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Original article

## The Effects of Job Demand-control-support Profiles on Presenteeism: Evidence from the Sixth Korean Working Condition Survey



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### ABSTRACT

**Background:** Presenteeism is closely related to work performance, work quality and quantity, and productivity at work. According to the job demand-control-support model, job demand, job control, and support play important roles in presenteeism. The present study investigated job characteristics profiles based on the job demand-control-support model and identify the association between job characteristics profiles and presenteeism.

**Methods:** This secondary data analysis used the Sixth Korean Working Condition Survey, a nationwide cross-sectional dataset. The study included 25,361 Korean wage workers employed in the workplace with two or more workers. Participants were classified into four job characteristics profiles based on the job demand-control-support model, using latent profile analysis, and logistic regression was performed to examine the association between study variables.

**Results:** Overall, 11.0 % of study participants reported experience of presenteeism in the past 12 months. Age, sex, location, monthly income, shift work, work hours, health problems, and sleep disturbances were significantly associated with presenteeism. The rate of presenteeism was the highest in the passive isolate group. The passive collective, active collective, and low-strain collective groups had a 23.0%, 21.0%, and 29.0% lower likelihood of experiencing presenteeism, respectively, than the passive isolate group.

**Conclusions:** The job demand-control-support profiles and the risk of presenteeism were significantly associated. The most significant group that lowered the experience of presenteeism was the low-strain collective group, which had a low level of demand and high levels of control and support. Therefore, we need a policy to reduce job demand and increase job control and support at the organizational and national levels.

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### 1. Introduction

Presenteeism refers to coming to work when the person is sick or ill [1,2]. Presenteeism is more complex than absenteeism, an absence from work due to illness and/or disability. Presenteeism is closely related to work performance, work quality and quantity, and productivity at work [3–5]. About 39% of European workers [6] and about 69% of American workers [7] reported presenteeism. In healthcare, about 49% of nurses reported presenteeism [8]. In addition, previous studies reported that increased job demand, lack of support, and job control were the most significant indicators of presenteeism in the general population [9].

The job demand-control-support (JDCS) model describes how job characteristics affect the psychological status of workers [10]. According to this model, job demands, such as heavy workload, high work speeds, role ambiguity, and psychological demands from customers, patients, or clients, are the main hindrances to worker well-being of workers [11]. However, the interaction between job demand and well-being can be buffered if a person has autonomy or decision authority over decision-making or support from co-workers or supervisors [10,12,13]. Further, the JDCS model distinguishes four types of jobs based on the different levels and combinations of high and low levels of demands and control, which are later extended by adding the new dimension of social support

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[14,15]. Researchers have reported that different levels of job demand and job control are associated with presenteeism. For example, Jourdain and Vézina showed that workers with a combination of low decision authority and high job demands were more likely to choose presenteeism, but the rates of presenteeism were more likely to be reduced when workers had some access to particular resources, such as support from the supervisors [15]. However, Gerich reported a curvilinear relationship between job control and sickness presenteeism and showed that an increase in job control at low or moderate levels was associated with lower presenteeism; however, very high levels of job control were associated with higher presenteeism [16].

Research has shown that presenteeism influences the health and well-being of workers over time. In a recent report, the rate of presenteeism among Korean workers was 23.5%, which is lower than in most European countries [17]. Meanwhile, Korean workers reported significantly lower percentages of sickness absence (9.9%) compared to European countries (average of 50%) [17]; and the ratio of presenteeism to absence in Korean workers was 2.37, which is much higher than the ratio of European countries of 0.81 [18]. These statistics indicate that Korean workers are not allowed to take sick leave even if they are ill, meaning the issue of presenteeism is even more tragic among Korean workers. Unfortunately, studies examining the relationships between JDCS and presenteeism are scarce in Korean workers [19,20].

In addition, these studies assessed the effects of job demand, control, and support on presenteeism separately, which utilized the variable-centered approach. The traditional analytical method (i.e., variable-centered approach) to examine the relationship between each JDCS variable and presenteeism may not fully capture the diverse nature of each worker's characteristics. Therefore, it could lead to over or under-estimated study results regarding the study populations [21]. However, workers may manifest different combined levels of JDCS profiles, and a combination of different levels of JDCS profiles may have varying effects on presenteeism among workers. Latent profile analysis (LPA), a person-centered approach, allows identifying subgroups with similar job profiles (job demand, control, support) [22] and how each group associates differently with presenteeism. Researchers have used the latent subgroup analysis to identify distinct job profiles and their influence on worker well-being in other countries, such as European countries and the United States [14,23–25]. Using the LPA to identify subgroups most prone to presenteeism can help develop targeted interventions to reduce presenteeism. Therefore, this study aimed to investigate job characteristics profiles based on the JDCS model using LPA and identify the association between JDCS profiles and presenteeism using the Sixth Korean Working Condition Survey (KWCS).

## 2. Materials and methods

### 2.1. Data source and sample

This study is a secondary analysis research that used data from the Sixth KWCS collected in 2020. The KWCS is a nationally representative cross-sectional design survey; data are collected every 3 years by the Occupational Safety and Health Research Institute (OSHRI) in Korea. Korea initially developed the KWCS based on the European Working Conditions Survey (EWCS). Researchers established the questionnaire's validity using a rigorous translation and back-translation approach, an expert review process, a real-life pretest, and cognitive interviews [26]. A professionally trained interviewer visited each household to conduct one-on-one interviews with selected household members (i.e., workers over 15 years). The survey uses a tablet-aided personal interview,

with an electronic questionnaire mounted on the tablet PC, and includes questions on occupation, working conditions, exposure to workplace hazards, and the health conditions of workers.

In the Sixth KWCS, 50,538 workers were interviewed. We defined eligible participants as wage workers in Republic of Korea and excluded the self-employed ( $n = 12,703$ , 25.1%), owners ( $n = 3,167$ , 6.3%), and unpaid workers ( $n = 1,605$ , 3.2%). We included workers employed in a workplace with two or more workers (we excluded 7,702 non-eligible participants) with support from colleagues and supervisors as one of the job characteristics in the LPA. Finally, we obtained a sample of 25,361 in this study.

### 2.2. Measures

The study included the following measures from the KWCS.

#### 2.2.1. Job characteristics

We critically reviewed previous studies on job demand, control, and support [14,28,29] and measured job characteristics using 23 items (six for job demands, ten for job control, and seven for job support) from the KWCS. The job demands indicators included three questions related to work speed (e.g., "Does your job involve working at very high speed?") and three to psychological demands (e.g., "Does your job involve handling angry clients, customers, patients, and pupils?"). The job control indicators included five questions related to work flexibility (e.g., flexible working hours, taking a break when you wish, and taking care of personal matters during working hours) and five to decision authority (e.g., "In your work situation, can you influence decisions that are important for your work?"). The job support indicators included six items of supervisor support (e.g., "In your work situation, does your manager help and support you?") and one of colleague support (e.g., "In your work situation, do your colleagues help and support you?").

#### 2.2.2. Presenteeism

Presenteeism was measured by asking: "Over the past 12 months, did you work when you were sick?" Participants reporting "yes" were considered to have experienced presenteeism; those reporting "no" or "I was not sick" were considered to not have experienced presenteeism.

#### 2.2.3. Participant characteristics

We included age, sex, location (urban/rural), monthly income, shift work, weekly total working hours, health problems, and sleep disturbances. We assessed health problems by asking the participants if they had any listed health problems (i.e., hearing problems, skin problems, backache, shoulder, neck, and upper limb pain, lower limb pain, headaches, eyestrain, injury, anxiety, overall fatigue, or other issues) in the past 12 months. We considered participants who responded "yes" to at least one problem to have a health problem. We also asked participants if they had any sleep-related problems (i.e., difficulty falling asleep, repeatedly waking up, and waking up feeling exhausted and fatigued) in the past 12 months. The response options were "daily," "several times a week," "several times a month," "not very often," and "never." We coded responses of "daily," "several times a week," and "several times a month" as "yes," while "not very often" and "never" as "no." We considered participants who answered "yes" to at least one of the three sleep-related problems to have a sleep disturbance.

### 2.3. Data analysis

We analyzed the data using STATA 15.1 (StataCorp LP, College Station, TX, USA) and Mplus 8.0. We described participant characteristics and study variables with descriptive statistics and used LPA

to classify job characteristics profiles based on the JDCS model. We evaluated the models using the following parameters to decide the optimal number of profile groups (Table 1): the Akaike information criterion (AIC), the Bayesian information criteria (BIC), the sample size-adjusted BIC (SABIC), entropy values, the Lo–Mendell–Rubin adjusted likelihood ratio test (LMRT), and the bootstrapped likelihood ratio test (BLRT). The best possible profiles model should have a lower AIC, BIC, and SABIC, higher entropy, significant LMRT, and BLRT *p*-values, and enough people in each profile (5%, [27]). We observed the lowest AIC, BIC, and SABIC and highest entropy for a six-profile solution. However, we obtained a profile proportion of less than 5% for the five- and six-profile solutions. Therefore, we retained the four-profile solution because the model presented a lower BIC value compared to the two- and three-profile solutions, higher entropy value, significant LMRT and BLRT *p*-values, and a considerable number of people in each profile (profile 1, *n* = 6,105; profile 2, *n* = 5,177; profile 3, *n* = 11,300; profile 4, *n* = 2,779).

Fig. 1 presents the results for the four-profile solution. We named each profile according to Johnson and Hall's [55] JDSC model. Participants in the first profile (*n* = 6,105; 24.1%) were the "passive isolate profile"—they had low levels of demand, control, and support. The second profile (*n* = 5,177; 20.4%) had low demand and control and high support—they were the "passive collective profile." The third profile (*n* = 11,300; 44.6%) presented high demand, control, and support levels—the "active collective profile." Finally, the fourth profile (*n* = 2,779; 10.9%)—the "low-strain collective profile"—had low levels of demand and high levels of control and support.

After constructing the JDSC profiles, we used a chi-square test to investigate the differences between the JDSC profiles and presenteeism according to participant characteristics. Finally, we performed logistic regression to identify the association between the JDSC profiles and presenteeism, controlling for participant characteristics. A *p*-value <0.05 indicated statistical significance, and we used 95% confidence intervals (CI).

#### 2.4. Ethical consideration

The study is a secondary analysis of the preexisting dataset. The Institutional Review Board of the first author's University (No. 1041078-202203-HR-142) waived requirements for an ethical review and approval for this study.

### 3. Results

Table 2 summarizes the descriptive characteristics of the sample. The proportion of male and female participants was 46.9% and 53.1%, respectively. Most participants were not involved in shift work (90.1%) and worked less than 40 hours per week (72.3%). Approximately 50% of participants had health problems, and 23.7% experienced sleep disturbances. There were significant differences in the distribution of age, sex, location, monthly income, shift work,

work hours, health problems, and sleep disturbances between the JDSC profile groups. In the passive isolate group, there were a higher proportion of females, located in rural areas, shift workers, working over 53 hours per week, with health problems and sleep disturbances compared to the proportions in the active collective and low-strain collective groups.

Table 3 presents the distribution of participant characteristics. Among the study participants, 11.0 % reported experiencing presenteeism in the past 12 months (*n* = 2,781). Age, sex, location, monthly income, shift work, work hours, health problems, and sleep disturbances were significantly associated with presenteeism. The rate of presenteeism was the highest in the passive isolate group (14.7%) and those aged 40–49 (12.4%). Females (12.4%) experienced a higher rate of presenteeism than males (9.5%). Participants who were involved in shift work (13.7%) experienced higher rates of presenteeism than those who were not (10.7%), and the presenteeism rate was the highest among participants who worked  $\geq 53$  hours per week (15.9%). Moreover, presenteeism was higher among those with health problems (21.4%) and sleep disturbances (24.6%) than those without these problems.

Table 4 and Fig. 2 present the results of the logistic regression model. The JDSC profiles and the risk of presenteeism showed a significant association. The passive collective group had a 23.0% lower likelihood of experiencing presenteeism than the passive isolate group (OR = 0.77, 95% CI = 0.67–0.88). The active collective group had a 21.0% lower likelihood of experiencing presenteeism than the passive isolate group (OR = 0.79, 95% CI = 0.72–0.88). The low-strain collective group had a 29.0% lower likelihood of experiencing presenteeism than the passive isolate group (OR = 0.71, 95% CI = 0.60–0.84). Females had a 1.47 times higher likelihood of experiencing presenteeism than males, and participants living in rural areas had a 1.11 times higher likelihood of experiencing presenteeism than those living in urban areas. Shift workers had a 1.20 times higher likelihood of experiencing presenteeism than non-shift workers. Participants who worked 41–52 hours and more than 53 hours had a 1.56- and 1.53-times higher likelihood of experiencing presenteeism than those who worked less than 40 hours, respectively. Participants with health problems and sleep disturbances had a 4.28- and 2.94-times higher likelihood of experiencing presenteeism than those without health problems and sleep disturbances.

### 4. Discussion

Although the direct cost of presenteeism may not be visible, the hidden cost of presenteeism may be high because workers are unable to perform at optimal levels due to health conditions while at work [1,6]. The overall rate for presenteeism was 11.0%. This rate is relatively lower than presenteeism reported in other countries (European and American workers at 35% and 69%, respectively). There could be several reasons for this discrepancy. For instance, some studies used a single item, while others used two-to-four-

**Table 1**  
Fit indices, entropy, and model comparisons for the six estimated job-demand-control-support profiles

	LL	AIC	BIC	SABIC	Entropy	LMRT ( <i>p</i> )	BLRT ( <i>p</i> )
1 profile	−747256.33	1494604.66	1494979.14	1494832.95	—	—	—
2 profiles	−712409.54	1424959.08	1425528.94	1425306.49	0.830	0.333	<0.001
3 profiles	−699447.71	1399083.43	1399848.68	1399549.95	0.829	<0.001	<0.001
<b>4 profiles</b>	<b>−688593.27</b>	<b>1377422.55</b>	<b>1378383.18</b>	<b>1378008.18</b>	<b>0.861</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>
5 profiles	−681777.44	1363838.88	1364994.90	1364543.63	0.866	<0.001	<0.001
6 profiles	−675114.53	1350561.07	1351912.47	1351384.92	0.891	<0.001	<0.001

Note. AIC, Akaike information criterion; BIC, Bayesian information criterion; BLRT, bootstrapped likelihood ratio test; LL, log-likelihood; LMRT, Lo–Mendell–Rubin test; SABIC, sample size-adjusted BIC. The bold values indicate that a four-profile model was determined to be optimal.

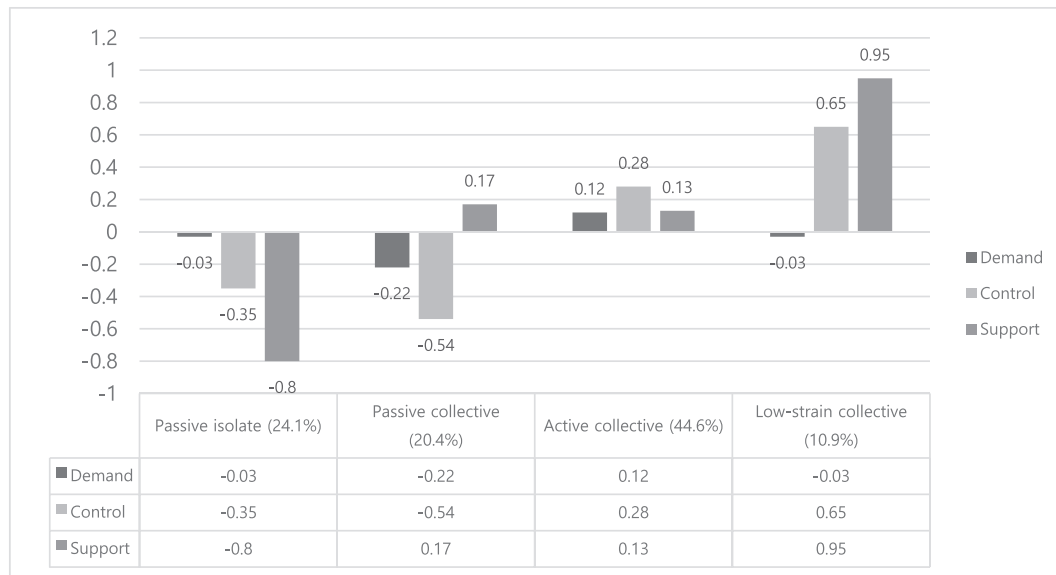


Fig. 1. Results from the latent profile analysis (standardized values).

item scales to measure presenteeism with a dichotomous or three-to-seven-point Likert scale. Most studies relied on self-reported data obtained by asking about experiences with presenteeism with different recall periods, ranging from a week to a nonspecific period, which could have resulted in recall bias [28]. Previous researchers have reported that workers in health care and education tended to report higher presenteeism than others because they felt obligated to their patients and students and cultural norms of

altruism [29,30]. Thus, the prevalence could vary among studies depending on the proportion of workers in different sectors. Future studies need to consider using unified, reliable, and validated instruments to capture the whole experience of presenteeism for cross-country comparison and cross-occupation comparison. We also recommend subgroup analysis between different occupations as the prevalence and organizational factors for presenteeism may differ.

**Table 2**  
Descriptive characteristics of the sample by the job demand-control-support profiles ( $n = 25,361$ )

Characteristics	Total	Job demand-control-support profiles				p
		Passive isolate ( $n = 6,105$ )	Passive collective ( $n = 5,177$ )	Active collective ( $n = 11,300$ )	Low-stain collective ( $n = 2,779$ )	
n (%)						
Age (years)						
< 30	3,422 (13.5)	809 (13.3)	836 (16.1)	1,399 (12.4)	378 (13.6)	<0.001
30–39	5,402 (21.3)	1,116 (18.3)	920 (17.8)	2,682 (23.7)	684 (24.6)	
40–49	6,056 (23.9)	1,346 (22.0)	921 (17.8)	3,002 (26.6)	787 (28.3)	
50–59	5,779 (22.8)	1,452 (23.8)	1,091 (21.1)	2,662 (23.5)	574 (20.7)	
≥ 60	4,702 (18.5)	1,382 (22.6)	1,409 (27.2)	1,555 (13.8)	356 (12.8)	
Sex						
Male	11,901 (46.9)	2,787 (45.6)	2,008 (38.8)	5,595 (49.5)	1,511 (54.4)	<0.001
Female	13,460 (53.1)	3,318 (54.4)	3,169 (61.2)	5,705 (50.5)	1,268 (45.6)	
Location						
Urban	11,875 (46.8)	2,675 (43.8)	2,305 (44.5)	5,497 (48.6)	1,398 (50.3)	<0.001
Rural	13,486 (53.2)	3,430 (56.2)	2,872 (55.5)	5,803 (51.4)	1,381 (49.7)	
Monthly income (1,000 KRW)						
< 2,000	8,108 (33.4)	2,449 (41.7)	2,566 (51.5)	2,507 (23.1)	586 (22.7)	<0.001
2,000–3,000	8,088 (33.3)	1,995 (33.9)	1,507 (30.2)	3,811 (35.1)	775 (30.0)	
3,000–4,000	4,769 (19.6)	973 (16.6)	609 (12.2)	2,613 (24.1)	574 (22.3)	
≥ 4,000	3,325 (16.7)	457 (7.8)	303 (6.1)	1,920 (17.7)	645 (25.0)	
Shift work						
Yes	2,513 (9.9)	736 (12.1)	638 (12.4)	932 (8.3)	207 (7.5)	<0.001
No	11,765 (90.1)	5,352 (87.9)	4,517 (87.6)	10,335 (91.7)	2,561 (92.5)	
Work hours (h/week)						
< 40	18,235 (72.3)	4,189 (69.1)	3,876 (75.2)	8,093 (71.9)	2,077 (75.4)	<0.001
41–52	5,291 (21.0)	1,354 (22.3)	945 (18.3)	2,454 (21.8)	538 (19.5)	
≥ 53	1,699 (6.7)	521 (8.6)	337 (6.5)	702 (6.3)	139 (5.1)	
Health problems						
Yes	9,799 (38.6)	2,710 (44.4)	1,743 (33.7)	4,320 (38.2)	1,026 (36.9)	<0.001
No	15,562 (61.4)	3,395 (55.6)	3,434 (66.3)	6,980 (61.8)	1,753 (63.1)	
Sleep disturbances						
Yes	6,021 (23.7)	1,948 (31.9)	1,264 (24.4)	2,262 (20.0)	547 (19.7)	<0.001
No	19,340 (76.3)	4,157 (68.1)	3,913 (75.6)	9,038 (80.0)	2,232 (80.3)	

Note. p-values are derived from the Chi-square test.

**Table 3**  
Distribution of presenteeism according to participant characteristics

Characteristics	Presenteeism		p
	No	Yes	
	n (%)		
<b>Profiles</b>			
Passive isolate	5,190 (85.3)	893 (14.7)	<0.001
Passive collective	4,683 (90.6)	485 (9.4)	
Active collective	10,109 (89.7)	1,160 (10.3)	
Low-strain collective	2,526 (91.2)	243 (8.8)	
<b>Age (years)</b>			
< 30	3,161 (92.6)	253 (7.4)	<0.001
30–39	4,779 (88.7)	606 (11.3)	
40–49	5,287 (87.6)	749 (12.4)	
50–59	5,080 (88.2)	683 (11.8)	
≥ 60	4,201 (89.5)	490 (10.5)	
<b>Sex</b>			
Male	10,739 (90.5)	1,123 (9.5)	<0.001
Female	11,769 (87.6)	1,658 (12.4)	
<b>Location</b>			
Urban	10,633 (89.9)	1,200 (10.1)	<0.001
Rural	11,875 (88.3)	1,581 (11.7)	
<b>Monthly income (1,000 KRW)</b>			
< 2,000	7,289 (90.0)	808 (10.0)	<0.001
2,000–3,000	7,109 (88.1)	960 (11.9)	
3,000–4,000	4,237 (88.9)	527 (11.1)	
≥ 4,000	2,926 (88.1)	395 (11.9)	
<b>Shift work</b>			
Yes	2,168 (86.3)	344 (13.7)	<0.001
No	20,268 (89.3)	2,429 (10.7)	
<b>Work hours (h/week)</b>			
< 40	16,511 (90.7)	1,684 (9.3)	<0.001
41–52	4,471 (84.8)	801 (15.2)	
≥ 53	1,425 (84.1)	269 (15.9)	
<b>Health problem</b>			
Yes	7,677 (78.6)	2,093 (21.4)	<0.001
No	14,831 (95.6)	688 (4.4)	
<b>Sleep disturbance</b>			
Yes	4,522 (75.4)	1,472 (24.6)	<0.001
No	17,986 (93.2)	1,309 (6.8)	

Note. *p*-values are derived from the Chi-square test.

A comparison of the four JDCS profiles revealed that the low-strain collective group (low level of demand and high levels of control and support) was less likely to experience presenteeism than the other three groups. A previous meta-analysis of presenteeism and its predictors showed that increased job demand and low resources, such as lack of control and support, were important correlates of presenteeism [9]. Increased job demands characterized by a heavy workload, overtime, and high work speed make workers come to work while ill to deal with the high volume of workload and meet deadlines [9,31]. Working while ill is associated with poor health and burnout [33]. The JDCS model also states that workers are likely to experience burnout with high job demands, but few resources are available [33,34].

Resources, including support from supervisors and colleagues and job control (decision authority or autonomy), may play important roles in reducing presenteeism. A previous researcher reported that job control was the most significant factor associated with presenteeism [35]. Job control provides essential resources for workers as it fosters personal learning and goal accomplishment and buffers the effect of high job demand on the health and well-being of workers [36,37]. In contrast, other studies have reported that high job control increases time pressure and reduces predictability [38,39]. For instance, Gerich also confirmed that very high job control is associated with increased presenteeism, whereas job control level at low or moderate levels is associated with decreased presenteeism [16].

These results could be due to discrepancies between workers studied in different industries and the roles of workers (e.g.,

**Table 4**  
Odds ratios of the job demand-control-support profiles on presenteeism

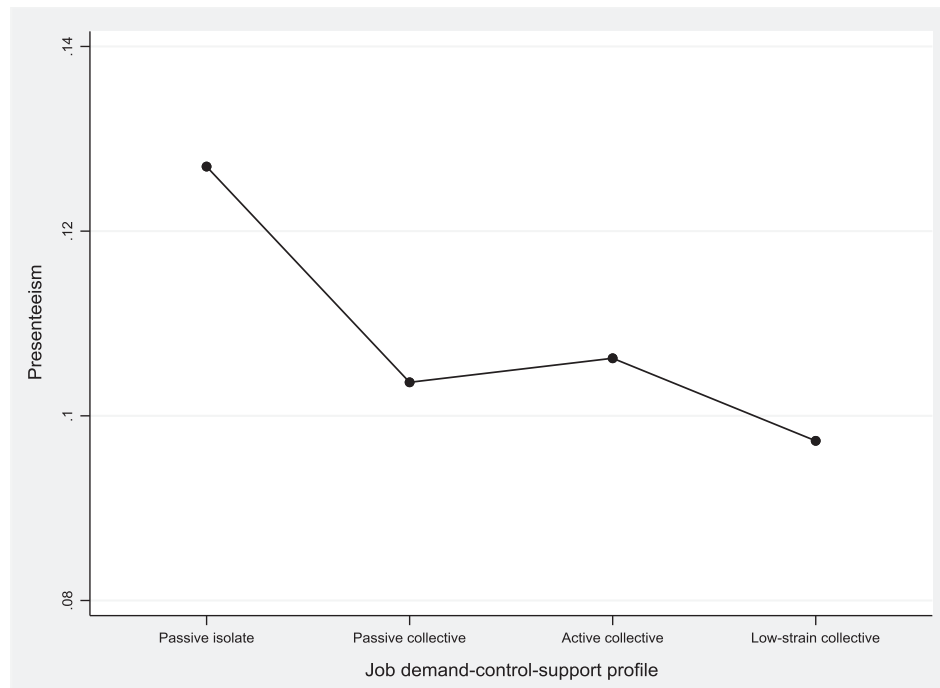
Variable	Presenteeism		p
	Odds ratio	95% CI	
<b>Profiles</b>			
Passive isolate	1.00	—	—
Passive collective	0.77	[0.67, 0.88]	<0.001
Active collective	0.79	[0.72, 0.88]	<0.001
Low-strain collective	0.71	[0.60, 0.84]	<0.001
<b>Age (years)</b>			
< 30	1.00	—	—
30–39	1.30	[1.10, 1.55]	0.002
40–49	1.29	[1.09, 1.52]	0.003
50–59	1.11	[0.94, 1.31]	0.211
≥ 60	1.07	[0.90, 1.28]	0.421
<b>Sex</b>			
Male	1.00	—	—
Female	1.47	[1.33, 1.62]	<0.001
<b>Location</b>			
Urban	1.00	—	—
Rural	1.11	[1.02, 1.21]	0.018
<b>Monthly income (1,000 KRW)</b>			
< 2,000	1.00	—	—
2,000–3,000	1.13	[1.00, 1.27]	0.039
3,000–4,000	1.15	[0.99, 1.33]	0.055
≥ 4,000	1.42	[1.21, 1.66]	<0.001
<b>Shift work</b>			
No	1.00	—	—
Yes	1.20	[1.04, 1.37]	0.010
<b>Work hours (h/week)</b>			
< 40	1.00	—	—
41–52	1.56	[1.41, 1.73]	<0.001
≥ 53	1.53	[1.31, 1.79]	<0.001
<b>Health problems</b>			
No	1.00	—	—
Yes	4.28	[3.89, 4.72]	<0.001
<b>Sleep disturbances</b>			
No	1.00	—	—
Yes	2.94	[2.69, 3.22]	<0.001

Note. CI refers to the confidence interval.

administrators, managers, and staff). For example, those who work in an environment and job position with high job control may feel a greater sense of obligation and pressure to show increased productivity. Consequently, absenteeism may decrease, but presenteeism may occur as high job control [40]. Our study results could explain why the groups of high job control revealed increased presenteeism. The presenteeism increases under profiles of higher job control with higher job demands (i.e., active collective group) compared to profiles of higher job control with lower job demands (i.e., low-strain collective). Therefore, maintaining a moderate level of control that does not increase job demand is crucial for reducing presenteeism. The supervisor should monitor and evaluate the level of job control among workers and support them to maintain a moderate level of job control for a given task. Further, delegating the work or task when overwhelmed could be one way to reduce job demand. However, previous studies and our study are cross-sectional in nature, and longitudinal studies are needed in the future to confirm the relationships between job control and presenteeism.

The analysis of four JDCS profiles showed that support seemed to be the most critical factor contributing to presenteeism. Strong organizational support from supervisors and coworkers may increase productivity and job satisfaction with reduced presenteeism [41,42]. However, studies report inconsistencies between support from coworkers and supervisors and presenteeism [43,44]. The inconsistency may be attributed to the analysis based on a simple examination of the relationship between support and presenteeism, not considering other important factors, including job demand and job control. Our study is novel because we used LPA to classify job characteristics profiles based on the JDCS model. The findings indicated that groups





**Fig. 2.** Predicted presenteeism probabilities according to the job demand-control-support profiles. The model was adjusted for participant characteristics (age, sex, location, monthly income, shift work, work hours, health problems, and sleep disturbances).

(profiles) with higher job support from supervisors and colleagues experienced less presenteeism than the low support profiles (group). Supervisor and coworker support reduces stress and burnout of workers, thus reducing presenteeism [45,46]. Positive relationships with coworkers relieve stress by providing sympathy and understanding, thereby reducing presenteeism [42,47].

Moreover, better communication with supervisors creates a healthy working environment [50]. Workers who perceive support from supervisors are more likely to trust supervisors, which reduces stress and, in turn, reduces presenteeism [45]. Supervisors also play essential roles in controlling job demand and control by controlling heavy workload, work speed, and flexible working hours that contribute to presenteeism. Thus, education programs for supervisors and workers that foster effective communication and a healthy working environment need to be developed. Furthermore, although there is a paid sick leave policy in Republic of Korea, organizational climates and cultural factors may hinder workers from taking paid sick leave [19]. Thus, the supervisors should support and inform their workplace's sick leave policies and apply them fairly to all workers. In addition, employers must inform their employees of their rights under sick leave policies. Moreover, institutional policy or cultures protecting workers from income loss and feeling dismissed from presenteeism would help workers promptly take appropriate care and treatment [17].

Several personal characteristics were associated with presenteeism. Similar to previous studies [31,49,50], we found an association between long working hours, shift work, health problems, sleep disturbance, and presenteeism. Long working hours are associated with chronic diseases, which increase the chances of workers presenting themselves at work while sick. Working while sick is closely associated with decreased productivity, which increases institutional costs in the long run [51]. Shift work disturbs circadian rhythms, leads to sleep disturbances, and interferes with recovery between shifts, which may result in fatigue. Sleep quantity and quality predict presenteeism in the general population and among shift workers.

Inadequate rest periods between shifts were a significant predictor of presenteeism in previous studies [52–54]. Thus, administrators and supervisors should consider limiting long working hours, including overtime, and provide an adequate recovery period between shifts. Furthermore, physical examination provided at the organizational level at low or no cost would be beneficial.

#### 4.1. Limitations

We should acknowledge some limitations. First, we measured presenteeism with a single item that relied on one's experience in the past 12 months. Therefore, there is a possibility that we may not have captured the entire concept of presenteeism, and we cannot exclude recall bias. Future studies should use reliable and validated instruments that address presenteeism's whole meaning and experience and a diary to reduce recall bias. Second, we used cross-sectional data, so we cannot assume a causal relationship between variables. Consequently, some independent variables, such as job demand, job control, support, and personal characteristics, including health status, may have longitudinal effects on presenteeism. Thus, we recommend longitudinal studies on presenteeism in the future. Third, we also recommend subgroup analysis of different work sectors as the working conditions and environment may differ. Employers need to reduce presenteeism with interventions based on the subgroup analysis results. Finally, because this study relied on secondary data analysis, the data may have excluded confounding variables influencing presenteeism, such as family support. Despite these limitations, our study provides new knowledge using LPA based on the JDCS model.

Presenteeism is a vital factor influencing productivity, economic cost, and workers' health. Our preeminent findings suggest that the groups with high job control, job support, and some personal characteristics, including long work hours and sleep, affect presenteeism based on the JDCS model. Our study's results suggest that we need policy development regarding monitoring and

limiting job demand (heavy workload and overtime) and increasing job control by allowing flexible working hours and breaks during work hours at the national and organizational levels. Moreover, organizational cultures allowing paid sick leave may be helpful.

### Ethical approval

The study received an exemption from the Institutional Review Board of Chung-Ang University (Approval No. 1041078-202203-HR-142).

### Data statement

The data that support the findings of this study from the KWCS are located at <https://oshri.kosha.or.kr/oshri/researchField/workingEnvironmentSurvey.do>.

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### Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### References

- [1] Aysun K, Bayram Ş. Determining the level and cost of sickness presenteeism among hospital staff in Turkey. *Int J Occup Saf Ergon* 2017;19:1–9. <https://doi.org/10.1080/10803548.2016.1274159>.
- [2] Johns G. Presenteeism in the workplace: a review and research agenda. *J Organ Behav* 2010;31:519–42. <https://psycnet.apa.org/doi/10.1002/job.630>.
- [3] Li Y, Zhang J, Wang S, Guo S. The effect of presenteeism on productivity loss in nurses: the mediation of health and the moderation of general self-efficacy. *Front Psychol* 2019 Jul 31;10:1745. <https://doi.org/10.3389/fpsyg.2019.01745>.
- [4] Howarth A, Quesada J, Silva J, Judycki S, Mills PR. The impact of digital health interventions on health-related outcomes in the workplace: a systematic review. *Digit Health* 2018;4:2055207618770861. <https://doi.org/10.1177/2055207618770861>.
- [5] Allen D, Hines EW, Pazdernik V, Konecny LT, Breitenback E. Four-year review of presenteeism data among employees of a large United States health care system: a retrospective prevalence study. *Hum Resour Health* 2018;16:59. <https://doi.org/10.1186/s12960-018-0321-9>.
- [6] Reuter M, Wahrendorf M, Di Tecco C, Probst TM, Ruhle S, Ghezzi V, Barbaranelli C, Iavicoli S, Dragano N. Do temporary workers more often decide to work while sick? Evidence for the link between employment contract and presenteeism in Europe. *Int J Environ Res Public Health* 2019 May 27;16(10):1868. <https://doi.org/10.3390/ijerph16101868>.
- [7] Maestas NA, Mullen KJ, Rennane S. Absenteeism and presenteeism among American workers. *J Disabil Policy Stud* 2021;32:13–23. <https://doi.org/10.1177/1044207320933211>.
- [8] Min A, Kang M, Park H. Global prevalence of presenteeism in the nursing workforce: a meta-analysis of 28 studies from 14 countries. *J Nurs Manag* 2022 May 20. <https://doi.org/10.1111/jonm.13688>.
- [9] Miraglia M, Johns G. Going to work ill: a meta-analysis of the correlates of presenteeism and a dual-path model. *J Occup Health Psychol* 2016;21:21–283. <https://doi.org/10.1037/ocp0000015>.
- [10] Karasek R, Theorell T. *Healthy work: stress, productivity, and the reconstruction of working life*. New York: Basic Books; 1990.
- [11] Karasek RA. Job demands, job decision latitude, and mental strain: implications for job redesign. *Adm Sci Q* 1979;24:285–308. <https://doi.org/10.2307/2392498>.
- [12] Mai HB, Kim J. The role of job resources in the relationship between job demands and work-related musculoskeletal disorders among hospital nurses in Thua Thien Hue Province, Vietnam. *Int J Environ Res Public Health* 2022 Apr 14;19(8):4774. <https://doi.org/10.3390/ijerph19084774>.
- [13] Del Pozo-Antúnez JJ, Ariza-Montes A, Fernández-Navarro F, Molina-Sánchez H. Effect of a job demand-control-social support model on accounting professionals' health perception. *Int J Environ Res Public Health* 2018 Nov 1;15(11):2437. <https://doi.org/10.3390/ijerph15112437>.
- [14] Portoghesi I, Galletta M, Leiter MP, Finco G, d'Aloja E, Campagna M. Job demand-control-support latent profiles and their relationships with interpersonal stressors, job burnout, and intrinsic work motivation. *Int J Environ Res Public Health* 2020;17(24):9430. <https://doi.org/10.3390/ijerph17249430>.
- [15] Jourdain G, Vézina M. How psychological stress in the workplace influences presenteeism propensity: a test of the demand-control-support model. *Eur J Work Organ Psychol* 2014;23:483–96. <https://doi.org/10.1080/1359432X.2012.754573>.
- [16] Gerich J. Sickness presenteeism as coping behaviour under conditions of high job control. *Ger J Hum Resour Manag* 2019;33:96–112. <https://doi.org/10.1177/2397002218794837>.
- [17] Kim SJ, Kim KT. Sickness absence and sickness presenteeism in Korea: implications for the introduction of a new sick pay scheme. *Korea Institute for Health and Social Affairs. Res Brief* 2020;63:1–8. [ResearchinBrief.2020.N063.pdf](https://www.kihasa.re.kr/ResearchinBrief.2020.N063.pdf) (kihasa.re.kr).
- [18] Kwon MJ. Occupational health inequalities by issues on gender and social class in labor market: absenteeism and presenteeism across 26 OECD countries. *Front Public Health* 2020;8(84):4. <https://doi.org/10.3389/fpubh.2020.00084>.
- [19] Yi JS, Kim H. Factors related to presenteeism among South Korean workers exposed to workplace psychological adverse social behavior. *Int J Environ Res Public Health* 2020;17(10):3472. <https://doi.org/10.3390/ijerph17103472>.
- [20] Kim J, Kim YK, Leem SH, Won JU. Association between job-related stress and experience of presenteeism among Korean workers stratified on the presence of depression. *Ann Occup Environ Med* 2019 Jan;31(1):e26. <https://doi.org/10.35371/aoem.2019.31.e26>.
- [21] von Eye A, Bergman LR. Research strategies in developmental psychopathology: developmental identity and the person-oriented approach. *Dev Psychopathol* 2003;15(3):553–80. <https://doi.org/10.1017/S0954579403000294>.
- [22] Weller BE, Bowen NK, Faubert SJ. Latent class analysis: a guide to best practice. *J Black Psychol* 2020;46:287–311. <https://doi.org/10.1177/0095798420930932>.
- [23] Fan W, Moen P, Kelly EL, Hammer LB, Berkman LF. Job strain, time strain, and well-being: a longitudinal, person-centered approach in two industries. *J Vocat Behav* 2019 Feb;110(Pt A):102–16. <https://doi.org/10.1016/j.jvb.2018.10.017>.
- [24] Mauno S, Mäkikangas A, Kinnunen U. A longitudinal person-centred approach to the job demands-control model. *Eur J Work Organ Psychol* 2016;25(6):914–27. <https://doi.org/10.1080/1359432X.2016.1187135>.
- [25] Gameiro M, Chambel MJ, Carvalho VS. A person-centered approach to the job demands-control model: a multifunctioning test of addictive and buffer hypotheses to explain burnout. *Int J Environ Res Public Health* 2020;17:8871. <https://doi.org/10.3390/ijerph17238871>.
- [26] Kim YS, Rhee KY, Oh MJ, Park J. The validity and reliability of the second Korean Working Conditions. *Surv Saf Health Work* 2013;4:111–6. <https://doi.org/10.1016/j.shaw.2013.05.001>.
- [27] Nylund KL, Asparouhov T, Muthén BO. Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Struct Equ Model Multidiscip J* 2007;14:535–69. <https://doi.org/10.1080/10705510701575396>.
- [28] Lui J, Andres EB, Johnston JM. Presenteeism exposures and outcomes amongst hospital doctors and nurses: a systematic review. *BMC Health Serv Res* 2018;18:985. <https://doi.org/10.1186/s12913-018-3789-z>.
- [29] Kinman G. Sickness presenteeism at work: prevalence, costs and management. *Br Med Bull* 2019;129:69–78. <https://doi.org/10.1093/bmb/ldy043>.
- [30] McKeivitt C, Morgan M, Dundas R, Holland WW. Sickness absence and 'working through' illness: a comparison of two professional groups. *J Public Health Med* 1997;19:295–300. <https://doi.org/10.1093/oxfordjournals.pubmed.a024633>.
- [31] Jeon SH, Leem JH, Park SG, Heo YS, Lee BJ, Moon SH, Jung DY, Kim HW. Association among working hours, occupational stress, and presenteeism among wage workers: results from the Second Korean Working Conditions Survey. *Ann Occup Environ Med* 2014;26:6. <https://doi.org/10.1186/2052-4374-26-6>.
- [32] Bakker AB, Demerouti E. The job demands-resources model: state of the art. *J Manage Psychol* 2007;22(3):309–28. <https://doi.org/10.1108/02683940710733115>.
- [33] Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB. The job demands-resources model of burnout. *J Appl Psychol* 2001;86:499–512. <https://psycnet.apa.org/doi/10.1037/0021-9010.86.3.499>.
- [34] Saijo Y, Yoshioka E, Nakagi Y, Kawanishi Y, Hanley S, Yoshida T. Social support and its interrelationships with demand-control model factors on presenteeism and absenteeism in Japanese civil servants. *Int Arch Occup Environ Health* 2017;90:539–53. <https://doi.org/10.1007/s00420-017-1218-y>.

- [36] Kubicek B, Korunka C, Tement S. Too much job control? Two studies on curvilinear relations between job control and eldercare workers' well-being. *Int J Nurs Stud* 2014;51:1644–53. <https://doi.org/10.1016/j.ijnurstu.2014.05.005>.
- [37] Ng TWH, Feldman DC. The moderating effects of age in the relationships of job autonomy to work outcomes. *Work Aging Retire* 2014;1:64–78. <https://doi.org/10.1093/workar/wau003>.
- [38] Høge T, Hornung S. Perceived flexibility requirements: exploring mediating mechanisms in positive and negative effects on worker well-being. *Econ Ind Democr* 2015;36:407–30. <https://doi.org/10.1177/0143831X13511274>.
- [39] Kubicek B, Paškvan M, Bunner J. The bright and dark sides of job autonomy. In: *Job demands in a changing world of work: impact on workers' health and performance and implications for research and practice*. Cham, Switzerland: Springer International Publishing/Springer Nature; 2019. p. 45–63.
- [40] Kelliher C, Anderson D. Doing more with less? Flexible working practices and the intensification of work. *Hum Relat* 2010;63:83–106. <https://doi.org/10.1177/0018726709349199>.
- [41] Coffeng JK, Hendriksen IJ, Duijts SF, Twisk JW, van Mechelen W, Boot CR. Effectiveness of a combined social and physical environmental intervention on presenteeism, absenteeism, work performance, and work engagement in office employees. *J Occup Environ Med* 2014;56:258–65. <https://doi.org/10.1097/JOM.000000000000116>.
- [42] Yang T, Ma T, Liu P, Liu Y, Chen Q, Guo YM, Zhang S, Deng J. Perceived social support and presenteeism among healthcare workers in China: the mediating role of organizational commitment. *Environ Health Prev Med* 2019;24:55. <https://doi.org/10.1186/s12199-019-0814-8>.
- [43] Cho YS, Park JB, Lee KJ, Min KB, Baek CI. The association between Korean workers' presenteeism and psychosocial factors within workplaces. *Ann Occup Environ Med* 2016;28:41. <https://doi.org/10.1186/s40557-016-0124-1>.
- [44] Wang J, Schmitz N, Smailes E, Sareen J, Patten S. Workplace characteristics, depression, and health-related presenteeism in a general population sample. *J Occup Environ Med* 2010;52:836–42. <https://doi.org/10.1097/JOM.0b013e3181ed3d80>.
- [45] Mori T, Nagata T, Nagata M, Odagami K, Mori K. Perceived supervisor support for health affects presenteeism: a cross-sectional study. *Int J Environ Res Public Health* 2022;19(7):4340. <https://doi.org/10.3390/ijerph19074340>.
- [46] Zhang J, Wang S, Wang W, Shan G, Guo S, Li Y. Nurses' job insecurity and emotional exhaustion: the mediating effect of presenteeism and the moderating effect of supervisor support. *Front Psychol* 2020;11:2239. <https://doi.org/10.3389/fpsyg.2020.02239>.
- [47] Baeriswyl S, Krause A, Elfering A, Berset M. How workload and co-worker support relate to emotional exhaustion: the mediating role of sickness presenteeism. *Int J Stress Manag* 2017;24:52–73. <https://psycnet.apa.org/doi/10.1037/str0000018>.
- [49] Allemann A, Siebenhüner K, Hämmig O. Predictors of presenteeism among hospital employees—a cross-sectional questionnaire-based study in Switzerland. *J Occup Environ Med* 2019;6:1004–10. <https://doi.org/10.1097/JOM.0000000000001721>.
- [50] Min A, Kang M, Hong HC. Sickness presenteeism in shift and non-shift nurses: using the Fifth Korean Working Conditions Survey. *Int J Environ Res Public Health* 2021;18(6):3236. <https://doi.org/10.3390/ijerph18063236>.
- [51] Letvak S. We cannot ignore nurses' health anymore: a synthesis of the literature on evidence-based strategies to improve nurse health. *Nurs Adm Q* 2013;37:295–308. <https://doi.org/10.1097/NAQ.0b013e3182a2f99a>.
- [52] Gingerich SB, Seaverson E, Anderson DR. Association between sleep and productivity loss among 598 676 employees from multiple industries. *Am J Health Promot* 2018;32:1091–4. <https://doi.org/10.1177/0890117117722517>.
- [53] Kadotani H, Takami M, Nishikawa K, Sumi Y, Nakabayashi T, Fujii Y, Matsuo M, Yamada N. 0354 Insomnia is associated with presenteeism in Japanese city government employees. *Sleep* 2018;41. <https://doi.org/10.1093/sleep/zsy061.353>. A136–A136.
- [54] Wee LH, Yeap L, Chan C, Wong JE, Jamil NA, Swarna Nantha Y, Siau CS. Antecedent factors predicting absenteeism and presenteeism in urban area in Malaysia. *BMC Public Health* 2019;19:540. <https://doi.org/10.1186/s12889-019-6860-8>.
- [55] Johnson JV, Hall EM. Job strain, Work place social support, and cardiovascular disease: A cross-sectional study of a random sample of the Swedish working population. *Am J Public Health* 1988;78:1336–42. <https://doi.org/10.2105/AJPH.78.10.1336>.