



■ Original Article

Association between Near Work Time and Depression among Workers in South Korea

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Background: The aim of this study was to evaluate the association between near work time and depression.

Methods: Data of 1,551 workers aged 19–49 years from the sixth Korea National Health and Nutrition Examination Survey were examined. The Patient Health Questionnaire-9 scores were used to screen for depression. Participants who scored a total of 10 or above, which is suggestive of the presence of depression, were classified as the depression group; the rest were classified as normal. The correlation between daily near work time and depression was analyzed using multivariate logistic analysis after adjusting for other sociodemographic and health behavior-related variables.

Results: Multivariate logistic analysis found that workers with 3 or more hours of near work were more likely to report depression compared to the reference group who had 2 or fewer hours per day of near work (adjusted odds ratio, 2.471; 95% confidence interval, 1.062–5.747).

Conclusion: Longer near work time was associated with depression among South Korea's workers. Therefore, it is necessary to reduce near work time to prevent depression.

Keywords: Near Work Time; Depression; Work; Korea

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INTRODUCTION

Depression is one of the most widespread mental disorders with a high prevalence rate among workers as well as the general public. Workers suffering from depression experience individual distress, which lowers their quality of life.¹⁾ In addition, it is directly related to economic loss at the corporate and national levels due to reduced productivity.²⁾ Although there is no clear cause of workers' depression, there are several studies assessing the risk factors leading to its development.³⁾ Long working hours is a major risk factor, especially in South Korea, which is one of the countries with the longest working hours among the Organization for Economic Cooperation and Development countries.

Many previous studies have reported a relationship between long working hours and health problems such as stroke, coronary heart disease, sleep disorders, stress, and depression.^{4,5)} However, certain studies have suggested that long working hours may not have a direct relationship with psychological health.^{6,7)} It is imperative to examine the actual workload such as work type and conditions, since many previous studies have considered long working hours as a risk factor for psychological health problems.⁷⁾

Near work refers to activities performed at short viewing distances, such as using visual media or reading. With the development and dissemination of various visual media such as computers, smartphones, and tablets, the exposure time to visual media has increased. Consequently, near work time has increased significantly in both work and everyday life. However, an increase in near work time may lead to health issues such as eye problems, including dry eye syndrome, asthenopia, myopia, and musculoskeletal problems, including neck and shoulder discomfort.^{8,9)} In addition, a study on the association between near work and mental health reported that workers with greater near work time are at risk for high perceived stress.¹⁰⁾ Stress can cause physical problems such as diabetes mellitus, hypertension, and cardiovascular diseases, as well as mental problems such as cognitive disorders and depression. Furthermore, work stress is a risk factor for the development of depressive symptoms and appears to precipitate diagnosable depression.¹¹⁻¹³⁾ However, no studies have reported on the direct correlation between near work time and depression.

Therefore, the purpose of this study was to investigate the cross-sectional association between near work time and depression among South Korea's workers.

METHODS

1. Study Population

This study used data from the 2014 Korea National Health and Nutrition Examination Survey (KNHANES) conducted by the Korea Centers for Disease Control (KCDC; currently Korea Disease Control and Prevention Agency). The Patient Health Questionnaire-9 (PHQ-9) score was surveyed in 2014. Of the 7,559 participants, 1,551 workers aged 19-49 years were selected. This is because near work time has been in-

vestigated only for participants in that age range. The survey protocols for KNHANES VI were approved by the Institutional Review Board of the KCDC, and informed consent was obtained from all participants.

2. Variables and Measurements

1) Assessment of near work time

In the KNHANES, the participants were asked, "How many hours per day on average did you spend on near work (e.g., computer work or reading) in the past year?" They were provided with four response options: (1) less than 1 hour, (2) 1-2 hours, (3) 3 hours, and (4) 4 hours or more. In a previous study on the relationship between near work time and stress perception, the stress perception was significantly higher in the group that worked for 3 hours or more.¹⁰⁾ Based on this, we divided the participants into two groups: (1) those doing near work for less than 2 hours, and (2) those doing near work for 3 hours or more.

2) Assessment of depression

Depression was assessed using the PHQ-9. The PHQ-9 is a nine-item questionnaire designed to screen for depression in primary care and other medical settings. The standard cut-off score for screening to identify possible major depression was 10 or above (maximum score=27).¹⁴⁾

3) Socioeconomic and health behavior variables

We included sociodemographic factors (sex, age, education level, marital status, and household income) and health behaviors (body mass index [BMI], smoking, and alcohol use) that may affect depression as confounding variables. In addition, occupational factors (occupation, shift work, employment type, and working hours) were included as confounding variables related to work. Age groups were 19-29 years, 30-39 years, and 40-49 years. Education level was divided into two groups: those with an education level of high school graduate or less, and those with a college degree or above. Participants' marital status was classified as married or unmarried. Based on the income data of the sample group, household income level was categorized into four groups: low, middle-low, middle-high, and high. The degree of obesity was divided into three categories: low (BMI <23.0 kg/m²), normal (BMI 23.0-24.9 kg/m²), and obese (BMI ≥25.0 kg/m²). Smoking status was classified into current smokers, ex-smokers, and never-smokers. Alcohol consumption status was categorized into two groups: those who consumed alcohol and those who never consumed alcohol. Occupation was divided into three groups (white collar, service, blue collar) based on the Korean Standard Classification of Occupation.¹⁵⁾ The workers were divided into two groups: those who reported their work schedule as fixed day work were classified as day workers, and the others were classified as shift workers. Employment types were classified as regular or non-regular. Finally, based on the working hours, four groups were formed: (1) <40 hours, (2) 40-49 hours, (3) 50-59 hours, and (4) ≥60 hours.

3. Statistical Analysis

We conducted chi-square tests (χ^2 tests) and logistic regression analyses to compare the characteristics of participants according to near work time. Odds ratios (ORs) and 95% confidence intervals (95% CIs) for depression were estimated using multivariate logistic analyses. Model A was adjusted for sex and age. Model B was adjusted for sex, age, socioeconomic factors (household income, education level, and

marital status), and health behavior factors (BMI, smoking, and alcohol use). Model C was adjusted for sex, age, socioeconomic factors, health behavior factors, and occupational factors (occupation, working hours, shift work, and employment type). All statistical analyses were performed using IBM SPSS ver. 25.0 (IBM Corp., Armonk, NY, USA). Statistical significance was set at $P < 0.05$.

RESULTS

The baseline characteristics of the study participants according to the near work time are presented in Table 1. In total, 965 out of 1,551 participants reported spending 3 hours or more on near work. In the univariate analyses, distributions of age, education level, marital status, household income, occupation, employment type, and weekly working hours indicated significant differences between the near work times of 3 hours or more and 2 hours or less group. Workers with daily near work times of more than 3 hours were found to be younger, more educated, and had higher incomes. Additionally, unmarried workers, white-collar workers, and workers with fewer weekly working hours were more likely to report higher daily near work time. However, the distributions by sex, BMI, smoking, alcohol use, and shift work did not show significant differences between the two groups.

Table 2 illustrates the prevalence of depression according to daily near work time. The 3 hours or more daily near work time group (6.0%) had higher PHQ-9 scores compared to the 2 hours or less daily near work time group (3.5%). Therefore, the 3 hours or more daily near work time group tended to have more workers with a PHQ-9 score of 10 or more. However, no statistically significant differences were observed between the two groups ($P = 0.067$).

Table 3 indicates the results of the multivariate logistic regression analysis of the association between daily near work time and depression according to the PHQ-9 score. Participants with daily near work times of 3 hours or more observed a significantly higher OR than those with daily near work times of 2 hours or less after adjustment (OR, 2.471; 95% CI, 1.062–5.747).

DISCUSSION

This study investigated the relationship between daily near work time and depression among Korean workers. The results indicated that the

Table 1. General characteristics of the study participants

Characteristic	Near work time/d		P-value
	<2 h	≥3 h	
Sex			0.534
Male	279 (57.8)	501 (59.5)	
Female	307 (42.2)	464 (40.5)	
Age (y)			<0.001
19–29	72 (17.2)	242 (31.7)	
30–39	196 (29.1)	407 (38.1)	
40–49	318 (53.8)	316 (30.2)	
Education level			<0.001
High school or less	366 (65.8)	317 (35.9)	
College or above	219 (34.2)	648 (64.1)	
Marital status			<0.001
Yes	487 (80.4)	616 (58.6)	
No	99 (19.6)	349 (41.4)	
Household income			0.007
Low	36 (5.9)	41 (4.7)	
Middle-low	154 (27.0)	173 (19.6)	
Middle-high	219 (36.0)	351 (35.3)	
High	175 (31.1)	399 (40.4)	
Body mass index			0.688
Low	32 (4.4)	53 (5.5)	
Normal	374 (65.3)	616 (64.0)	
Obese	171 (30.3)	280 (30.5)	
Smoking			0.188
Current-smoker	188 (37.1)	281 (32.3)	
Ex-smoker	76 (15.6)	172 (18.7)	
Non-smoker	319 (47.3)	509 (49.0)	
Alcohol use			0.426
Drinking	387 (70.1)	677 (72.1)	
Never	196 (29.9)	285 (27.9)	
Occupation			<0.001
White collar	181 (27.4)	665 (66.2)	
Service	168 (29.1)	176 (19.3)	
Blue collar	237 (43.5)	124 (14.5)	
Shift work			0.607
Yes	31 (5.3)	44 (4.7)	
No	555 (94.7)	918 (95.5)	
Employment type			0.014
Regular	162 (41.0)	422 (50.5)	
Non-regular	233 (59.0)	365 (49.5)	
Working hours/wk			<0.001
<40	214 (34.5)	278 (28.2)	
40–49	165 (28.6)	422 (43.5)	
50–59	106 (18.9)	163 (17.1)	
≥60	101 (18.0)	102 (11.2)	

Values are presented as number of persons (weighted %). P-values for the differences in variables among the two groups for daily near work time were obtained by chi-square test for categorical variables or by analysis of variance for numerical variables.

Table 2. The PHQ-9 score according to the daily near work time

PHQ-9 score	Near work time/d	
	<2 h	≥3 h
0–9	567 (96.5)	901 (94.0)
≥10	18 (3.5)	64 (6.0)

Values are presented as number of persons (weighted %). P-values for the differences in variables among the two groups for daily near work time were obtained by chi-square test for categorical variables or by analysis of variance for numerical variables.

PHQ-9, Patient Health Questionnaire-9.

Table 3. Odds ratio (95% confidence intervals) of depression according to daily near work time

Near work time/d	Unadjusted	Adjusted		
		Model A	Model B	Model C
<2 h	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
≥3 h	1.766 (0.950–3.282)	1.426 (0.750–2.711)	2.005 (1.015–3.959)	2.471 (1.062–5.747)
P-value	0.072	0.278	0.045	0.036

Adjusted odds ratio from multivariate logistic regression analysis. Model A: adjusted for sex and age; model B: adjusted for sex, age, education level, marital status, household income, BMI, smoking, and alcohol use; and model C: adjusted for sex, age, education level, marital status, household income, BMI, smoking, alcohol use, occupation, working hours, shift work, and employment type. BMI, body mass index.

workers who engaged in 3 or more hours of daily near work had higher scores on the PHQ-9, and a significantly higher prevalence of depression was observed in this group compared to the 2 or fewer hours of daily near work time group (OR, 2.471; 95% CI, 1.062–5.747). Therefore, it can be inferred that near work time is associated with depression, independent of working hours.

Several previous studies have reported an association between long working hours and depression in workers.^{16,17} However, few studies have reported a relationship between near work and mental health, including depression. Moreover, the causes associated with near work time and depression have not been clearly identified.⁶ Some studies have suggested the importance of investigating the type or condition of work that causes greater mental load.^{7,18} The job demands-resources model may be a plausible explanation for the link between near work and mental health.^{19,20} According to the job demand-control model of Karasek et al.,²¹ workers with high job demands and low job control may be at an increased risk with respect to the various aspects of their mental as well as physical health.

A visual display terminal (VDT) is a piece of equipment with a screen on which information can be displayed, such as computers, smartphones, and tablets. The long-term use of these devices can cause several problems such as VDT syndrome.²² The increased use of VDT during near work requires concentration that can cause stress and mental strain, in addition to ophthalmic symptoms and musculoskeletal problems.²³ The use of VDT devices has become an essential part of the modern lifestyle, and the usage time of VDT has been gradually increasing. Accordingly, near work time is expected to continue to increase in the future. Some characteristics of near work, such as inappropriate posture (e.g., awkward body posture, using keyboard or mouse), high visual demand (e.g., reading from a computer screen or book form close proximity), and mental concentration, are regarded as job demand factors in the job demand-control model.^{9,24} Consequently, near work may warrant increased job demands and job strain. Furthermore, physical problems such as eye and musculoskeletal discomfort itself can have adverse effects on mental health, including the development of depression or depressive symptoms.²⁵⁻²⁷

This study has numerous comparative advantages; it is a large-scale study with a sample representative of the Korean population. Additionally, this is the first study to examine the relationship between near work time and depression among Korean workers. However, this study

has certain limitations. First, as the study is cross-sectional in design, we cannot assess whether the association between near work time and depression is causal. Second, despite the usefulness of the PHQ-9 as a screening tool, it cannot be used as a stand-alone diagnostic test. Therefore, further research focusing on the clinical diagnosis of depression is required. Third, we divided the subjects into two groups according to their near work time. However, the number of subjects in the two groups was significantly different and because of the division into two groups, various statistical analyses, including correlation analysis, could not be performed. Finally, the distributions of occupational factors showed significant differences between the two groups. The group with 3 hours or more of daily near work time tended to have higher income, shorter working hours, higher rate of regular work, and lower rate of shift work. As a result of cross-tabulation analysis of occupational factors and PHQ-9 score, the group with higher PHQ-9 scores tended to have lower income, longer working hours, lower rate of regular work, and higher rate of shift work. Consequently, there would not have been any significant differences before correction for the relevant factors.

In conclusion, this study indicated that a longer near work time was associated with the prevalence of depression in Korean workers. Further investigation is necessary to explore methods to prevent depression in workers engaged in near work.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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