

Psychological Factors Including Sense of Coherence and Some Lifestyles are Related to General Health Questionnaire-12 (GHQ-12) in Elderly Workers in Japan

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Abstract

Objectives: The number of elderly workers has also been increasing and poor psychological well-being in elderly workers has been reported. The aim of this study is to elucidate the factors that are related to poor psychological well-being in elderly workers.

Methods: We administered General Health Questionnaire-12 (GHQ-12) as an indicator of psychological well-being to 330 male elderly workers in the age range of 50–69, and analyzed different psychological factors, namely sense of coherence (SOC), and physical and lifestyle variables such as blood pressure, serum total cholesterol, smoking frequency, alcohol intake, exercise frequency, and body mass index (BMI) that are related to GHQ-12.

Results: When the cut-off point of GHQ-12 was 2/3, 97 workers who showed high GHQ-12 score were classified as one group having poor psychological well-being. A statistically significantly lower SOC score, higher stress score, lower frequency of exercise, higher smoking score and higher BMI, but not longer working hours or higher shift work score in the workers with higher GHQ-12 scores were observed than in the workers with normal GHQ-12 scores. Multiple logistic regression analysis showed that the low SOC score, low frequency of exercise, high smoking frequency and high BMI significantly contributed to the high GHQ-12 score.

Conclusions: A low SOC score in elderly workers is assumed to be directly related to poor psychological well-being, or via the development of lifestyle problems such as lack of exercise, obesity, and smoking in elderly workers. This assumption must be confirmed by conducting future intervention studies on lifestyle.

Key words: elderly workers, General Health Questionnaire-12, multiple logistic regression analysis, psychological well-being, sense of coherence

Introduction

Japan's society is aging rapidly and by 2010, baby boomers, that is, people born between 1947 and 1949, will be in

their early to mid-60s leading to the possibility that 1/5 of the general population and 1/3 of the workforce will be 60 or over. The opportunities for employment are scarce for old people with age restrictions on various positions and there is difficulty for middle-aged people in finding re-employment. However, considering the rapidly aging population, it is inevitable that old people be employed to maintain the strength and stability of the workforce. For the purpose of enriching the mental and physical well-being of the elderly, it is particularly ideal for the elderly to contribute meaningfully to society in various ways, find employment, and strike a balance between work, family, and

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society in the pursuit of a “vital elderly population” (active aging) (1).

Along with the disintegration of the lifetime employment system, physical problems that accompany aging, an increase in the complexities of human relationships, and a poor ability to adapt to job details have led to the deterioration of the mental health of the elderly working population. Research on the ideal work environment of the elderly as well as their psychological problems will be conducted because the lack of improvement in the mental health condition of the elderly is considered to be an exceedingly important problem (2, 3).

Taking together such recent work conditions in Japan, we must examine psychological and lifestyle factors related to poor psychological well-being in elderly workers. Recently, we have demonstrated that sense of coherence (SOC) may be an important psychological modifier for determining lifestyle including exercise and dietary habits (4), smoking behaviors (5), and reaction to job stress (6). According to the National Institute for Occupational Safety and Health (NIOSH) model of job stress, exposure to stressful working conditions (called job stressors) can have a direct influence on a worker’s health, such as the development of cardiovascular diseases and musculoskeletal disorders, through a stress reaction, i.e., the development of psychological, physiological, and behavioral problems that include depression, alcoholism, and absenteeism (7–9). Individual and other situational factors can intervene to strengthen or weaken this influence (8, 9). Therefore, SOC and other personal trait may be involved as the intervening factors that can modify the relationship between work and a worker’s health. On the other hand, mental health is an important component of occupational health because NIOSH recognizes psychological disorders as work-related diseases and injuries (10). On the basis of this deteriorating mental health condition in elderly workers, in this study, we used our model to focus on psychological well-being as a mental problem, which is influenced by physiological and behavioral factors, and work conditions. Therefore, we analyzed how psychological modifiers including SOC and physiological and behavioral factors such as blood pressure, body fat, smoking and exercise habits as well as working conditions are related to General Health Questionnaire-12 (GHQ-12) as indicators of the psychological well-being of elderly workers.

Subjects and methods

1) Subjects

The subjects consisted of 330 male office workers with ages ranging 50 to 69 years old (mean age±standard deviation (SD), 57.6±4.45 years), working in five corporations, namely, a computer service enterprise, a computer store, an electrical equipment enterprise, an electrical equipment store, and a department store in Ishikawa and Toyama Prefectures in Japan. After giving their written informed consent, the subjects completed several self-administered questionnaires regarding their psychological well-being using GHQ-12, the health locus of control (HLC), SOC, and perceived stress. In addition to completing psychological questionnaires, they also completed a self-administered questionnaire regarding working hours per

day and their shift work schedule as well as their lifestyles that included exercise, smoking, and alcohol drink habits. The overall response rate to the questionnaires was 91.7%.

After completing a self-administered questionnaire with the ambient temperature maintained at 23°C, the subjects were instructed to remain still and were prohibited from smoking or drinking for at least 30 min before physical and blood chemical examinations. Systolic and diastolic blood pressures, and body mass index (BMI) as an indicator of obesity were measured at 9:00 AM for subjects who were instructed to fast. Using blood samples drawn from the cubital vein, serum total cholesterol level was determined using the routine method. Blood samples were taken at the same time at 9:00 AM from subjects who were instructed to fast. None of the subjects were exposed to any toxic substances in their workplace. They have no history of use of medical drugs or history of having common diseases such as hypertension, hyperlipidemia, diabetes mellitus, angina pectoris, or acute common cold. This study was approved by the Ethics Committee on Experimentation of Kanazawa University, Takara-machi Campus.

2) GHQ-12

To assess psychological well-being and the factors associated with it, we used GHQ-12, which is modified shorter version of an original 60-item questionnaire. GHQ was developed by Goldberg in England to screen for minor psychiatric disorders (11, 12). Regarding the scoring system we applied to GHQ scoring, each item response category was coded 0-0-1-1, with total score ranging from 0 to 12 points. High scores indicate poor psychological well-being. We used the cutoff point 2/3 to identify the actors associated with psychological well-being.

3) HLC

HLC assessment was performed using the Japanese version of HLC in which Horige (13) had modified the multi-dimensional HLC scales described by Wallston et al. (14). The Japanese version of HLC was designed to measure the five following separate dimensions of the locus of control beliefs related to health behavior for Japanese people: Internal (I), Professional (P), Family: (F), Chance (C), and Supernatural (S) HLCs. Each HLC contains five 6-item scales.

4) SOC

A Japanese version of SOC, in which Yamazaki (15) translated the SOC described by Antonovsky (16) was used in the actual SOC questionnaire. SOC has been described as a global orientation system that expresses the extent to which one has a persistent, enduring yet dynamic feeling of confidence that (1) the stimuli, derived from one’s internal and external environments in the course of living are structured, predictable and explicable, (2) resources are available to one for meeting the demands posed by these stimuli, and (3) such demands are challenges, worthy of investment and engagement (16). The three components in the SOC construct are comprehensibility, manageability and meaningfulness. The lower the SOC score, the poorer was one’s psychological attitude to SOC.

5) *Perceived stress scale*

The 14-item perceived stress scale described by Cohen et al. (17) was used to assess the degree to which various situations in life were perceived as stressful. Items on the perceived stress scale were designed to measure the degree to which the subjects felt their lives were unpredictable, uncontrollable, and overwhelming (17, 18). A high score on the stress index indicates a greater degree of stress.

6) *Lifestyles and work*

Physical exercise habits, alcohol drinking, and smoking habits were separately assessed by the same interviewer. The responses to the physical exercise frequency were classified never (less than 1 day, 2 points), a few days (2–3 days, 1 point), and always (more than 4 days, 1 point) according to the frequency of the exercise performed per week. Light exercise, including walking for more than 30 consecutive min was regarded as a form of physical exercise in the questionnaire. The responses to alcohol drinking frequency was scored from 0 to 2 as never (1 point), sometimes (1 point), and everyday (2 points). According to their frequency of cigarette smoking, subjects were coded as current smokers (2 points), nonsmokers, (1 point), and ex-smokers (1 point). Shift workers and nonshift workers were scored 2 points and 1 point, respectively.

7) *Statistical analysis*

We compared the scores from psychological factors (HLC, SOC, and stress score) and physical factors (BMI, systolic and diastolic blood pressures, and serum total cholesterol), lifestyles and work variables between workers with normal and high GHQ-12 scores using Student’s t test when the variance between the two groups was recognized to be statistically equal using F test, or Welch’s t-test when the variance between the two groups was not equal. Furthermore, multiple logistic regression analysis was performed for workers with high and normal GHQ-12 scores. In the statistical analysis, the independent variables included psychological and physical factors, lifestyle and work variables. Because work system and lifestyle were considered to be nominal scale, GHQ-12 scores were compared among the categories according to work system and lifestyle using one-way analysis of variance (ANOVA), followed by the post-hoc Dunnett test when the number of categories was three. The categories of the work system included workers with working less than 7, 7–9, and more than 9 hours per day, and workers with and without shift work. The categories of lifestyle are nonsmokers, smokers, ex-smokers, and workers with physical exercise frequencies of 4–7, 2–3, and 0–1 times per week. All statistical tests were two-tailed. SPSS (Ver 11) was used for all statistical analyses. P values less than 0.05 were regarded as indicating statistical significance.

Results

The distribution of the GHQ-12 score of 330 workers is shown in Fig. 1. When the cut-off point of GHQ-12 score was 2/3, 97 workers who showed high GHQ-12 score were classified into one group with poor psychological well-being. HLC, SOC, and stress scores (Table 1), and work system, lifestyle,

and physical factors (Table 2) were compared between workers with normal and high GHQ-12 score. We obtained a statistically significantly higher mean age, lower SOC score, higher stress score (Table 1), lower frequency of exercise, higher smoking score and higher BMI, but not longer work hour or higher shift work score (Table 2) in the workers with high GHQ-12 scores than in the workers with normal GHQ-12 score. The multiple logistic regression analysis showed that a low SOC score, a low frequency of exercise, a high smoking score and a high BMI significantly contributed to the high GHQ-12 score (Table 3). We compared GHQ-12 scores according to working time and shift work (Fig. 2). ANOVA showed no statistically significant difference in GHQ-12 scores among the groups of the work system. When we compared the GHQ-12 scores according to smoking status (nonsmoker, present smoker, and ex-smoker) and exercise frequency, the post-hoc Dunnett test showed that the GHQ-12 score of the present smoker was significantly higher than that of nonsmoker, but that the GHQ-12 score in ex-smoker was not statistically different from that of nonsmoker (Fig. 3). We observed a significantly higher GHQ-12 score in the workers with an exercise frequency of 0–1 times per week than those with an exercise frequency of 4–7 times per week. There was no significant difference in the GHQ-12 score between the workers with an exercise frequency of 4–7 times per week and the workers with an exercise frequency of 2–3 times per week.

Discussion

The GHQ, which was developed by Goldberg (19), is a self-administered screening questionnaire designed for detecting current diagnosable changes in the mental health status and is used for identifying cases of potential mental disorders providing a detailed data for definitive diagnosis to a psychiatric interview. GHQ is also used in primary health care screenings in the general population surveys or in general medical practice (11, 12). Validation studies of a shortened version of GHQ-12 as a measure of psychological well-being are well documented (11, 12). A high GHQ score, which indicates poor psychological well-being, is associated with suicide attempts

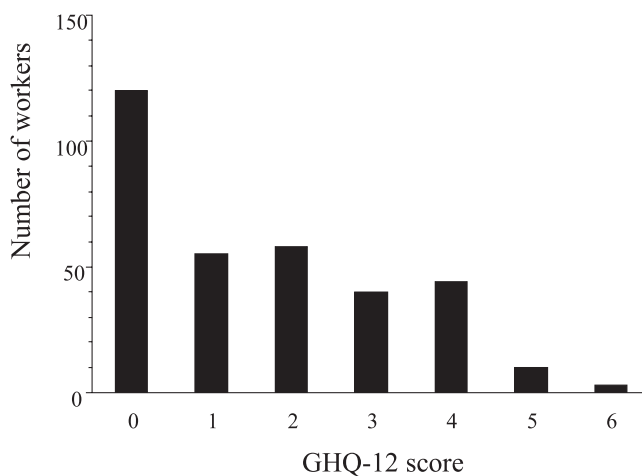


Fig. 1 Distribution of GHQ-12 scores of 330 elderly workers.

Table 1 HLC, SOC, and stress scores according to GHQ-12 group

GHQ group	Number of subjects	Value (mean±SD)							
		Age (year)	SHLC (score)	IHLC (score)	CHLC (score)	FHLC (score)	PHLC (score)	SOC (score)	Stress (score)
Normal	233	57.3±4.30	11.2±4.79	24.4±3.32	14.4±4.80	21.4±4.46	19.2±4.49	128.2±18.1	27.8±5.38
High	97	58.4±4.74*	12.0±5.03	24.4±3.27	14.7±4.75	21.1±4.64	18.6±4.11	119.8±19.7***	29.6±6.37**

Statistical analysis of difference was performed using Student's t test when the variance between the two groups was recognized to be statistically equal using F test, or Welch's t-test when the variance between the two groups was not equal. Statistically significant differences were obtained by comparing the scores of high-score GHQ group subjects and those of normal-score GHQ subjects, * p<0.05, ** p<0.01, *** p<0.001.

Table 2 Work system, lifestyle and physical factor scores according to GHQ-12 group

GHQ group	Number of subjects	Value (Mean±SD)								
		Working time (hour)	Shift work (score)	Exercise (score)	Alcohol (score)	Smoking (score)	BMI (kg/m ²)	Systolic BP (mmHg)	Diastolic BP (mmHg)	Total CHOL (mg/dl)
Normal	233	7.92±0.882	1.11±0.316	1.24±0.426	1.21±0.408	1.22±0.417	22.9±2.92	134.3±12.8	84.7±11.5	190.5±34.1
High	97	7.88±0.820	1.12±0.331	1.44±0.499***	1.18±0.382	1.37±0.486**	23.7±2.76*	136.2±12.1	84.4±12.3	193.9±32.4

Statistical analysis of difference was performed using Student's t test when the variance between the two groups was recognized to be statistically equal using F test, or Welch's t-test when the variance between the two groups was not equal. Statistically significant differences were obtained by comparing the scores of high-score GHQ group subjects and those of normal-score GHQ subjects, * p<0.05, ** p<0.01, *** p<0.001.

Table 3 Multiple logistic regression analysis for GHQ-12 using HLC, SOC and other behavioral and physical factors as explanatory variables

Variables	Regression coefficient	(SE)	P value	Odds ratio	(95% Confidence interval)
Age (≥ vs <60 years)	-0.017	0.295	0.954	0.983	(0.552-1.75)
SHLC (≥12 vs <12 points)	0.064	0.034	0.058	1.07	(0.998-1.14)
IHLC (≥25 vs <25 points)	0.02	0.045	0.665	1.02	(0.933-1.11)
CHLC (≥15 vs <15 points)	-0.038	0.035	0.279	0.963	(0.899-1.03)
FHLC (≥22 vs <22 points)	0	0.036	0.995	1.00	(0.932-1.07)
PHLC (≥20 vs <20 points)	-0.034	0.036	0.349	0.967	(0.900-1.04)
SOC (≥126 vs <126 points)	-0.023	0.009	0.013	0.977	(0.959-0.995)
Stress (≥29, vs <29 points)	0.045	0.027	0.095	1.05	(0.992-1.10)
Working time (≥ vs <9 hours per day)	-0.204	0.346	0.555	0.815	(0.414-1.61)
Shift work (presence vs absence)	0.364	0.422	0.388	1.44	(0.630-3.29)
Exercise (0-1 vs 2-7 times/week)	1.09	0.281	0.000	2.97	(1.71-5.15)
Alcohol (every day vs not every day)	-0.239	0.340	0.482	0.787	(0.404-1.53)
Smoking (current smoker vs nonsmoker)	0.732	0.296	0.013	2.08	(1.16-3.71)
BMI (more than vs less than 25 mg/m ²)	0.899	0.307	0.003	2.46	(1.35-4.49)
Systolic BP (≥ vs <140 mmHg)	-0.171	0.295	0.563	0.843	(0.473-1.50)
Total cholesterol (≥ vs <220 mg/dl)	0.476	0.332	0.152	1.61	(0.839-3.09)

and psychiatric disorders such as alcoholism, major depressive episodes (20) as well as high mortality after stroke or cerebrovascular diseases (21, 22). Irie et al., who examined the relationship of 8-OH-dG level, a biomarker of cancer-related oxidative DNA damage, to GHQ-12 score in female workers have found a higher 8-OH-dG level in female workers with a high GHQ-12 score, suggesting that poor psychological well-being is related to a higher risk of developing cancer due to oxidative DNA damage in females, possibly via neutrophil activation (23). Therefore, the relationships of poor psychological well-being with the subsequent development of mental and physical diseases and mortality are likely to reinforce the importance of the assessment of psychological factors, work systems and lifestyles, followed by appropriate intervention to alleviate

these psychological symptoms (24).

Ezoe and Morimoto (25) have demonstrated that mental stress, nutritional balance, eating breakfast regularly, physical exercise, and working hours are related to the level of psychological stress among Japanese workers. Fuchino et al. (12), who examined the association between mental health and a health-related lifestyle and the strength of the association in the Japanese population in the age range of 40-60 years, found that regular exercise is most significantly associated with mental health condition. The results in this study also indicate the lack of exercise, obesity, and smoking as lifestyle problems in elderly workers and show that such problems are related to poor psychological well-being. Accordingly, regular exercise, discontinuance of smoking, and nutrition balance seem to pro-

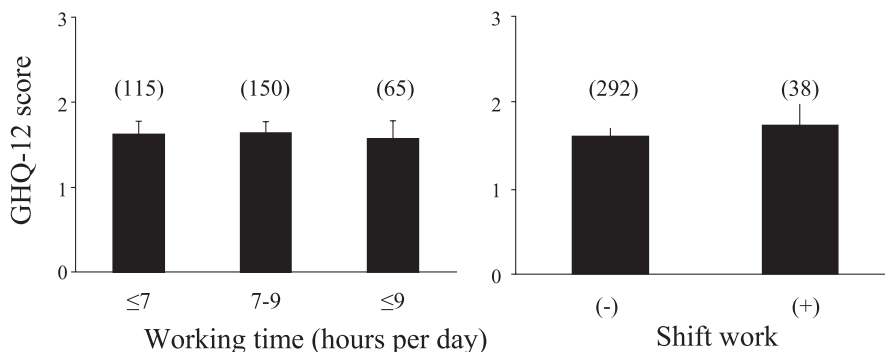


Fig. 2 GHQ-12 scores according to working time (left) and shift work (right). Each value is expressed as mean±SE. The value in each parenthesis indicates the number of the variables.

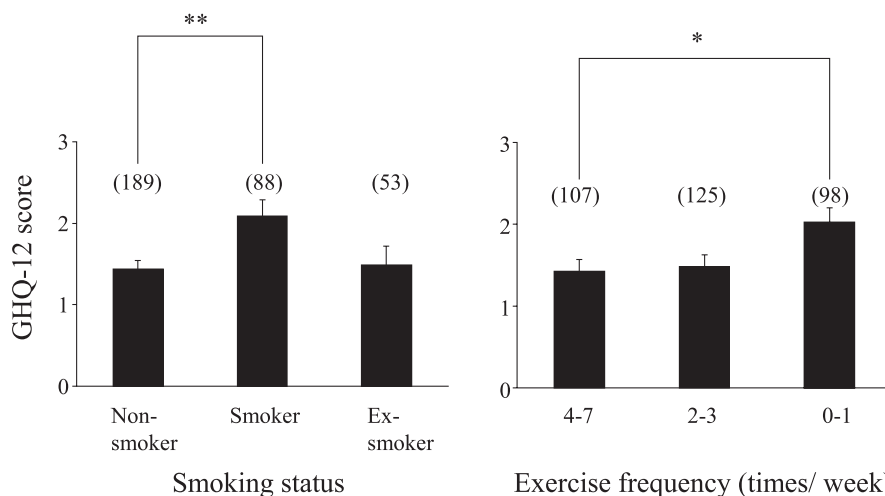


Fig. 3 GHQ-12 scores according to smoking status (left) and exercise frequency (right). Each value is expressed as mean±SE. The value in each parenthesis indicates the number of the variables. Statistical analysis of difference was performed by one-way ANOVA, followed by the post-hoc Dunnett test. * p<0.05, ** p<0.01.

mote psychological well-being in elderly workers. Because we have no evidence showing that intervention of health education such as regular exercise, discontinuance of smoking, and nutrition balance promote psychological well-being in elderly workers (26), we should clarify the effects of health educational programs on the psychological well-being of elderly workers in a future study.

Harma et al. (3) observed that the general health and well-being of an elderly shift worker depend on the interaction of several individual, medical, psychosocial, and job-related factors. However, our finding showing no significant association between shift work score and GHQ-12 score does not coincide well with the observation reported by Harma et al. (3). Yamada and his colleagues (27) found that there is tendency for 12-h shift workers to partake in sedentary free time activities and have high alcohol and cigarette consumption rates, suggesting that unhealthy activities result in poor health, dissatisfaction with life, and slow recuperation from fatigue. From these results and our findings, it is suggested that health promotion services at the workplace should devote more attention to addressing lifestyle problems associated with long-hour-shift workers than the work system itself.

Both monivariate and multivariate analyses showed that SOC score is related to GHQ-12 score. This finding is very noteworthy because we extracted SOC as a relevant factor for GHQ-12 even after we adjusted the effects of lifestyle variables such as exercise, obesity, and smoking in elderly workers. SOC, a candidate for a mediating stress factor, is studied in the framework of Antonovsky’s salutogenesis paradigm, which emphasizes the origin of health (28–31). Life event stressors, depression, and anxiety as well as working condition, particularly work stressors, influence levels of SOC (29, 32–34). Takayama et al. (35) showed that SOC is positively related to psychological health, suggesting the buffering effect of SOC on the maintenance of normal psychological health in dealing with stressful life events. We previously demonstrated that SOC is also closely associated with exercise frequency (4) and smoking habit (5). On the basis of our findings, a low SOC score seems to be related to poor psychological well-being in elderly workers directly, or via lifestyle problems such as the lack of exercise, obesity, and smoking associated with a low SOC score. These assumptions must be confirmed by conducting follow-up study in which the subjects must include a larger population with a more appropriate age range, such as

60–70 years.

In conclusion, the monivariate and multivariate analyses showed that a low SOC score, a low frequency of exercise, a high frequency of smoking, and a high BMI are significantly associated with poor psychological well-being in elderly workers. Exercise, the discontinuance of smoking and proper nutrition seem to promote psychological well-being in elderly workers. A low SOC score in elderly workers is assumed to be directly related to poor psychological well-being, or via the

development of lifestyle problems such as lack of exercise, obesity, and smoking. This assumption must be confirmed by conducting future intervention studies on lifestyle.

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