Analysis of structural relationship among the occupational dysfunction on the psychological problem in healthcare workers: A study using structural equation modeling

Mutsumi Teraoka, Makoto Kyougoku

**Purpose**: The purpose of this study is to demonstrate the hypothetical model based on structural relationship with the occupational dysfunction on psychological problems (stress response, burnout syndrome, and depression) in healthcare workers.

**Method**: Three cross sectional studies were conducted to assess the following relations: 1) occupational dysfunction on stress response (n = 468), 2) occupational dysfunction on burnout syndrome (n = 1142), and 3) occupational dysfunction on depression (n = 687). Personal characteristics were collected through a questionnaire (such as age, gender, and job category, opportunities for refreshment, time spent on leisure activities, and work relationships) as well as the Classification and Assessment of Occupational Dysfunction (CAOD). Furthermore, study 1 included the Stress Response Scale-18 (SRS-18), study 2 used the Japanese Burnout Scale (JBS), and study 3 employed the Center for Epidemiological Studies Depression Scale (CES-D). The Kolmogorov–Smirnov test, confirmatory factor analysis (CFA), exploratory factor analysis (EFA), and path analysis of structural equation modeling (SEM) analysis were used in all of the studies. EFA and CFA were used to measure structural validity of four assessments; CAOD, SRS-18, JBS, and CES-D. For examination of a potential covariate, we assessed the correlation of the total and factor score of CAOD and personal factors in all studies. Moreover, direct and indirect effects of occupational dysfunction on stress response (Study 1), burnout syndrome (Study 2), and depression (Study 3) were also analyzed.

**Results**: In study 1, CAOD had 16 items and 4 factors. In Study 2 and 3, CAOD had 16 items and 5 factors. SRS-18 had 18 items and 3 factors, JBS had 17 items and 3 factors, and CES-D had 20 items and 4 factors. All studies found that there were significant correlations between the CAOD total score and the personal factor that included opportunities for refreshment, time spent on leisure activities, and work relationships (p<0.01). The hypothesis model results suggest that the classification of occupational dysfunction had good fit on the stress response (RMSEA = 0.061, CFI = 0.947, and TLI = 0.943), burnout syndrome (RMSEA = 0.076, CFI = 0.919, and TLI = 0.913), and depression (RMSEA=0.060, CFI=0.922, TLI=0.917). Moreover, the detected of covariates include
opportunities for refreshment, time spent on leisure activities, and work relationships on occupational dysfunction.

**Conclusion:** Our findings indicate that psychological problems are associated with occupational dysfunction in healthcare workers. Better improvement of occupational dysfunction might be a strategy of better preventive occupational therapies for healthcare workers with psychological problems. However, longitudinal study will be needed in order to judgmental a causal relationship.
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The authors have declared that no competing interests exist.

Key words
Stress response, Burnout syndrome, Depression, Occupational dysfunction
Abstract

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Results: In study 1, CAOD had 16 items and 4 factors. In Study 2 and 3, CAOD had 16 items and 5 factors. SRS-18 had 18 items and 3 factors, JBS had 17 items and 3 factors, and CES-D had 20 items and 4 factors. All studies found that there were significant correlations between the CAOD total score and the personal factor that included opportunities for refreshment, time spent on leisure activities, and work relationships (p<0.01). The hypothesis model results suggest that the classification of occupational dysfunction had good fit on the stress response (RMSEA = 0.061, CFI = 0.947, and TLI = 0.943), burnout syndrome (RMSEA = 0.076, CFI = 0.919, and TLI = 0.913), and depression (RMSEA = 0.060, CFI = 0.922, TLI = 0.917). Moreover, the detected of covariates include opportunities for refreshment, time spent on leisure activities, and work relationships on occupational dysfunction.

Conclusion: Our findings indicate that psychological problems are associated with occupational dysfunction in healthcare workers. Better improvement of occupational dysfunction might be a strategy of better preventive occupational therapies for healthcare workers with psychological
problems. However, longitudinal study will be needed in order to judgmental a causal relationship.
Introduction

Practitioners, educators, and researchers have been acknowledging occupational dysfunction as major health problems in preventive occupational therapy [1-4]. Occupational dysfunction is defined as a negative experience emerging from an unsatisfactory lifestyle atmosphere; it includes occupational imbalance, occupational deprivation, occupational alienation, and occupational marginalization [5,6]. Occupational marginalization is defined as impeding participation in daily activities [7]. Occupational deprivation is a lack of choices in daily activities that are beyond the individual’s control [8]. Occupational alienation is the failure to fulfill the inner needs in everyday activities [9]. Occupational imbalance is a loss of balance in engagement during daily activities [10].

Occupational dysfunction occurs not only among the disabled but also in healthy persons [11,12]. It has been indicated that occupational dysfunction can occur devoid of apparent medical disease [11]. According to a finding of an observational study of workers without obvious medical disease, 36% of workers have some occupational dysfunction [13]. Regarding occupational alienation, 43% of workers from the same study reported experiencing serious psychological problems [13]. Moreover, a report found that occupational dysfunction was observed in 75.4% of rehabilitation therapists without obvious medical disease, and occupational dysfunction showed a correlation with job stress [14]. People suffering from occupational dysfunction are unable to participate in day-to-day activities of work, leisure, self-care, and rest.

A previous study indicates that healthcare workers frequently experience occupational dysfunction and various psychological issues than other professionals, which includes stress response, burnout syndrome, and depression [13,14]. Depression and burnout syndrome are due to an increase in stress response [15,16]. Job related stress response is defined as the harmful physical and emotional responses that occur when the requirements of the job do not correlate with the capabilities, resources, or needs of the worker [17]. Job related stress response is recognized as a major psychological issue for healthcare workers [18,19]. Moreover, burnout syndrome is defined as a job related stress response that includes symptoms of exhaustion and indifference toward work [20]. Burnout syndrome influences the job related performance of the healthcare worker to collaborate with other team members under challenging circumstances [21]. At the individual level, burnout syndrome is related to depression for the healthcare worker [22]. Depression is defined as a problem with persistent feelings of sadness and emptiness and a loss
of pleasure and interests [12]. In Japanese society, there is a recognized association between depressive mood and subsequent suicide among workers [23,24]. Furthermore, over 60% of workers are reported to suffer from a stress related psychological problem in Japan [25]. One of the primary causes of psychological problem among workers is attributed to difficult working conditions, such as heavy overtime work, understaffing, deadline pressure, relationship problems, and cost-cutting practices [26-29]. Many Japanese workers are classified as workaholics, which leads to fatigue and is also one of the causes of depression [29,30]. There has been a growing concern about the psychological problems, especially among healthcare workers, because stress response, burnout syndrome, and depression are the most common work-related health problems in the healthcare profession [31].

However, there has been no previous study examining the impact of classification of occupational dysfunction on psychological problems, including stress response, burnout syndrome, and depression. A case study on occupational therapy has both suggested a causal association between occupational dysfunction and psychological problem [11,12]. A theoretical study on occupational dysfunction has related to mental well-being [32]. Therefore, occupational dysfunction has the possibility to antedate the appearance of psychological problem in workers.

We hypothesize that the occupational dysfunction has the impact of the structural relationship for the stress response, burnout syndrome, and depression of healthcare workers in hospitals (Figure 1). The structural relationship is a snapshot of a point in time and, observed findings suggest to an influence relationship between variables. In Study 1, we hypothesize that occupational dysfunction, as assessed by the Classification and Assessment of Occupational Dysfunction (CAOD), is associated with the Stress Response Scale-18 (SRS-18). In Study 2, we hypothesize that occupational dysfunction is associated with the Japanese Burnout Scale (JBS). In Study 3, we hypothesize that occupational dysfunction is associated with the Center for Epidemiological Studies Depression Scale (CES-D).

Moreover, we surmise that occupational dysfunction and psychological problems in healthcare workers is further influenced by personal factors, including age, gender, years of work experience, job category, opportunities for refreshment, time spent on leisure activities, and quality of work relationships.

In summary, this study demonstrated the hypothesis model of structural relationship that psychological problems are affected by occupational dysfunction among healthcare workers.
Ethics statement

The Ethics Committee of Kibi International University and the research ethics committee of partnership hospitals approved all research protocol and informed consent procedures (No. 13–30). Written informed consent was obtained from all the participants. We provided participants with a letter explaining the outline and purpose of the study. Participants received the right to drop out of the research project at any time without any reason. We regarded the return of the survey sheet as consent for participation in this research. Survey sheets were returned in anonymous, sealed envelopes.

Statistical software

SPSS Statistics (http://www.spss.com) were used for the sample characteristics and correlation analysis. Mplus 7.3 (http://www.statmodel.com) was used for the structural equation modeling (SEM) in all studies. The SEM is a comprehensive statistical analysis of the integration of path analysis and factor analysis [33]. SEM aids the identification of structural or cause relationships [33]. Mplus is a statistical modeling software for SEM, developed by Muthén & Muthén [34]. Mplus is a flexible tool to analyze multivariate data [34].

Study 1

Purpose

The aim of this study is to test the hypothesis that job related stress response affects occupational dysfunction in healthcare workers (see Figure 1). Moreover, this hypothesis model examines the effect of personal factors on job related stress response and occupational dysfunction.

Methods

Participants

In total, there were 468 participants (21 doctors, 159 nurses, 52 physical therapists, 60 occupational therapists, and 176 other healthcare workers).
Measures

Sample characteristics: Demographic data were obtained from all participants. We assessed age, gender, job category, years of work experience, opportunities for refreshment, time spent on leisure activities, and work relationships.

CAOD [6]: We developed CAOD for measuring the classification of occupational dysfunction, based on the Occupation Based Practice 2.0 (OBP2.0) [5,6]. Figure 2 demonstrates that OBP2.0 offers a conceptual foundation for the assessment and intervention in occupational dysfunction and belief conflict under various circumstances [6]. Using this model, the occupational therapy practitioner is able to enhance the occupational therapy effects in a person with occupational dysfunction [6]. Furthermore, the occupational therapy practitioner can help the client overcome belief conflicts by using the OBP2.0 [5,35]. Thus, this model will be able to increase the quality of occupational therapy and teamwork. The CAOD measures occupational dysfunction in four domains: occupational marginalization (6 items), occupational imbalance (4 items), occupational alienation (3 items), and occupational deprivation (3 items). The CAOD comprises 16 items on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). CAOD has been widely used as an assessment tool for occupational dysfunction.

SRS-18 [36]: The SRS-18 was used to measure job related stress response using 18 items in 3 subscales: depression and anxiety (6 items), displeasure and anger (6 items), and lassitude (6 items) with a 4-point response (0 = completely different, 3 = it’s correct). High point totals related to higher degrees of stress.

Statistical analysis

Sample characteristics: The participants’ demographics were summarized using descriptive analyses. The normal distribution of all scores was analyzed using the Kolmogorov–Smirnov test (p < 0.05).

Structural validity: The factor structure of CAOD and SRS-18 was determined by confirmatory factor analysis (CFA) using a robust weighted least squares factoring method (WLSMV) with missing data [37]. The WLSMV is robust to deviations of data from a hypothetical model and is recommended for structural equation modeling of categorical data with non-normality.
we have selected the WLSMV as estimation. We utilized three indexes to evaluate the model data fit of CFA. The first and second indexes were the comparative fit index (CFI) and the Tucker-Lewis index (TLI), with critical values above 0.90. The third index was the root mean square error of approximation (RMSEA). The diagnostic values of RMSEA from 0.08 to 0.10 indicate a modest fit while less than 0.08 indicate a good fit [38].

If an unacceptable model fit by CFA was found, we performed an exploratory factor analysis (EFA), utilizing a WLSMV. EFA is able to decide on the appropriate factor structure through reanalysis that even where a poor model fit by CFA was found [38]. EFA also utilizes CFI, TLI, and RMSEA to estimate the model data fit. We reanalysis factor structure of assessment tool by CFA, based on the factor structure supported by the EFA [38,39].

**Correlation analysis:** Correlation analysis was assessed using Spearman’s correlation coefficient to measure the association between the factor and total score of CAOD, SRS-18, and the personal factors. The covariates were entered into the path analysis using a correlation analysis technique. Personal factor of more than 0.2 of correlation coefficient against all tools was considered as statistically significant covariates.

**Structural model:** The hypothetical model was analyzed using SEM by WLSMV with missing data. The analysis was examining the structural relationship of occupational dysfunction on the stress response in Figure 1. Personal factors were considered to be covariates that influenced the SRS-18 and CAOD scores. We evaluated the model fit of the hypothesized relationships between latent variables (occupational dysfunction, stress response, and personal factors) and data from SEM. The indirect effects path was stress responses to covariates that include occupational dysfunction.

Model fit index was used the CFI, TLI, and RMSEA. The critical values of RMSEA from 0.08 to 0.10 indicate a mediocre fit, and below 0.08 indicate a good fit. The critical values for CFI and TLI were 0.90 and above. The significance of standardization coefficient were examining by p value (p < 0.05) and 95 % confidence interval (95 % CI). This model also estimated the indirect effects path, using Mplus.

**Results**
Sample characteristics: Sample characteristics are indicated in Table 1. Participants’ average age was 35.8 (SD = 10.2) with a gender distribution of 141 (30.1%) males, 317 (67.7%) females, and 10 (2.1%) others. The Kolmogorov–Smirnov test indicated that all scores had a normal distribution.

Structural validity of CAOD and SRS-18: Analysis of the CAOD using CFA found that four factors were a good model fit (RMSEA = 0.097, CFI = 0.963, and TLI = 0.954) in Figure 3. Figure 4 shows the results of the CFA of the SRS-18. The three factors of the SRS-18 were estimated to be a good model fit (RMSEA = 0.089, CFI = 0.951, and TLI = 0.943).

Correlation analysis: Results are shown in Table 2. Age, gender, job category, and years of work experience had no relation to the CAOD total score and SRS-18. In addition, significant correlation was observed between occupational dysfunction and limited opportunities for refreshment, time spent on leisure activities, and work relationships. These covariates can be understood as a problem of life individual feelings. Therefore, these observable variables have put together in the covariates as latent variable. Table 3 shows the correlation between the factor score of CAOD and SRS-18. The correlation was obtained from all the factors. Therefore, occupational dysfunction and stress response were found to be associated.

Structural relationship: Figure 5 and Table 4 shows the model fit indicators for structural relationships. Model fit indicators for the structural model demonstrated of model fit (RMSEA = 0.061, CFI = 0.947, and TLI = 0.943). In this model, occupational dysfunction has structural relationship the stress response (standardized direct effect = 0.748, 95% CI = 0.500; 0.995, p < 0.001). Moreover, the covariates (such as opportunities for refreshment, time spent on leisure activities, and work relationships) have structural relationship the occupational dysfunction (standardized direct effect = 0.826, 95% CI = 0.758; 0.894, p < 0.001). However, these covariates were not found to be related to job stress response (standardized direct effect = −0.062, 95% CI = −0.338; 0.215, p = 0.566). The indirect effects of SRS of the covariates, including occupational dysfunction, was also estimated = 0.617 (95% CI = 0.396; 0.838, p < 0.001).

Study 2
Purpose
This study aims to test the hypothesis that burnout syndrome is influenced by occupational dysfunction in healthcare workers (see Figure 1). Moreover, this hypothesis model examines the effect of personal factors on burnout syndrome and occupational dysfunction.

Methods
Participants
There were a total of 1142 participants (21 doctors, 484 nurses, 205 physical therapists, 180 occupational therapists, and 252 other healthcare workers).

Measures
Sample characteristics: Same as Study 1.
CAOD [6]: Same as Study 1.

JBS [40]: The JBS measures burnout syndrome in three domains: depersonalization (6 items; score range 6–30), emotional exhaustion (5 items; score range 1–25), and diminished personal accomplishment (6 items; score range 6–30). The JBS comprises 17 items on a 5-point response scale from 1 (disagree) to 5 (agree).

Statistical analysis
Statistical analysis is the same as Study 1. Measurement tools to be used CAOD and JBS.

Results
Sample Characteristics: Table 5 shows the results of sample characteristics. Participant’s average age was 34.5 ± 10.2 years with a gender distribution of 476 (41.6%) males, 650 (56.9%) females, and 16 (1.4%) others. The Kolmogorov–Smirnov test showed that all scores were normally distributed.

Structural validity of CAOD and JBS: Figure 6 shows the results of CFA of CAOD. First, CFA was found to be a over the criteria of RMSEA of model fit (RMSEA = 0.102, CFI = 0.951,
Therefore, we used EFA with WLSMV. EFA was showed with five factors that included occupational marginalization of shared environment (2 items), occupational marginalization of unshared environment (4 items), occupational imbalance (4 items), occupational alienation (3 items), and occupational deprivation (3 items). Therefore, based on EFA, we performed CFA, and found that the CAOD comprised 16 items with 5 factors. The model fit were RMSEA = 0.089, CFI = 0.965, and TLI = 0.955.

Figure 7 shows the results of the CFA of the JBS. The three factors of the JBS were estimated to be a model fit (RMSEA = 0.091, CFI = 0.963, and TLI = 0.956).

Correlation analysis: The results are shown in Table 2. Age and years of work experience had no correlation to the CAOD total score or the JBS. Gender and job category of nurses had a weak correlation to JBS. Opportunities for refreshment, time spent on leisure activities, and work relationships fulfilled the criterion correlation. As with study 1, these covariates have analysis using as latent variable. Table 3 shows the correlation between CAOD and JBS. No or only weak correlations were found between Diminished personal accomplishment and CAOD (include occupational imbalance, occupational deprivation, occupational marginalization, and total score).

Structural relationship: Figure 8 and Table 6 shows that the hypothesized model exhibited fit on the first analysis (RMSEA = 0.076, CFI = 0.919, TLI = 0.913). In this model, occupational dysfunction has structural relationship the burnout syndrome (standardized direct effect = 0.876, 95% CI = 0.723; 1.029, p < 0.001). Moreover, some personal factors as covariates (such as opportunities for refreshment, time spent on leisure activities, and work relationships) structural related the occupational dysfunction (standardized direct effect = 0.796, 95% CI = 0.750; 0.841, p < 0.001). However, the covariates were not found to have a highly significant relation to burnout syndrome (standardized direct effect = −0.173, 95% CI = −0.349; 0.003, p = 0.011). Indirect effects of JBS to covariates includes occupational dysfunction was estimated = 0.697 (95% CI = 0.556; 0.838, p < 0.001).

Study 3

Purpose
This study aims to test the hypothesis that depression is influenced by occupational dysfunction in healthcare workers (see Figure 1). Moreover, this hypothesis model examines the effect of personal factors on depression and occupational dysfunction.

**Methods**

**Participants**

In this study, a total of 687 participants were included: 401 nurses (including 12 public health nurses and midwives and 63 assistant nurses), 155 physical therapists, 123 occupational therapists, and 8 other healthcare workers.

**Measures**

**Sample Characteristics**: Same as Study 1 and 2.

**CAOD [6]**: Same as Study 1 and 2.

**CES-D [41]**: CES-D was measured based on the level of depression experienced within the past week using 20 items on 4 subscales: depressed affect (7 items), negative affect (4 items), interpersonal difficulties (2 items), and somatic symptoms (7 items). Questions were answered using a 4-point response (0 = never, 3 = all the time). In epidemiologic studies, CES-D has been used worldwide as an assessment tool for depression. Among the negative affect-related items, 4 were originally regarded as related to a positive affect. In the present study, the 4 items were inversely scored to make this point more comprehensible.

**Statistical analysis**

Statistical analysis is the same as Study 1. Measurement tools to be used CAOD and CES-D.

**Results**

**Sample Characteristics**: Table 7 indicates the results of sample characteristics, including 159 males, 509 females, and 7 unknowns, with an average age of 33.6 ± 10.2 years. The Kolmogorov–Smirnov test showed that all scores had normal distribution.
Structural validity of CAOD and CES-D: Figure 9 shows the results of the CFA on CAOD. Firstly, the CFA was found to have a poor estimate of RMSEA for model fit (RMSEA = 0.104, CFI = 0.943, and TLI = 0.931). Therefore, we performed EFA, and found that the CAOD comprised 16 items of 5 factors like study 2. The indexes for the EFA model were RMSEA = 0.066, CFI = 0.988, and TLI = 0.972. Based on EFA, CFA of CAOD was determined to be a good estimate of model fit (RMSEA = 0.092, CFI = 0.958, TLI = 0.946).

Figure 10 shows the results of a CFA of CES-D. The CFA model for the latent factors of CES-D exhibited good fit for depressed affect, negative affect, interpersonal difficulties, and somatic symptoms (RMSEA = 0.060, CFI = 0.950, and TLI = 0.942).

Correlation analysis: The results are shown in Table 2. Age, gender, job category, and years of work experience had no correlation to the CAOD total scores. Opportunities for refreshment, time spent on leisure activities, and work relationships fulfilled a criterion correlation. As with study 1 and 2, these covariates have analysis using as latent variable. Table 3 shows the correlation between CAOD and CES-D. Correlation was obtained from all the factors; occupational dysfunction and depression were found to be associated.

Structural relationship: Figure 11 and Table 8 demonstrates the results of the final model. The hypothesized model exhibited model fit (RMSEA = 0.060, CFI = 0.922, TLI = 0.917). In this model, occupational dysfunction has structural relationship the depression (standardized indirect effect = 0.695, p < 0.001, 95% CI = 0.521; 0.869). Moreover, personal factors as covariates (such as opportunities for refreshment, time spent on leisure activities, and work relationships) have structural relationship the occupational dysfunction (standardized direct effect = 0.796, 95% CI = 0.750; 0.841, p < 0.001). Furthermore, covariates were not related to the burnout syndrome (standardized direct effect = 0.063, 95% CI = −0.133; 0.259, p = 0.407). Indirect effects of CES-D to covariates including occupational dysfunction were also estimated = 0.544 (95% CI = 0.398; 0.690, p < 0.001).

Discussion

This study was aimed to identify by a hypothetical model of a structural relationship that psychological problems are affected by occupational dysfunction in healthcare workers
Our biggest finding was confirming the structural relationship, indicating that hypothesis model was valid across three studies.

Our three studies showed that occupational dysfunction has a significant role on psychological problems; it includes stress, burnout, and depression. The result of the study was the displayed that CAOD factor scores were significantly and positively correlated with SRS-18, JBS, and CES-D total scores (Table 3). Moreover, even after making the necessary amendments to the covariance (limited opportunities for refreshment, time spent on leisure activities, and work relationships), psychological problem in healthcare worker was explained by occupational dysfunction (Figures 5, 8 and 11, Tables 4, 6 and 8). This finding is significant because a majority of research studies on occupational dysfunction has focused on prevalence rate based on epidemiological observational study [13,14].

In the cross-sectional design, it is difficult to posit about cause/effect; however our results suggest that occupational dysfunction is an important factor in building psychological problem. Occupation is the centered of the human experience in everyday life; it includes things people need to do, want to do, and are expected to do [32]. The concept of occupational dysfunction is a negative human experience to occur by a lifestyle issue [6]. A healthy lifestyle is an essential to psychological problem reduction [12]. In other words, people have the potential to promote the psychological problem by occupational dysfunction of a lifestyle issue [32]. In this respect, the present findings suggest by statistical evidence that occupational dysfunction and psychological problem have revealed a significant structural relationship.

This study indicated that all measurement tools were significantly and positively correlated with opportunities for refreshment, time spent on leisure activities, and work relationships in personal factors (Table 2). Meanwhile, the path analysis of three studies indicated that CAOD was only significantly and positively related with these personal factors (Figures 5, 8 and 11, Tables 4, 6 and 8). In addition, no or only weak correlations were found between all measurement tools and other personal factors (age, gender, job category, and years of work experience) in this study (Table 2). Therefore, we considered that behind the occupational dysfunction is holding a problem of human relations, unbalance of the lifestyle in this study.

CFA approach displayed good fitness levels. We were able to understand of the objective phenomenon the using the factor structure of all measurement tools. However, the factor structure of occupational marginalization of the CAOD differed from among the three
studies. Study 1 and previous study [6] was the same factor structure such as occupational marginalization. On the other hand, Studies 2 and 3 were vary factor structure; it shared and non-shared environmental occupational marginalization. However, the shared and non-shared environmental occupational marginalization stems from the concept of occupational marginalization. Therefore, CAOD factor structure of study 1 is not irrelevant to it of studies 2 and 3. We think that result of CAOD of three studies can understand as the framework in a similar occupational marginalization.

2. Clinical usefulness

CAOD is an assessment tool that has been developed as a theoretical background the OBP2.0. This is able to intervention for people with disabilities but also healthy people. We can consider intervention to healthcare workers with occupational dysfunction by reveals structural relation of occupational dysfunction and psychological problems. For example, healthcare workers could be routinely asked to answer the CAOD to identify their existing classification of occupational dysfunction. Subsequently, an occupational therapist or occupational health physician could meet with each healthcare worker to review the responses and gain a clear understanding of their occupational dysfunctions. Some of the methods for solution with occupational dysfunction include occupational therapy, psychological therapy, and cognitive behavioral therapy. Effective application of these approaches could help healthcare workers with occupational dysfunction.

3. Limitation

Our study has several limitations. First, this study was cross-sectional design. However, this design was appropriate because a previous study was not investigated the relationships between the occupational dysfunction and psychological problem; it includes stress response, burnout syndrome, and depression. For the future, longitudinal studies are needed to the causal relationship of the existence of occupational dysfunction related psychological problem. Second, all participants were recruited from among healthcare worker in Japan. This may be limiting the possibility to generalization these findings to the other population. Third, our study is using self-report assessments; it includes CAOD, SRS-18, JBS and CES-D. There instruments has high validity. However, we need to use observation assessment together for accurate diagnostic.
Figures

Figure 1. The hypothesized model of structural relationship

Note. Occupational dysfunction includes occupational imbalance, occupational deprivation, occupational alienation, and occupational marginalization. Psychological problems include stress response (Study1), burnout syndrome (Study2), and depression (Study3). The purpose of three studies are to examine whether the hypothesis model can be reproduced. Personal factors include age, gender, years of work experience, job category, opportunities for refreshment, time spent on leisure activities, and work relationships.
Figure 2. Occupation based practice 2.0 (OBP2.0) model

Note. Description of theoretical structure of the OBP2.0. The purpose of this model is to improving of occupational dysfunction and promoting of teamwork. The improving of occupational dysfunction has used assessment and intervention of an occupation based practice (OBP). OBP is occupational therapy technique to increase with health and well-being through a meaningful occupation. In addition, using this model, the promoting of teamwork has used the Dissolution Approach for Belief Conflict (DAB) [42]. DAB is intervention technique for dissolving the dissensus. OBP2.0 is able to use for improve the both occupational dysfunction and belief conflict.
Figure 3. CFA of CAOD (study 1)

Note. Marginalization = Occupational marginalization, Imbalance = Occupational imbalance, Deprivation = Occupational deprivation, Alienation = Occupational alienation. Previous study showed the occupational imbalance (CAOD1, 7, 12, 15), occupational deprivation (CAOD2, 5, 9), occupational alienation (CAOD3, 10, 13), and occupational marginalization (CAOD4, 6, 8, 11, 14, 16).

RMSEA = 0.097, CFI = 0.963, TLI = 0.954.
Figure 4. CFA of SRS-18 (study 1)

Note. Previous study showed the depression and anxiety (SRS2, 3, 5, 9, 12, 15), displeasure and anger (SRS1, 4, 6, 7, 8, 10), and lassitude (SRS11, 13, 14, 16, 17, 18). RMSEA = 0.089, CFI = 0.951, TLI = 0.943
Figure 5. Structural relationships of SRS-18 on CAOD (study 1)

Note. OD = Occupational dysfunction, PS = Personal factor, SR = Stress response, Refreshment = Opportunities for refreshment, Leisure (satisfaction) = Time spent on leisure activities, Relationship = Work relationships. RMSEA = 0.061, CFI = 0.947, TLI = 0.943
Figure 6. CFA of CAOD (study 2)

Note. Marginalization (non-shared) = non-shared environmental occupational marginalization, Marginalization (shared) = shared environmental occupational marginalization. Another latent variables name and factor structure are same as study 1. RMSEA = 0.089, CFI = 0.965, TLI = 0.955
Figure 7. CFA of JBS (study 2)

Note. Exhaustion = Emotional exhaustion, Accomplishment (diminish) = Diminished personal accomplishment. Previous study showed the emotional exhaustion (JBS1, 7, 8, 12, 16), depersonalization (JBS3, 5, 6, 10, 11, 14), and diminished personal accomplishment (JBS2, 4, 9, 13, 15, 17). RMSEA = 0.091, CFI = 0.963, TLI = 0.956
Figure 8. Structural relationships of JBS on CAOD (study 2)

Note. OD = Occupational dysfunction, BS = Burnout syndrome. Another latent variables name are same as Study 1. RMSEA = 0.076, CFI = 0.919, TLI = 0.913
Figure 9. CFA of CAOD (study 3)

Note. Latent variables name and factor structure are same as study 2. RMSEA = 0.092, CFI = 0.958, TLI = 0.946
Figure 10. CFA of CESD (study 3)

Note. Affect (depression) = Depressed affect, Symptom = Somatic symptoms, Interpersonal = Interpersonal difficulties, Affect (negative) = Negative affect. Previous study showed the depressed affect (CESD3, 6, 9, 10, 14, 17, 18), somatic symptoms (CESD1, 2, 5, 7, 11, 13, 20), interpersonal difficulties (CESD15, 19), and negative affect (CESD4, 8, 12, 16). RMSEA = 0.060, CFI = 0.950, TLI = 0.942
Figure 11. Structural relationships of CES-D on CAOD (study 3)

Note. DP = Depression. Another latent variables name are same as Study 1 and 2. RMSEA = 0.060, CFI = 0.922, TLI = 0.917
### Table 1. Sample characteristics of CAOD and SRS-18 (study 1)

|                       | M ± SD       |
|-----------------------|--------------|
| Total Age             | 35.8 ± 10.2  |
| Doctors               | 48.6 ± 10.2  |
| Nurses                | 36.1 ± 10.8  |
| Physical therapists   | 34.4 ± 8.5   |
| Occupational therapists | 33.7 ± 8.3 |
| Others                | 34.9 ± 9.3   |
| Total Years of work experience | 11.8 ± 9.4  |
| Doctors               | 23.3 ± 10.0  |
| Nurses                | 13.5 ± 10.2  |
| Physical therapists   | 10.9 ± 7.6   |
| Occupational therapists | 9.62 ± 7.7 |
| Others                | 9.68 ± 8.3   |

| Gender                | Total N | %  |
|-----------------------|---------|----|
| Male                  | 141     | 30.1|
| Female                | 317     | 67.7|
| Others                | 10      | 2.1 |

| Job category          | Total N | %  |
|-----------------------|---------|----|
| Doctor                | 21      | 4.5 |
| Nurse, Health nurse,  | 159     | 34.0|
| Midwife               |         |    |
| Physical therapist    | 52      | 11.1|
| Occupational therapist| 60      | 12.8|
| Other healthcare workers | 176   | 37.6|

| Opportunities for refreshment | Total N | %  |
|-------------------------------|---------|----|
| Very good                     | 41      | 8.7 |
| Good                          | 265     | 56.6|
| Neither good nor bad          | 52      | 11.1|
| Fair                          | 56      | 11.9|
| Poor                          | 44      | 9.4 |
| Unknown                       | 10      | 2.1 |

| Time spent on leisure activities | Total N | %  |
|----------------------------------|---------|----|
| Very good                        | 29      | 6.2 |
| Good                             | 224     | 34.6|
|                          | Neither good nor bad | Fair | Unknown |
|--------------------------|----------------------|------|---------|
| Work relationships       | 56                   | 114  | 20      |
|                          | 12.0                 | 24.4 | 4.3     |
| Fair                     | 114                  |      |         |
| Poor                     | 25                   |      |         |
| Unknown                  | 20                   |      |         |
|                          | 12.0                 | 3.9  | 4.3     |
| Very good                | 22                   |      |         |
| Good                     | 107                  |      |         |
|                          | 4.7                  | 22.9 |         |
| Neither good nor bad     | 47                   |      |         |
| Fair                     | 19                   |      |         |
| Poor                     | 1                    |      |         |
| Unknown                  | 272                  |      |         |
|                          | 58.1                 |      |         |
Table 2. Correlation analysis of personal factors and CAOD total score in study 1, 2, and 3

|                  | Study 1 | Study 2 | Study 3 |
|------------------|---------|---------|---------|
|                  | CAOD    | SRS-18  | CAOD    | JBS     | CAOD    | CES-D   |
| Age              | −0.09   | −0.122* | 0.012   | −0.156**| 0.053   | −0.115**|
| Gender           | −0.09   | −0.096* | −0.065* | 0.243** | 0.074   | 0.064   |
| Nurses           | 0.152*  | −0.134**| 0.160*  | 0.275** | 0.199** | 0.079   |
| Physical         | 0.019   | −0.047  | −0.136**| −0.070* | −0.185**| −0.071  |
| Job category     | −0.092  | −0.029  | −0.110**| −0.050  | −0.102**| −0.023  |
| Occupational     | −0.092  | −0.029  | −0.110**| −0.050  | −0.102**| −0.023  |
| therapists       | Others  | −0.117* | −0.002  | −0.009  | −0.021  | −0.017  |
| Years of work    | −0.049  | −0.063  | 0.044   | −0.127**| 0.067   | −0.138**|
| experience       | Opportunities for refreshment | 0.530** | 0.309** | 0.485** | 0.224** | 0.463** | 0.313** |
| Time spent on leisure activities | 0.559** | 0.347** | 0.525** | 0.277** | 0.517** | 0.392** |
| Work relationships | 0.392** | 0.442** | 0.429** | 0.305** | 0.438** | 0.356** |

Note. * = Significant at 5% level; ** = Significant at 1% level

Note. Bold indicates correlation coefficient > 0.2.
Table 3. Correlation analysis between CAOD, SRS-18, JBS and CES-D.

|                          | Imbalance | Deprivation | Alienation | Marginalization |
|--------------------------|-----------|-------------|------------|-----------------|
| **S** Depression and anxiety | 0.342**   | 0.415**     | 0.438**    | 0.529**         |
| **l** Displeasure and anger | 0.302**   | 0.321**     | 0.357**    | 0.490**         |
|                           | 0.352**   | 0.476**     | 0.503**    | 0.534**         |
| Total SRS-18              | 0.382**   | 0.462**     | 0.492**    | 0.583**         |

|                          | Imbalance | Deprivation | Alienation | Marginalization (non-shared) | Marginalization (shared) |
|--------------------------|-----------|-------------|------------|-------------------------------|--------------------------|
| **S** Emotional exhaustion | 0.530**   | 0.417**     | 0.482**    | 0.480**                       | 0.222**                  |
| **t** Depersonalization | 0.343**   | 0.378**     | 0.505**    | 0.524**                       | 0.313**                  |
| Diminished personal accomplishment | –0.02 | 0.014 | 0.174** | 0.021 | –0.029 |
| Total JBS                | 0.306**   | 0.288**     | 0.464**    | 0.376**                       | 0.168**                  |

|                          | Imbalance | Deprivation | Alienation | Marginalization |
|--------------------------|-----------|-------------|------------|-----------------|
| **S** Depressed affect   | 0.400**   | 0.392**     | 0.476**    | 0.408**         |
| **t** Somatic symptoms   | 0.438**   | 0.406**     | 0.481**    | 0.409**         |
| Interpersonal difficulties | 0.178** | 0.217** | 0.264** | 0.369** | 0.291** |
| Negative affect           | 0.177**   | 0.292**     | 0.380**    | 0.302**         |
| Total CES-D              | 0.426**   | 0.461**     | 0.581**    | 0.503**         | 0.330**                 |
Note. St. = Study, Imbalance = Occupational imbalance, Deprivation = Occupational deprivation, Alienation = Occupational alienation, Marginalization = Occupational marginalization, Marginalization (non-shared) = Non-shared environment marginalization, Marginalization (shared) = Shared environment marginalization. Study 1 is separated 4 factor of CAOD, Study 2 and 3 are separated 5 factor of CAOD.
Table 4. Structural relationships of CAOD and SRS-18 (study 1)

|                      | Estimate | S.E. | Est./S.E. | Two-Tailed P-Value | 95% CI       |
|----------------------|----------|------|-----------|-------------------|--------------|
| **Model fit information** |          |      |           |                   |              |
| RMSEA                | 0.061    |      |           |                   | [90% CI = 0.057; 0.064] |
| CFI                  | 0.947    |      |           |                   |              |
| TLI                  | 0.943    |      |           |                   |              |
| **Standardized model results** |          |      |           |                   |              |
| **Stress** On        |          |      |           |                   |              |
| Occupational dysfunction | 0.748   | 0.096 | 7.771     | 0.000             | 0.500; 0.995 |
| Covariates           | −0.062   | 0.107 | −0.574    | 0.566             | −0.338; 0.215 |
| **Occupational dysfunction** On |          |      |           |                   |              |
| Covariates           | 0.826    | 0.026 | 31.284    | 0.000             | 0.758; 0.894 |
| **Occupational dysfunction by** |          |      |           |                   |              |
| Occupational imbalance | 0.677    | 0.028 | 23.861    | 0.000             | 0.604; 0.750 |
| Occupational deprivation | 0.893   | 0.017 | 53.737    | 0.000             | 0.850; 0.936 |
| Occupational alienation | 0.840   | 0.021 | 39.462    | 0.000             | 0.785; 0.894 |
| Occupational Marginalization | 0.880    | 0.017 | 52.298    | 0.000             | 0.837; 0.923 |
| **Stress by response** |          |      |           |                   |              |
| Depression and anxiety | 0.971    | 0.014 | 70.326    | 0.000             | 0.935; 1.006 |
| Displeasure and anger | 0.787    | 0.024 | 32.723    | 0.000             | 0.725; 0.849 |
|                      |        |      |      |      |       |
|----------------------|--------|------|------|------|-------|
| Lassitude            | 0.915  | 0.017| 52.651| 0.000| 0.870; 0.960 |
| Covariates           | Ind    |      |      |      |       |
| Stress response      | 0.617  | 0.086| 7.195| 0.000| 0.396; 0.838 |
| R Square             |        |      |      |      |       |
| Stress response      | 0.487  | 0.040| 12.112| 0.000| –     |

Note. S.E. = Standard error, Est. / S.E. = Estimator / Standard error, CI = Confidence interval, On = Structural association, By = Construct, Ind = Indirect, R Square = R coefficient of determination.
Table 5. Sample characteristics of CAOD and JBS (study 2)

| Age                  | M ± SD                  |            |            |
|----------------------|-------------------------|------------|------------|
| Total                | 34.5 ± 10.2             |            |            |
| Doctors              | 48.6 ± 10.2             |            |            |
| Nurses               | 36.1 ± 10.5             |            |            |
| Physical therapists  | 30.6 ± 7.3              |            |            |
| Occupational therapists | 29.6 ± 6.6              |            |            |
| Another              | 37.2 ± 11.1             |            |            |
| Total                | 10.5 ± 9.3              |            |            |
| Doctors              | 23.3 ± 10.0             |            |            |
| Nurses               | 12.5 ± 9.7              |            |            |
| Physical therapists  | 7.0 ± 6.4               |            |            |
| Occupational therapists | 6.4 ± 5.7              |            |            |
| Another              | 11.6 ± 10.5             |            |            |

| Gender               | Total N | %   |
|----------------------|---------|-----|
| Male                 | 476     | 41.6|
| Female               | 650     | 56.9|
| Others               | 16      | 1.4 |

| Job category         | Total N | %   |
|----------------------|---------|-----|
| Doctor               | 21      | 1.8 |
| Nurse, Health nurse, Midwife | 484     | 42.3|
| Physical therapist   | 205     | 17.9|
| Occupational therapist | 180     | 15.7|
| Other healthcare workers | 252     | 22.0|

| Opportunities for refreshment | Total N | %   |
|--------------------------------|---------|-----|
| Very good                      | 111     | 9.7 |
| Good                           | 629     | 55.0|
| Neither good nor bad           | 143     | 12.5|
| Fair                           | 112     | 9.8 |
| Poor                           | 106     | 9.2 |
| Unknown                        | 41      | 3.5 |

| Time spent on leisure activities | Total N | %   |
|----------------------------------|---------|-----|
| Very good                        | 82      | 7.1 |
| Good                             | 509     | 44.5|
|                | Neither good nor bad |    |  |  |  |  |
|----------------|----------------------|----|---|---|---|---|
|                | Fair                 | 237| 20.7|  |  |  |
|                | Poor                 | 68 | 5.9 |  |  |  |
|                | Unknown              | 213| 18.6|  |  |  |
|                | Very good            | 107| 9.3 |  |  |  |
|                | Good                 | 463| 40.5|  |  |  |
| Work           | Neither good nor bad | 209| 18.3|  |  |  |
| relationships  | Fair                 | 48 | 4.2 |  |  |  |
|                | Poor                 | 14 | 1.2 |  |  |  |
|                | Unknown              | 301| 26.3|  |  |  |
### Table 6. Structural relationships CAOD and JBS (study 2)

| Estimate | S.E.  | Est./S.E. | Two-Tailed P-Value | 95% CI       |
|----------|-------|-----------|-------------------|--------------|
| RMSEA    | 0.076 | [90% CI = 0.073; 0.078] |
| CFI      | 0.919 |
| TLI      | 0.913 |

**Model fit information**

**Standardized model results**

| Variable | Estimate | S.E.  | Est./S.E. | Two-Tailed P-Value | 95% CI       |
|----------|----------|-------|-----------|-------------------|--------------|
| Burnout  |          |       |           |                   |              |
| On      |          |       |           |                   |              |
| Occupational dysfunction | 0.876 | 0.060 | 14.714 | 0.000 | 0.723; 1.029 |
| Covariates | −0.173 | 0.068 | −2.538 | 0.011 | −0.349; 0.003 |
| Occupational dysfunction | 0.796 | 0.018 | 45.214 | 0.000 | 0.750; 0.841 |
| Occupational by dysfunction |          |       |           |                   |              |
| Occupational imbalance | 0.714 | 0.017 | 41.649 | 0.000 | 0.670; 0.758 |
| Occupational deprivation | 0.884 | 0.010 | 86.646 | 0.000 | 0.857; 0.910 |
| Occupational alienation | 0.855 | 0.012 | 70.107 | 0.000 | 0.824; 0.886 |
| Occupational Marginalization (non shared) | 0.888 | 0.011 | 84.104 | 0.000 | 0.861; 0.916 |
| Occupational marginalization (shared) | 0.615 | 0.024 | 25.447 | 0.000 | 0.552; 0.677 |

**Burnout by syndrome**
| Emotional exhaustion | 0.971 | 0.014 | 67.697 | 0.000 | 0.934; 1.008 |
|-----------------------|-------|-------|--------|-------|---------------|
| Depersonalization     | 0.871 | 0.016 | 55.916 | 0.000 | 0.831; 0.911  |
| Diminished personal accomplishment | 0.178 | 0.032 | 5.642  | 0.000 | 0.097; 0.260  |

| Covariates | Ind  |
|------------|------|
| Burnout syndrome | 0.697 | 0.055 | 12.725 | 0.000 | 0.556; 0.838 |

| R Square |
|----------|
| Burnout syndrome | 0.556 | 0.029 | 19.135 | 0.000 | – |

Note. S.E. = Standard error, Est. / S.E. = Estimator / Standard error, CI = Confidence interval, On = Structural association, By = Constrast, Ind = Indirect, R Square = R coefficient of determination.
Table 7. Sample characteristics of CAOD and CES-D (study 3)

|                          | M ± SD       |
|--------------------------|-------------|
| **Total**                | 33.6±10.2   |
| **Nurses**               | 37.4±11.2   |
| **Physical therapists**  | 29.3±6.4    |
| **Occupational therapists** | 27.6±4.1  |
| **Total**                | 9.67±9.2    |
| **Nurses**               | 12.8±10.3   |
| **Physical therapists**  | 5.64±5.3    |
| **Occupational therapists** | 4.84±3.5  |

| Gender                | Total N | %     |
|-----------------------|---------|-------|
| Male                  | 159     | 23.5  |
| Female                | 509     | 75.4  |
| Unknown               | 7       | 1.0   |

| Job category                        | Total N | %     |
|-------------------------------------|---------|-------|
| Nurse                               | 326     | 48.2  |
| Health nurse, Midwife               | 12      | 1.7   |
| Assistant nurse                     | 63      | 9.3   |
| Physical therapist                  | 155     | 22.9  |
| Occupational therapist              | 123     | 18.2  |
| Unknown                             | 8       | 1.1   |

| Opportunities for refreshment       | Total N | %     |
|-------------------------------------|---------|-------|
| Very good                           | 71      | 10.5  |
| Good                                | 364     | 54    |
| Neither good nor bad                | 91      | 13.5  |
| Fair                                | 56      | 8.3   |
| Poor                                | 62      | 9.1   |
| Unknown                             | 30      | 4.4   |

| Time spent on leisure activities    | Total N | %     |
|-------------------------------------|---------|-------|
| Very good                           | 53      | 7.8   |
| Good                                | 285     | 42.2  |
| Neither good nor bad                | 141     | 20.9  |
| Fair                                | 123     | 18.2  |
| Poor                                | 43      | 6.3   |
| Unknown                             | 29      | 4.3   |
|                |        |        |
|----------------|--------|--------|
| Very good      | 85     | 12.6   |
| Good           | 356    | 52.8   |
| Neither good nor bad | 162   | 24     |
| Fair           | 29     | 4.3    |
| Poor           | 13     | 1.9    |
| Unknown        | 29     | 4.3    |
Table 8. Structural relationships CAOD and CES-D (study 3)

| Estimate | S.E. | Est./S.E. | Two-Tailed P-Value | 95% CI       |
|----------|------|-----------|-------------------|--------------|
| **Model fit information** |      |           |                   |              |
| RMSEA    | 0.060 | [90% CI = 0.057; 0.063] |                   |              |
| CFI      | 0.922 |           |                   |              |
| TLI      | 0.917 |           |                   |              |
| **Standardized model results** |      |           |                   |              |
| **Depression** | On |            |                   |              |
| Occupational dysfunction | 0.695 | 0.067 | 10.301 | 0.000 | 0.521; 0.869 |
| Covariates | 0.063 | 0.076 | 0.829 | 0.407 | −0.133; 0.259 |
| **Occupational dysfunction** | On |            |                   |              |
| Covariates | 0.783 | 0.023 | 33.791 | 0.000 | 0.723; 0.842 |
| **Occupational by dysfunction** |            |                   |              |
| Occupational imbalance | 0.688 | 0.025 | 27.477 | 0.000 | 0.624; 0.753 |
| Occupational deprivation | 0.898 | 0.015 | 57.989 | 0.000 | 0.858; 0.938 |
| Occupational alienation | 0.874 | 0.015 | 56.918 | 0.000 | 0.835; 0.914 |
| Occupational Marginalization (non shared) | 0.879 | 0.014 | 61.800 | 0.000 | 0.843; 0.916 |
| Occupational marginalization (shared) | 0.632 | 0.032 | 19.721 | 0.000 | 0.549; 0.714 |
| **Depression** | by |            |                   |              |
| Depressed affect | 0.960 | 0.015 | 65.960 | 0.000 | 0.922; 0.997 |
|                         |        |       |       |       |        |
|------------------------|--------|-------|-------|-------|--------|
| Somatic symptoms       | 0.915  | 0.017 | 54.215| 0.000 | 0.872; 0.959 |
| Interpersonal difficulties | 0.785  | 0.032 | 24.395| 0.000 | 0.702; 0.868 |
| Negative affect        | 0.543  | 0.041 | 13.098| 0.000 | 0.436; 0.649 |
| Covariates             | ind    |       |       |       |        |
| Depression             | 0.544  | 0.057 | 9.578 | 0.000 | 0.398; 0.690 |
| R Square               |        |       |       |       |        |
| Depression             | 0.556  | 0.031 | 17.714| 0.000 |        |

Note. S.E. = Standard error, Est. / S.E. = Estimator / Standard error, CI = Confidence interval, On = Structural association, By = Construct, Ind = Indirect, R Square = R coefficient of determination
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Figure 1 (on next page)

Figure 1

The hypothesized model of structural relationship
Psychological problem

Personal factors

Occupational imbalance

Occupational deprivation

Occupational alienation

Occupational marginalization

Occupational dysfunction

Psychological problem

Factor 1

Factor 2

Factor 3

Factor 4

Manuscript to be reviewed
Figure 2 (on next page)

Figure 2

Occupation based practice 2.0 (OBP2.0) model
Figure 3 (on next page)

CFA of CAOD (study 1)
Figure 4 (on next page)

Figure 4

CFA of SRS-18 (study 1)
Figure 5 (on next page)

Structural relationships of SRS-18 on CAOD (study 1)
Figure 6 (on next page)

CFA of CAOD (study 2)
Manuscript to be reviewed
Figure 7 (on next page)

Figure 7

CFA of JBS (study 2)
Figure 8 (on next page)

Figure 8

Structural relationships of JBS on CAOD (study 2)
Figure 9 (on next page)

CFA of CAOD (study 3)
Figure 10 (on next page)

CFA of CESD (study 3)
Figure 11 (on next page)

Figure 11

Structural relationships of CES-D on CAOD (study 3)
**Table 1** (on next page)

Sample characteristics of CAOD and SRS-18
Table 1. Sample characteristics of CAOD and SRS-18 (study 1)

|                     | M ± SD           |
|---------------------|------------------|
| **Total**           | 35.8 ± 10.2       |
| **Doctors**         | 48.6 ± 10.2       |
| **Nurses**          | 36.1 ± 10.8       |
| **Physical therapists** | 34.4 ± 8.5   |
| **Occupational therapists** | 33.7 ± 8.3 |
| **Others**          | 34.9 ± 9.3        |
| **Age**             |                  |
| **Total**           | 11.8 ± 9.4        |
| **Doctors**         | 23.3 ± 10.0       |
| **Nurses**          | 13.5 ± 10.2       |
| **Physical therapists** | 10.9 ± 7.6  |
| **Occupational therapists** | 9.62 ± 7.7 |
| **Others**          | 9.68 ± 8.3        |
| **Years of work experience** |         |
| **Total**           |                  |
| **Male**            | 141              |
| **Female**          | 317              |
| **Others**          | 10               |
| **Gender**          |                  |
| **Doctor**          | 21               |
| **Nurse, Health nurse, Midwife** | 159  |
| **Physical therapist** | 52            |
| **Occupational therapist** | 60         |
| **Other healthcare workers** | 176  |
| **Job category**    |                  |
| **Opportunities for refreshment** |            |
| **Very good**       | 41               |
| **Good**            | 265              |
| **Neither good nor bad** | 52          |
| **Fair**            | 56               |
| **Poor**            | 44               |
| **Unknown**         | 10               |
| **Total N**         |                  |
| **Time spent on leisure activities** |         |
| **Very good**       | 29               |
| **Good**            | 224              |
| **%**               |                  |
| **Total**           |                  |
| **Male**            | 30.1             |
| **Female**          | 67.7             |
| **Others**          | 2.1              |
|                | Neither good nor bad |   |     |
|----------------|----------------------|---|-----|
|                | Fair                 | 114| 24.4|
|                | Poor                 | 25 | 3.9 |
|                | Unknown              | 20 | 4.3 |
| Work relationships | Neither good nor bad | 47 | 10.0|
|                | Fair                 | 19 | 4.1 |
|                | Poor                 | 1  | 0.2 |
|                | Unknown              | 272| 58.1|
Table 2 (on next page)

Table 2

Correlation analysis of personal factors and CAOD
### Table 2. Correlation analysis of personal factors and CAOD total score in study 1, 2, and 3

|                  | Study 1 | Study 2 | Study 3 |
|------------------|---------|---------|---------|
|                  | CAOD    | SRS-18  | CAOD    | JBS     | CAOD    | CES-D   |
| Age              | −0.09   | −0.122* | 0.012   | −0.156**| 0.053   | −0.115**|
| Gender           | −0.09   | −0.096* | −0.065* | **0.243**| 0.074   | 0.064   |
| Nurses           | 0.152*  | −0.134**| 0.160*  | **0.275**| 0.199** | 0.079   |
| Physical         | 0.019   | −0.047  | −0.136**| −0.070* | −0.185**| −0.071  |
| Job category     | −0.092  | −0.029  | −0.110**| −0.050  | −0.102**| −0.023  |
| Occupational     | −0.117* | −0.002  | −0.009  | −0.021  | −0.017  |         |
| therapists       |         |         |         |         |         |         |
| Others           | −0.117* | −0.002  | −0.009  | −0.021  | −0.017  |         |
| Years of work    | −0.049  | −0.063  | 0.044   | −0.127**| 0.067   | −0.138**|
| experience       |         |         |         |         |         |         |
| Opportunities    | **0.530**| **0.309**| **0.485**| **0.224**| **0.463**| **0.313**|
| for refreshment  |         |         |         |         |         |         |
| Time spent on    | **0.559**| **0.347**| **0.525**| **0.277**| **0.517**| **0.392**|
| leisure activities|         |         |         |         |         |         |
| Work relationships| **0.392**| **0.442**| **0.429**| **0.305**| **0.438**| **0.356**|

2 Note. * = Significant at 5% level; ** = Significant at 1% level
3 Note. Bold indicates correlation coefficient > 0.2.
Table 3 (on next page)

Table 3

Correlation analysis between CAOD, SRS-18, JBS, and CES-D
Table 3. Correlation analysis between CAOD, SRS-18, JBS and CES-D.

|                  | Imbalance | Deprivation | Alienation | Marginalization (non-shared) | Marginalization (shared) |
|------------------|-----------|-------------|------------|-------------------------------|--------------------------|
| **S Depression and anxiety** | 0.342**   | 0.415**     | 0.438**    | 0.529**                       |                          |
| **1 Displeasure and anger**   | 0.302**   | 0.321**     | 0.357**    | 0.490**                       |                          |
| Lassitude         | 0.352**   | 0.476**     | 0.503**    | 0.534**                       |                          |
| **Total SRS-18**  | 0.382**   | 0.462**     | 0.492**    | 0.583**                       |                          |
|                  | Imbalance | Deprivation | Alienation | Marginalization (non-shared) | Marginalization (shared) |
| **S Emotional exhaustion** | 0.530**   | 0.417**     | 0.482**    | 0.480**                       | 0.222**                  |
| **2 Depersonalization**   | 0.343**   | 0.378**     | 0.505**    | 0.524**                       | 0.313**                  |
| Diminished personal accomplishment | −0.02      | 0.014       | 0.174**    | 0.021                         | −0.029                    |
| **Total JBS**      | 0.306**   | 0.288**     | 0.464**    | 0.376**                       | 0.168**                  |
| **S Depressed affect** | 0.400**   | 0.392**     | 0.476**    | 0.408**                       | 0.251**                  |
| **3 Somatic symptoms** | 0.438**   | 0.406**     | 0.481**    | 0.409**                       | 0.272**                  |
| Interpersonal difficulties | 0.178**   | 0.217**     | 0.264**    | 0.369**                       | 0.291**                  |
| Negative affect    | 0.177**   | 0.292**     | 0.380**    | 0.302**                       | 0.191**                  |
| **Total CES-D**    | 0.426**   | 0.461**     | 0.581**    | 0.503**                       | 0.330**                  |
Note. St. = Study, Imbalance = Occupational imbalance, Deprivation = Occupational deprivation, Alienation = Occupational alienation, Marginalization = Occupational marginalization, Marginalization (non-shared) = Non-shared environment marginalization, Marginalization (shared) = Shared environment marginalization. Study 1 is separated 4 factor of CAOD, Study 2 and 3 are separated 5 factor of CAOD.
Table 4 (on next page)

Table 4

Structural relationships of CAOD and SRS-18
### Table 4. Structural relationships of CAOD and SRS-18 (study 1)

|                          | Estimate | S.E. | Est./S.E. | Two-Tailed P-Value | 95% CI        |
|--------------------------|----------|------|-----------|--------------------|---------------|
| **Model fit information** |          |      |           |                    |               |
| RMSEA                    | 0.061    |      |           |                    | [0.057; 0.064]|
| CFI                      | 0.947    |      |           |                    |               |
| TLI                      | 0.943    |      |           |                    |               |
| **Standardized model results** |          |      |           |                    |               |
| **Stress**               |          |      |           |                    |               |
| On Occupational dysfunction | 0.748    | 0.096| 7.771     | 0.000              | 0.500; 0.995  |
| Covariates               | −0.062   | 0.107| −0.574    | 0.566              | −0.338; 0.215 |
| **Occupational dysfunction** |          |      |           |                    |               |
| On Covariates            | 0.826    | 0.026| 31.284    | 0.000              | 0.758; 0.894  |
| **Occupational dysfunction** |          |      |           |                    |               |
| by Occupational imbalances | 0.677    | 0.028| 23.861    | 0.000              | 0.604; 0.750  |
| Occupational deprivation | 0.893    | 0.017| 53.737    | 0.000              | 0.850; 0.936  |
| Occupational alienation  | 0.840    | 0.021| 39.462    | 0.000              | 0.785; 0.894  |
| Occupational Marginalization | 0.880    | 0.017| 52.298    | 0.000              | 0.837; 0.923  |
| **Stress**               |          |      |           |                    |               |
| by Depression and anxiety | 0.971    | 0.014| 70.326    | 0.000              | 0.935; 1.006  |
| Displeasure and anger    | 0.787    | 0.024| 32.723    | 0.000              | 0.725; 0.849  |
| Covariates | Ind | Stress response | 0.617 | 0.086 | 7.195 | 0.000 | 0.396; 0.838 |
|------------|-----|----------------|-------|-------|-------|-------|--------------|
| Lassitude  |     |                | 0.915 | 0.017 | 52.651| 0.000 | 0.870; 0.960 |

R Square

| Stress response | 0.487 | 0.040 | 12.112 | 0.000 | – |

Note. S.E. = Standard error, Est. / S.E. = Estimator / Standard error, CI = Confidence interval, On = Structural association, By = Construct, Ind = Indirect, R Square = R coefficient of determination
Sample characteristics of CAOD and JBS
Table 5. Sample characteristics of CAOD and JBS (study 2)

| Age                  | M ± SD         |
|----------------------|----------------|
| Total                | 34.5 ± 10.2    |
| Doctors              | 48.6 ± 10.2    |
| Nurses               | 36.1 ± 10.5    |
| Physical therapists  | 30.6 ± 7.3     |
| Occupational therapists | 29.6 ± 6.6   |
| Another              | 37.2 ± 11.1    |
| Total                | 10.5 ± 9.3     |
| Doctors              | 23.3 ± 10.0    |
| Nurses               | 12.5 ± 9.7     |
| Physical therapists  | 7.0 ± 6.4      |
| Occupational therapists | 6.4 ± 5.7   |
| Another              | 11.6 ± 10.5    |

| Years of work experience | M ± SD         |
|--------------------------|----------------|
| Total                    | 4.5 ± 6.2      |
| Doctors                  | 7.3 ± 6.4      |
| Nurses                   | 5.4 ± 5.6      |
| Physical therapists      | 9.1 ± 7.5      |
| Occupational therapists  | 8.0 ± 7.2      |
| Another                  | 9.6 ± 7.8      |

| Gender                 | Total N | %  |
|------------------------|---------|----|
| Male                   | 476     | 41.6|
| Female                 | 650     | 56.9|
| Others                 | 16      | 1.4 |

| Job category            | Total N | %  |
|-------------------------|---------|----|
| Doctor                  | 21      | 1.8 |
| Nurse, Health nurse,    | 484     | 42.3|
| Midwife                 |         |    |
| Physical therapist      | 205     | 17.9|
| Occupational therapist  | 180     | 15.7|
| Other healthcare workers| 252     | 22.0|

| Opportunities for refreshment | Total N | %  |
|-------------------------------|---------|----|
| Very good                     | 111     | 9.7 |
| Good                          | 629     | 55.0|
| Neither good nor bad          | 143     | 12.5|
| Fair                          | 112     | 9.8 |
| Poor                          | 106     | 9.2 |
| Unknown                       | 41      | 3.5 |

| Time spent on leisure activities | Total N | %  |
|----------------------------------|---------|----|
| Very good                        | 82      | 7.1 |
| Good                             | 509     | 44.5|
|                | Neither good nor bad | Fair | Poor | Unknown |
|----------------|----------------------|------|------|---------|
| Work relationships |                      |      |      |         |
|                | Very good            | 107  |      |         |
|                | Good                 | 463  |      |         |
|                | Neither good nor bad | 209  |      |         |
|                | Fair                 | 48   |      |         |
|                | Poor                 | 14   |      |         |
|                | Unknown              | 301  |      |         |

|                | 33  | 2.8 |
|----------------|-----|-----|
| Fair           | 237 | 20.7|
| Poor           | 68  | 5.9 |
| Unknown        | 213 | 18.6|
| Very good      | 107 | 9.3 |
| Good           | 463 | 40.5|
| Neither good nor bad | 209 | 18.3|
| Fair           | 48  | 4.2 |
| Poor           | 14  | 1.2 |
| Unknown        | 301 | 26.3|
Table 6 (on next page)

Table 6

Structural relationships CAOD and JBS
Table 6. Structural relationships CAOD and JBS (study 2)

|                      | Estimate | S.E.  | Est./S.E. | Two-Tailed P-Value | 95% CI          |
|----------------------|----------|-------|-----------|--------------------|-----------------|
| **Model fit information** |          |       |           |                    |                 |
| RMSEA                | 0.076    | 0.060 | 1.235     | 0.000              | 0.723; 1.029    |
| CFI                  | 0.919    |       |           |                    |                 |
| TLI                  | 0.913    |       |           |                    |                 |
| **Standardized model results** |          |       |           |                    |                 |
| **Burnout**          |          |       |           |                    |                 |
| On                   |          |       |           |                    |                 |
| Occupational dysfunction | 0.876   | 0.060 | 14.714    | 0.000              | 0.723; 1.029    |
| Covariates           | −0.173   | 0.068 | −2.538    | 0.011              | −0.349; 0.003   |
| **Occupational dysfunction** |          |       |           |                    |                 |
| On                   |          |       |           |                    |                 |
| Covariates           | 0.796    | 0.018 | 45.214    | 0.000              | 0.750; 0.841    |
| **Occupational by occupational dysfunction** |          |       |           |                    |                 |
| Occupational imbalance | 0.714   | 0.017 | 41.649    | 0.000              | 0.670; 0.758    |
| Occupational deprivation | 0.884   | 0.010 | 86.646    | 0.000              | 0.857; 0.910    |
| Occupational alienation | 0.855   | 0.012 | 70.107    | 0.000              | 0.824; 0.886    |
| Occupational Marginalization (non shared) | 0.888   | 0.011 | 84.104    | 0.000              | 0.861; 0.916    |
| Occupational Marginalization (shared) | 0.615    | 0.024 | 25.447    | 0.000              | 0.552; 0.677    |
| **Burnout by burnout syndrome** |          |       |           |                    |                 |
| Emotional exhaustion | 0.971 | 0.014 | 67.697 | 0.000 | 0.934; 1.008 |
|-----------------------|-------|-------|--------|-------|---------------|
| Depersonalization     | 0.871 | 0.016 | 55.916 | 0.000 | 0.831; 0.911  |
| Diminished personal accomplishment | 0.178 | 0.032 | 5.642  | 0.000 | 0.097; 0.260  |

| Covariates | Ind | Burnout syndrome | 0.697 | 0.055 | 12.725 | 0.000 | 0.556; 0.838 |

| R Square | Burnout syndrome | 0.556 | 0.029 | 19.135 | 0.000 | – |

Note. S.E. = Standard error, Est. / S.E. = Estimator / Standard error, CI = Confidence interval, On = Structural association, By = Construct, Ind = Indirect, R Square = R coefficient of determination
Table 7 (on next page)

Table 7

Sample characteristics of CAOD and CES-D
Table 7. Sample characteristics of CAOD and CES-D (study 3)

| Age               | M ± SD          |
|-------------------|-----------------|
| Total             | 33.6±10.2       |
| Nurses            | 37.4±11.2       |
| Physical therapists | 29.3±6.4       |
| Occupational therapists | 27.6±4.1    |

| Years of work experience | M ± SD          |
|--------------------------|-----------------|
| Total                    | 9.67±9.2        |
| Nurses                   | 12.8±10.3       |
| Physical therapists      | 5.64±5.3        |
| Occupational therapists  | 4.84±3.5        |

| Gender          | Total N | %  |
|-----------------|---------|----|
| Male            | 159     | 23.5|
| Female          | 509     | 75.4|
| Unknown         | 7       | 1.0 |

| Job category                                      | Total N | %  |
|---------------------------------------------------|---------|----|
| Nurse                                             | 326     | 48.2|
| Health nurse, Midwife                            | 12      | 1.7 |
| Assistant nurse                                  | 63      | 9.3 |
| Physical therapist                               | 155     | 22.9|
| Occupational therapist                           | 123     | 18.2|
| Unknown                                          | 8       | 1.1 |

| Opportunities for refreshment                     | Total N | %  |
|---------------------------------------------------|---------|----|
| Very good                                        | 71      | 10.5|
| Good                                              | 364     | 54  |
| Neither good nor bad                             | 91      | 13.5|
| Fair                                              | 56      | 8.3 |
| Poor                                              | 62      | 9.1 |
| Unknown                                          | 30      | 4.4 |

| Time spent on leisure activities                  | Total N | %  |
|---------------------------------------------------|---------|----|
| Very good                                        | 53      | 7.8 |
| Good                                              | 285     | 42.2|
| Neither good nor bad                             | 141     | 20.9|
| Fair                                              | 123     | 18.2|
| Poor                                              | 43      | 6.3 |
| Unknown                                          | 29      | 4.3 |
| Work relationships | Quality   | Percentage |
|--------------------|-----------|------------|
| Good               | 356       | 52.8       |
| Neither good nor bad | 162       | 24         |
| Fair               | 29        | 4.3        |
| Poor               | 13        | 1.9        |
| Unknown            | 29        | 4.3        |
Table 8

Table 8

Structural relationships CAOD and CES-D
### Table 8. Structural relationships CAOD and CES-D (study 3)

|                          | Estimate | S.E. | Est./S.E. | Two-Tailed P-Value | 95% CI        |
|--------------------------|----------|------|-----------|--------------------|---------------|
| **Model fit information** |          |      |           |                    |               |
| RMSEA                    | 0.060    |      |           |                    | [90% CI = 0.057; 0.063] |
| CFI                      | 0.922    |      |           |                    |               |
| TLI                      | 0.917    |      |           |                    |               |
| **Standardized model results** |          |      |           |                    |               |
| Depression On            |          |      |           |                    |               |
| Occupational dysfunction | 0.695    | 0.067| 10.301    | 0.000              | 0.521; 0.869  |
| Covariates               | 0.063    | 0.076| 0.829     | 0.407              | −0.133; 0.259 |
| Occupational dysfunction On |      |      |           |                    |               |
| Covariates               | 0.783    | 0.023| 33.791    | 0.000              | 0.723; 0.842  |
| Occupational dysfunction by |      |      |           |                    |               |
| Occupational imbalance   | 0.688    | 0.025| 27.477    | 0.000              | 0.624; 0.753  |
| Occupational deprivation | 0.898    | 0.015| 57.989    | 0.000              | 0.858; 0.938  |
| Occupational alienation  | 0.874    | 0.015| 56.918    | 0.000              | 0.835; 0.914  |
| Occupational Marginalization (non shared) | 0.879 | 0.014 | 61.800 | 0.000 | 0.843; 0.916 |
| Occupational marginalization (shared) | 0.632 | 0.032 | 19.721 | 0.000 | 0.549; 0.714 |
| Depression by            |          |      |           |                    |               |
| Depressed affect         | 0.960    | 0.015| 65.960    | 0.000              | 0.922; 0.997  |
|                        | Ind       |       |         |       |        |
|------------------------|-----------|-------|---------|-------|--------|
| Somatic symptoms       | 0.915     | 0.017 | 54.215  | 0.000 | 0.872; 0.959 |
| Interpersonal          | 0.785     | 0.032 | 24.395  | 0.000 | 0.702; 0.868 |
| difficulties           |           |       |         |       |        |
| Negative affect        | 0.543     | 0.041 | 13.098  | 0.000 | 0.436; 0.649 |
|                        |           |       |         |       |        |
| Covariates             |           |       |         |       |        |
|                        |           |       |         |       |        |
| Depression             | 0.544     | 0.057 | 9.578   | 0.000 | 0.398; 0.690 |
|                        |           |       |         |       |        |
| R Square               |           |       |         |       |        |
| Depression             | 0.556     | 0.031 | 17.714  | 0.000 | –       |

Note. S.E. = Standard error, Est. / S.E. = Estimator / Standard error, CI = Confidence interval, On = Structural association, By = Construct, Ind = Indirect, R Square = R coefficient of determination.