



Contents lists available at ScienceDirect

Safety and Health at Work

journal homepage: www.e-shaw.net

Original Article

Is Work Hour Mismatch Associated with Depression?

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ARTICLE INFO

Article history:

Received 4 March 2020

Received in revised form

14 September 2020

Accepted 20 September 2020

Available online 24 September 2020

Keywords:

Depression

Overemployed

Underemployed

Work hours mismatch

ABSTRACT

Background: Many studies have reported noticeable increases in the proportion of employees working either relatively short or relatively long hours. Such trends have been accompanied by an increasing concern regarding work hour mismatches defined as a discrepancy between actual and preferred work hours. The aim of this study was to investigate association between work hour mismatch and depression. **Methods:** Data regarding work hour mismatches for 47,551 adults were extracted from the 2017 Korean Working Conditions Survey. The World Health Organization-Five Well-Being Index was used to measure depression. Multiple logistic regression analyses were performed to examine the association between work hour mismatch and depression.

Results: Men and women workers with work hour mismatch were more likely to have depression [underemployed males: odds ratio (OR) = 1.30, 95% confidence interval (CI) = 1.14–1.49, overemployed males: OR = 1.28, 95% CI = 1.18–1.40; underemployed females: OR = 1.37, 95% CI = 1.20–1.56, overemployed females: OR = 1.12, 95% CI = 1.02–1.23]. Underemployed workers, workers who worked more than 52 hours per week, and workers with a high income level, all had higher ORs for depression. The greater the discrepancy between actual and preferred work hours, the higher OR for depression among both underemployed and overemployed workers.

Conclusions: A difference between actual and preferred work hours was associated with depression. Underemployed workers had a higher risk of depression than that of overemployed workers. As a work hour mismatch negatively affected workers' mental health, it is important to reduce work hours mismatches as well as shorten the absolute number of work hours.

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1. Introduction

Workers within a company are not always in equal positions and are placed under numerous restrictions, limiting their ability to choose the number of hours worked [1]. In recent decades, the average length of the workweek has either decreased or remained largely unchanged, but variations in the average workweek have increased [2]. Many studies indicated noticeable increases in the proportion of employees reporting either relatively short or long workweeks [3–5]. Such trends have been accompanied by rising levels of concern regarding work hour mismatches, defined as a difference between actual and preferred work hours.

As work hour mismatches are the fundamental choices of companies, not workers, most mismatches involve longer work

hours than preferred by the worker. Long work hours are particularly pronounced in East Asian countries, such as Japan and Korea [6]. According to Organization for Economic Cooperation and Development report, Koreans worked an average of 2,124 hours per year in 2014, the second longest hours in Organization for Economic Cooperation and Development countries [7]. Employees work longer hours in Korea than in countries with lower income level. One study suggested that long work hours have negative effects on health and safety [8].

Recent studies suggest that not only overemployment but also underemployment negatively affects subjective well-being [2], mental health [9], and job satisfaction [10]. As a result, recent researches on mismatched work hours have provided a number of implications for business as well as government policies.

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Table 1
General characteristics of study population

| Variables | Depression | | | | | | | | | |
|--|--------------|---------------|---------------|---------------|----------|--------------|---------------|---------------|---------------|----------|
| | Male | | | | <i>p</i> | Female | | | | <i>p</i> |
| | Yes | | No | | | Yes | | No | | |
| | N | (%) | N | (%) | N | (%) | N | (%) | | |
| Type of work hour | | | | | | | | | | |
| Underemployed | 885 | (45.9) | 1,042 | (54.1) | <.0001 | 1,192 | (44.2) | 1,503 | (55.8) | <.0001 |
| Matched | 4,849 | (32.3) | 10,146 | (67.7) | | 5,218 | (33.9) | 10,159 | (66.1) | |
| Overemployed | 2,649 | (41.3) | 3,767 | (58.7) | | 2,461 | (40.1) | 3,680 | (59.9) | |
| Age (y) | | | | | | | | | | |
| <29 | 546 | (25.4) | 1,602 | (74.6) | <.0001 | 555 | (25.1) | 1,657 | (74.9) | <.0001 |
| 30–39 | 1,283 | (28.9) | 3,162 | (71.1) | | 1,122 | (29.1) | 2,730 | (70.9) | |
| 40–49 | 1,808 | (33.5) | 3,586 | (66.5) | | 1,929 | (32.2) | 4,056 | (67.8) | |
| 50–59 | 2,099 | (36.7) | 3,618 | (63.3) | | 2,493 | (36.7) | 4,307 | (63.3) | |
| 60– | 2,647 | (47.0) | 2,987 | (53.0) | | 2,772 | (51.7) | 2,592 | (48.3) | |
| Family member | | | | | | | | | | |
| 1 | 1,449 | (36.9) | 2,479 | (63.1) | <.0001 | 2,342 | (43.6) | 3,027 | (56.4) | <.0001 |
| 2 | 3,017 | (41.0) | 4,336 | (59.0) | | 2,630 | (40.0) | 3,937 | (60.0) | |
| 3 | 1,847 | (32.5) | 3,828 | (67.5) | | 1,872 | (32.4) | 3,899 | (67.6) | |
| 4– | 2,070 | (32.4) | 4,312 | (67.6) | | 2,027 | (31.2) | 4,479 | (68.8) | |
| Education level | | | | | | | | | | |
| Under high school | 5,298 | (43.2) | 6,968 | (56.8) | <.0001 | 6,175 | (42.5) | 8,364 | (57.5) | <.0001 |
| More than college | 3,085 | (27.9) | 7,987 | (72.1) | | 2,696 | (27.9) | 6,978 | (72.1) | |
| Spouses' employment status | | | | | | | | | | |
| Single | 2,035 | (36.3) | 3,576 | (63.7) | <.0001 | 3,331 | (41.5) | 4,687 | (58.5) | <.0001 |
| Spouse unemployed | 3,354 | (33.8) | 6,556 | (66.2) | | 1,212 | (35.4) | 2,207 | (64.6) | |
| Spouse employed | 2,994 | (38.3) | 4,823 | (61.7) | | 4,328 | (33.9) | 8,448 | (66.1) | |
| Income level per month | | | | | | | | | | |
| Low | 1,703 | (48.1) | 1,839 | (51.9) | <.0001 | 3,723 | (44.2) | 4,691 | (55.8) | <.0001 |
| Mid-low | 1,416 | (38.6) | 2,255 | (61.4) | | 2,229 | (32.8) | 4,571 | (67.2) | |
| Mid-high | 2,142 | (32.6) | 4,432 | (67.4) | | 1,497 | (30.2) | 3,457 | (69.8) | |
| High | 3,122 | (32.7) | 6,429 | (67.3) | | 1,422 | (35.2) | 2,623 | (64.8) | |
| Employment types | | | | | | | | | | |
| Self-employed | 3,668 | (40.5) | 5,379 | (59.5) | <.0001 | 3,517 | (40.8) | 5,097 | (59.2) | <.0001 |
| Permanent employee | 3,668 | (31.3) | 8,061 | (68.7) | | 3,558 | (58.8) | 2,490 | (41.2) | |
| Temporary employee | 1,159 | (43.3) | 1,515 | (56.7) | | 1,796 | (18.8) | 7,755 | (81.2) | |
| Job classification | | | | | | | | | | |
| White collar | 1,489 | (26.4) | 4,156 | (73.6) | <.0001 | 1,669 | (27.9) | 4,311 | (72.1) | <.0001 |
| Blue collar | 4,813 | (42.9) | 6,419 | (57.1) | | 2,994 | (47.3) | 3,341 | (52.7) | |
| Pink collar | 2,081 | (32.2) | 4,380 | (67.8) | | 4,208 | (35.4) | 7,690 | (64.6) | |
| Shift work | | | | | | | | | | |
| Yes | 850 | (37.4) | 1,421 | (62.6) | 0.1148 | 610 | (33.1) | 1,231 | (66.9) | 0.0013 |
| No | 7,533 | (35.8) | 13,534 | (64.2) | | 8,261 | (36.9) | 14,111 | (63.1) | |
| Working hours (per week) | | | | | | | | | | |
| ≤52 | 5,859 | (34.5) | 11,119 | (65.5) | <.0001 | 6,657 | (35.7) | 11,977 | (64.3) | <.0001 |
| >52 | 2,524 | (39.7) | 3,836 | (60.3) | | 2,214 | (39.7) | 3,365 | (60.3) | |
| Satisfaction of working condition | | | | | | | | | | |
| Yes | 5,213 | (30.0) | 12,167 | (70.0) | <.0001 | 5,910 | (31.5) | 12,824 | (68.5) | <.0001 |
| No | 3,170 | (53.2) | 2,788 | (46.8) | | 2,961 | (54.0) | 2,518 | (46.0) | |
| Whole body fatigue | | | | | | | | | | |
| Yes | 2,712 | (48.1) | 2,923 | (51.9) | <.0001 | 3,010 | (49.0) | 3,132 | (51.0) | <.0001 |
| No | 5,671 | (32.0) | 12,032 | (68.0) | | 5,861 | (32.4) | 12,210 | (67.6) | |
| TOTAL | 8,383 | (35.9) | 14,955 | (64.1) | | 8,871 | (36.6) | 15,342 | (63.4) | |

Considering that discussions on working hours in the industrial health sector have only taken place in special areas such as long time work, shift, and night-time work, research on the work hour mismatches will serve as an opportunity to expand the scope of the working hours topic in the industrial health sector [11]. Studies on work hour mismatches in Korea is limited, as most have only considered overworking, with very few on the effects of a work hour mismatches on Korean workers. A recent study suggested that work hours mismatches have negative effects on both overemployed and underemployed Korean workers [1]. However, that study used 2011 data and focus mainly on physical health. Also other studies suggest that work hours mismatches associated with psychological well-being including depression; however, the target population are usually western countries [2,9,12]. Therefore, the effect of a work hour mismatches on the mental health on Korean workers is unknown.

The aim of the study is to investigate association between work hour mismatch and mental health, particularly depression.

2. Method

2.1. Data source and study population

Data were derived from the fifth Korean Working Conditions Survey (KWCS) which was conducted by the Korea Occupational Safety and Health Agency in 2017. The KWCS collects information on social/occupational health and overall employment conditions. The target population of the KWCS includes those who are defined by domestic standards and by the International Labor Organization as workers aged ≥15 years. The population was selected from across the nation using a multistage systematic cluster sampling method. The methodology and survey questionnaire used by the KWCS are very similar to those used by the European Working Conditions Survey.

The baseline study population included 50,205 individuals. After excluding those unable to provide information, 47,551 individuals were included in the final study sample.

2.2. Variables

Depression was the main dependent variable in this study. We used the World Health Organization-Five Well-Being Index (WHO-5) to measure depression. The WHO-5 is a self-administered five-item scale. Each item assesses the degree of positive well-being during the past 2 weeks on a 6-point Likert scale graded from 0 (never) to 5 (all of the time), with a total score range of 0–25; higher scores indicate an increased sense of well-being [13]. WHO-5 is a unidimensional instrument originally designed to measure overall well-being, but it is also used by the WHO to screen for depressive episodes and to measure depression severity [14]. The standard cut-off WHO-5 score is 13.

The key independent variable was work hour mismatch, defined as a discrepancy between actual and preferred work hours. Actual work hours are based on self-reports by employees of the number of hours worked each week. Lunch time and commuting time were not counted, and minutes exceeding 30 were rounded up to 1 hour. Preferred work hours were also based on self-reports considering earned living wages. We subtracted the preferred from actual number of work hours. If the value was greater or less than 0, then the participant was considered overemployed or underemployed, respectively, and a value equal to 0 was defined as matched work hours.

The control variables included demographic, socioeconomic, health-related characteristics, and work environment variables. The demographic variables included sex, age, and number of family members. The socioeconomic variables included education, income per month (based on quartiles), spouse's employment status, employment types, and job classification. The health-related characteristics included whole body fatigue. The work environment variables included shift work, work hours (based on the 52 hour/week rule in South Korea), and satisfaction with working conditions.

2.3. Statistical analysis

We analyzed men and women separately because of gender difference in wages, work hour, and job type [15,16]. In particular, there is a difference in time devoted to home production of 10 hours per week increases the observed gender wage gap by roughly 11% points and decreases the share of females in high hours occupations by 14% points [17]. Also, there is gender differences in depression. Previous studies show that twofold greater prevalence of depression in females than males, and the symptoms and comorbidities of depression also differ by gender [18]. We calculated the frequencies for each categorical variable, and the Chi-square test was employed to examine the general characteristics of the study population. A multiple logistic regression was used to analyze the association between a work hour mismatch and depression according to sex, age, number of family member, education level, employment status of the spouse, income per month, employment type, job classification, shift work, work hours, satisfaction with working conditions, and whole body fatigue. The results are reported as odd ratios (ORs) and 95% confidence intervals (CIs). Subgroup analyses were also performed using multiple logistic regression models. A p value <0.05 was considered significant. The statistical analyses were conducted using SAS version 9.4 (SAS Institute, Inc., Cary, NC, USA).

3. Result

The participants comprised 47,551 Korean workers (23,338 men and 24,213 women). Among the participants, 1,927 men (8.3%) and 2,695 women (11.1%) were underemployed, and 6,416 men (27.5%)

Table 2

The result of multiple logistic regression to analyzed the association between work hour mismatch and depression

| Variables | Depression | | | |
|--|------------|--------------|--------|--------------|
| | Male | | Female | |
| | OR | 95% CI | OR | 95% CI |
| Type of work hour | | | | |
| Underemployed | 1.30 | (1.14–1.49)* | 1.37 | (1.20–1.56)* |
| Matched | 1.00 | | 1.00 | |
| Overemployed | 1.28 | (1.18–1.40)* | 1.12 | (1.02–1.23)* |
| Age (y) | | | | |
| <29 | 1.00 | | 1.00 | |
| 30–39 | 1.38 | (1.16–1.63)* | 1.27 | (1.09–1.49)* |
| 40–49 | 1.48 | (1.25–1.75)* | 1.31 | (1.12–1.54)* |
| 50–59 | 1.44 | (1.22–1.70)* | 1.26 | (1.07–1.48)* |
| 60– | 1.68 | (1.42–2.00)* | 1.58 | (1.32–1.90)* |
| Family member | | | | |
| 1 | 1.16 | (0.97–1.38) | 1.27 | (1.08–1.48)* |
| 2 | 1.09 | (0.99–1.21) | 1.24 | (1.11–1.38)* |
| 3 | 1.03 | (0.94–1.13) | 1.04 | (0.94–1.15) |
| 4– | 1.00 | | 1.00 | |
| Education level | | | | |
| Under high school | 1.27 | (1.16–1.40)* | 1.31 | (1.18–1.45)* |
| More than college | 1.00 | | 1.00 | |
| Spouses' employment status | | | | |
| Single | 0.91 | (0.79–1.06) | 0.89 | (0.79–1.01) |
| Spouse unemployed | 0.96 | (0.89–1.04) | 0.94 | (0.83–1.05) |
| Spouse employed | 1.00 | | 1.00 | |
| Income level per month | | | | |
| Low | 1.23 | (1.09–1.39)* | 1.05 | (0.93–1.19) |
| Mid-low | 1.11 | (0.99–1.25) | 0.93 | (0.83–1.05) |
| Mid-high | 0.92 | (0.84–1.01) | 0.89 | (0.79–1.00) |
| High | 1.00 | | 1.00 | |
| Employment types | | | | |
| Self-employed | 1.00 | (0.92–1.10) | 0.87 | (0.78–0.97) |
| Permanent employee | 1.00 | | 1.00 | |
| Temporary employee | 1.07 | (0.94–1.21) | 1.06 | (0.93–1.20) |
| Job classification | | | | |
| White collar | 1.00 | | 1.00 | |
| Blue collar | 1.17 | (1.05–1.30)* | 1.10 | (0.99–1.23) |
| Pink collar | 0.96 | (0.85–1.08) | 1.04 | (0.94–1.15) |
| Shift work | | | | |
| Yes | 0.94 | (0.83–1.06) | 0.96 | (0.83–1.11) |
| No | 1.00 | | 1.00 | |
| Working hours (per week) | | | | |
| ≤52 | 1.00 | | 1.00 | |
| >52 | 1.03 | (0.94–1.13) | 1.11 | (1.00–1.24) |
| Satisfaction of working condition | | | | |
| Yes | 1.00 | | 1.00 | |
| No | 2.09 | (1.93–2.26)* | 2.08 | (1.90–2.27)* |
| Whole body fatigue | | | | |
| Yes | 1.45 | (1.34–1.58)* | 1.62 | (1.49–1.77)* |
| No | 1.00 | | 1.00 | |

* $p < 0.05$.

CI, confidence interval; OR, odds ratio.

and 6,141 women (25.4%) were overemployed. In total, 14,995 men (64.3%) and 15,377 women (63.5%) had matched work hours, of whom 32.36% and 33.9%, respectively, exhibited depression (Table 1). Among the underemployed men and women, 45.9% and 44.2% had depression, and among the overemployed men and women, 41.3% and 40.1%, respectively, had depression.

Table 2 indicates the results of the multiple logistic regression analysis of factors associated with depression. The risk of depression increased if workers had mismatched work hours. Underemployed men and women had higher ORs than those of their overemployed counterparts (underemployed males: OR = 1.30, 95% CI = 1.14–1.49, overemployed males: OR = 1.28, 95% CI = 1.18–1.40; underemployed females: OR = 1.37, 95% CI = 1.20–1.56, overemployed females: OR = 1.12, 95% CI = 1.02–1.23). ORs were higher in men and women over 60 years of age compared with the other age group (males: OR = 1.68, 95% CI = 1.42–2.00; females: 95% OR = 1.58, CI = 1.32–1.90). ORs were also higher in participants

Table 3

Subgroup analysis of work hour mismatch in relation to depression stratified by covariates

| Variables | Type of work hour | | | | |
|---------------------------------|-------------------|---------------|--------------|--------------|--------------|
| | Matched | Underemployed | | Overemployed | |
| | | OR | OR | 95% CI | OR |
| Male | | | | | |
| Employment types | | | | | |
| Self-employed | 1.00 | 1.54 | (1.26–1.87)* | 1.30 | (1.15–1.47)* |
| Permanent employee | 1.00 | 1.15 | (0.90–1.46) | 1.24 | (1.09–1.40)* |
| Temporary employee | 1.00 | 1.33 | (1.02–1.72)* | 1.45 | (1.11–1.90)* |
| Job classification | | | | | |
| White collar | 1.00 | 1.57 | (1.09–2.25)* | 1.66 | (1.37–2.01)* |
| Blue collar | 1.00 | 1.18 | (1.00–1.38) | 1.09 | (0.97–1.22) |
| Pink collar | 1.00 | 1.42 | (1.08–1.87)* | 1.34 | (1.16–1.56)* |
| Working hours (per week) | | | | | |
| ≤52 | 1.00 | 1.27 | (1.11–1.46)* | 1.22 | (1.09–1.37)* |
| >52 | 1.00 | 1.52 | (0.94–2.45) | 1.38 | (1.21–1.58)* |
| Female | | | | | |
| Employment types | | | | | |
| Self-employed | 1.00 | 1.38 | (1.05–1.81)* | 1.29 | (1.12–1.49)* |
| Permanent employee | 1.00 | 1.17 | (0.94–1.45) | 1.04 | (0.91–1.18) |
| Temporary employee | 1.00 | 1.58 | (1.29–1.94)* | 1.24 | (0.96–1.59) |
| Job classification | | | | | |
| White collar | 1.00 | 1.12 | (0.82–1.55) | 1.01 | (0.83–1.23) |
| Blue collar | 1.00 | 1.40 | (1.13–1.74)* | 1.24 | (1.01–1.52)* |
| Pink collar | 1.00 | 1.44 | (1.20–1.74)* | 1.14 | (1.01–1.28)* |
| Working hours (per week) | | | | | |
| ≤52 | 1.00 | 1.35 | (1.18–1.54)* | 1.12 | (1.00–1.26)* |
| >52 | 1.00 | 1.89 | (1.03–3.45)* | 1.16 | (1.00–1.34)* |

CI, confidence interval; OR, odds ratio.

* $p < 0.05$.

with a low income, but this result was only significant in men (males: OR = 1.23, 95% CI = 1.09–1.39; females: OR = 1.05, 95% CI = 0.93–1.01). Participants who worked more than 52 hours per week, those who were not satisfied with their working condition, and those who had whole body fatigue had higher ORs than those who worked less than 52 hours per week, those who were satisfied with their working condition, and those who had not had whole body fatigue.

Table 3 presents the results of the multiple logistic regression analysis of the association between work hour mismatch and depression stratified by employment type, job classification, and work hours. Self-employed men and women who were underemployed had a higher OR compared with those who were overemployed and matched working hours (males: OR = 1.54, 95% CI = 1.26–1.87; females: 95% OR = 1.38, CI = 1.05–1.81). Blue collar and pink collar underemployed workers had significantly higher ORs, both men and women, than matched hour workers. Participants who worked more than 52 hours per week and underemployed had a higher ORs; however, these results are statistically significant only among women (males: OR = 1.52, 95% CI = 0.94–2.45; females: OR = 1.89, 95% CI = 1.03–3.45).

Fig. 1 shows the results of the association between a work hour mismatch and depression stratified by income level. Men and women with high income and who were underemployed had higher a OR than matched hour worker (males: OR = 1.40, 95% CI = 1.10–1.79; females: 95% OR = 1.71, CI = 1.21–2.42).

Fig. 2 presents the results regarding the association between work hour mismatch and depression according to discrepancy work hours. The greater the discrepancy between actual and preferred work hours, the higher the OR among both underemployed and overemployed workers. However, the OR decreased

slightly for 30 hours or more overemployment in men and women (males: OR = 1.31, 95% CI = 1.02–1.68, females: OR = 1.40, 95% CI = 1.04–1.90).

4. Discussion

In this study, we examined the association between work hour mismatch and depression. The main finding of the study suggests that a discrepancy between actual and preferred numbers of work hours is related to a risk of depression. Specifically, underemployed participants had a higher risk of depression than overemployed participants. Participants who worked more than the legal number of work hours and those who were underemployed had higher ORs for depression. In addition, participants with a high income and those who were underemployed had higher ORs. The greater the discrepancy between actual and preferred work hours, the greater the risk of depression. These results are statistically significant in both men and women.

Work has long been regarded as an important facet of mental health identity [19]. It has been argued that employment provides latent benefits, including a time structure for the waking day, regular contact with people outside the nuclear family, and involvement in shared goals. However, under the pressure of economic rationalism, workforce numbers have decreased, even though the amount of work to be performed in general has not, which has resulted in both overemployment and underemployment.

Interesting finding of this study was that participants who worked fewer hours than desired are associated with depression. This can be explained by experiencing more chronic disease, low positive self-concept, and low job satisfaction [20]. The more interesting finding is that who worked more than legal number of hours as well as those who were underemployed had a higher risks of depression compared with overemployed workers. This results can be explained by workaholism, a colloquial term used in the popular press, and research literature to describe people who are addicted to work [21]. Previous studies revealed that workaholism is associated with mental health problem [22,23]. Similarly, high income level and underemployment were associated with a higher risks of depression compared with overemployment. Previous research has shown that workaholism tends to be associated with higher income [24]. Based on these results, Korea underemployed workers may also be caused by work addiction as well as part-time job or temporary work.

4.1. Comparison with other studies

Previous research on the association between work hour mismatch and psychological well-being consist of a range of different countries using diverse control variables. Research show that both overemployment and underemployment associated with well-being. Most previous studies suggest that overemployment has more impact than underemployment [2,9]. Our study also found similar outcomes but suggest that underemployment is more likely associated with depression in Korean workers. Although another study found that there was no associations between becoming underemployed and lower subjective well-being for men who worked more than 40 hours a week [12], we found that male participants who worked more than 52 hours per week and underemployed had a higher chance of depression. Compared with other studies, we include various health-related characteristics and work environment variables to validate our results.

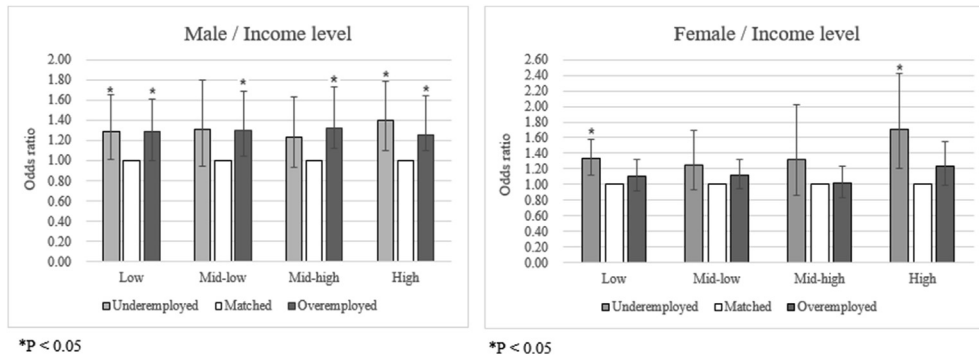


Fig. 1. Subgroup analysis of work hour mismatch and depression stratified by income level.

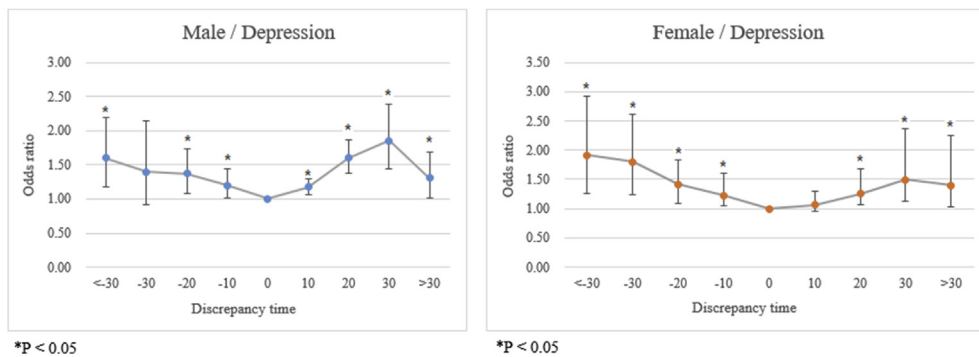


Fig. 2. Subgroup analysis of work hour mismatch and depression by discrepancy time.

4.2. Implications of the findings

We postulate that the findings from this study is enough to support improvement of working hours. Previous studies showed that workplace productivity associated with poor mental health are substantial [25] and that depression associated with more work-related loss and work cutback days compared with most other chronic medical conditions [26,27]. As workers struggle with the symptoms of their disorders, their coworkers and supervisors will also be affected. Previous studies have shown that workers suffering from depression are more likely to have difficulty focusing on tasks and meeting their quotas [28,29] and that workers with poor mental health functioning are more likely to plan early retirement [30]. As workers' mental health affect not only individuals but also workplace, we should pay more attention to work hour mismatch.

4.3. Limitations and strengths

This study has a few limitations. First, because we used 1-year cross-sectional data, we could not rule out potential reverse causality. Thus, the results should be interpreted carefully, and further research is needed to evaluate the association between work hour mismatches and depression from a longitudinal perspective. Second, the data were collected by a self-reported survey and, therefore, may have been subjected to recall bias. Third, all variables affecting the results may not have been included in our analyses despite, incorporating several covariates.

Despite these limitation, this study also has strengths. First, we used data based on a nationwide survey representing the South Korean working population. Using this large-scale sample increases the external validity of this study and provides more representative results. Second, compared with previous study, this study focuses

on the work hour mismatch and depression with consideration of the demographic characteristics, health status, and various working conditions of Korean workers. Controlling those variables enabled us to obtain more precise results. Third, unlike previous studies, we observe that underemployment is more negatively associated with depression than overemployment. Especially, participants who worked more than the legal number of work hours and who have high income level are associated with higher depression. This results are unique because they show that work addiction is highly associated with depression in Korea.

4.4. Conclusion

In conclusion, this study identified an association between work hour mismatch and depression according to sex, and the results were significant. We found that overemployment as well as underemployment negatively affected the mental health of workers. Thus, it is important to reduce work hour mismatches to improve the mental health of workers. Individuals should be allowed to determine their own work hours.

Conflicts of interest

The authors declare no conflict of interest.

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