

Original Article



# Factors related to depressive symptoms in Korean self-employed workers

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Received: Mar 12, 2021

Accepted: Jun 13, 2021

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**Abbreviations**

aOR: adjusted odds ratio; CI: confidence interval; EU: European Union; EWCS: European Working Conditions Survey; ISCO: International Standard Classification of Occupations; KOSHA: Korea Occupational Safety and Health Agency; KSCO: Korea Standard Classification of Occupations; KWCS: Korea Working Conditions Survey; PPS: probability proportional to size.

## ABSTRACT

**Background:** We examined factors related to depressive symptoms in Korean self-employed workers.

**Methods:** This secondary analysis examined data of 14,454 self-employed individuals from the fifth Korean Working Conditions Survey (2017). Multiple logistic regression analysis was used to assess the relationship of depressive symptoms with different variables.

**Results:** Self-employed workers who had a good work-life balance, a good subjective health, and worked 40 to 48 hours or 48 to 60 hours/week were less likely to report depressive symptoms (all  $p < 0.05$ ). However, those who always interacted with angry clients, had severe exposure to ergonomic risk factors, and were exposed to moderate or severe abusive behaviors were more likely to report depressive symptoms (all  $p < 0.05$ ). Age, gender, weekly work days, and working at very fast speed were unrelated to depressive symptoms.

**Conclusions:** Several factors known to be related to depressive symptoms do not lead to depression in self-employed individuals. Different interventions may therefore be needed to prevent depression in self-employed workers.

**Keywords:** Depression; Ergonomics; Occupational groups

## BACKGROUND

Depression is a major problem in modern society, and many affected individuals may experience various symptoms and disabilities that contribute to poor work performance. Depressive symptoms can also cause other mental health problems and even physical problems, such as heart diseases.<sup>1,2</sup> Depression is a huge societal burden that is associated with significant economic cost.<sup>3</sup> Depressive symptoms can appear in workers in various workplaces, and multiple studies are currently using different approaches to examine the underlying causes. Because the prevalence of depressive symptoms is increasing, other studies are examining the different characteristics of this condition. In particular, there is an urgent need to understand the association of the work environment with depressive symptoms.

During 2009, workers who were self-employed (independent workers who had no waged employees) accounted for about 10% of all workers in Europe, ranging from 4% in Estonia to 21% in Greece. Analysis of the entire European Union (EU) indicated a slight decline in the

**Competing interests**

The authors declare that they have no competing interests.

**Author contributions**

Conceptualization: Park J, Kim Y; Data curation: Kim AR; Writing - original draft: Kim H; Writing - review & editing: Kim Y.

percentage of self-employed workers since 2005.<sup>4</sup> The proportion of self-employed workers in Korea is greater than in the EU, although Korea also experienced a decline of self-employed workers from 1998 (24.1%) to 2020 (15.5%).<sup>5</sup>

Self-employed people are classified as “employers” (23%), “small traders and farmers” (25%), “stable own-account workers” (26%), “vulnerable workers” (17%), or “concealed workers” (8%) in the EU.<sup>4</sup> Individuals in the EU who were classified as “stable own-account workers” had more education and greater income, and were more likely to be self-employed because of personal preference, in contrast to “small traders and farmers”.<sup>4</sup> In Korea, however, “employers” are not considered to be self-employed, whereas “vulnerable” and “concealed” workers are considered as waged employees. Thus, about 80% of self-employed workers in Korea are farmers and owners of small shops and restaurants.<sup>6</sup>

Few studies have examined factors related to depression in self-employed workers. One study suggested that models examining the effect of work on mental health and well-being should differ for entrepreneurs, because entrepreneurs have greater autonomy than employed workers.<sup>7</sup> Specifically, entrepreneurs can make decisions about what, when, and with whom to work, and have high work demands that require intense effort and concentration.<sup>7</sup>

Starting entrepreneurs who experienced high demands and worked longer hours were found to be more satisfied with their work,<sup>8</sup> because they interpreted increased demand as an indicator that their businesses were doing well. A large multi-national study of entrepreneurs also found a positive association between long working hours and improved mental health and well-being.<sup>9</sup> These findings suggest that entrepreneurs regard longer working hours as a challenge stressor, defined as a stressor regarded as providing opportunities for future achievement. These studies, which included both employers and self-employed individuals, suggest that job demands, such as longer working hours, have a positive effect on the well-being of self-employed persons. A European study comparing the mental well-being of employers with other self-employed individuals, including farmers, dependent freelancers, and own-account workers, found that mental well-being was poorer in the latter individuals than in employers of medium-to-large sized businesses.<sup>10</sup>

Although necessity entrepreneurs, defined as individuals transitioning from unemployment to self-employment, had improved mental health but not physical health, opportunity entrepreneurs, defined as individuals transitioning from regular employment to self-employment, showed improvements in both physical and mental health.<sup>11</sup> These findings suggested that the reason for being self-employed may be a factor associated with well-being in self-employed workers. A systematic review reported that the four most-cited influences on the mental health of farmers were pesticide exposure, financial difficulties, climate variabilities and drought, and poor physical health and past injuries.<sup>12</sup>

Self-employed individuals usually choose their work arrangements, thereby optimizing their autonomy. Thus, self-employment is more conducive to balancing work and family demands, especially for women.<sup>13,14</sup>

We used representative data from the fifth Korea Working Conditions Survey (KWCS) to identify factors related to depressive symptoms in self-employed workers in Korea. In addition, we investigated whether the factors related to depressive symptoms differ among occupational classes.

## METHODS

### Data source

All data were from a secondary analysis of the fifth KWCS, which was performed by the Korea Occupational Safety and Health Agency (KOSHA) from June to September in 2017. This triennial survey has high content validity and reliability,<sup>15</sup> and it assesses working conditions, exposure to hazards, and work-related health problems at workplaces throughout Korea. The study population was representative of all Korean individuals who were at least 15 years-old and worked during the survey period. A worker was defined as a person who worked for pay or profit for at least 1 h during the week preceding the interview. Retirees, the unemployed, homemakers, and students were excluded. The KWCS is similar to the European Working Conditions Survey (EWCS).

### Study subjects

After excluding foreign workers, employers, and waged workers from the 50,205 individuals in the KWCS there were 14,454 Korean self-employed workers in the study sample. A “self-employed” was worker classified as an individual who worked alone or with family members and had no employees. Family members who worked with a self-employed individual were not included as study subjects. After explanation of the survey, each participant provided written informed consent prior to participation. This research was approved by the Institutional Review Board (IRB) of Ulsan University Hospital (IRB file No. 2020-06-007).

### Measurements

#### *Dependent variable*

The following yes-or-no question was used to assess depressive symptoms: “Have you suffered from depressive symptoms during the past 12 months?” Respondents who responded “yes” were classified as having experienced depression.

#### *Independent variables*

The following demographic and socioeconomic factors were analyzed: sex, age (< 40 years, 40–49 years, 50–59 years, ≥ 60 years), education (no high school graduation, high school graduation, college or more), and monthly income (< 1,000 USD, 1,000–2,000 USD, 2,000–3,000 USD, 3,000–4,000 USD, ≥ 4,000 USD).

There were 4 occupational classes: “Managers, professionals, clerks,” “Service and sales workers,” “Agriculture, forestry and fisheries workers,” “Other manual workers.” The first 2 classes were classified as non-manual jobs and the other two as manual jobs. Manual workers were further classified as “Skilled workers related to agriculture, forestry and fisheries,” or “Other manual workers.” The “Other manual workers” were classified into 3 of the 9 major groups in the Korea Standard Classification of Occupations (KSCO)<sup>16</sup> and the International Standard Classification of Occupations (ISCO)<sup>17</sup> as “Craft and related trade workers,” “Workers related to equipment, machine operating and assembling,” and “Elementary occupations” (unskilled manual workers). Non-manual workers were categorized as “Managers, professionals and related workers, and clerks” or “Service and sales workers.” Finally, all study subjects were classified into 4 occupational classes: “Managers, professionals and related workers, and clerks,” “Service and sales workers,” “Skilled workers related to agriculture, forestry and fisheries,” and “Other manual workers.” Initial analysis of the 14,454 self-employed individuals indicated that only 0.1% were managers and only 0.5% were clerks; these subjects were therefore excluded from further analysis.

The remaining study subjects were classified into 4 occupational classes: professionals and related workers (hereinafter professionals), service and sales workers (hereinafter small-scale shop/restaurant owners), skilled workers in jobs related to agriculture, forestry and fisheries (hereinafter farmers because farmers accounted for 95.7% of this class), and other manual workers (hereinafter craftsmen).

Subjects were classified into 4 groups according to average weekly working time (< 40, ≥ 40 to < 48, ≥ 48 to < 60, ≥ 60 hours) and into two 2 groups according to weekly work days (< 6, ≥ 6 days). Work duration in years was classified into 3 groups, < 10, ≥ 10 to < 20, and ≥ 20. The frequency of working at very high speed was assessed by asking: “Does your job involve working at very high speed?” The response options were “always,” “almost always,” “75% of the time,” “50% of the time,” “25% of the time,” “almost never,” or “never.” For analysis, the first 5 responses (≥ 25%) were classified as “yes” and the last 2 responses as “no.” Work life balance was assessed by asking: “In general, how do your working hours fit in with your family or social commitments outside work?” The response options were: “very well,” “well,” “not very well,” or “not at all well.” For analysis, the first 2 responses were classified as “good” and the last 2 responses as “poor.” The motivation for being self-employed was classified as “personal choice” or “no other alternative.” Interaction with angry clients was classified by duration. Interaction with angry clients all the time or almost all the time was classified as “always,” interaction at least a quarter of the time as “frequent,” and rare or no interaction as “rare.” Exposure to ergonomic factors was assessed by asking if the work required exhausting or painful postures; pushing, pulling, or moving heavy materials; or repetitive hand or arm movements. Performing these tasks more than quarter of time was classified as “yes” and less than a quarter of the time as “no.” Exposure to 3 ergonomic factors was classified as “severe,” exposure to 1 or 2 factors as “moderate,” and no exposure as “none.” Exposure to ≥ 2 ergonomic factors was classified as “yes,” whereas exposure to 0–1 factor was classified as “no” when individuals were stratified by occupational class, thereby avoiding too small numbers in each category. Exposure to abusive behaviors was assessed by asking whether the individual experienced verbal abuse, was harmed by unwanted sexual comments, felt threatened, was subjected to insulting behaviors, experienced physical violence, or experienced sexual harassment. Participants who answered “yes” to at least 2 of these items were classified as having “severe exposure,” and those who answered “yes” to 1 item were classified as having “moderate exposure.” Exposure to ≥ 2 abusive behaviors was classified as “yes,” whereas exposure to 0–1 factor was classified as “no” when individuals were stratified by occupational class to avoid too small numbers in each category. Self-reported health status was assessed by asking: “How is your health in general?” The possible responses were “very good,” “good,” “fair,” “bad,” or “very bad.” The first 2 responses were classified as “good” and the last 3 as “bad.”

### Statistical analysis

The  $\chi^2$  test was used to compare the demographic, socioeconomic, and psychosocial work factors of participants who had different occupational classes, and to compare the prevalence rate of depressive symptoms of participants who had different occupational classes by the various variables. Then, multiple logistic regression was used to calculate adjusted odds ratios (aORs) and 95% confidence intervals (95% CIs) for the relationship of depressive symptoms with various independent variables. Crude models showed the relationships of depressive symptoms with occupational classes. Model 1 showed the relationship after adjustment for demographic and socioeconomic factors (age, sex, education, income, and income change). Model 2 showed this relationship after adjustment for psychosocial work factors (weekly work hours, weekly work days, working at very high speed, work duration, motivation for becoming

self-employed, work-life balance, exposure to ergonomic risk factors, exposure to abusive behavior, interacting with angry clients, and subjective health) in addition to the covariates in Model 1. Multiple logistic regression analyses were performed to calculate aORs and 95% CIs for the relationship of depressive symptoms with independent variables by stratification of occupational classes. In these analyses, some variables with too small numbers were not considered, and some categories were collapsed for statistical testing.

## RESULTS

Higher percentages of farmers were older and had less education, lower monthly incomes, greater exposure to ergonomic risk factors, a good work-life balance, longer work duration, and depressive symptoms (all  $p < 0.001$ ). Higher percentages of shop/restaurant owners were women and worked  $\geq 60$  hours/day and  $\geq 6$  days/week, with greater interacting with angry clients. Higher percentages of craftsmen were men, working at very high speed and having greater exposure to abusive behaviors. Higher percentages of professionals became self-employed by personal choice and had good subjective health (Table 1).

We next examined the prevalence rate of depressive symptoms of participants who had different occupational classes by the demographic, socioeconomic, and psychosocial work factors (Table 2). A total of 506 participants (3.5%) of the 14,454 Korean self-employed workers in the KWCS reported they experienced depressive symptoms during previous 12 months. Depression was more common in women; the elderly; in those who had less education, low monthly incomes, short weekly work hours ( $< 40$  hours), poor work-life balance, greater interactions with angry clients, greater exposure to abusive behaviors, greater exposure to ergonomic factors, bad subjective health, and longer work duration. A cross-analysis of depressive symptoms indicated significant differences in gender, age, education level, monthly income, working hours per week, work duration, motivation for being self-employed, work-life balance, interaction with angry clients, exposure to ergonomic factors, exposure to abusive behavior, and subjective health (all  $p < 0.001$ ). Weekly work days, and working at a very fast speed were unrelated to depressive symptoms.

When stratified by occupational classes, depression was more common in female than in male farmers and craftsmen. Assessments of shop/restaurant owners, farmers, and craftsmen showed that depression was more common in elderly than in younger persons and in those who had less education and lower monthly incomes. Depression was also more common in shop/restaurant owners with more than fewer weekly working days and in those who worked  $\geq 60$  than  $< 60$  hours/week. However, depression was more common in farmers with fewer than more weekly working days and in farmers and craftsmen who worked  $< 40$  than  $\geq 40$  hours/week. Depression was more common in professionals, shop/restaurant owners, and farmers who were involuntarily rather than voluntarily self-employed. Depression in shop/restaurant owners and craftsmen was more common among those with poor work-life balance, those who interacted more frequently with angry clients, and those with greater exposure to ergonomic risk factors and abusive behaviors. Depression in farmers was more common in those with longer work duration. In all occupational classes, depression was less common in those with good subjective health.

Next, we performed a multivariate logistic regression analysis of factors associated with depressive symptoms after adjustment for other variables (Table 3). Depressive symptoms

## Factors related to depressive symptoms in self-employed

**Table 1.** Demographic, socioeconomic, and psychosocial work-related factors of self-employed workers in different occupational classes

Characteristics	Professionals	Small shop/ restaurant owners	Farmers	Craftsmen	Total	p-value
Sex						< 0.001
Male	539 (49.6)	2,030 (31.5)	2,074 (55.4)	2,305 (74.6)	6,948 (48.4)	
Female	547 (50.4)	4,414 (68.5)	1,668 (44.6)	783 (25.4)	7,412 (51.6)	
Age (year)						< 0.001
< 40	200 (18.4)	836 (13.0)	35 (0.9)	198 (6.4)	1,269 (8.8)	
≥ 40 to < 50	345 (31.8)	1,567 (24.3)	167 (4.5)	567 (18.4)	2,646 (18.4)	
≥ 50 to < 60	360 (33.1)	2,371 (36.8)	511 (13.7)	1,196 (38.7)	4,438 (30.9)	
≥ 60	181 (16.7)	1,670 (25.9)	3,029 (80.9)	1,127 (36.5)	6,007 (41.8)	
Education						< 0.001
< High school	26 (2.4)	1,161 (18.1)	2,664 (71.3)	791 (25.6)	4,642 (32.4)	
= High school	283 (26.1)	3,524 (54.8)	892 (23.9)	1,784 (57.8)	6,483 (45.2)	
> High school	775 (71.5)	1,746 (27.1)	179 (4.8)	512 (16.6)	3,212 (22.4)	
Monthly income (USD)						< 0.001
< 1,000	35 (3.3)	265 (4.2)	1,599 (43.2)	207 (6.8)	2,106 (14.9)	
1,000 to < 2,000	181 (16.9)	1,513 (23.9)	1,154 (31.2)	664 (21.7)	3,512 (24.8)	
2,000 to < 3,000	294 (27.5)	2,221 (35.1)	600 (16.2)	934 (30.6)	4,049 (28.6)	
3,000 to < 4,000	327 (30.6)	1,515 (23.9)	213 (5.8)	740 (24.2)	2,795 (19.7)	
≥ 4,000	231 (21.6)	818 (12.9)	133 (3.6)	511 (16.7)	1,693 (12.0)	
Weekly work days						< 0.001
< 6	389 (35.9)	695 (10.8)	1,486 (40.0)	855 (27.8)	3,425 (24.0)	
≥ 6	695 (64.1)	5,720 (89.2)	2,229 (60.0)	2,222 (72.2)	10,866 (76.0)	
Weekly working hour						< 0.001
< 40	241 (22.3)	489 (7.6)	1,877 (50.5)	429 (13.9)	3,036 (21.2)	
≥ 40 to < 48	226 (20.9)	591 (9.2)	769 (20.7)	510 (16.6)	2,096 (14.7)	
≥ 48 to < 60	352 (32.5)	1,964 (30.6)	640 (17.2)	968 (31.5)	3,924 (27.4)	
≥ 60	264 (24.4)	3,380 (52.6)	431 (11.6)	1,170 (38.0)	5,245 (36.7)	
Working at very fast speed						< 0.001
Yes	394 (36.3)	2,852 (44.3)	1,380 (36.9)	1,803 (58.4)	6,429 (44.8)	
No	692 (63.7)	3,591 (55.7)	2,362 (63.1)	1,285 (41.6)	7,930 (55.2)	
Reason for being self-employed						< 0.001
Personal choice	977 (96.0)	5,502 (93.2)	2,846 (90.6)	2,591 (92.7)	11,916 (92.7)	
No other alternative	41 (4.0)	401 (6.8)	297 (9.4)	204 (7.3)	943 (7.3)	
Working-life balance						< 0.001
Good	870 (80.3)	3,784 (58.8)	3,144 (84.2)	2,047 (66.4)	9,845 (68.7)	
Bad	213 (19.7)	2,648 (41.2)	591 (15.8)	1,037 (33.6)	4,489 (31.3)	
Interaction with angry clients						< 0.001
Always	59 (5.4)	374 (5.8)	44 (1.2)	129 (4.2)	606 (4.2)	
Sometimes	214 (19.7)	1,599 (24.8)	198 (5.3)	711 (23.0)	2,722 (19.0)	
Rare	811 (74.8)	4,467 (69.4)	3,494 (93.5)	2,247 (72.8)	11,019 (76.8)	
Exposure to abusive behavior						< 0.001
Severe	10 (0.9)	164 (2.6)	0 (0.0)	92 (3.0)	266 (1.9)	
Moderate	21 (1.9)	257 (4.0)	3 (0.1)	122 (4.0)	403 (2.8)	
None	1,052 (97.1)	6,008 (93.5)	3,736 (99.9)	2,870 (93.1)	13,666 (95.3)	
Exposure to ergonomic factors						< 0.001
None	408 (37.6)	1,179 (18.3)	120 (3.2)	196 (6.4)	1,903 (13.3)	
Moderate	624 (57.6)	3,708 (57.6)	1,205 (32.2)	1,580 (51.2)	7,117 (49.6)	
Severe	52 (4.8)	1,551 (24.1)	2,417 (64.6)	1,310 (42.4)	5,330 (37.1)	
Subjective health						< 0.001
Good	821 (75.6)	4,063 (63.1)	1,369 (36.6)	1,798 (58.2)	8,051 (56.1)	
Bad	265 (24.4)	2,381 (36.9)	2,372 (63.4)	1,290 (41.8)	6,308 (43.9)	
Work duration (year)						< 0.001
< 10	562 (53.1)	3,144 (50.0)	410 (11.2)	1,034 (34.2)	5,150 (36.7)	
≥ 10 to < 20	341 (32.2)	1,833 (29.2)	437 (12.0)	973 (32.2)	3,584 (25.6)	
≥ 20	155 (14.7)	1,310 (20.8)	2,804 (76.8)	1,015 (33.6)	5,284 (37.7)	
Depressive symptoms						< 0.001
Yes	23 (2.1)	208 (3.2)	178 (4.8)	95 (3.1)	504 (3.5)	
No	1,063 (97.9)	6,228 (96.8)	3,561 (95.2)	2,989 (96.9)	13,841 (96.5)	

HS: high school.

## Factors related to depressive symptoms in self-employed

**Table 2.** The prevalence of depressive symptoms by various variables in self-employed workers with different occupational classes

Characteristics	Professionals	Small shop/ restaurant owners	Farmers	Craftsmen	Total
<b>Sex</b>					
Male	14 (2.6)	60 (3.5)	60 (2.9)	57 (2.5)	192 (2.7)
Female	9 (1.6)	148 (3.4)	118 (7.1)	38 (4.9)	314 (4.2)
<i>p</i> -value	0.276	0.406	< 0.001	0.001	< 0.001
<b>Age</b>					
< 40	5 (2.5)	17 (2)	0 (0)	4 (2)	26 (2)
≥ 40 to < 50	10 (2.9)	35 (2.2)	2 (1.2)	11 (1.9)	58 (2.2)
≥ 50 to < 60	4 (1.1)	73 (3.1)	9 (1.8)	33 (2.8)	120 (2.7)
≥ 60	4 (2.2)	83 (5)	167 (5.5)	47 (4.2)	302 (5)
<i>p</i> -value	0.404	< 0.001	< 0.001	0.043	< 0.001
<b>Education</b>					
< High school	2 (7.7)	64 (5.5)	165 (6.2)	38 (4.8)	269 (5.8)
= High school	7 (2.5)	105 (3)	11 (1.2)	46 (2.6)	171 (2.6)
> High school	14 (1.8)	38 (2.2)	2 (1.1)	11 (2.1)	65 (2)
<i>p</i> -value	0.109	< 0.001	< 0.001	0.004	< 0.001
<b>Monthly income (USD)</b>					
< 1,000	2 (5.7)	16 (6.1)	116 (7.3)	19 (9.2)	153 (7.3)
≥ 1,000 to < 2,000	2 (1.1)	75 (5)	45 (3.9)	26 (3.9)	148 (4.2)
≥ 2,000 to < 3,000	4 (1.4)	53 (2.4)	7 (1.2)	22 (2.4)	88 (2.2)
≥ 3,000 to < 4,000	7 (2.1)	36 (2.4)	3 (1.4)	18 (2.4)	64 (2.3)
≥ 4,000	8 (3.5)	18 (2.2)	4 (3)	8 (1.6)	38 (2.2)
<i>p</i> -value	0.214	< 0.001	< 0.001	< 0.001	< 0.001
<b>Weekly work days</b>					
< 6	7 (1.8)	8 (1.2)	84 (5.7)	24 (2.8)	124 (3.6)
≥ 6	16 (2.3)	197 (3.4)	91 (4.1)	70 (3.2)	375 (3.4)
<i>p</i> -value	0.582	0.001	0.027	0.615	0.723
<b>Weekly working hour</b>					
< 40	5 (2.1)	15 (3.1)	125 (6.7)	25 (5.9)	170 (5.5)
≥ 40 to < 48	2 (0.9)	8 (1.4)	23 (3)	11 (2.2)	46 (2.2)
≥ 48 to < 60	8 (2.3)	46 (2.3)	23 (3.6)	17 (1.8)	94 (2.4)
≥ 60	8 (3)	137 (4.1)	5 (1.2)	39 (3.3)	189 (3.6)
<i>p</i> -value	0.431	< 0.001	< 0.001	< 0.001	< 0.001
<b>Working at very fast speed</b>					
Yes	10 (2.5)	96 (3.4)	66 (4.8)	60 (3.3)	233 (3.6)
No	13 (1.9)	112 (3.1)	112 (4.7)	35 (2.7)	273 (3.4)
<i>p</i> -value	0.468	0.576	0.949	0.336	0.525
<b>Reason for being self-employed</b>					
Personal choice	18 (1.8)	154 (2.8)	103 (3.6)	69 (2.7)	346 (2.9)
No other alternative	3 (7.3)	23 (5.7)	21 (7.1)	9 (4.4)	56 (5.9)
<i>p</i> -value	0.016	0.001	0.003	0.141	< 0.001
<b>Working-life balance</b>					
Good	17 (2)	87 (2.3)	142 (4.5)	54 (2.6)	302 (3)
Poor	6 (2.8)	121 (4.6)	36 (6.1)	41 (4)	204 (4.5)
<i>p</i> -value	0.434	< 0.001	0.100	0.044	< 0.001
<b>Interaction with angry clients</b>					
Always	0 (0)	28 (7.5)	0 (0)	7 (5.4)	35 (5.7)
Sometimes	6 (2.8)	60 (3.8)	4 (2)	31 (4.4)	101 (3.7)
Rare	17 (2.1)	120 (2.7)	174 (5)	57 (2.5)	370 (3.3)
<i>p</i> -value	0.415	< 0.001	0.054	0.014	0.006
<b>Exposure to abusive behavior</b>					
Severe	3 (30)	24 (14.6)	0 (0)	10 (10.9)	37 (13.8)
Moderate	1 (4.8)	22 (8.6)	0 (0)	3 (2.5)	26 (6.4)
None	19 (1.8)	160 (2.7)	178 (4.8)	82 (2.9)	441 (3.2)
<i>p</i> -value	< 0.001	< 0.001	0.698	< 0.001	< 0.001
<b>Exposure to ergonomic factors</b>					
Severe	1 (1.9)	69 (4.5)	123 (5.1)	58 (4.4)	252 (4.7)
Moderate	14 (2.2)	108 (2.9)	53 (4.4)	34 (2.2)	209 (2.9)
None	8 (2)	31 (2.6)	2 (1.7)	3 (1.5)	45 (2.3)
<i>p</i> -value	0.949	0.007	0.176	0.001	< 0.001

(continued to the next page)

## Factors related to depressive symptoms in self-employed

**Table 2.** (Continued) The prevalence of depressive symptoms by various variables in self-employed workers with different occupational classes

Characteristics	Professionals	Small shop/ restaurant owners	Farmers	Craftsmen	Total
Subjective health					
Good	10 (1.2)	80 (2)	25 (1.8)	23 (1.3)	139 (1.7)
Bad	13 (4.9)	128 (5.4)	153 (6.5)	72 (5.6)	367 (5.8)
p-value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Work duration (year)					
< 10	8 (1.4)	87 (2.8)	10 (2.4)	30 (2.9)	135 (2.6)
≥ 10 to < 20	13 (3.8)	68 (3.7)	16 (3.7)	31 (3.2)	130 (3.6)
≥ 20	2 (1.3)	48 (3.7)	148 (5.3)	33 (3.3)	231 (4.4)
p-value	0.042	0.118	0.022	0.884	< 0.001

Notes: Numbers in cell; no. of workers with depressive symptoms (rate of workers with depressive symptoms per 100 workers).

were more common in farmers (crude model) and women, less common in high school graduates and those with more education than in non-graduates, and less common those in higher income groups than in the lowest income group (Model 1). These associations, however, disappeared after adjustment for psychosocial work factors (Model 2). Depressive symptoms were less common in those with a good work-life balance, those who worked 40 to 48 or 48 to 60 hours/week relative to less than 40 hours/week, those with good than poor subjective health, and farmers relative to professionals. In contrast, depressive symptoms were more common in those who became self-employed involuntarily rather than voluntarily, those who always rather than never interacted with angry clients, those who were than were not exposed to severe ergonomic risk factors, those who were than were not exposed to moderate or severe abusive behavior, and those who worked for 10–20 years than < 10 years (Model 2). Weekly work days and working at very fast speed were unrelated to depressive symptoms.

We also examined differences in the factors related to depressive symptoms among different occupational classes of self-employed individuals (Table 4). Self-employed professionals had no psychosocial work factors related to depressive symptoms. Among shop/restaurant owners, depressive symptoms were more common in subjects who involuntarily rather than voluntarily became self-employed, in those who always than never interacted with angry clients, and in individuals who were than were not exposed to abusive behavior, but were less common in those with a good than a poor work-life balance. Depressive symptoms were more common in those who became farmers involuntarily rather than voluntarily, in farmers who worked < 40 than ≥ 40 hours/week, in those with greater exposure to ergonomic risk factors, and in farmers with a poor than a good work-life balance. Among craftsmen, depressive symptoms were more common in those who frequently interacted with angry clients, and in those exposed to abusive behaviors and ergonomic risk factors.

Analysis of the factors related to depressive symptoms according to the reason for being self-employed showed that those who became voluntarily self-employed showed typical findings on the relationship between depression and psychosocial work factors as observed in total self-employed (data not shown).

## DISCUSSION

Self-employed workers with good work-life balance were less likely to experience depressive symptoms, in agreement with a previous study on self-employed including employers.<sup>13</sup> Self-employed workers who always interacted with angry clients were more



## Factors related to depressive symptoms in self-employed

**Table 3.** Adjusted odds ratios and 95% confidence intervals for the relationships of different variables with depressive symptoms in self-employed workers

Variables	Crude model	Model 1	Model 2
<b>Occupational class</b>			
Professionals	1.0 (reference)	1.0 (reference)	1.0 (reference)
Small shop/restaurant owners	1.544 (0.999–2.386)	1.089 (0.687–1.727)	0.705 (0.422–1.177)
Farmers	2.310 (1.488–3.586)	0.792 (0.478–1.312)	0.504 (0.279–0.911)
Craftsmen	1.469 (0.927–2.329)	1.065 (0.649–1.748)	0.611 (0.349–1.067)
<b>Gender</b>			
Men		1.0 (reference)	1.0 (reference)
Women		1.363 (1.111–1.672)	1.147 (0.906–1.453)
<b>Age (years)</b>			
< 40		1.0 (reference)	1.0 (reference)
≥ 40 to < 50		0.997 (0.620–1.605)	0.838 (0.498–1.410)
≥ 50 to < 60		1.023 (0.645–1.621)	0.726 (0.432–1.221)
≥ 60		1.334 (0.822–2.165)	1.018 (0.585–1.772)
<b>Education</b>			
< High school		1.0 (reference)	1.0 (reference)
= High school		0.672 (0.513–0.880)	0.838 (0.610–1.152)
> High school		0.559 (0.375–0.833)	0.888 (0.562–1.405)
<b>Monthly income (USD)</b>			
< 1,000		1.0 (reference)	1.0 (reference)
≥ 1,000 to < 2,000		0.634 (0.488–0.824)	0.784 (0.564–1.090)
≥ 2,000 to < 3,000		0.366 (0.264–0.508)	0.469 (0.314–0.701)
≥ 3,000 to < 4,000		0.446 (0.308–0.647)	0.632 (0.405–0.986)
≥ 4,000		0.471 (0.306–0.725)	0.627 (0.380–1.035)
<b>Weekly work days</b>			
< 6			1.0 (reference)
≥ 6			1.233 (0.912–1.667)
<b>Weekly working hours</b>			
< 40			1.0 (reference)
≥ 40 to < 48			0.484 (0.320–0.731)
≥ 48 to < 60			0.536 (0.368–0.781)
≥ 60			0.809 (0.562–1.163)
<b>Working at very fast speed</b>			
Yes			1.0 (reference)
No			0.959 (0.763–1.204)
<b>Reason for being self-employed</b>			
Personal choice			1.0 (reference)
No other alternative			1.789 (1.302–2.458)
<b>Working-life balance</b>			
Poor			1.0 (reference)
Good			0.695 (0.546–0.885)
<b>Interaction with angry clients</b>			
Rare			1.0 (reference)
Frequent			1.143 (0.857–1.525)
Always			2.202 (1.452–3.340)
<b>Exposure to abusive behavior</b>			
None			1.0 (reference)
Moderate			2.350 (1.466–3.765)
Severe			5.412 (3.473–8.434)
<b>Exposure to ergonomic factors</b>			
None			1.0 (reference)
Moderate			1.322 (0.876–1.995)
Severe			1.861 (1.203–2.878)
<b>Subjective health</b>			
Bad			1.0 (reference)
Good			0.361 (0.282–0.462)
<b>Work duration (year)</b>			
< 10			1.0 (reference)
≥ 10 to < 20			1.398 (1.032–1.893)
≥ 20			1.264 (0.916–1.743)

Model 1: adjusted for age, gender, education and income. Model 2; adjusted for psychosocial work factors plus covariates in Model 1.

## Factors related to depressive symptoms in self-employed

**Table 4.** Adjusted odds ratios and 95% confidence intervals for the relationships of different variables with depressive symptoms in self-employed workers with different occupational class

Variables	Professionals	Small shop/restaurant owners	Farmers	Craftsmen
Weekly work days ≥ 6 vs. < 6 (ref.)	0.577 (0.138–2.419)		0.986 (0.654–1.484)	1.084 (0.575–2.042)
Working at very fast speed Yes vs. No (ref.)	1.155 (0.492–2.714)	0.984 (0.700–1.384)	0.861 (0.568–1.305)	0.837 (0.504–1.388)
Reason for becoming self-employed No other alternative vs. personal choice (ref.)		2.032 (1.256–3.287)	2.000 (1.174–3.408)	0.979 (0.426–2.249)
Work-life balance Good vs. Poor (ref.)	0.870 (0.321–2.356)	0.624 (0.446–0.871)	0.594 (0.355–0.996)	0.675 (0.403–1.128)
Interaction with angry clients Rare		1.0 (reference)		1.0 (reference)
Frequent		1.091 (0.741–1.606)		2.055 (1.207–3.496)
Always		3.012 (1.867–4.860)		2.025 (0.752–5.453)
Exposure to abusive behavior Yes vs. No (ref.)		4.398 (2.939–6.580)		2.244 (1.078–4.670)
Exposure to ergonomic factors Yes vs. No (ref.)		1.266 (0.887–1.807)	3.134 (1.258–7.809)	3.494 (1.474–8.283)
Weekly work hours < 40	1.0	1.0 (reference)	1.0 (reference)	1.0 (reference)
≥ 40 to < 48	(< 48 hours [reference])	0.708 (0.257–1.955)	0.424 (0.226–0.798)	0.655 (0.287–1.496)
≥ 48 to < 60	1.779 (0.396–7.986)	0.955 (0.446–2.043)	0.475 (0.259–0.872)	0.396 (0.170–0.926)
≥ 60	2.195 (0.449–10.733)	1.717 (0.843–3.496)	(≥ 48 hours)	0.752 (0.344–1.647)
Work duration (years) < 10	1.0 (reference)	1.0 (reference)	1.0 (reference)	1.0 (reference)
≥ 10 to < 20	2.466 (0.909–6.691)	1.088 (0.735–1.610)	0.822 (0.298–2.265)	1.508 (0.809–2.812)
≥ 20	(≥ 10 years)	0.938 (0.593–1.484)	1.085 (0.495–2.378)	1.426 (0.742–2.739)

Adjusted for age, gender, education and income. Some variables with too small numbers was not considered, and some categories were collapsed for statistical testing.

likely to experience depressive symptoms, similar to waged employees.<sup>18,19</sup> Self-employed workers exposed to more ergonomic risk factors were more likely to experience depressive symptoms, compatible with previous studies on farmers.<sup>12</sup> Self-employed workers exposed to increasingly more abusive behavior were increasingly more likely to experience depressive symptoms (dose-response relationship), in agreement with previous studies.<sup>20-22</sup> We also found that the risk of depressive symptoms was significantly lower in individuals who became self-employed by choice rather than because they had no alternative. A previous study similarly reported that self-employment provided job satisfaction only for those who wanted to be self-employed.<sup>23</sup>

We unexpectedly found that some factors were not associated with depressive symptoms in the self-employed. For example, working at very high speed and more weekly work days were unrelated to depressive symptoms in the self-employed. We also found that working more than 60 hours/week had no effect on depressive symptoms, but those who worked 40 to 60 hours/week were less likely to report depressive symptoms relative to those who worked less than 40 hours/week. In contrast, previous studies reported that long working hours,<sup>24-26</sup> weekend work,<sup>27</sup> and high work intensity<sup>28</sup> were all associated with depression. This discrepancy may be because the self-employed have greater work autonomy, including the freedom to choose their own working hours and the option to work more hours so they can earn more money. Consistent with this interpretation, we also found that high monthly income reduced the risk of depressive symptoms in the self-employed. Similarly, recent studies found a positive association between health and financial performance in the self-employed,<sup>29</sup> usually measured in terms of earnings.<sup>30</sup> The self-employed typically have

longer working hours than waged workers,<sup>6,31</sup> but these longer working hours do not lead to greater stress in the self-employed.<sup>32</sup> A self-employed individual who works more hours may do so because the business is successful and because the individual has a higher level of work satisfaction.<sup>9</sup> However, as working more than 60 hours/week may have adverse impacts on sleep and work-life balance, it may impact the risk of depressive symptoms in the self-employed. These findings point to the need for further studies of the relationship between depression and working hours in the self-employed.

We found that gender was unrelated to depressive symptoms in the self-employed. In contrast, several previous studies reported that women had more adverse psychological symptoms than men.<sup>33,34</sup> We also found that age was unrelated to depressive symptoms in the self-employed. Farmers were more likely to experience depressive symptoms, but this association disappeared after adjustment for demographic and socioeconomic factors. Moreover, farmers were less likely to experience depressive symptoms after adjustment for psychosocial work factors. Thus, depressive symptoms of self-employed farmers may not be explained by the intrinsic nature of this type of work, but may be associated with unfavorable demographic, socioeconomic, and psychosocial work factors.

The present study also identified differences among self-employed individuals in different occupational classes. Self-employed professionals are more likely to be younger, more highly educated, have a higher income, good subjective health, and become voluntarily self-employed, but were less likely to be exposed to ergonomic risk factors and abusive behavior. None of the tested variables was significantly associated with depressive symptoms among professionals probably because some variables with too small numbers were not considered in the analysis.

Self-employed shop/restaurant owners were more likely to be women, work extremely long hours/day for  $\geq 6$  days/week, always interact with angry clients, and have greater exposure to abusive behavior. However, the frequency of depressive symptoms in this group did not differ from frequencies in other occupational classes. Economic rewards from long working hours may decrease depressive symptoms. In addition, female shop/restaurant owners have high self-esteem because they own their businesses. This high self-esteem may also decrease depressive symptoms.<sup>35</sup> Depressive symptoms were more common in those who became shop/restaurant owners involuntarily than voluntarily, in those who always interacted with angry clients, and in those exposed to abusive behaviors, but these symptoms were less common in those with a good work-life balance.

Although self-employed farmers were more likely to be old ( $> 60$  years) and have less education, but less likely to interact with angry clients, and have exposure to abusive behavior. Farmers were more likely to work  $< 40$  hours/week and have lower incomes, with those working  $\geq 40$  hours/week having fewer depressive symptoms. Farmers had greater exposure to ergonomic risk factors, which increased depressive symptoms, and had a good work-life balance, which decreased depressive symptoms.

All self-employed craftsmen in this study were male and always worked at very high speed. This group also had the second-highest average monthly income (after professionals). Craftsmen had the second highest rate of exposure to ergonomic risk factors (after farmers), which increased depressive symptoms. Depressive symptoms among craftsmen were more common in those who frequently interacted with angry clients and were exposed to abusive

behavior. Although self-employed craftsmen are manual workers similar to farmers, they have higher incomes than farmers due to their special skills.

This study is the first comprehensive analysis of the association of depressive symptoms with socioeconomic factors and psychosocial work factors in self-employed workers. Our results have implications for employment and public health policies in Korea. First, lower socioeconomic status, poor work-life balance, interaction with angry clients, and exposure to ergonomic risk factors and abusive behavior were associated with depressive symptoms in the self-employed. Thus, it is important to address these issues for prevention of depression in this group. Second, working hours had positive effects in the self-employed. Self-employed individuals are likely motivated to increase their incomes by working more hours, even overtime, and thus experience fewer depressive symptoms. Thus, customized strategies may be needed to address the effect of long working hours in self-employed. For example, self-employed should be encouraged not to work excessively (over 60 hours/week), rather than simply to shorten their working hours. However, even though self-employed individuals who have long weekly work hours have no increased risk of depressive symptoms, many of these individuals are elderly and unprotected by the occupational health systems of Korea and many other countries. Vulnerable self-employed individuals should therefore receive improved access to mental health care from community health-care services, such as regional mental health welfare centers.

This study has several strengths. We examined a large and representative sample of the Korean working population. The principal biases in epidemiology studies are selection bias and measurement (classification) bias. The KWCS was designed to reduce these biases by performing a probability proportional to size (PPS) sampling with a multistage, stratified, random sample design, and it has high content validity and reliability, and minimal bias.<sup>15</sup> Statistical modeling is usually used to control for confounding in the analytical phase of a study. Thus, we performed a multivariate logistic analysis with adjustment for age, sex, education, and monthly income.

This study also has some limitations. First, our study was cross-sectional, so we cannot infer the causality of any association because unknown intermediary factors may be responsible. A prospective study is needed to establish the causality. Second, we partly relied on self-reported data, rather than objective data. The validity of self-reported questionnaires may be questionable, so our results should be interpreted with caution. We measured depressive symptoms using a simple question, rather than a detailed objective instrument. This question has potential use in screening for depression, although a semi-structured interview is necessary for diagnosing depression in those who screened positive.<sup>36,37</sup> Our question only asked about the presence of depressive symptoms during last 12 months, and we had no information on the intensity or duration of depressive symptoms, and whether depressive symptoms were present at the time of the survey. Finally, this study was performed in Korea, so caution should be exercised when extending these results to other countries. Further research on the effects of different variables on depressive symptoms in the self-employed should be conducted in other countries.

In conclusion, our assessment of the relationship of multiple factors with depressive symptoms in self-employed workers from Korea unexpectedly found that some factors related to depression did not lead to depression in the self-employed. Thus, different interventions may be needed to prevent depression in self-employed workers.

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