Effect of stress coping ability and working hours on burnout among residents

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Abstract

**Background:** Burnout (BO) among residents leads to interruptions in training and even to exit from programs. Despite the implementation of working hour restrictions in the U.S. in 2013, the high rate of BO remains a serious problem. Therefore, with the aim of providing support for residents and evidence-based guidelines for working environments, we analyzed Japanese residents’ BO, training conditions, and associated factors, especially stress coping ability.

**Methods:** In total, 37 teaching hospitals were randomly selected, and all residents in the third and fifteenth months of a residency program at these hospitals were targeted for this research. We analyzed the residents’ BO rates, associated factors, and interactions using response data from a self-administered questionnaire consisting of the Japanese versions of the Maslach Burnout Inventory (MBI) and the Sense of Coherence (SOC) scale, as well as items asking about their training environments, gender, and age.

**Results:** Overall, 48 (49.5%) of 97 residents in 18 teaching hospitals (62 and 35 in the third and fifteenth months, respectively), whose average working hours were 63.3 hours per week, were judged as having BO, among whom, 33 (53.2%) and 15 (42.9%) had BO in the third and fifteenth months, respectively. Logistic regression analysis indicated that working hours and 10 items on the SOC scale (SOC10) were significant factors of BO. Two-way analysis of variance revealed that working hours was a significant variable for the MBI-emotional exhaustion score and SOC10 in the third and fifteenth months, respectively. Regarding the MBI-cynicism and professional efficacy scores, the SOC10 was a significant variable in both the third and fifteenth months. In addition, the high SOC group (SOC10>45) showed higher personal efficacy under longer working hours.

**Conclusion:** About half of the Japanese residents were judged as having BO as early as the third month of training under regulations of working 40 hours per week. Individual stress coping ability and working hours were found to be significant factors for BO. Residents with high stress coping ability exhibited more personal efficacy with more working experiences, which suggests that the SOC scale could be a valuable tool to help foster a suitable training environment.

Background
Postgraduate residency programs in the United States, Canada, and many other countries now aim to foster medical doctors who possess competencies as professionals. To accomplish this goal, qualified residency programs under governmental or professional regulations and guidelines provide residents with opportunities for essential clinical training as well as necessary support and a proper working environment.

Burnout (BO) is defined as a prolonged work-related response to emotional and interpersonal stressors on the job, and has been associated with withdrawal, intention to leave the job, job turnover, loss of productivity, and quality of work [1-3]. Maslach and Jackson developed the Maslach Burnout Inventory (MBI) [1], which is composed of three subscales that evaluate the BO dimensions of emotional exhaustion, cynicism (depersonalization), and professional efficacy (personal accomplishment). The MBI has been used for evaluating emotional state and judging BO [3].

Medical and health professionals, among others, might easily fall into BO because of excessive demand for mental energy in the process of assisting patients [4]. Previous studies using the MBI have reported that 76% of internal medicine residents in the United States in 2001 [5] and 61% of residents in Australia in 2001 [6] were judged as having BO.

Maslach et al. analyzed the causes of BO based on interviews with company administrators and workers, and reported that BO was the result of factors such as social environmental problems, overtime working, a lack of discretionary power, inadequate remuneration, dissatisfaction with work, poor human relations, and the uncontrollability of work [7]. As for residents’ BO, risk factors and effective interventions have repeatedly been discussed [3]. Several studies have reported that inadequate remuneration [8] and frequent calls [9] and night duty [10] are promoting (or worsening) factors for BO, and that 80 or fewer hours of work per week [11], counselling [12,13], the existence of somebody to consult with, such as those in mentoring programs [14,15], stress-relieving opportunities [16,17], and mindfulness-based skills programs [18] are preventive (or relieving) factors for BO.

In addition to the training environment, individual factors such as marriage [19] and childcare [20] have been reported to reduce the factors of BO. Men have reported significantly more job- and patient-related BO than women [21], whereas women are more likely than men to report frequently
‘experiencing fatigue’ and ‘BO from work’ [22]. In addition, Tsele et al. and Cliiers reported that individual stress coping ability affects BO among health professionals [23,24].

Antonovsky proposed the concept of salutogenesis, and developed the Sense of Coherence (SOC) scale to evaluate individual stress coping ability [25]. The SOC scale is a self-administered questionnaire composed of the following three subscales: the extents to which a person comprehends the world (comprehensibility), perceives manageability in whatever situation that arises (manageability), and finds meaning in life (meaningfulness). A previous study involving 79 nurses using the SOC scale, MBI, and Beck’s Depression Inventory indicated that people with a low SOC score were at higher risk of BO and depression [23]. Tartas et al. reported that SOC scores examined prior to medical school admission were significantly correlated with occupational stress and BO among medical doctors after graduation [26].

In the United States, the Accreditation Council for Graduate Medical Education implemented working hour regulations on residency programs to prevent overwork, resulting in an average of 80 working hours per week [27–29]. Although the frequency of BO decreased from 36–77% to 25–69% [28,30–33], BO remains a serious problem. Therefore, in addition to uniform restrictions on working hours, residency programs require evidence-based guidelines for fostering effective working environments. Therefore, in the present study, we analyzed BO and related environmental and individual factors in Japanese residents from the standpoint of the training phase. We also analyzed individual stress coping ability, emotional exhaustion, cynicism, and professional efficacy, as well as their relationship with working hours.

Methods

Targets and data collection

All postgraduate residency programs in Japan are qualified by the Ministry of Health, Labour and Welfare. It is mandatory for residents to practice internal medicine, general surgery, community medicine, and emergency medicine in a 2-year program. We randomly selected 37 teaching hospitals of various sizes that operate qualified residency programs based on geological distribution (1–6 hospitals/prefecture) from all over Japan.
To collect data at the early and later phases of training, all residents in the third and fifteenth months at these hospitals were targeted for this research.

Next, we created a self-administered questionnaire consisting of the following:

Japanese version of the MBI-General Survey (MBI-GS) (Mind Garden, Inc. Menlo Park, CA, USA)[34]. The MBI-GS is a scale composed of 16 items rated on a seven-point Likert scale. The Japanese version of the MBI-GS was created and validated by Kitaoka et al. [35]. Kitaoka granted the authors of the present study permission to use the validated Japanese version.

Japanese version of the SOC scale. The SOC scale is composed of 13 items rated on a seven-point Likert scale. The Japanese version of the SOC scale was created and validated by Togari et al. [36]. Yamazaki (a coauthor of that study) granted the authors of the present study permission to use the validated Japanese version.

Items regarding influential factors in the training environment, including frequency of night duty[10], working hours [11], existence of somebody to consult with [14,15], has ways to release one’s stress [16,17], feels adequate reward for own work [8], and work controllability [7], and personal characteristics such as gender and age.

We distributed the printed questionnaire by mail with an exploratory description of this research and its ethical approval, and collected responses from July to September 2014.

**Data analysis**

We confirmed the independence of the MBI and SOC scales by exploratory factor analysis with promax rotation using item scores of both scales, and then excluded the SOC items that were classified into the same factors as the MBI subscale for the subsequent analysis. We confirmed the internal consistencies of the MBI, MBI subscales, and SOC scale using Cronbach’s a coefficient.

The cutoff and abnormal scores for each MBI subscale as indicated by the MBI-GS were as follows:

- MBI-GS subscale emotional exhaustion (MBI-EX) score: 16 or higher
- MBI-GS subscale cynicism (MBI-CY) score: 11 or higher
- MBI-GS subscale professional efficacy (MBI-PE) score: 23 or lower

Individual BO judgments vary in the literature, so we adopted the following criteria validated by Schaufeli et al. [37]: an MBI-EX score of 16 or higher and/or an MBI-CY score of 11 or higher. These criteria can discriminate between clinical BO and non-BO employees [37], and have been used in previous BO studies [5,6].

Next, we analyzed the frequency of BO, MBI-EX, MBI-CY, and MBI-PE scores, influential factors related to these scores, and differences in training phases using the t-test, chi-squared test, and logistic regression analysis. To assess the effects of stress coping ability on BO, the respondents were divided
into low and high SOC groups using the average SOC scores. Correlation and two-way analysis of variance was then carried out to analyze the relationship between MBI-EX, MBI-CY, and MBI-PE scores, SOC scores, and working hours. SPSS (version 21; IBM, New York, NY, USA) was used for all data analyses.

Results
In total, 107 residents (response rate: 28.2%) at 18 teaching hospitals in 11 prefectures responded to the questionnaire. After excluding invalid responses, such as choosing the same options, data from 97 residents (41 residents in hospitals with 500 beds or more, 36 in hospitals with 300–499 beds, and 20 in hospitals with 299 beds or less; 62 in the third month of their residency program and 35 in the fifteenth) were used for the analysis.

Table 1 shows the respondents’ demographic data and working environments. The residents’ average ages in the third and fifteenth months were 26.7 and 27.6 years, respectively, average frequency of night duty was 3.6 times per month, and average number of working hours per day was 11.5, which is equivalent to 63.3 hours per week.

Confirmation of scales
Exploratory factor analysis with promax rotation of the Japanese versions of the MBI and SOC scale using data from the 97 respondents indicated a six-factor structure (Table 2). Factors 1, 2, and 4 had items identical to the MBI-PE, MBI-EX, and MBI-CY detected in the original English version. The three-factor structure of the original version of the SOC scale did not detect these in the present analysis, and two items on the SOC scale were classified into factor 1 (MBI-PE); one item had a loading of over 0.4 for factor 4 (MBI-CY) and factor 6. These three items were excluded, and thus, 10 items of the SOC scale (SOC10) were used for the analysis.

Cronbach’s a coefficients for the MBI-EX, MBI-CY, and MBI-PE were 0.91, 0.88, and 0.89, respectively. Cronbach’s a coefficient for the SOC10 was 0.81.

**MBI-GS subscale scores, BO frequency, and influential factors**

As shown in Table 3, the residents’ mean MBI-EX, -CY, and -PE scores were 15.2, 7.7, and 16.4, respectively.
Among 97 respondents, 48 (49.5%) were judged as having BO (Table 4). The frequencies of BO in the third and fifteenth months were 53.2% and 42.9%, respectively, with no significant difference. The frequencies of BO among men and women were 49.2% and 50.0%, respectively; gender was not a significant factor.

Logistic regression analysis of BO using gender, frequency of night duty, working hours, age, work controllability, and the SOC10 as independent variables indicated that working hours (odds ratio [OR]: 1.315, 95% confidence interval [Cl]: 1.057-1.636, p=0.014) and the SOC10 (OR: 0.928, 95% CI: 0.882-0.976, p=0.004) were significant. The SOC10 (OR: 0.918, 95% CI: 0.854-0.976, p=0.004) and frequency of night duty (OR: 0.615, 95% CI: 0.388-0.974, p=0.038) were significant variables for BO for respondents in the third and fifteenth months of the residency program, respectively.

**MBI subscale scores at different training phases**

At the third month, 32 (51.6%, 97.0% of BO residents), 16 (25.8%, 48.5% of BO residents), and 47 (75.8%) residents were judged as having abnormally high scores on the MBI-EX and MBI-CY, and low scores on the MBI-PE, respectively (Table 5).

At the fifteenth month, 12 (34.3%, 80.0% of BO residents), 9 (25.7%, 60.0% of BO residents), and 30 (85.7%) residents were judged as having abnormally high scores on the MBI-EX and MBI-CY, and low scores on the MBI-PE, respectively.

**MBI subscale scores, SOC10 score, and working hours**

The average SOC10 score of the 97 residents was 45.0 (standard deviation 10.1) (Table 3). Thirty residents (62.5%) in the low SOC group (SOC10≤45, n=48) and 18 (36.7%) in the high SOC group (SOC10>45, n=49) were judged as having BO (Table 4).

The MBI subscale scores in the low and high SOC groups in the third and fifteenth months are shown in Table 6. All subscale scores in the low and high SOC groups were significantly different, except the MBI-EX score in the fifteenth month.

In the low SOC group, the Pearson correlation coefficients between working hours and all three MBI subscale scores were significant in the third month (MBI-EX: r=0.47, p=0.007; MBI-CY: r=0.39, p=0.029; MBI-PE: r=-0.44, p=0.012), but not in the fifteenth. In the high SOC group, working hours
was correlated with only MBI-PE in the third month \((r=0.36, p=0.049)\) (Table 6).

To analyze the relationship between working hours, SOC scores, and MBI subscale scores, the respondents were divided to four groups: \(\leq 9\) hours (19 residents), \(>9\) to 11 hours (29 residents), \(>11\) to 13 hours (32 residents), and \(>13\) hours (17 residents) per day.

As shown in Figure 1, two-way analysis of variance with working hours and SOC scores as factors of the MBI-EX score revealed that working hours and SOC scores were significant variables in the third and fifteen months, respectively. Regarding the MBI-CY and MBI-PE scores, SOC was a significant variable in both the third and fifteenth months. The MBI-PE score in the high SOC group was higher (more professional efficacy) in longer working hour groups, whereas the MBI-PE score of the low SOC group was lower (less professional efficacy) in longer working hour groups.

**Discussion**

In the present study, 49.5% of Japanese residents were judged as having BO, and working hours was significantly related to BO. However, the residents in this study, whose average working hours was 63.3 per week, showed a similar high frequency of BO in the United States after working 80 hours per week, which indicates that working hour regulations alone might not be adequate for reducing BO.

Our data also indicated that half of Japanese residents were judged as having BO as early as the third month of training. Among BO residents at the third month, 97.0% had a high MBI-EX score and 48.4% had a high MBI-CY score. The MBI-EX, which is composed of five items, e.g., ‘I feel emotionally drained from my work’, and ‘I feel tired when I get up in the morning and have to face another day on the job’, indicates decreased working vitality, that is, a low state of mental, creative, and physical energy levels. Meanwhile, the MBI-CY, which is composed of five items, e.g., ‘I’ve become less interested in my work since I started this job’, and ‘I doubt the significance of my work’, indicates decreased enthusiasm, that is, a low degree of interest in working.

Teunissen et al. pointed out a problem at the transitional phase from undergraduate education to postgraduate residency training [38]. Residents were under greater stresses caused by interacting with patients and medical staff, learning new material in a more self-directed way, and bearing many responsibilities that accompany the delivery of patient care and the need to take on increasingly
more tasks independently [38]. Residents were mentally fatigued and had restrained emotions during this phase.

**BO among Japanese medical students, whose clinical training is usually finished 8 months prior to graduation, was reported as being 13.3% for males and 31.3% for females [39]. When these students start residency training in a teaching hospital, there is a substantial change in their professional role as a licensed medical doctor and in their personal life. Encountering a new environment might be a cause of BO among Japanese residents at the third month.**

In this study, working hours was correlated with MBI-EX scores for residents in the low SOC group at the early phase of training.

At the fifteenth month, 80% of the residents with BO had a high MBI-EX score, and 60% had a high MBI-CY score. At this point, the enthusiasm among residents with BO faded, and they tended to view things cynically in addition to having low interest in working.

Cynicism in the later phase of training has previously been reported [40], and our data indicate that residents with low stress coping ability might have this tendency.

BO as judged by the MBI indicates an individual’s state at the time of inquiry. On the other hand, a resident’s stress coping ability as evaluated by the SOC scale is fixed to some extent in early adulthood, and might be only slightly changeable because of life experiences [25]. As previously reported [23,26], resident groups with high SOC scores showed a low frequency of BO as judged by emotional exhaustion and cynicism. In addition, these residents showed high professional efficacy, regardless of the training phase. Furthermore, longer working hours did not worsen their emotional exhaustion or cynicism; rather, professional efficacy was increased in this group, in contrast to the low SOC group, in which professional efficacy decreased.

Kroninger-Jungaberle et al. reported that the concepts of SOC and self-efficacy foster resilience [41]. Mastery experience has also been reported to increase self-efficacy [42]. Our data indicate that residents with high stress coping ability can increase their self-efficacy by gaining more clinical experience, as indicated by working hours, thereby obtaining resilience.

A previous report pointed out that limiting working hours is obviously effective for the prevention of
BO, but there was some discussion that excessive restrictions might hinder professional development [29,43]. We found that appropriate working hours for effective training might vary among individuals, and that in addition to supportive programs for residents, personalized programs compatible with his/her stress coping ability and current BO status would be required.

Residents are in danger of BO at the very early phase of training, and the expression of BO might change as time passes. **Screening residents using the SOC scale could help teaching staffs and program directors identify residents at high risk of BO and provide necessary support early for its prevention without excessively limiting clinical experience for those at low risk.**

**Limitations**

The hospital targeted in the present study was randomly selected from among those throughout the entire country, but the response rate and number of samples for analysis were low. **We could not exclude the possibility that BO residents did not respond to the questionnaire, or that the prevalence of BO was higher than that identified in our analysis.** In addition, we used a cross-sectional survey design **with two data collection points.** Thus, the relationship between working hours and BO at the later phase of a training program remains somewhat unclear because long working hours could be a cause of BO, and also shortened as a result of BO. To confirm the changes in BO status during the training period, it will be necessary to follow these individuals in a cohort study.

Furthermore, this was a survey of residents in a Japanese training program; additional research in other regions and with different training systems is required before our results can be generalized.

**Conclusions**

Half of the Japanese residents analyzed in the present study were emotionally restrained and judged as having BO in the third month of training. As previously reported, working hours and stress coping ability as evaluated by the SOC were both independent influential factors for BO. In addition, we found that residents with high stress coping ability maintained their interest and enthusiasm for working and obtained professional efficacy under longer working hours, whereas residents with low stress coping ability were liable to experience BO under the same working conditions. Individual stress coping ability could therefore be valuable information for fostering a suitable training
environment.

Declarations

Ethics approval and consent to participate

This research project was approved by the Graduate School of Medical and Dental Science, Kagoshima University (No. 638, 180122).

All target residents received a written explanation of the study protocol and the voluntary nature of participation. Residents who consented to participate were asked to return the completed questionnaire. Informed consent was assumed to be obtained when the participants returned a completed questionnaire.

Consent for publication

All target residents received a written explanation of the possible publication of the research findings. Residents who consented to participate were asked to return the completed questionnaire.

Availability of data and materials

Data except MBI can be disclosed within the scope of ethical codes according to requests to Masami Tagawa.

Competing interests

The authors declare that they have no competing interests.

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None.

Authors’ contributions

SK was responsible for designing the questionnaire, performing the statistical analysis, and drafting the initial manuscript; MT made substantial revisions to the manuscript and supported SK in its development, including the search process; KT was responsible for the methodology of the statistical analysis. All authors have read and approved the final version of this manuscript for submission.

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Abbreviations
BO: burnout

MBI: Maslach Burnout Inventory

SOC: Sense of Coherence

MBI-GS: Maslach Burnout Inventory-General Survey

MBI-EX: MBI-GS subscale emotional exhaustion

MBI-CY: MBI-GS subscale cynicism

MBI-PE: MBI-GS subscale professional efficacy

OR: odds ratio

CI: confidence interval

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Tables
Table 1. Baseline demographics of the survey respondents.
|                          | Third month | Fifteenth month | Total  |
|--------------------------|-------------|-----------------|--------|
|                          | n  (%)      | n  (%)          | n  (%) |
| Respondent               | 62 (100)    | 35 (100)        | 97 (100) |
| Male                     | 37 (59.7)   | 26 (74.3)       | 63 (64.9) |
| Female                   | 25 (40.3)   | 9 (25.7)        | 34 (35.1) |

|                          | Mean (SD)   | Mean (SD)       | Mean (SD) |
|--------------------------|-------------|-----------------|-----------|
| Age (years)              | 26.7 (3.6)  | 27.6 (3.5)      | 27.1 (3.6) |
| Working environment      |             |                 |           |
| Night duty (days/month)  | 3.8 (2.2)   | 3.3 (2.3)       | 3.6 (2.3) |
| Working hours (h/day)    | 11.9 (2.7)  | 10.9 (1.7)      | 11.5 (2.4) |

n: number of respondents. SD: standard deviation.

Table 2. Promax-rotated pattern/structure coefficients for each factor, extracted communalities (h²), and eigenvalues for SOC and MBI factor analysis of scores from 97 residents.
| Item    | 1     | 2     | 3     | 4     | 5     | 6     | $h^2$ |
|---------|-------|-------|-------|-------|-------|-------|-------|
| MBI16   | 0.880 | -0.087| -0.012| 0.086 | 0.090 | -0.027| 0.757 |
| MBI10   | 0.873 | -0.181| -0.004| 0.164 | 0.041 | -0.102| 0.735 |
| MBI11   | 0.768 | 0.038 | -0.154| -0.068| -0.011| 0.080 | 0.552 |
| MBI7    | 0.757 | 0.079 | 0.054 | -0.052| 0.025 | 0.002 | 0.639 |
| MBI12   | 0.683 | 0.137 | -0.103| -0.218| 0.056 | 0.272 | 0.625 |
| MBI5    | 0.561 | 0.163 | 0.076 | -0.205| -0.180| -0.092| 0.487 |
| SOC4    | 0.298 | 0.162 | 0.157 | -0.070| 0.056 | 0.189 | 0.209 |
| XSOC10  | 0.271 | -0.198| 0.018 | -0.061| 0.017 | -0.202| 0.187 |
| MBI2    | -0.026| 0.906 | -0.063| -0.089| 0.044 | 0.036 | 0.774 |
| MBI1    | 0.013 | 0.821 | -0.069| 0.001 | 0.000 | 0.084 | 0.686 |
| MBI6    | 0.047 | 0.781 | 0.207 | 0.194 | -0.019| 0.195 | 0.619 |
| MBI3    | -0.049| 0.746 | -0.009| 0.094 | -0.009| -0.138| 0.728 |
| MBI4    | -0.004| 0.645 | -0.054| 0.253 | 0.009 | -0.109| 0.720 |
| SOC12   | -0.027| 0.144 | 0.783 | -0.245| -0.048| 0.109 | 0.767 |
| SOC9    | -0.031| -0.067| 0.769 | 0.088 | 0.078 | -0.089| 0.575 |
| SOC8    | 0.118 | -0.048| 0.718 | 0.007 | -0.031| -0.352| 0.663 |
| SOC5    | -0.239| -0.126| 0.645 | 0.069 | 0.009 | 0.106 | 0.427 |
| SOC13   | 0.001 | 0.176 | 0.624 | -0.194| -0.008| -0.061| 0.463 |
| SOC6    | 0.301 | -0.284| 0.421 | 0.265 | -0.203| 0.077 | 0.375 |
| SOC11   | 0.095 | -0.036| 0.365 | -0.078| 0.212 | -0.315| 0.370 |
| MBI15   | -0.108| 0.014 | -0.067| 0.787 | 0.087 | 0.035 | 0.728 |
| MBI8    | -0.019| 0.246 | 0.043 | 0.762 | 0.044 | -0.112| 0.810 |
| MBI14   | -0.049| -0.035| -0.143| 0.717 | 0.018 | 0.187 | 0.624 |
| MBI9    | -0.001| 0.157 | 0.017 | 0.716 | -0.051| -0.142| 0.720 |
| MBI13   | 0.212 | 0.38  | 0.010 | 0.421 | -0.090| -0.064| 0.473 |
| XSOC2   | 0.147 | 0.020 | -0.153| 0.047 | 0.815 | -0.133| 0.633 |
| XSOC3   | -0.122| -0.009| 0.162 | 0.037 | 0.735 | 0.044 | 0.604 |
| XSOC1   | 0.057 | 0.001 | 0.264 | -0.076| 0.410 | 0.080 | 0.387 |
| XSOC7   | 0.123 | -0.130| -0.048| -0.420| 0.005 | 0.468 | 0.593 |

Rotated sums of squared loadings 5.375 5.328 5.490 6.320 2.461 1.324
We used the main factor method to extract factors. We defined a high factor loading as $\geq 0.4$. Factor analysis was performed by exploratory analyses.

Table 3. Residents’ mean scores for the MBI-GS subscales and SOC10.

|         | Third month (n=62) | Fifteenth month (n=35) | Total (n=97) |
|---------|-------------------|------------------------|--------------|
|         | Mean   | SD     | Mean    | SD     | Mean  | SD     |
| MBI     |        |        |         |        |        |        |
| EX      | 16.0   | 7.0    | 13.6    | 7.0    | 15.2  | 7.1    |
| CY      | 7.4    | 6.5    | 8.3     | 7.5    | 7.7   | 6.9    |
| PE      | 16.9   | 8.0    | 15.4    | 6.9    | 16.4  | 7.6    |
| SOC10   |        |        |         |        |        |        |
|         | 45.0   | 10.0   | 45.0    | 10.5   | 45.0  | 10.1   |

MBI: Maslach Burnout Inventory; EX: emotional exhaustion; CY: cynicism; PE: professional efficacy; SOC10: scores on the Sense of Coherence scale, excluding three items that were classified into the Maslach Burnout Inventory subscales. n: number of respondents. SD: standard deviation.

Table 4. Number and percentage of burnout according to the participants’ gender and working environment.
### Table 5. Number of respondents who had abnormal MBI subscale scores in the third and fifteenth months of their residency program.

| Variable                      | Third month |           | Fifteenth month |           | Total  |
|-------------------------------|-------------|-----------|------------------|-----------|--------|
|                               | n        | (%)      | n        | (%)      | n        |
| **High MBI-EX**               |           |          |           |          |          |
| High MBI-EX                   | 32 (51.6) |          | 12 (34.3) |          | 44 (45.4) |
| High MBI-CY                   | 16 (25.8) |          | 9 (25.7)  |          | 25 (25.8) |
| Low MBI-PE                    | 47 (75.8) |          | 30 (85.7) |          | 77 (79.4) |
| BO                            | 33 (53.2) |          | 15 (42.9) |          | 48 (49.5) |
| **Total**                     | 62 (100)  |          | 35 (100)  |          | 97 (100)  |

**High MBI-EX:** residents whose Maslach Burnout Inventory (MBI) emotional exhaustion score was $\geq 16$.

**High MBI-CY:** residents whose MBI cynicism score was $\geq 11$.

**Low MBI-PE:** residents whose MBI professional efficacy score was $\leq 25$. 

BO: respondents who were diagnosed as burnout by the Maslach Burnout Inventory (emotional exhaustion $\geq 16$ and/or cynicism $\geq 11$).

\(n\): number of respondents. SOC10: scores on the Sense of Coherence scale, excluding three items that were classified into the Maslach Burnout Inventory subscales.
BO: respondents who were diagnosed as having burnout by High MBI-EX and/or High MBI-CY.

n: number of respondents.

Table 6. Average MBI subscale scores in the low and high SOC groups and Pearson correlation coefficients with working hours.

| Third month |                  |                  | Third month |                  |                  |
|-------------|------------------|------------------|-------------|------------------|------------------|
|             |                  |                  | t-test      |                  |                  |
|             |                  |                  |             |                  |                  |
| group       | n    | Mean | SD   | p     | r   | p     | n    |
|-------------|------|------|------|-------|-----|-------|------|
| Low SOC     | 32   | 17.7 | 6.8  | 0.048* | 0.47 | 0.007** | 16   |
| High SOC    | 30   | 14.2 | 6.9  | 0.28   | 0.134 | 0.001** | 19   |
| Low SOC     | 32   | 9.9  | 7.2  | 0.001** | 0.39 | 0.029*   | 16   |
| High SOC    | 30   | 4.6  | 4.4  | 0.14   | 0.466 | 0.008** | 19   |
| Low SOC     | 32   | 14.3 | 7.1  | 0.008** | -0.44| 0.012*   | 16   |
| High SOC    | 30   | 19.7 | 8.1  | 0.049*   | 0.36 | 0.049*   | 19   |

MBI-EX: Maslach Burnout Inventory-emotional exhaustion. MBI-CY: Maslach Burnout Inventory-cynicism. MBI-PE: Maslach Burnout Inventory-professional efficacy.

Low SOC: Respondents whose score on the 10-item Sense of Coherence Scale was ≤45.

High SOC: Respondents whose score on the 10-item Sense of Coherence Scale was >45.

n: number of respondents. SD: standard deviation.

r: Pearson correlation coefficient.

*p<0.05; **p<0.01: Significant difference in average MBI subscale scores between the low and high SOC groups based on a t-test, and in Pearson correlation analysis of MBI subscale scores and working hours.

Figures
Average Maslach Burnout Inventory (MBI) subscale scores in the high and low Sense of Coherence (SOC) scale groups by working hours (–9: ≤9 h/day; –11: >9 to 11 h/day; –13: >11 to 13 h/day; and 13+: >13 h/day). MBI-EX: MBI-emotional exhaustion; MBI-CY: MBI-cynicism; MBI-PE: MBI-professional efficacy. The area with blue shadowing indicates clinical burnout or abnormally low professional efficacy. Low SOC: residents with a score of ≤45 on 10 items of the SOC scale (SOC10); High SOC: residents with a score >45 on the SOC10. The significance of independent variables (h, SOC) and their interactions calculated by two-way analysis of variance for each MBI subscale score are indicated. *p<0.05; **p<0.01.