2,402 (54.6 %) of the injured workers did not complete the questionnaire survey. While we tried to contact them by phone, 1,299 (29.5 %) did not answer the phone, 707 (16.1 %) refused to answer the questionnaire, and 396 (9.0 %) could not be reached because we had the wrong phone number. Therefore, a total of 2001 injured workers completed self-reported questionnaire, with a response rate of 45.5 %. Among those who completed the questionnaire, the majority were males (73.1 %), and the average age was 42 years (SD = 12.2). Most were married (62.6 %), and the majority had an education level of high school or above (42.6 %). Among the 2001 participants, 1,149 had returned to work at 12 weeks after injury. Among the 852 who were unable to return to work 12 weeks after injury, 225 reportedly returned to work by 1 year. Participants with the following characteristics: female gender, loss of consciousness as a result of this injury, self-reported injury severity at critical level or higher, longer hospital stay due to injury, injury affecting physical appearance, injury type, and not returning to work (NRTW) at 12 weeks or at 1 year, scored significantly higher in BSRS GSI (Table 1).

Among the 10 psycho-physiological symptom groups of the BSRS-50, the most frequent distressing symptom dimension (adjusted T score $\geq$ 80) was psychoticism (7.8 %) followed by paranoid tendency (7.6 %), phobic anxiety (7.3 %), depression (5.0 %), hostility (5.0 %), obsessive–compulsive symptoms (4.8 %), interpersonal sensitivity (4.5 %), anxiety (2.4 %), somatization (2.3 %), and additional symptoms (1.9 %). Approximately 12 % of the participants scored GSI at 70 or higher, and 28.8 % scored greater than or equal to 6, a definition for psychiatric cases in the BSRS-5 (Table 2).

Figure 1 summarized the relationship between psychological symptoms and the rate of not returning to work 1 year after the injury. A higher proportion of the participants who scored 70 or higher in the BSRS-50 GSI did not return to work 1 year after the injuries as compared to those who score lower. Cox regression was used to adjust for potential confounders, namely, gender, age, education, length of hospital stay, injury affected physical appearance, injury type, and loss of consciousness. Higher score in the BSRS-50 predicted NRTW 1 year after injuries after adjusting for potential confounders (Table 3). In addition, high score in the BSRS-5 was a significant risk factor for NRTW. Examination of the psycho-physiological subscales of the BSRS-50 for their prediction of NRTW by Cox regression model was summarized in Table 4. Among the 10 subscales, high score in phobic-anxiety predicted NRTW significantly. Among the 10 subscales, a high score in phobic-anxiety predicted NRTW significantly.

For predicting not returning to work, we set up model 1, which included gender, age, education, length of hospital stay, injury affected physical appearance, injury type, and loss of consciousness. Then, based on the results presented in Table 4, we added BSRS-5 and phobic-anxiety score of BSRS-50 as psychological factors, to develop model 2. The ability of models to discriminate between RTW and NRTW was shown in Fig. 2. Compared with an AUC = 0.5, AUC statistics were significantly different from 0.5 in both model 1 (AUC = 0.68 [95 % CI = 0.66–0.70], $p = 0.0001$) and model 2 (AUC = 0.70 [95 % CI = 0.68–0.72], $p = 0.0001$). The AUC statistics were significantly better for model 2 as compared with model 1 ($p = 0.001$), indicating better capability of discrimination between RTW and NRTW by model 2 as compared with model 1.

**Table 1** Demographics, condition associated with the injury, and return to work of injured workers who participated this study (Total = 2001)

| Characteristics | Total N (%) | BSRS GSI < 70 N (%) | BSRS GSI ≥ 70 N (%) |
|---|---|---|---|
| Gender* | | | |
| Male | 1462 (73.1) | 1305 (89.3) | 157 (10.7) |
| Female | 539 (26.9) | 453 (84.0) | 86 (16.0) |
| Age (years) (Mean ± SD) | 42.0 ± 12.2 | 41.6 ± 12.1 | 40.4 ± 11.9 |
| 17–29 | 386 (19.3) | 335 (86.8) | 51 (13.2) |
| 30–44 | 765 (38.2) | 667 (87.2) | 98 (12.8) |
| 45–59 | 743 (37.1) | 665 (89.5) | 78 (10.5) |
| ≧60 | 107 (5.3) | 91 (85.0) | 16 (15.0) |
| Education | | | |
| Elementary school or below | 238 (11.9) | 206 (86.6) | 32 (13.4) |
| Junior high school | 409 (20.4) | 360 (88.0) | 49 (12.0) |
| High school | 853 (42.6) | 761 (89.2) | 92 (10.8) |
| College or above | 501 (25.1) | 431 (86.0) | 70 (14.0) |
| Marital status | | | |
| Single | 585 (29.2) | 514 (87.9) | 71 (12.1) |
| Married | 1253 (62.6) | 1106 (88.3) | 147 (11.7) |
| Divorced/separated/widowed | 163 (8.2) | 138 (84.7) | 25 (15.3) |
| Loss of consciousness as a result of this injury* | | | |
| No | 1699 (84.9) | 1510 (88.9) | 189 (11.1) |
| Yes | 302 (15.1) | 248 (82.1) | 54 (17.9) |
| Total days of hospitalization within 12 weeks after injury* (Mean ± SD) | 10.9 ± 12.2 | 10.6 ± 12.0 | 13.7 ± 13.3 |
| Whether this injury affected physical appearance* | | | |
| No | 601 (30.0) | 565 (94.0) | 36 (6.0) |
| Yes, minor | 907 (45.3) | 810 (89.3) | 97 (10.7) |
| Yes, major | 493 (24.7) | 383 (77.7) | 110 (22.3) |
| Injury type* | | | |
| Fracture | 1107 (55.3) | 972 (87.8) | 135 (12.2) |
| Intracranial injury | 218 (10.9) | 174 (79.8) | 44 (20.1) |
| Open wound of upper limbs | 67 (3.3) | 64 (95.5) | 3 (4.5) |
| Crushing injury | 190 (9.5) | 169 (88.9) | 21 (11.1) |
| Burns | 68 (3.4) | 64 (94.1) | 4 (5.9) |
| Others[a] | 351 (17.6) | 315 (89.7) | 36 (10.3) |
| Return to work at 12 weeks* | | | |
| No | 852 (42.6) | 695 (81.6) | 157 (18.4) |
| Yes | 1149 (57.4) | 1063 (92.5) | 86 (7.5) |
| Return to work at 1 year* | | | |
| No | 627 (31.3) | 511 (81.5) | 116 (18.5) |
| Yes | 1374 (68.7) | 1247 (90.8) | 127 (9.2) |

* $p < 0.05$

[a] Including matter flying down, caught in or crushed in collapsing materials, struck against objects, exposure to harmful substances or environments, contact with hot or low temperature, breaking and improper action

## Discussion

In this study we followed up injured workers to determine factors for their returning to work, and tested the hypothesis that presence of psychological symptoms predicted poorer probability of returning to work after occupational injury. At 12 weeks after occupational injuries, 57.4 % (1149/2001) of workers were able to return to work. Among the remaining 852 who had not returned to work at 12 weeks after injury, 225 reportedly returned to work by 1 year, resulting in an overall non-RTW rate of 31 %. Psychological symptoms as assessed by the BSRS-50 were associated with poorer probability of returning to work at both 12 weeks and 1 year after the injury, while other factors were adjusted. Among the symptoms assessed by the BSRS-50, phobic-anxiety was the most significant symptom predicting RTW. This is the

**Table 2** Number and percent of participants who scored at severe levels by BSRS-50 General severity index (GSI), the ten psycho-physiological symptoms of BSRS-50, or BSRS-5

| | N | % |
|---|---|---|
| BSRS-50 GSI score ≥ 70 | 243 | 12.1 |
| Psycho-physiological symptoms score of BSRS-50 ≥ 80 | | |
| Anxiety symptoms | 49 | 2.4 |
| Additional symptoms | 38 | 1.9 |
| Depressive symptoms | 100 | 5.0 |
| Hostility | 100 | 5.0 |
| Obsessive–compulsive symptoms | 96 | 4.8 |
| Paranoid tendency | 152 | 7.6 |
| Phobic-anxiety | 147 | 7.3 |
| Psychoticism | 157 | 7.8 |
| Interpersonal sensitivity | 90 | 4.5 |
| Somatic complaints | 46 | 2.3 |
| BSRS-5 score ≥ 6 | 577 | 28.8 |

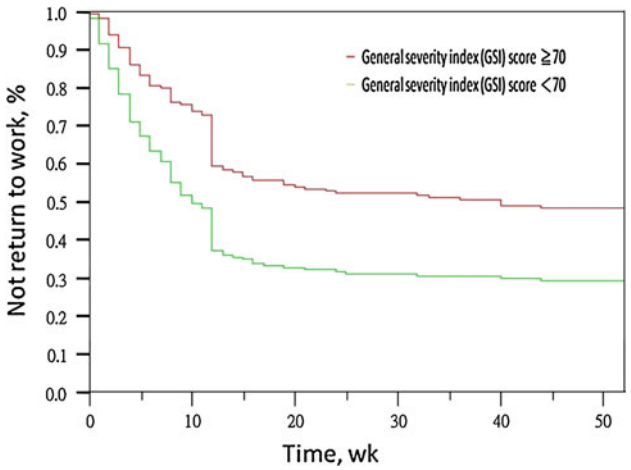


**Fig. 1** The percentage of participants not yet return to work 1 year after occupational injury, as GSI score of BSRS-50

first study documenting the relationship among psychological symptoms and the rate of returning to work in injured workers.

Several studies reported that the rates of RTW 1 year after injury varied from 28 to 72 % [3, 4], depending on the types and severity of the injuries. The RTW rate 1 year after occupational injury found in this study fall within the range of RTW rates reported by previous studies. The results of RTW rates at 12 weeks after injuries were comparable with RTW rates of 64 % for low back injury [7] and 58 % after upper extremity fractures [8] 12 weeks after injuries.

In the present study, after adjusting for all possible risk factors (gender, age, education, marital status, self-rated severity, length of hospital stay, injury affected physical appearance, and loss of consciousness), higher scores in BSRS-50 at 12 weeks after injury turned out to be significant risk factors for not return to work. Hence, psychological symptoms at 12 weeks after occupational injury predicted RTW at 1 year after injury. To our best knowledge, no study on the relationship among psychological symptoms and the rate of returning to work among injured workers has been conducted. Nevertheless, there is rare literature on addressing the relative importance of psychological symptoms in explaining RTW in the individuals following non-occupational injuries [6]. Opsteegh et al. found that symptoms of post-traumatic stress disorder (PTSD) were a determinant of late return to work in patients with acute hand injuries. After injury, workers with psychological symptoms may become very hyperarousal and begin to avoid events and activities related to the injury. Thus, the emotional disturbance developed after injury may result in influencing and prolonging RTW process.

In addition to psychological symptoms, the factors affecting RTW outcome as determined by Cox model were female gender, lower education level, longer length of hospitalization, affected physical appearance, injury type of burns. For gender, education level, length of hospital stay, and injury type, there were evidences from our findings to completely agree with some other studies [9, 11]. Walker et al. found that individuals who were female, higher education level, and shorter length of inpatient stay were more likely to return to work at 1 year after injury [11]. On the other hand, He et al. [9] also found that among workers with occupational injury, injury type of burns was a significant beneficial determinant of RTW.

Taking background population score of GSI as 50 and standard deviation as 10 [16], our study found that each of the 10 psycho-physiological symptom of the BSRS-50 was higher in the traumatized workers than in background population. Assuming normal distribution, in background population only 2.5 % should have GSI score higher than 2 standard deviations. In this study, we found 12.1 % of injured workers had GSI score higher than 2 standard deviations, indicating more psychological problems among injured workers.

After a traumatic event, victims may develop psycho-physiological symptoms [21]. In this present study, we found that the frequencies of psycho-physiological symptoms were psychoticism, followed by paranoid ideation tendency and phobic-anxiety. Among the 10 psycho-physiological symptom groups of BSRS-50, phobic-anxiety was the most important risk factor for not returning to work after adjusting for gender, age, education, length of hospitalization, affected physical appearance, injury type, and loss of consciousness. Phobic-anxiety can be both distressing and markedly disabling, leading to the commonly experienced symptom of PTSD, that is avoidance of

**Table 3** Adjusted Ratio of return to work 1 year after Occupational Injury by a proportional hazards analysis

| Variables | Model 1 Adjusted Ratio[a] (95 % CI) | Model 2 Adjusted Ratio[b] (95 % CI) |
|---|---|---|
| Gender | | |
| Male | 1.0 | 1.0 |
| Female | 1.08* (1.02–1.15) | 1.08* (1.01–1.15) |
| Age (years) | | |
| 17–39 | 1.0 | 1.0 |
| 40–59 | 0.94 (0.85–1.04) | 0.94 (0.85–1.04) |
| ≥60 | 0.94 (0.78–1.11) | 0.93 (0.78–1.10) |
| Education | | |
| >9 years | 1.0 | 1.0 |
| ≤9 years | 0.83* (0.78–0.88) | 0.83* (0.78–0.88) |
| Hospitalization in 12 weeks (days) | | |
| <8 days | 1.0 | 1.0 |
| ≥8 days | 0.77* (0.73–0.82) | 0.78* (0.74–0.83) |
| Whether this injury affected physical appearance | | |
| Non-severe | 1.0 | 1.0 |
| Severe | 0.81* (0.76–0.87) | 0.83* (0.77–0.89) |
| Injury type | | |
| Fracture | 1.0 | 1.0 |
| Intracranial injury | 1.13 (0.97–1.32) | 1.12 (0.96–1.32) |
| Open wound of upper limbs | 1.01 (0.79–1.27) | 1.02 (0.80–1.28) |
| Crushing injury | 0.91 (0.78–1.06) | 0.92 (0.78–1.07) |
| Burns | 1.44* (1.13–1.80) | 1.42* (1.11–1.78) |
| Others | 1.03 (0.91–1.17) | 1.03 (0.91–1.17) |
| Loss of consciousness as a result of this injury | | |
| No | 1.0 | 1.0 |
| Yes | 0.95 (0.87–1.03) | 0.96 (0.88–1.04) |
| BSRS-50 at 12 weeks after injury[†] | | |
| GSI < 70 | 1.0 | – |
| GSI ≥ 70 | 0.80* (0.73–0.88) | – |
| BSRS-5 at 12 weeks after injury | | |
| Score < 6 | – | 1.0 |
| Score ≥ 6 | – | 0.81* (0.75–0.86) |

[a] Adjusted for all above variables except BSRS-5 and derived from proportional hazards regression

[b] Adjusted for all above variables except BSRS-50 and derived from proportional hazards regression

[†] *GSI* general severity index

* $p < 0.05$

stimuli associated with the trauma event, such as passing the place of the accident, or similar working conditions. Under this circumstance, workers who develop phobic-anxiety may have high risk of not returning to work after the injury.

Therapeutic modalities for PTSD were proposed while symptoms of phobic-anxiety become evident, and imaginal and live exposure was considered more effective than cognitive restructuring, and relaxation [22]. Thus, for those injured workers who developed psychological symptoms especially phobic-anxiety, it is potentially useful to apply suitable intervention as early as possible in order to help workers to return to work.

RTW is good for injured workers in the long run [5, 6]. Adequate early intervention improves RTW [23, 24]. Among injured workers in this study, higher score in the BSRS-5 at 12 weeks after injury predicted RTW at 1 year after injury. Since BSRS-5 is a satisfactory screening tool to identify psychological symptoms, we suggest in the future BSRS-5 and the questions concerning phobic-anxiety dimension in BSRS-50 can be used as a screening tool among injured workers to identify high risk individuals for further RTW management.

Several limitations in this study should be noted. First, the data in this study were based on injured workers' self-reports and were subject to potential biases and mis-reporting present in this survey. Notwithstanding, self-reported data are the mechanism to evaluate injured workers' concerns and circumstances for return to work and degree of injury which are not obtainable in claims

**Table 4** Adjusted ratio of return to work 1 year after injury by psycho-physiological symptoms of BSRS-50 and BSRS-5

| Variables | Adjusted ratio[a] |
|---|---|
| Gender | |
| Male | 1.0 |
| Female | 1.08* (1.02–1.15) |
| Age (years) | |
| 17–39 | 1.0 |
| 40–59 | 0.94 (0.85–1.04) |
| ≥60 | 0.94 (0.78–1.11) |
| Education | |
| >9 years | 1.0 |
| ≤9 years | 0.83* (0.78–0.88) |
| Hospitalization in 12 weeks (days) | |
| <8 days | 1.0 |
| ≥8 days | 0.78* (0.73–0.83) |
| Whether this injury affected physical appearance | |
| Non-severe | 1.0 |
| Severe | 0.83* (0.78–0.89) |
| Injury type | |
| Fracture | 1.0 |
| Intracranial injury | 1.13 (0.97–1.33) |
| Open wound of upper limbs | 1.02 (0.79–1.27) |
| Crushing injury | 0.91 (0.78–1.07) |
| Burns | 1.42* (1.11–1.78) |
| Others | 1.03 (0.91–1.17) |
| Loss of consciousness as a result of this injury | |
| No | 1.0 |
| Yes | 0.97 (0.89–1.05) |
| Psycho-physiological symptoms of BSRS-50 (score ≥ 80) | |
| Anxiety symptoms | 0.85 (0.61–1.18) |
| Additional symptoms | 1.06 (0.76–1.48) |
| Depressive symptoms | 0.78 (0.60–1.00) |
| Hostility | 0.97 (0.80–1.15) |
| Obsessive–compulsive symptoms | 1.18 (0.93–1.46) |
| Paranoid tendency | 1.11 (0.95–1.31) |
| Phobic-anxiety | 0.85* (0.72–0.99) |
| Psychoticism | 0.94 (0.80–1.08) |
| Interpersonal sensitivity | 1.17 (0.92–1.49) |
| Somatic complaints | 0.80 (0.61–1.03) |
| BSRS-5 (score ≥ 6) | 0.83* (0.78–0.90) |

[a] Adjusted for all above variables and derived from proportional hazards regression

* $p < 0.05$

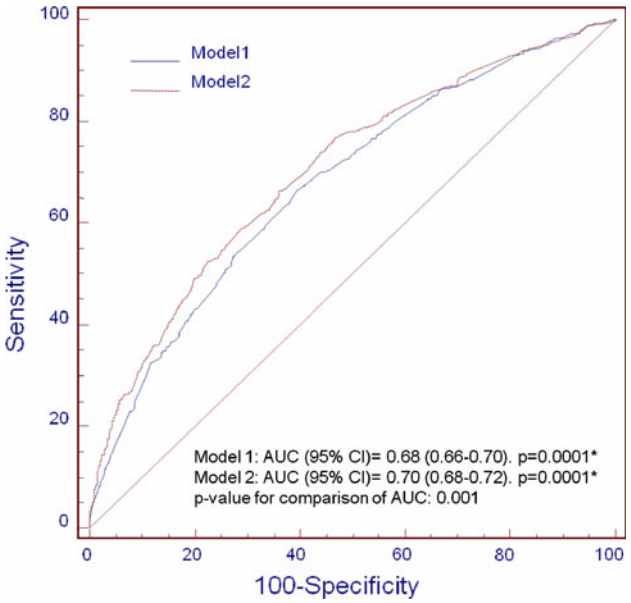


**Fig. 2** Receiver-operating characteristic curves for the prediction of not return to work by model 1 and model 2. Factors of model 1 include gender, age, education, length of hospital stay, injury affected physical appearance, injury type, and loss of consciousness. Model 2 includes model 1 variables, BSRS-5, and phobic-anxiety score of BSRS-50. The diagonal line indicates a reference area under curve (AUC) = 0.5 (no better than chance alone). *$p$ value for AUC of models compared with AUC = 0.5

data. Second, the response rate to the questionnaire was low. Since higher response rates are desired to enhance the generalizability of the data, it is possible that our participants are not fully representative of the population of injured workers. In addition, those who were still hospitalized or those with more severe psychological distress also had more difficulty responding to the questionnaire survey, which might cause underestimation of the results. Nevertheless, our non-response analyses revealed that those who completed the questionnaire and those who did not had similar proportion on gender, mechanisms of injuries, and types of injuries. Third, since we were unable to obtain the objective assessment of injured workers' injury severity, the level of injury severity in this study was substituted by self-rated severity and length of hospital stay. However, the participants' own ratings of severity of their injury correlated significantly with length of hospital stay in our study.

In summary, after all other factors taken into consideration, the presence of psychological symptoms further predicted poorer probability of returning to work after occupational injury. Among the psycho-physiological symptoms, phobic-anxiety was the most significant symptom predicting poor RTW. BSRS-5 is a satisfactory screening tool to identify psychological symptoms that could affect RTW after occupational injury. Development of preventive measures among injured workers according to the risk factors identified in this study is warranted.

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