

# Association of weekly working hours with poor psychological well-being and moderation by employment status in Korean workers

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**Abstract:** We examined the association of weekly working hours with poor psychological well-being in Korean workers and the moderating effect of employment status. This secondary analysis examined data from the fifth Korean Working Conditions Survey (2017). There were 30,108 waged employees and 14,459 self-employed individuals. The two groups were compared using a moderated regression model with Hayes' PROCESS macro for SPSS. The self-employed had a greater mean age than the waged employees. Higher percentages of the self-employed had short weekly working hours (<40), excessively long weekly working hours (≥60), and poor psychological well-being. After controlling for age, gender, education, monthly income, and occupational class, the interaction between weekly working hours and employment status on psychological well-being was significant ( $p<0.001$ ). Among the self-employed, the well-being score was lowest in the short working hour group (<40 h/week), highest in the long working hour (48–59 h/week) groups, and intermediate in the excessively long working hours (≥60 h/week) group. For waged employees, psychological well-being was the greatest in the short working hour group and decreased continuously as the number of weekly working hours increased. In conclusion, employment status (employee vs. self-employed) moderated the relationship between weekly working hours and psychological well-being.

**Key words:** Employment, Working hour, Well-being, Self-employed, Moderation

## Introduction

Self-employed workers, defined as independent workers who have no waged employees, accounted for about 10% of all workers in Europe during 2009. This percentage was

lowest in Estonia (4%) and greatest in Greece (21%). Among the 28 European Union (EU) member states, the percentage of workers who were self-employed decreased slightly since 2005<sup>1)</sup>. Self-employed workers still account for a greater mean proportion of all workers in Korea than in the EU, although Korea experienced a similar decrease, from 24.1% in 1988 to 15.3% in 2016<sup>2)</sup>.

Individuals may choose self-employment for several reasons, such as a desire for more autonomy; the freedom to choose working hours, location, and type of work; and the

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opportunity to convert a hobby into an income source<sup>3)</sup>. However, other individuals are forced into self-employment following loss of a job<sup>3)</sup>.

Self-employed individuals, who worked alone or with family members and had no employees, mainly consist of small-scale shop/restaurant owners and farmers (approximately 80%) in Korea. Self-employed without employees are more likely to be self-employed out of necessity rather than out of choice, and to do their work close to their homes in Korea.

Our previous study showed that waged employees and self-employed without employees were affected by different occupations, working conditions and OSH issues. Compared to employees, a higher percentage of self-employed performed sales and service jobs (49.1% vs. 26.7%), and skilled jobs related to agriculture, forestry and fisheries (29.4% vs. 0.4%). Thus, in Korea, small-scale shop/restaurant owners and farmers, account for most of self-employed without employees. Relative to employees, the self-employed were older, less educated, and worked longer hours. In addition, they had greater exposure to ergonomic hazards in the workplace, more musculoskeletal problems, poorer mental well-being, and were more likely to perceive their health as bad, compared to employees. The self-employed in Korea are not protected by its occupational health system and are therefore more vulnerable to OSH problems than employees<sup>4)</sup>. In addition, the self-employed in Korea generally have more unstable jobs<sup>5, 6)</sup>.

Long working hours have been a social issue related to sudden cardiovascular death in Asian countries such as Japan, Korea, and Taiwan<sup>7)</sup>. Thus, many researchers studied the effects of long working hours on the risks of cardiovascular diseases<sup>8)</sup>. Furthermore, several studies investigated a relationship between long working hours and mental health. Several cross-sectional studies reported an association between long working hours and poor mental ill health in waged employees<sup>9–11)</sup>. Several prospective studies also showed an association between long working hours and poor mental ill health, mainly depressive symptoms<sup>12–17)</sup>. However, other prospective studies reported no association between long working hours and depressive symptoms<sup>18–24)</sup>.

Many systemic reviews estimated the association of long working hours with the risk of depressive symptoms and depression<sup>25–31)</sup>. A systemic review by Bannai & Tamakoshi<sup>26)</sup> showed that working long hours was associated with a depressive state and anxiety. A meta-analysis by Ng & Feldman<sup>27)</sup> found that long working hours was negatively associated with measures of employee well-being. A 2018 systematic review and meta-analysis by Virtanen *et*

*al.*<sup>31)</sup> found an association between long working hours and the onset of depressive symptoms; they also found a stronger association in Asia than in Europe, but no association in North America and Australia. However, the systemic review by Ganster *et al.*<sup>28)</sup> concluded that evidence supporting a relationship between long working hours and depression was equivocal. Theorell *et al.*<sup>29)</sup> examined six cohort studies of high or moderate quality and concluded that evidence supporting an association of long working hours with depression was “limited” for women and “very limited” for men. Instead, they found that estimates of the association of a long work week with depression were inconsistent and not large enough to necessitate an upgrade of the strength of this association. Watanabe *et al.*<sup>30)</sup> performed a meta-analysis of seven cohort studies that examined overtime work and the risk of onset of depressive disorders. Their results showed an increased risk of depressive disorders in those who worked overtime, but this association was not statistically significant. Thus, these many previous systematic reviews and meta-analyses reported different results regarding the association between long working hours and depressive symptoms. These inconsistencies may stem from differences in the study populations (gender, age, socioeconomic status, geographic residence), working conditions, employment status, and in the definitions of depression and long working hours<sup>25, 26, 28, 31, 32)</sup>. Recently, the World Health Organization (WHO) and the International Labor Organization (ILO) developed a methodology to estimate the burden of depression from long working hours<sup>25)</sup>.

Most of the above studies examined waged employees, and only a few examined waged employees and the self-employed<sup>14, 15)</sup>. Few studies examined the relationship between working hours and mental health status of the self-employed. Stephan suggested that different models should be applied to entrepreneurs when examining the effect of work on mental health and well-being, because these individuals have high autonomy, in that they can make decisions about what, when, and with whom to work, and they also have high work demands that require intense effort and concentration<sup>33)</sup>. Bradley & Roberts found that a subset of starting entrepreneurs were more satisfied with their work if they experienced high demands and worked longer hours<sup>34)</sup> because they interpreted this as a signal that the business was doing well. A large multi-national study of entrepreneurs also found a positive association of long working hours with improved mental health and well-being<sup>35)</sup>. These findings suggest that entrepreneurs may appraise long working hours as a “challenge stressor” (a stressor perceived as providing opportunities for future achievement). However,

these studies examined self-employed individuals with employees (employers) and self-employed individuals without employees.

Thus, we formulated the following two hypotheses:

H1. There is a negative association between long working hours and psychological well-being in waged employees.

H2. There is a positive association between long working hours and psychological well-being in self-employed individuals without employees, because these individuals tend to work autonomously and are motivated to increase their incomes by working more hours.

We therefore identified the association of weekly working hours with psychological well-being according to employment status (self-employed vs. employee), after controlling for the effects of age, gender, education, monthly income, and occupational class, and then examined whether employment status moderated this association.

## Subjects and Methods

### *Data source*

The present study was a secondary analysis of data collected during the fifth KWCS (June to September 2017), which was conducted by the Korea Occupational Safety and Health Agency (KOSHA)<sup>36</sup>. The KWCS which have a design for cross-sectional study, has high content validity and reliability<sup>37</sup>. This triennial survey evaluates working conditions, exposure to hazards, and work-related health problems at workplaces in Korea. The study population was representative of individuals who were 15 years or older and were working in Korea during the survey period. A worker was considered to be an individual who worked for pay or profit for 1 h or more during the week prior to the interview. Retirees, the unemployed, homemakers, and students were excluded. This study did a probability proportional to size (PPS) sampling with a multistage, stratified, random sample design, and examined workers who lived in the same enumeration districts used for the 2010 population and housing census. This survey consisted of 50,205 in-person household interviews. All data were weighted with relative to the economically active population of Korea.

### *Study subjects*

The study subjects were categorized as “employees” (30,108) or “self-employed” (14,459). A self-employed worker worked alone or with family members and had no employees. Employers (3,256) were excluded. Family

members (2,190) were not classified as employees of workers who were self-employed, and were not included as study subjects. The responses of all 30,108 waged employees and all 14,459 self-employed workers were evaluated. After explanation of the survey, all participating individuals provided written informed consent prior to participation. The data obtained by KWCS are registered as government-approved statistics, and the data is strictly managed by the government, and confidentiality and anonymity are guaranteed by Statistics Laws. This research was approved by the Institutional Review Board (IRB) of Ulsan University Hospital (IRB File No. 2020–06–007). All participants provided written informed consent.

## Measurements

### *Dependent variable*

Self-reported well-being was determined using the Well-Being Index developed by the WHO (WHO-5)<sup>38</sup>. This index has five questions, in which the participants were asked to indicate their well-being over the previous two weeks. In particular, they were asked if they (a) felt cheerful and in good spirits, (b) felt calm and relaxed, (c) felt active and vigorous, (d) woke up feeling fresh and rested, and (e) had a daily life that was filled with things that interested them. Each item had a score of 0 to 5 points; the maximum possible score was 25. A higher score indicated better psychological well-being. A total score of 13 or less indicated poor psychological well-being and the possibility of depression; and a score above 13 indicated good psychological well-being<sup>38</sup>. The systematic review of Topp *et al.* reported that the WHO-5 index had adequate psychometric properties and also evaluated the clinical validity of the WHO-5 in terms of construct validity. Topp *et al.* cited several studies that use a cut-off point of 50% (equivalent to a raw score of 13) as a “screening diagnosis” for depression when examining psychosocial problems related to the work environment<sup>39</sup>.

### *Independent variables*

Average weekly working time was classified as short working hours (SWH, <40 h), moderate working hours (MWH, 40–47 h), long working hours (LWH, 48–59 h), or excessively long working hours (ELWH, ≥60 h). Many countries define standard working hours as 35–40 h/week, with a threshold of 48 h/week, to determine long working hours<sup>25</sup>. A threshold of 60 h/week (equivalent to 80 h/month of overtime work) may adversely impact sleep and increase the risk of death due to overwork (karoshi) in Japan<sup>32</sup>. We used these working-hour limits to examine the

public health implications of the relationship of working hours and mental health. Employment status was classified as waged employees and self-employed individuals without employees.

### Covariates

The demographic factors in the analysis were sex and age in years (<40, 40–49, 50–59, 60 or more). The socioeconomic factors in the analysis were education (no high school graduation, high school graduation, college or more), monthly income in USD (<1,000, 1,000–2,000, 2,000–3,000, 3,000–4,000, 4,000 or more), and occupational class. The occupational classes were “manual workers”, “service and sales workers”, or “other non-manual workers”. After categorization of work as manual or non-manual, non-manual workers were categorized as “service and sales workers” or “other non-manual workers”. “Service and sales work” is different from other types of non-manual work that requires cognitive skills, such as that performed by “managers, professionals and related workers” and “clerks”<sup>40</sup>.

### Statistical analysis

The Chi-square test was used for comparisons of the occupational and demographic characteristics of workers who had different scores on the WHO-5 Index. These data were analyzed using a moderated regression model with the Hayes’ PROCESS macro for SPSS<sup>41,42</sup>. Simple moderation analysis was used to determine whether the effect of weekly working hours on poor psychological well-being varied in magnitude and nature as a function of employment status. This analysis identified statistical interactions between variables that were predictors (weekly working hours) and variables that were moderators (employment status), and the strength and direction of their effects on the outcome variable (psychological well-being) after adjustment for age, sex, education, and monthly income. Regression analyses were also performed to assess the impact of weekly working hours on monthly income with moderation by employment status. The calculated *p* values in this study were all two-sided and considered significant at *p*<0.05.

## Results

Employees and the self-employed had no significant difference in gender distribution (Table 1, *p*=0.534). However, the self-employed were older and had less education (both *p*<0.001). Higher percentages of the self-employed had monthly incomes below 1000 USD, whereas higher per-

centages of waged employees had monthly incomes of 1,000 to 2,000 USD. Higher percentages of the self-employed had SWH and ELWH, performed service and sales work, and had poor psychological well-being (all *p*<0.001). Mean scores of psychological well-being in the self-employed were lower than those in employees.

Analysis of the self-employed and waged employees indicated that the number of weekly working hours was associated with psychological well-being in each group (Table 2, both *p*<0.001). The self-employed were generally less likely to have poor psychological well-being as weekly working hours increased (Table 2); however, poor psychological well-being was more common in those who had ELWH. Analysis of waged employees indicated that those who had ELWH were most likely to have poor psychological well-being, followed by those who had SWH, LWH, and MWH.

Moderation analysis, which controlled for the effects of age, gender, education, and monthly income, indicated that the effect of the interaction between weekly working hours and employment status on psychological well-being was significant (*p*<0.001) (Tables 3–4). Main effects such as weekly working hours and employment status on psychological well-being were also statistically significant. Women were more likely to have good psychological well-being (*p*<0.001). Age was negatively associated with good psychological well-being (*p*<0.001). Workers with more education and monthly income were more likely to have good psychological well-being (both *p*<0.001). Manual workers were more likely to have poor psychological well-being (*p*<0.001).

For the self-employed and relative to the group with SWH, the interaction slope for weekly working hours on psychological well-being was 0.357 for the MWH group (*p*<0.05) and 0.558 for the LWH group (*p*<0.05), and 0.092 for the ELWH group. For waged employees and relative to the group with SWH, the interaction slopes for weekly working hours on psychological well-being was –0.454 for the LWH group and –1.086 for the ELWH group (both *p*<0.001). Thus, for waged employees, psychological well-being was greatest in workers with SWH, and then decreased continuously as the number of weekly working hours increased to 60 or more. In contrast, for the self-employed, psychological well-being was lowest in workers with SWH, and greater in those with MWH and LWH. On going from the LWH group to the ELWH group, the well-being score decreased but remained greater than that of employees (Fig. 1).

In addition, moderation analysis, which adjusted for

age, gender, education level, and occupational class, indicated that among the self-employed, monthly income increased as the number of working hours increased from less than 40 to 60 or more. However, among waged em-

ployees monthly income was the greatest in the MWH group, and was slightly less in those with longer working hours (Table 5, Fig. 2).

**Table 1. Demographic, socioeconomic, and work-related factors of individuals who were self-employed or waged employees**

		Employment status		P-value
		Self-employed n=14,459	Employees n=30,108	
<b>Gender</b>	Men	7,007 (48.5)	14,496 (48.1)	0.534
	Women	7,452 (51.5)	15,612 (51.9)	
<b>Mean age, years</b>		57.4	45.3	<b>&lt;0.001</b>
<b>Education</b>	<High school	4,651 (32.2)	3,791 (12.6)	<b>&lt;0.001</b>
	High school	6,528 (45.2)	10,511 (34.9)	
	>High school	3,257 (22.6)	15,783 (52.5)	
<b>Monthly income, USD</b>	<1,000	2,113 (14.8)	3,030 (10.2)	<b>&lt;0.001</b>
	1,000–2,000	3,528 (24.8)	9,232 (30.9)	
	2,000–3,000	4,067 (28.5)	8,622 (28.9)	
	3,000–4,000	2,819 (19.8)	5,289 (17.7)	
	≥4,000	1,722 (12.1)	3,671 (12.3)	
<b>Weekly working hours</b>	<40 (SWH)	3,069 (21.3)	4,654 (15.5)	<b>&lt;0.001</b>
	40–47 (MWH)	2,122 (14.7)	16,012 (53.3)	
	48–59 (LWH)	3,946 (27.4)	6,318 (21.0)	
	≥60 (ELWH)	5,262 (36.5)	3,059 (10.2)	
<b>Occupational class</b>	Other non-manual workers	1,182 (8.2)	12,069 (40.2)	<b>&lt;0.001</b>
	Service and sales worker	6,446 (44.6)	7,925 (26.4)	
	Manual workers	6,831 (47.2)	10,021 (33.4)	
<b>Psychological well-being</b>	score	13.6 ± 5.4	14.7 ± 5.1	<b>&lt;0.001</b>
<b>Poor psychological well-being</b>	Yes	5,258 (36.4)	8,582 (28.5)	<b>&lt;0.001</b>
	No	9,174 (63.6)	21,510 (71.5)	

Numbers in cells; No (%), mean ± standard deviation

**Table 2. Prevalence of poor psychological well-being of individuals who were self-employed or waged employees and had different weekly working hours**

Weekly working hours	Self-employed		P-value	Employees		P-value
	Yes	No		Yes	No	
<b>&lt;40 (SWH)</b>	1,401 (45.8)	1,660 (54.2)	<b>&lt;0.001</b>	1,656 (35.7)	2,978 (64.3)	<b>&lt;0.001</b>
<b>40–47 (MWH)</b>	760 (35.8)	1,362 (64.2)		3,934 (24.6)	12,063 (75.4)	
<b>48–59 (LWH)</b>	1,237 (31.4)	2,705 (68.6)		1,832 (29.0)	4,479 (71.0)	
<b>≥60 (ELWH)</b>	1,825 (34.7)	3,427 (65.3)		1,118 (36.7)	1,926 (63.3)	

Table 3. B coefficients (95% CIs) of psychological well-being according to variables after adjustment for other variables (n=43,867)

Variables		B coefficient (95% CI)
Weekly working hours	<40 (SWH)	reference
	40–47 (MWH)	0.811 (0.224 to 1.398)**
	48–59 (LWH)	1.571 (1.048 to 2.094)***
	≥60 (ELWH)	1.270 (0.749 to 1.792)***
	Employment status	Employees vs. self-employed
Interaction 1	Employment status x MWH	–0.454 (–0.787 to –0.121)**
Interaction 2	Employment status x LWH	–1.012 (–1.324 to –0.701)***
Interaction 3	Employment status x ELWH	–1.178 (–1.508 to –0.848)***
Sex	Women vs men	0.121 (0.112 to 0.230)*
Age, yr		–0.036 (–0.041 to –0.031)***
Education	<HS	reference
	HS	0.892 (0.730 to 1.054)***
	>HS	1.309 (1.110 to 1.509)***
Monthly income, USD	<1,000	0 (reference)
	1,000 to <2,000	0.652 (0.457 to 0.847)***
	2,000 to <3,000	0.931 (0.720 to 1.142)***
	3,000 to <4,000	1.122 (0.893 to 1.351)***
	≥4,000	1.507 (1.261 to 1.753)***
Occupational class	Other non-manual workers	reference
	Service and sales worker	0.039 (–0.107 to 0.184)
	Manual workers	–0.491 (–0.645 to –0.337)***

SWH; short working hours (<40 h), MWH; moderate working hours (40–47 h), LWH; long working hours (48–59 h), ELWH; excessively long working hours (≥60 h), HS; high school \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .  $R^2$ ; 6.7%

Table 4. Conditional effect (95% CIs) of weekly working hours on psychological well-being at self-employed and waged employees after adjustment for age, sex, education, monthly income, and occupational class (n=43,867).

Interaction (weekly working hours × employment status) ***		
Employment status		
Weekly working hours	Self-employed	Employees
<40 (SWH)	reference	reference
40–47 (MWH)	0.357 (0.072 to 0.642)*	–0.097 (–0.296 to 0.102)
48–59 (LWH)	0.558 (0.306 to 0.810)***	–0.454 (–0.673 to –0.236)***
≥60 (ELWH)	0.092 (–0.152 to 0.336)	–1.086 (–1.341 to –0.831)***

\*  $p < 0.05$  vs. ref, \*\*\*  $p < 0.001$  vs. ref.

Table 5. Conditional effect (95% CIs) of weekly working hours on monthly income at self-employed and waged employees after adjustment for age, sex, education, and occupational class (n=41,279)

Interaction (weekly working hours × employment status) ***		
Employment status		
Weekly working hours	Self-employed	Employees
<40 (SWH)	reference	reference
40–47 (MWH)	47.2 (34.6 to 59.9) ***	99.8 (92.0 to 107.6) ***
48–59 (LWH)	71.7 (60.8 to 82.6) ***	99.1 (90.1 to 107.8) ***
≥60 (ELWH)	86.9 (76.4 to 97.3) ***	89.6 (79.3 to 99.9) ***

\*\*\*  $p < 0.001$  vs. ref.

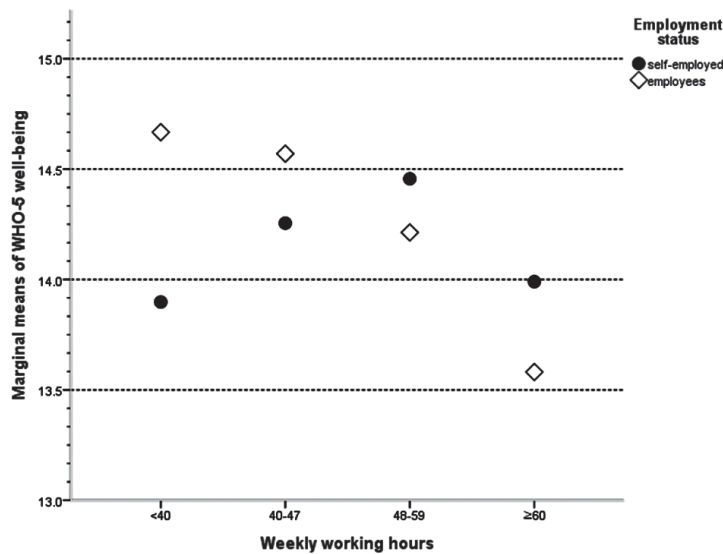


Fig. 1. Interaction between weekly working hours and employment status in their influence on psychological well-being.

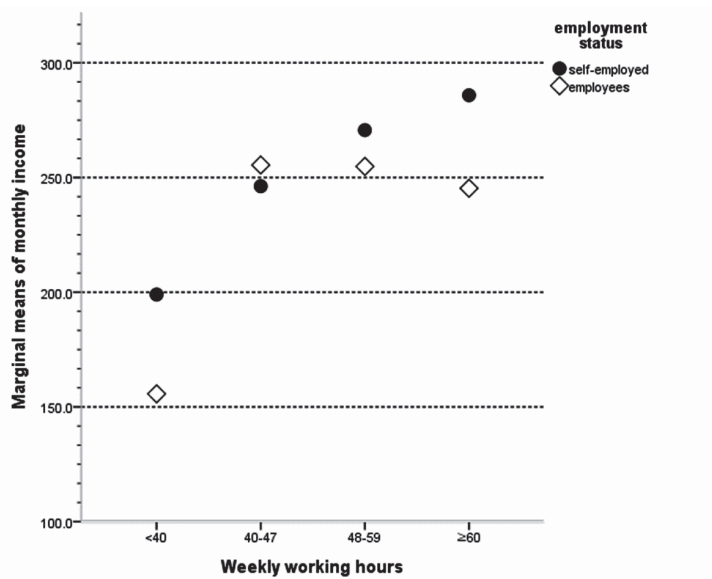


Fig. 2. Interaction between weekly working hours and employment status in their influence on monthly income.

## Discussion

This nationwide cross-sectional study showed that the association between long working hours and psychological well-being was moderated by employment status after controlling for the effects of age, gender, education, and monthly income. Among the self-employed, the well-being score was lowest in the SWH group, highest in the LWH groups, and intermediate in the ELWH group. In contrast, for waged employees, psychological well-being was the greatest in the SWH group and decreased continuously as the number of weekly working hours increased. Thus, our results support H1 (long working time is associated with decreased psychological well-being of waged employees) and H2 (long working time is associated with improved psychological well-being of the self-employed). Our findings on the relationship between poor psychological well-being and working hours in waged employees are in agreement with previous studies. In particular, previous studies found that mental health problems in waged employees, such as depression, anxiety, and poor psychological well-being, were significantly associated with longer weekly working hours<sup>4, 9, 12, 13</sup>). However, we found that the effect of weekly working hours on psychological well-being differed remarkably for the self-employed and waged employees. Thus, relative to SWH, self-employed individuals who worked MWH and LWH showed greater psychological well-being.

Among the self-employed, monthly income rose as the number of weekly working hours increased from less than 40 to 60 or more. Self-employed individuals who worked more hours also tended to have higher incomes. However, among waged employees monthly income was greatest in the MWH group, and slightly less in those with LWH. Working up to 52 h per week is legally permitted for standard employees in Korea, and this explains why employees with MWH have greater income than those with SWH; however, employees with VLWH, who are mostly non-standard workers or unskilled manual workers, still have low incomes because of the nature of their jobs. This novel finding may be due to differences in the work characteristics between the self-employed and employees. Small shop/restaurant owners and farmers, who account for most of the self-employed (approximately 80%) in Korea, are older and less educated than employees. In addition, these individuals are unprotected by the occupational health scheme and more vulnerable to OSH problems and job insecurity than employees. They are more likely to be self-employed

out of necessity rather than out of choice, and to do their work close to their homes. However, they tend to be economically independent and work autonomously<sup>43</sup>), and are motivated to increase their incomes by simply working more hours, even overtime<sup>44</sup>). These economic rewards and feelings of achievement may increase the well-being of the self-employed despite their longer working hours, according to the “effort-reward imbalance model”<sup>45</sup>). In addition, because working long hours is often optional for the self-employed, this may increase their psychological well-being<sup>31</sup>). However, working extremely long hours (more than 60 h per week) may adversely impact sleep, provide reduced time for recovery, and increase the risk of fatigue, thus decreasing psychological well-being according to the “effort-recovery model”<sup>46</sup>). In addition, working extremely long hours may adversely affect the work-life balance and contribute to poor psychological well-being.

There have only been limited studies on the impact of working hours on mental health in self-employed individuals mixed with waged employees employers<sup>14, 15, 33, 34</sup>). No previous study compared the impact of working hours on mental health in waged employees and self-employed individuals without employees. The present study is the first to identify a different effect of weekly working hours on the psychological well-being of waged employees and self-employed individuals without employees.

The subjects in the present study were self-employed individuals who worked alone or with family members and had no employees. The self-employed in the European Union are divided into five clusters: ‘employer (23%)’, ‘small traders and farmers (25%)’, ‘stable own-account workers (26%)’, ‘vulnerable (17%)’, and ‘concealed (8%)’<sup>43</sup>). In Korea, ‘vulnerable’ and ‘concealed’ workers are considered as employees, and ‘employers’ are not considered self-employed; ‘thus, the self-employed workers examined in the present study were predominantly ‘small traders and farmers’ (~80%). Eurofound have shown that ‘stable own-account workers’ had higher education and income, are were more likely to be self-employed through personal choice, than ‘small traders and farmers’<sup>43</sup>). Transnational comparisons of studies on the self-employed should therefore consider differences in the characteristics of the self-employed. Further research should be conducted in other countries where the characteristics of the self-employed are different, or in countries with other work cultures.

Our finding that the relationship of weekly working hours with psychological well-being differed for waged employees and the self-employed may have implications



for public health policies and occupational health practitioners in Korea. For the self-employed, the well-being score was lowest in the SWH group, and greater in the MWH and LWH groups presumably due to the greater income in these two groups. In contrast, for waged employees, income was greatest in the MWH group, but this group had a slightly decreased well-being relative to the SWH group. Thus, different strategies may be needed to improve the psychological well-being of waged employees and the self-employed. The self-employed should be encouraged not to work excessively, because working extremely long hours may have adverse impacts on sleep, increase the risk of fatigue, and thereby decrease psychological well-being. For employees, however, shorter working hours are beneficial, although the possibility of an inverse association between working hour mismatches and mental well-being may be considered<sup>47, 48</sup>). Occupational health practitioners may recommend adjustment of working hours by considering the desires of individual employees; some employees may prefer working MWH rather than SWH due to the increased income despite the slight decrease in well-being. Even though the mental health of self-employed individuals who have LWH is not bad, these individuals tend to be elderly and unprotected by the occupational health scheme of Korea<sup>49</sup>). Vulnerable self-employed individuals may be able to receive mental health care from community health-care services, such as regional mental health welfare centers, if occupational health practitioners cooperate with community health care workers. Health protection measures provided by community health systems in local governments are therefore helpful for improving the well-being of the self-employed.

This study has several limitations. Our study had a cross-sectional design, so we cannot infer the causality of the observed associations because unknown intermediary factors may be responsible. We also partly relied on self-reported data in this survey. The predictor and outcome were measured using the same survey, so common-variance bias may be an issue. The predictor was an observable variable, so recall bias was also possible. However, the variables analyzed in the present study, such as psychological well-being, age, gender, education, and income, were for current status so recall bias was probably minimal. Finally, this study was conducted in Korea, so inferences about other countries should be made with caution. For example, we should consider differences in the characteristics of the self-employed when making comparisons with European countries, where there are increasing numbers of self-employed who have more education and greater income, such

as “stable own account workers”. However, our findings on the self-employed may be relevant to freelancers who have precarious employment, a status that has become more common due to the rapid expansion of the “gig economy”<sup>44</sup>). Our results may be more generalizable to other countries with similar cultural traditions, such as Asian countries, where there are large numbers of precarious self-employed individuals.

In conclusion, the relationship of weekly working hours with psychological well-being differed in Koreans according to their type of employment. Thus, different interventions may be needed to improve the psychological well-being of Korean individuals who are self-employed and waged employees. For employees, we recommend shorter working hours and increased flexibility in the work schedule. For the self-employed, we recommend limiting excessive work, rather than simply working fewer hours. Vulnerable self-employed individuals, who are unprotected by the occupational health scheme, can receive mental health care from community health-care services.

### Authors' contributions:

Design and concept of the study: Jungsun Park  
 The acquisition, analysis of data for the work; Yangho Kim  
 Drafting the manuscript of the study; Jungsun Park  
 Revising manuscript critically; Yangho Kim  
 Final approval of the version to be published; Jungsun Park, Yangho Kim  
 Accountability for the accuracy and integrity of any part of this paper: Yangho Kim

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### Disclaimer

None

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