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Original article

Psychological Well-being Interactively Affected by Long Working Hours and Caregiving Activities

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ABSTRACT

Background: Long working hours and caregiving responsibilities are prevalent in many societies. These demands can lead to stress and adverse mental health outcomes. This study examines the associations of long working hours and family caregiving on psychological well-being and their interactions among South Korean wage workers.

Methods: Using data from the Korean Working Conditions Survey, this cross-sectional study involved 33,063 participants. Long working hours were categorized as 40 and 52 hours a week, and caregiving was assessed through self-reports of non-work-related caregiving activities. The World Health Organization Well-Being Index was used to measure psychological well-being, with Poisson regression models analyzing the associations and interactions between working hours, caregiving activities, and psychological well-being.

Results: The prevalence of low psychological well-being was significantly higher among individuals with both long working hours and caregiving responsibilities than among those with either or neither stressor (adjusted prevalence ratio = 1.81; 95% confidence interval: 1.42–2.31, multiplicative scale = 1.32; 95% confidence interval: 1.00–1.73).

Conclusion: This study highlights the significant mental health implications of combining long working hours with caregiving responsibilities in the Republic of Korea. The synergistic interaction between these factors suggests that interventions and policies aimed at reducing work-related stress and supporting caregivers could have substantial benefits for mental health.

1. Introduction

The adverse health effects of long working hours have been extensively discussed in a number of studies, and the evidence has been firmly established over the years. Long working hours are strongly associated with cerebrocardiovascular diseases such as ischemic heart disease and stroke [1–3]. They are also linked to diminished mental health and well-being [4,5]. Furthermore, inadequate rest, particularly due to long working hours, compromises health by depriving workers of the chance to recuperate physically and mentally [6].

Worldwide, families often provide informal, unpaid care for children, older adults, and people with disabilities, among others [7]. Such family caregiving can negatively affect mental health due to the stress of multiple roles and time scarcity. This is further explained by relevant theories and the caregiving process model [8–11]. Moreover, workers with family caregiving responsibilities may find it challenging to reconcile work and family demands. Situations such as work interruptions due to family matters or the inability to unwind postwork because of caregiving obligations can lead to various health problems.

The Republic of Korea is known for its long working hours among Organisation for Economic Cooperation and Development countries, ranking fifth according to the latest Organisation for Economic Cooperation and Development report [12]. This has made long working hours a persistent topic of discussion within the nation.

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Additionally, the country's Confucian culture emphasizes family-based care for the elderly and disabled. With an aging population, this cultural expectation is leading to increased concerns about caregiver burden, burnout, and health impacts [13–15].

Given this social context, it is reasonable to assume that combining long working hours with family caregiving would have a negative impact on mental health. In fact, a recent study reported an increased risk of depression among Korean workers who experienced work–family conflict due to working long hours [16]. However, no studies have examined the mental health effects of working long hours and caring for family members in depth. In this study, we used data from a representative Korean worker survey to explore the effects of working long hours on the psychological well-being among workers caring for disabled or elderly family members. This research aims to provide a basis for policy recommendations for workers engaged in caregiving at home.

2. Methods

2.1. Study participants

The Korean Working Conditions Survey (KWCS) is a survey conducted by the Occupational Safety and Health Research Institute, adapting the structure and questions of the European Working Conditions Survey to suit Korean circumstances. It is a cross-sectional study sampling about 50,000 individuals who are employed and aged 15 or above. The KWCS comprehensively assesses work conditions through over 130 questions [17]. In this study, we used the sixth KWCS data, which was conducted from October 2020 to January 2021, with a response rate of 0.349 [17]. Of the 50,538 respondents in the sixth KWCS, 33,063 wage workers were included in the analysis, excluding 15,870 self-employed and 1,605 unpaid family workers.

2.2. Long working hours

Long working hours were measured using a question that asked respondents how many hours they actually worked in the workplace in a week. Weekly working hours were categorized into three groups as follows: (1) $\leq$40 hours/week; (2) $>$40 and $\leq$52 hours/week; (3) $>$52 hours/week. This classification is based on the Labor Standards Act, which sets the prescribed and maximum working hours per week at 40 and 52 hours, respectively.

2.3. Caregiving activities

In order to determine the participants' involvement in caregiving activities beyond their job duties, we used a question that asked about non-work activities, with a particular focus on those directed toward elderly or disabled family members. The questions we used are as follows: "Outside of work, how often do you participate in the following activities?" and "The following activities option: caring for elderly or disabled family members". Those who answered "every day", "several times a week", "several times a month", or "rarely" were categorized as caregiving, while those who answered "never" or "I do not have an elderly or disabled family member to care for." were categorized as not doing caregiving.

2.4. World Health Organization Well-Being Index

The World Health Organization Well-Being Index was originally developed as a tool to measure psychological well-being, and a few studies have reported an association with depressive symptoms [18]. It consists of five questions on a 0- to 5-point scale, with a raw score ranging from 0 to 25, with 25 representing the best possible psychological well-being. Scores less than half of the total (below 13 out of 25 points) indicate poor wellbeing and a need for mental health screening, such as depression [19]. Therefore, in this study, we categorized participants who scored less than 13 out of 25 as being at poor mental health and categorized them into the poor psychological well-being group.

2.5. Covariates

Age was categorized into six groups (15–19, 20–29, 30–39, 40–49, 50–59, and 60 years old or more) and monthly income into four groups ($<$2, $\geq$2 and $<$3, $\geq$3 and $<$4, and $\geq$4 million Korean Won). Educational level was categorized into four groups (elementary school or less, middle school, high school, and college or university). Following a study by Choi et al. that defined a simple classification of occupations, occupations were categorized as follows: managers, professionals, and technicians, and clerical support workers were categorized as white-collar workers; service, sales, agricultural, forestry, and fishery workers were categorized as pink-collar workers; and crafts, trades, machine operators, assemblers, and elementary occupations were categorized as blue-collar workers [20].

2.6. Statistical analysis

The frequency of caregiving activities and long working hours, and the prevalence of poor psychological well-being between the different groups (sex, age, income level, education, occupation, psychological well-being, caregiving activities, and working hours per week) were compared using a Chi-squared test.

The prevalence ratio (PR) and 95% confidence intervals (CI) of poor psychological well-being for weekly working hours and caregiving activities were calculated by the Poisson regression, where the reference of weekly working hours and caring activities were set to $\leq$40 hours/week and no caring activities, respectively. Additional models are derived by adjusting with common adjustments for sex, age, income level, educational level, and occupation group, and further adjusting for weekly working hours or caregiving activities excluding own variables.

After grouping by weekly working hours (based on 52 hours/week) and caregiving activities, an additional Poisson regression was performed to examine the interaction effect of the two variables. Participants were divided into four groups based on whether they worked long hours or provided caregiving and were further stratified by sex. The analysis controlled for sex, age, income level, education level, and occupation. The reference group included those who worked less than 52 hours per week and did not provide caregiving for an elderly or disabled family member. The relative excess risks of interaction, multiplicative scale, attributable proportion, and synergistic index were used to analyze synergistic effect [21–23]. All statistical analyses were conducted using the R software (version 4.3.2; R Foundation for Statistical Computing, Vienna, Austria).

3. Results

The characteristics of the study participants according to groups of caregiving activities, weekly working hours, and psychological well-being are given in Tables 1 and 2. The proportion of workers providing caregiving for an elderly or disabled family member was the highest among women (4.9%), those in their 50s (5.8%), the highest income group (5.7%), those who had less than an elementary school education (7.2%), and those with white-collar jobs (7.9%). Working long hours (52 hours or more per week) was most

Table 1
Characteristics of the study participants by caregiving activities and weekly working hours

	Caregiving activities (missing 45)			Weekly working hours (missing 163)			
	No	Yes	p	≤40 hours	41–52 hours	>52 hours	p
	(n = 31,477)	(n = 1541)		(n = 23,771)	(n = 6889)	(n = 2240)	
Sex			0.041				<0.001
Male	14,800 (47.0%)	683 (44.3%)		10,285 (43.3%)	3737 (54.2%)	1389 (62.0%)	
Female	16,677 (53.0%)	858 (55.7%)		13,486 (56.7%)	3152 (45.8%)	851 (38.0%)	
Age			<0.001				<0.001
15–19	144 (0.5%)	3 (0.2%)		133 (0.6%)	8 (0.1%)	5 (0.2%)	
20–29	4201 (13.3%)	77 (5.0%)		3031 (12.8%)	903 (13.1%)	325 (14.5%)	
30–39	6778 (21.5%)	220 (14.3%)		4905 (20.6%)	1639 (23.8%)	444 (19.8%)	
40–49	7431 (23.6%)	452 (29.3%)		5626 (23.7%)	1753 (25.4%)	480 (21.4%)	
50–59	7102 (22.6%)	439 (28.5%)		5282 (22.2%)	1702 (24.7%)	527 (23.5%)	
≥60	5821 (18.5%)	350 (22.7%)		4794 (20.2%)	884 (12.8%)	459 (20.5%)	
Income level*			<0.001				<0.001
<2M/month	10,009 (33.2%)	553 (37.5%)		8844 (38.9%)	1246 (18.8%)	426 (19.0%)	
2–3M/month	10,119 (33.6%)	408 (27.7%)		6600 (29.0%)	2863 (43.1%)	1042 (46.5%)	
3–4M/month	5905 (19.6%)	267 (18.1%)		4129 (18.2%)	1563 (23.5%)	459 (20.5%)	
≥4M/month	4104 (13.6%)	247 (16.7%)		3157 (13.9%)	969 (14.6%)	222 (9.9%)	
Education			<0.001				<0.001
Elementary school	1941 (6.2%)	150 (9.7%)		1891 (8.0%)	124 (1.8%)	63 (2.8%)	
Middle school	1824 (5.8%)	102 (6.6%)		1427 (6.0%)	305 (4.4%)	176 (7.9%)	
Highschool	10,845 (34.5%)	505 (32.8%)		7372 (31.1%)	2718 (39.5%)	1218 (54.4%)	
College/university	16,818 (53.5%)	782 (50.8%)		13,045 (55.0%)	3735 (54.3%)	781 (34.9%)	
Occupation			0.006				<0.001
White-collar	17,422 (55.3%)	892 (57.9%)		13,955 (58.7%)	3462 (50.3%)	861 (38.4%)	
Pink-collar	3634 (11.5%)	138 (9.0%)		2384 (10.0%)	959 (13.9%)	416 (18.6%)	
Blue-collar	10,421 (33.1%)	511 (33.2%)		7432 (31.3%)	2468 (35.8%)	963 (43.0%)	
Poor psychological well-being			<0.001				<0.001
No	21,527 (68.5%)	968 (63.1%)		16,400 (69.1%)	4648 (67.6%)	1382 (61.8%)	
Yes	9894 (31.5%)	566 (36.9%)		7324 (30.9%)	2231 (32.4%)	854 (38.2%)	

* The unit M means million Korean Won.

Table 2
Characteristics of the study participants by poor psychological well-being

	Poor psychological well-being (missing 69)		
	No	Yes	p
	(n = 22,520)	(n = 10,474)	
Sex			0.455
Male	10,589 (47.0%)	4878 (46.6%)	
Female	11,931 (53.0%)	5596 (53.4%)	
Age			<0.001
15–19	115 (0.5%)	32 (0.3%)	
20–29	3213 (14.3%)	1058 (10.1%)	
30–39	5059 (22.5%)	1940 (18.5%)	
40–49	5523 (24.5%)	2358 (22.5%)	
50–59	5028 (22.3%)	2504 (23.9%)	
≥60	3582 (15.9%)	2582 (24.7%)	
Income level*			<0.001
<2M/month	6547 (30.3%)	4004 (40.1%)	
2–3M/month	7306 (33.8%)	3219 (32.2%)	
3–4M/month	4496 (20.8%)	1674 (16.8%)	
≥4M/month	3253 (15.1%)	1095 (11.0%)	
Education			<0.001
Elementary school	1005 (4.5%)	1082 (10.4%)	
Middle school	1118 (5.0%)	807 (7.7%)	
Highschool	7488 (33.3%)	3851 (36.8%)	
College/university	12,881 (57.3%)	4711 (45.1%)	
Occupation			<0.001
White-collar	13,081 (58.1%)	5217 (49.8%)	
Pink-collar	2747 (12.2%)	1030 (9.8%)	
Blue-collar	6692 (29.7%)	4227 (40.4%)	
Caregiving activities			<0.001
No	21,527 (95.7%)	9894 (94.6%)	
Yes	968 (4.3%)	566 (5.4%)	
Working hours per week			<0.001
≤40 hours	16,400 (73.1%)	7324 (70.4%)	
41–52 hours	4648 (20.7%)	2231 (21.4%)	
>52 hours	1382 (6.2%)	854 (8.2%)	

* The unit M means million Korean Won.

common among men (9.0%), those in their 20s (7.6%), those earning between 2 million and 3 million Korean Won (9.9%), high school graduates (10.8%), and those with pink–collar jobs (11.1%). Poor psychological well-being was significantly higher among those aged 60 and older (41.9%), the lowest income group (37.9%), those with less than an elementary school education (51.8%), those with blue–collar jobs (38.7%), caregivers (36.9%), and those working 52 hours or more per week (38.2%).

As shown in Table 3, in both crude and adjusted models, working longer hours was associated with significantly higher poor psychological well-being than in the reference group (adjusted PR [aPR] = 1.10; 95% CI: 1.04–1.17 for 41–52 hours/week, aPR = 1.27; 95% CI: 1.17–1.38 for >52 hours/week). Similarly, performing caregiving activities was associated with significantly increased PRs in all models (aPR = 1.16; 95% CI: 1.05–1.27).

Table 4 shows the interaction effect of the weekly working hours and caregiving activities on psychological well-being. The aPRs for the "Long working hours without caregiving activities" group and "Caregiving activities without long working hours" group were 1.22 (95% CI: 1.12–1.33) and 1.13 (95% CI: 1.02–1.25), respectively. Workers with long working hours and caregiving activities were more likely to have poor psychological well-being (aPR = 1.81, 95% CI: 1.42–2.31). When stratified by sex, the participants with both two factors were associated with a higher risk of poor psychological well-being (aPR = 1.83; 95% CI: 1.36–2.47 for male, aPR = 1.71; 95% CI: 1.18–2.49 for female) than those with only one factor.

In interaction analysis, the relative excess risk of interaction was 0.46 (95% CI: 0–0.92), meaning that there was positive interaction on the additive scale but not statistically significant. The measure of interaction on a multiplicative scale, the ratio of PRs, was 1.32 (95% CI: 1.00–1.73), meaning that the risk of poor psychological well-being when both caregiving activities and long working hours are present is greater than the risks when each variable is present independently, indicating a significant multiplicative interaction. The attributable proportion was 0.26 (95% CI: 0.06–0.45), suggesting that the total risk of poor psychological well-being due to the interaction effect of both factors is 26%, and the 95% CI for the synergistic index greater than 1.00, meaning that there was a synergistic effect between the two variables.

Table 3
The prevalence ratio (PR) of poor psychological well-being by weekly working hours and caregiving activities from Poisson regression models

	PR	95% confidence interval	
		Lower	Upper
Weekly working hours			
Crude model			
≤40 hours	(Ref)		
41–52 hours	1.07	1.01	1.14
>52 hours	1.29	1.19	1.39
Adjusted model*			
≤40 hours	(Ref)		
41–52 hours	1.10	1.04	1.17
>52 hours	1.27	1.17	1.38
Caregiving activities			
Crude model			
No	(Ref)		
Yes	1.21	1.10	1.34
Adjusted model†			
No	(Ref)		
Yes	1.16	1.05	1.27

* Adjusted for age, sex, income level, educational level, occupation, and caregiving activities.
† Adjusted for age, sex, income level, educational level, occupation, and weekly working hours.

4. Discussion

This study found that long working hours and caregiving activities for an elderly or disabled family member were each associated with poor psychological well-being in wage workers and that the two factors interacted synergistically. These findings suggest that workers who are required to perform caregiving activities at home and are asked to work long hours at the same time are at an even greater risk of developing poor mental health.

Numerous studies internationally have been conducted on the relationship between long working hours and mental health, particularly depressive symptoms. A study analyzing 7,775 Korean workers found that those who worked more than 52 hours per week were more likely to be at a high risk for depression (odds ratio [OR] = 1.41; 95% CI = 1.20–1.65) [6]. A recent systematic review and meta-analysis reported an increased risk of new-onset depressive symptoms with long working hours, generally defined as over 55 hours per week, with country-specific meta-analysis showing the strongest association was found in Asian countries (OR = 1.50; 95% CI: 1.13–2.01), whereas a weak or no association was observed in Europe (OR = 1.11; 95% CI: 1.00–1.22), North America (OR = 0.97; 95% CI: 0.70–1.34), and Australia (OR = 0.95; 95% CI: 0.70–1.29), [4].

Some previous research on caregiving activities for disabled or elderly family members has found negative mental health effects. A longitudinal study of 9,368 men and women in the United Kingdom found higher levels of psychological distress among women who provided intermittent or long-term informal caregiving for more than three years to a sick, disabled, or elderly family member or friend than in noncaregivers, whereas there were no significant findings among men [24]. On the other hand, a study of 6,421 participants in 10 European countries found that parental caregiving with any frequency was negatively associated with mental health, significantly in both men and women [25].

While long hours of work in itself can have adverse mental health effects due to the prolonged state of tension and the release of stress hormones, the difficulty of finding time after work has been suggested as an important negative mental health trigger. Long working hours might lead to difficulties in unwinding after work, worsening the condition of prolonged increased cortisol levels [26,27]. Lack of personal time due to time spent at work also leads to work-life imbalance, disrupted health behaviors, and reduced recovery and rest time after work [4,28–30]. Similarly, the lack of time devoted to family is likely to lead to work–family conflicts [16], which are strongly linked to the difficulties of workers who have to perform family caregiving.

The theories of multiple role strains/overload and time scarcity have been identified as the principal frameworks explaining how caregiving duties impact mental health. As individuals take on caregiving roles in addition to their existing roles, such as homemakers or workers, the increased strain, excessive workload, and lack of physical time can affect their mental health [8,9,11]. The combination of caregiving and long working hours thus may intensify both role strain and work overload and further exacerbate time scarcity. Despite the nonremunerative nature of informal caregiving for elderly and disabled family members, the intrinsic linkage between the caregiver and the care recipient denotes that caregiving is not only a physically demanding task but also an emotionally taxing one [31]. This relationship suggests that caregiving can heighten emotional stress, potentially escalating role conflict and, in a synergistic manner, augmenting the risk of poor psychological well-being.

Our findings confirm that workers who cannot disengage from caregiving responsibilities at home while working long hours experience heightened stress. This indicates that individual stressors from both the workplace and home have a synergistic impact on health. To effectively manage workers' mental well-being, comprehensive interventions targeting both domains are necessary. It is crucial to address the mental health of workers

Table 4
The interaction effect of weekly working hours and caregiving activities on poor psychological well-being, stratified by sex

	Weekly working hours		Interaction assessment
	<52 hours	≥52 hours	
	PR* (95% CI)	PR* (95% CI)	
Overall			RERI = 0.46 (0.00, 0.92)
Caregiving activities (no)	(Ref)	1.22 (1.12, 1.33)	AP = 0.26 (0.06, 0.45)
Caregiving activities (yes)	1.13 (1.02, 1.25)	1.81 (1.42, 2.31)	SI = 2.33 (1.16, 4.66)
			Multiplicative scale = 1.32 (1.00, 1.73)
Male			RERI = 0.45 (-0.13, 1.03)
Caregiving activities (no)	(Ref)	1.23 (1.11, 1.36)	AP = 0.25 (-0.01, 0.50)
Caregiving activities (yes)	1.15 (0.99, 1.35)	1.83 (1.36, 2.47)	SI = 2.17 (0.92, 5.13)
			Multiplicative scale = 1.29 (0.91, 1.83)
Female			RERI = 0.41 (-0.26, 1.09)
Caregiving activities (no)	(Ref)	1.21 (1.04, 1.41)	AP = 0.24 (-0.07, 0.55)
Caregiving activities (yes)	1.09 (0.95, 1.24)	1.71 (1.18, 2.49)	SI = 2.39 (0.74, 7.71)
			Multiplicative scale = 1.3 (0.86, 1.98)

AP, attributable proportion; CI, confidence interval; PR, prevalence ratio; RERI, relative excess risks of interaction; SI; synergistic index.
* Prevalence ratio adjusted for age, sex, income level, educational level, and occupation.

burdened by caregiving duties through a number of helpful policies and supports, including expanded family care leave policies, support for caregivers, and increased family care allowances.

There are several limitations to this study. First, this study used data from the KWCS, and the low response rate may raise concerns about nonresponse bias. Although information regarding the characteristics of nonrespondents in the KWCS is not available, the KWCS remains a widely recognized and validated source for research on working conditions in the Korea, with extensive use in peer-reviewed studies [32–35]. Secondly, the cross-sectional nature of this study limits our ability to establish causality between working hours, caregiving activities, and psychological well-being. It is conceivable that those experiencing poor mental health may reduce their working hours or participation in caregiving activities, potentially diluting the results toward the null hypothesis. In addition, we cannot rule out the possibility of reverse causality, as poor mental health, such as poor psychological well-being, may lead to cognitive deficits, including problems with attention, memory, and processing speed, which may cause affected workers to work less efficiently and require longer working hours. In addition, previous studies using longitudinal data sets to track caregiving transitions have been shown to have greater explanatory power than cross-sectional analyses of caregiving involvement [36,37]. Therefore, future studies using longitudinal data are essential to circumvent these issues and clarify causal relationships. Third, as the study was based on a survey of the working population only, it was not possible to take into account cases where workers with poor mental well-being took sick leave or left the labor market altogether. To compensate for this limitation, we included all very short-time workers in the analysis to get a complete picture. Fourth, detection of poor mental health, or poor psychological well-being, in this study was facilitated by the World Health Organization-5 Well-Being Index, which relies on self-report. In addition, the survey questions on working long hours and family caregiving were all asked in a self-report format, which raises some concerns about reporting bias. Nevertheless, the questionnaire has established validity, as it uses common internationally accepted items; therefore, the potential for bias might be minimal. Fifth, although adjustments were made for potential confounders, we did not examine other variables that might be significantly associated with long working hours, caregiving, and psychological well-being, such as individual medical history or other detailed family roles. In addition, the sixth KWCS was conducted during the COVID-19 pandemic, and unlike other surveys, a number of confounding variables may have had unexpected effects. Therefore, further longitudinal studies are needed to establish clear causality.

Nevertheless, this study has unique strengths. It includes a representative sample of the general working population in the Republic of Korea, which has relatively long working hours, making it well suited to assess the impact of working long hours and caregiving on poor psychological well-being. By providing evidence on the synergistic effects of working hours and family caregiving activities on mental health, this study can help shape public health policies such as caregiver support.

In conclusion, our study highlights the profound interaction between long working hours and caregiving responsibilities, which is significantly correlated with an increased risk of poor psychological well-being among the working population in the Republic of Korea. It underscores the reality that individuals engaged in multiple roles of employed work and caregiving do not face isolated stressors but are at the nexus of compounded mental health risks. This research confirms the urgent need for tailored public health policies and workplace practices that recognize and mitigate the synergistic effects of prolonged work and caregiving activities on mental health.

CRediT authorship contribution statement

Min Young Park: Writing – original draft, Formal analysis, Data curation, Conceptualization. **Jongin Lee:** Writing – review & editing, Validation, Supervision, Methodology.

Ethical statements

This original study was approved with an exemption of ethical deliberation by the Institutional Review Board of St. Mary's Hospital, Catholic University of the Republic of Korea (exemption number: KC24ZASI0096). The authors confirm that all methods used in this study adhere to the ethical guidelines set forth by the respective national and institutional review boards on human research, in alignment with the principles of the 1975 Helsinki Declaration, as amended in 2008.

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Conflicts of interest

All authors declare that there is no conflict of interest.

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