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Research Article

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The relationship between working hours and the intention to quit smoking in male office workers: data from the 7th Korean National Health and Nutrition Examination Survey (2016–2017)

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Abbreviations
BMI: body mass index; CI: confidence interval; IRB: Institutional Review Board; KNHANES: Korea National Health and Nutrition Examination Survey; KSCO: Korean Standard Classification of Occupations; LAAM: living alone after marriage; OR: odds ratio.

Competing interests
The authors declare that they have no competing interests.

ABSTRACT

Background: The intention to quit smoking is one of the most important factors in smoking cessation. Long working hours is also a constant issue, and many studies have shown an association between the working hours and diseases, including cardiovascular and gastrointestinal diseases. This study evaluated the relationship between working hours and the intention to quit smoking among Korean male office workers, and blue collar workers for comparison.
Methods: This study was based on the Seventh Korea National Health and Nutrition Examination Survey (2016–2017). A total of 1,389 male workers were smokers, and then office workers and blue collar workers were selected. Logistic regression was used to calculate the odds ratio (OR) for the intention to quit smoking according to smoking-related characteristics and working hours after adjusting for age group, body mass index (kg/m^2), marital status, household income (quartile), educational level, drinking, exercise, smoking-related characteristics (smoking initiation age, smoking amount, and attempt to quit smoking more than 1day in the past year) and working hours.
Results: The percentage of workers who had the intention to quit smoking in 6 months was higher in office workers (38.9% for office workers and 29.4% for blue collars, $p = 0.017$). Blue collar workers had higher percentages of workers who worked more than 52 hours per week (19.8% for office workers and 38.9% for blue collar workers, $p < 0.001$). Logistic regression analysis showed that working > 52 hours per week was significantly associated with a lower intention to quit smoking within 6 months among male office workers (OR = 0.30, 95% confidence interval = 0.14–0.66).
Conclusions: Working more than 52 hours per week was positively related with a lower intention to quit smoking among currently smoking male office workers. Further studies are needed considering more work-related variables such as job stress and physical load.

Keywords: Working hours; Intention to quit smoking; Smoking; Office workers; Blue collar workers

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Availability of data and materials

The datasets analyzed during the current study are available on Korea Centers for Disease Control and Prevention, Korea National Health and Nutrition Examination Survey, https://knhanes.cdc.go.kr/knhanes/sub03/sub03_02_02.do.

Authors contributions

Data curation: Kim DH; Formal analysis: Choi EH, Ryu JY; Investigation: Ryu JY; Writing - original draft: Choi EH, Ryu JY.

BACKGROUND

Smoking is a common risk factor for cancer, cardiovascular disease, diabetes, and chronic obstructive pulmonary disease, as stated by the World Health Organization, and accounts for over 7 million deaths worldwide annually [1]. In 2016, at least 20% of male deaths in approximately 55 countries were attributed to tobacco use [2]. In 2017, smoking accounted for 52,412 deaths among Korean males (34% of all male deaths), which is relatively higher than the worldwide death rate attributed to smoking [3]. In 2013, smoking resulted in 6 billion dollars of medical expenses through lost productivity and early death in the Korean population, which was 1.6 times higher than that in 2005 [4].

Smoking cessation leads to instant and long-term health benefits at all ages [5]. Motivation is the most important factor when attempting to quit smoking [6]. The intention to quit smoking is a prerequisite for executing and maintaining smoking cessation [7]. When applying the theory of planned behavior to smoking cessation, intention is one of the most important factors resulting in action [8]. Several studies have shown the importance of the intention or motivation to stop smoking. One study reported a strong association between the intention to quit smoking and attempts to quit smoking [9], and another study reported that the intention to stop smoking within 6 months was significantly correlated with a higher success rate of smoking cessation [10].

The health effects of long working hours are also a constant issue. One study in California reported that working more than 56 hours per week could lead to higher mortality due to heart disease [11]. Another study suggested that long working hours may cause various health problems, including cardiovascular disorders, gastrointestinal and musculoskeletal disorders, immunosuppression, and psychological problems [12]. In Korea, several studies have proposed that long working hours are related to increased work stress [13,14], and one study suggested that long working hours are related to an increase in suicidal thoughts among workers [15]. Some studies have evaluated the effects of long working hours on the smoking tendencies or smoking cessation success rates of workers. One study reported that longer working hours lead to higher smoking tendencies in Korean employees [16], and another study reported that subjects who fail to maintain smoking abstinence for 1 year continuously had more working hours than those who succeeded [17]. However, few studies have evaluated the association between long working hours and the intention to quit smoking.

Office workers generally are not exposed to physical stress or a hazardous work environment, and as a result they are often used as the reference group to evaluate other occupational groups in previous studies related to smoking. But their prevalence of chronic diseases such as diabetes and hyperlipidemia, which have associations with smoking [18,19], has been increasing in office workers [20,21]. This makes them just as worth studying as any other occupational groups. In this study, using 2016–2017 Korea National Health and Nutrition Examination Survey (KNHANES) data, we evaluated the relationship between the working hours and the intention to quit smoking among Korean male office workers, and blue collar workers for comparison.

METHODS

Study participants

This study was based on data from the Seventh KNHANES conducted by the Korea Centers for Disease Control and Prevention from 2016 to 2017. The survey included 16,277 subjects from 400 regional districts selected based on the population distribution. Data were collected via personal interviews and physical examinations. Among 16,277 subjects, 7,039 were currently employed, of whom 3,676 were men (**Fig. 1**). Office workers were selected by the Korean Standard Classification of Occupations (KSCO) (n = 646). For comparison, blue collar workers were included in the analysis (n = 1,688). They are workers who are classified as 'craft and related trades workers', 'equipment, machine operating and assembling workers' and 'elementary workers' by the KSCO. Current smokers were than selected; 244 office workers were current smokers (37.7%) and 646 blue collar workers were current smokers (38.3%). Subjects who answered "everyday" or "from time to time" on the questionnaire item "Are you currently smoking?" were considered current smokers, and those who answered "I quit smoking" or "I have never smoked" were considered non-smokers. Working hours were collected through work-related surveys, and were grouped into two groups, workers who work 32 to 52 hours a week and workers who work more than 52 hours a week.

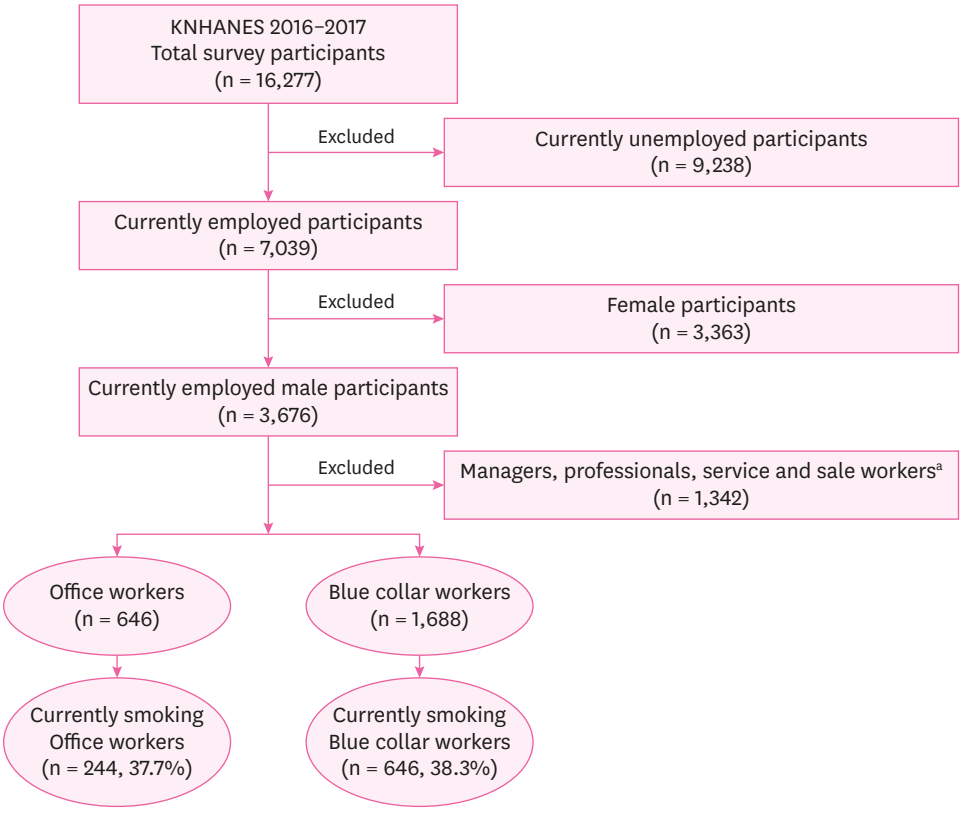

Fig. 1. Flowchart assessing eligible subjects in KNHANES (2016–2017).
KNHANES: Korea National Health and Nutrition Examination Survey.
[a]Includes soldiers and subjects who unanswered the questionnaire for eligibility.

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The intention to quit smoking and smoking-related characteristics

The intention to quit smoking was assessed by the questionnaire item "Are you planning to quit smoking in the next month?" Smokers who answered "I am planning on quitting in a month" or "I am planning on quitting in 6 months" were considered to have an intention to quit. Smokers who answered "I don't have plans to quit smoking in the next 6 months, but I am planning to quit someday" or "I am not planning on quitting" were considered to have no intention to quit.

The amount of smoking was classified into 1–10 cigarettes/day, 11–20 cigarettes/day, or > 20 cigarettes/day. The age at which the subject started smoking was classified as < 19 years or ≥ 19 years. Smoking cessation experience was categorized as quit smoking for > 1 day within the past year or no experience (Attempt to quit smoking).

Covariates

All subjects were aged ≥ 19 years, and the subjects were divided into the following age groups: 19–44, 45–64, and > 64 years. Marital status was classified as cohabitation with or without marriage and living alone after marriage (LAAM) (i.e., divorced, widowed, or separated), or single. Household income was divided into four quartiles. Educational level was categorized as high school or lower and college or more. Alcohol drinking status was divided into non-drinkers and drinkers. On questionnaire item asking the drinking frequency of the past year, subjects who answered "I didn't drink," "less than once per month," and "once per month" were defined as non-drinkers, and those who answered "2–4 times per month (or more)" as current drinkers. The exercise status of the subjects were collected as yes or no on the questionnaire about one's high- or mid-intensity exercise conducted during their spare time. BMI was divided into < 25 kg/m^2 and ≥ 25 kg/m^2.

Statistical analyses

Stratum, cluster, and weight were applied in the analyses because of the stratified multistage cluster sampling used in the KNHANES. Differences in the weighted prevalence of the intention to quit smoking according to general characteristics, smoking-related factors and occupational factors were analyzed using the Rao–Scott chi-square test. Multiple logistic regression analysis was performed to calculate the adjusted odds ratio (OR) for the intention to quit smoking according to smoking-related characteristics (smoking initiation age, smoking amount and attempt to quit smoking more than 1day in the past year) and working hours of two work groups, after adjusting for age group, body mass index (kg/m^2), marital status, household income (quartile), educational level, drinking, exercise, smoking-related characteristics. The SPSS statistical program (ver. 25; IBM, Armonk, NY, USA) was used for all analyses.

Ethics statement

This study was approved by the Institutional Review Board (IRB) of Haeundae Paik Hospital (IRB No. 2020-07-028).

RESULTS

Table 1 shows the difference in general characteristics, smoking related characteristics and working hours of currently smoking office workers and blue collar workers. There were significant differences between two groups in age, household income, education, and exercise. Office workers were relatively younger and had more income and higher education.

Table 1. General characteristics, smoking related characteristics and working hours of study samples (smoking male office workers and blue collar workers) in comparison

Variables	Office workers (n = 244)	Blue collar (n = 646)	*p*-value
General characteristics			
Age (years)			< 0.001
19–44	154 (67.9)	240 (44.0)	
45–64	83 (30.7)	322 (48.6)	
≥ 65	7 (1.5)	84 (7.4)	
BMI (kg/m^2)			0.968
< 25	136 (58.5)	381 (58.3)	
≥ 25	108 (41.5)	265 (41.7)	
Marital status			0.312
Cohabitation	187 (72.8)	475 (68.7)	
LAAM or single	57 (27.2)	171 (31.3)	
Household income (quartile)			< 0.001
Q1 (low)	7 (3.7)	75 (8.0)	
Q2	43 (17.4)	194 (28.8)	
Q3	87 (36.5)	222 (38.2)	
Q4 (high)	107 (42.3)	154 (25.0)	
Education			< 0.001
≤ High school	79 (32.6)	503 (75.9)	
≥ College	165 (67.4)	143 (24.1)	
Drinking			0.995
No	58 (24.1)	164 (24.2)	
Yes	183 (75.9)	463 (75.8)	
Exercise			< 0.001
No	153 (61.4)	522 (78.5)	
Yes	91 (38.6)	124 (21.5)	
Smoking-related characteristics			
Intention to quit smoking			0.017
No	151 (61.1)	452 (70.6)	
Yes	93 (38.9)	194 (29.4)	
Smoking initiation age (years)			0.028
< 19	97 (41.2)	306 (50.6)	
≥ 19	147 (58.8)	340 (49.4)	
Smoking amount (cigarettes/day)			0.025
1–10	100 (41.5)	249 (38.5)	
11–20	133 (54.2)	329 (50.9)	
> 21	11 (4.3)	68 (10.6)	
Attempt to quit smoking			0.905
No	108 (43.5)	281 (44.1)	
Yes	136 (56.5)	365 (55.9)	
Work-related characteristics			
Working hours			< 0.001
≤ 52	186 (80.2)	332 (61.1)	
> 52	41 (19.8)	213 (38.9)	

Data are presented as number (weighted%). Total number may vary due to unanswered questionnaires.
BMI: body mass index, LAAM: living alone after marriage.

There were more workers who exercise in their spare times in office workers. The percentage of workers who had the intention to quit smoking in 6 months was higher in office workers (38.9% for office workers and 29.4% for blue collars, $p = 0.017$). Office workers showed lower percentages of workers whose smoking initiation age was younger than 19 years old (41.2% for office workers and 50.6% for blue collar workers, $p = 0.028$). Blue collar workers had higher percentages of workers who worked more than 52 hours per week (19.8% for office workers and 38.9% for blue collar workers, $p < 0.001$).

Table 2 shows the intention to quit smoking according to general characteristics, smoking related characteristics, and working hours in office workers. Workers who work 52 or less

Table 2. Intention to quit smoking according to general characteristics among smoking male office workers

Variables	Intention to quit smoking		*p*-value
	Yes	No	
General characteristics			
Age (years)			0.267
19–44	58 (37.9)	96 (62.1)	
45–64	30 (39.6)	53 (60.4)	
> 65	5 (74.0)	3 (26.0)	
BMI (kg/m^2)			0.248
< 25	55 (42.2)	81 (57.8)	
≥ 25	38 (34.4)	70 (65.6)	
Marital status			0.650
Cohabitation	72 (40.0)	115 (60.0)	
LAAM or single	21 (36.1)	36 (63.9)	
Household income (quartile)			0.717
Q1 (low)	4 (59.0)	3 (41.0)	
Q2	16 (38.3)	27 (61.7)	
Q3	32 (37.9)	55 (62.1)	
Q4 (high)	41 (38.3)	66 (61.7)	
Education			0.236
≤ High school	28 (33.1)	51 (66.9)	
≥ College	65 (41.8)	100 (58.2)	
Drinking			0.127
No	17 (29.6)	41 (70.4)	
Yes	76 (42.5)	107 (57.5)	
Exercise			0.835
Yes	57 (38.4)	96 (61.6)	
No	36 (39.8)	55 (60.2)	
Smoking-related characteristics			
Smoking initiation age (years)			0.076
≥ 19	33 (31.7)	64 (68.3)	
< 19	60 (44.0)	87 (56.0)	
Smoking amount (cigarettes/day)			0.103
1–10	48 (47.3)	52 (52.7)	
11–20	41 (33.5)	92 (66.5)	
≥ 21	4 (27.5)	7 (72.5)	
Attempt to quit smoking			< 0.001
Yes	66 (50.1)	70 (49.9)	
No	27 (24.4)	81 (75.6)	
Work-related characteristics			
Working hours			0.013
≤ 52	74 (42.4)	112 (57.6)	
> 52	11 (21.5)	30 (78.5)	

Data are presented as number (weighted%).
BMI: body mass index, LAAM: living alone after marriage.

hours per week had higher prevalence of having the intention to quit, compared with workers who work more than 52 hours per week (42.4% vs. 21.5%, $p = 0.013$). The prevalence of the intention to quit smoking was also significantly different by having the attempt to quit smoking in the past year (24.4% for no attempts to quit smoking and 50.1% for attempts to quit smoking, $p < 0.001$).

Table 3 shows the intention to quit smoking according to working hours and other covariates in blue collar workers. The prevalence of the intention to quit smoking was significantly different by smoking amount (38.8% for 1–10 cigarettes per day, 24.1% for 11–20 cigarettes per day, and 20.6% for 21 or more cigarettes per day, $p = 0.002$) and attempt to quit smoking in the past year (11.2% for no attempts to quit smoking and 43.7% for attempts to quit smoking, $p < 0.001$). The prevalence of intention to quit smoking was lower in the workers who work

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Table 3. Intention to quit smoking according to general characteristics among smoking male blue collar workers

Variables	Intention to quit smoking		*p*-value
	Yes	No	
General characteristics			
Age (years)			0.562
19–44	73 (31.5)	167 (68.5)	
45–64	93 (27.4)	229 (72.6)	
> 65	28 (29.7)	56 (70.3)	
BMI (kg/m^2)			0.957
< 25	109 (29.3)	272 (70.7)	
≥ 25	85 (29.5)	180 (70.5)	
Marital status			0.269
Cohabitation	150 (31.0)	35 (69.0)	
LAAM or single	44 (25.8)	127 (74.2)	
Household income (quartile)			0.204
Q1 (low)	31 (41.2)	44 (58.8)	
Q2	52 (26.8)	142 (73.2)	
Q3	64 (31.5)	158 (68.5)	
Q4 (high)	47 (25.4)	107 (74.6)	
Education			0.737
≤ High school	155 (29.8)	348 (70.2)	
≥ College	39 (28.0)	104 (72.0)	
Drinking			0.995
No	51 (29.0)	113 (71.0)	
Yes	135 (29.0)	328 (71.0)	
Exercise			0.408
Yes	45 (32.8)	79 (67.2)	
No	149 (28.4)	373 (71.6)	
Smoking-related characteristics			
Smoking initiation age (years)			0.425
≥ 19	98 (27.6)	242 (72.4)	
< 19	96 (31.1)	210 (68.9)	
Smoking amount (cigarettes/day)			0.002
1–10	101 (38.8)	148 (61.2)	
11–20	80 (24.1)	249 (75.9)	
≥ 21	13 (20.6)	55 (79.4)	
Attempt to quit smoking			< 0.001
Yes	161 (43.7)	204 (56.3)	
No	33 (11.2)	248 (88.8)	
Work-related characteristics			
Working hours			0.167
≤ 52	103 (31.0)	229 (69.0)	
> 52	57 (25.3)	156 (74.7)	

Data are presented as number (weighted%).
BMI: body mass index, LAAM: living alone after marriage.

more than 52 hours per week than in the workers who work 52 or less hours per week, but it was not statistically significant.

Table 4 shows the adjusted ORs for the intention to quit smoking according to smoking related characteristics and working hours in office workers and blue collar workers. In office workers, those who work more than 52 hours per week had lower intention to quit smoking than those who work 52 or less hours per week (OR: 0.30, 95% CI: 0.14–0.66), but there was no significant association in blue collar workers. In both office workers and blue collar workers, no attempt to quit smoking more than 1 day in the past year was negatively associated with the intention to quit smoking (OR: 0.36, 95% CI: 0.18–0.71 for office workers and OR: 0.14, 95% CI: 0.08–0.25 for blue collar workers).

Table 4. Logistic regression analysis (ORs and 95% CIs) of the intention to quit smoking within 6 months according to smoking-related characteristics and working hours of smoking male office workers and blue collar workers

General characteristics	Office worker (n = 224[a])	Blue collar (n = 531[b])
	Adjusted OR (95% CI)	Adjusted OR (95% CI)
Smoking related characteristics		
Smoking initiation age (years)		
≥ 19	1	1
< 19	0.56 (0.29–1.09)	1.47 (0.91–2.38)
Smoking amount (cigarettes/day)		
1–10	1	1
11–20	0.90 (0.46–1.78)	0.58 (0.35–0.97)
> 21	1.15 (0.22–6.12)	0.63 (0.23–1.71)
Attempt to quit smoking		
Yes	1	1
No	0.36 (0.18–0.71)	0.14 (0.08–0.25)
Work-related characteristics		
Working hours		
≤ 52	1	1
> 52	0.30 (0.14–0.66)	0.75 (0.48–1.19)

OR: odds ratio, CI: confidence interval.
[a]Total n may vary due to unanswered questionnaires; [b]Adjusting for age group, body mass index, marital status, household income, educational level, drinking, exercise, smoking initiation age, smoking amount, attempt to quit smoking and working hours.

DISCUSSION

This study showed that working over 52 hours per week was significantly associated with a lower intention to quit smoking within 6 months in smoking male office workers. There are previous studies regarding working hours and smoking. Eriksen et al. [22] showed that nurses' aides, who work more than 19 hours per week, had reduced OR for smoking cessation when compared to workers who work 9 hours or less per week. Shields et al. [23] reported that changing working hours from '35 to 40 hours per week' to 'over 40 hours per week' was associated with increased daily smoking. However, to our best knowledge, there are no studies which evaluated the association between working hours and the intention to quit smoking.

Long working hours may affect the intention to quit smoking by causing stresses. Long working hours have been suggested as a job stressor in previous studies. Lee et al. [24] showed that long working hours more than 55 hours per week were associated with psychological stress response. In a study of Japanese workers, overtime work hours had linear associations with stress responses including anxiety, depression, and so on [25]. Smoking workers who experience stress, anger, or depressive mood in the workplace may feel the need to smoke because many smokers believe that smoking can relieve the stress responses and want to self-medicate their depressive mood [26,27]. Also, these work-related stress and mood changes may affect worker's smoking behaviors. A longitudinal study reported the association between depressive symptoms and lower likelihood of quitting smoking [28]. Additionally, in a human laboratory study, stress increased tobacco craving, which was associated with reduced workers' ability to resist smoking [29]. According to Muraven and Baumeister et al. [30], self-control (i.e. controlling the urge to smoke) is a limited resource and coping with stress can reduce self-control. Therefore, stress related to long working hours may affect a worker's self-control for smoking cessation.

Our study did not show any significant association between working hours and the intention to quit smoking in blue collar workers. The intention to quit smoking among blue collar

workers may be affected more by other factors related to work environment rather than working hours. Blue collar workers can have less workplace rules limiting smoking and have lesser access to smoking cessation programs, compared to white collar workers [31]. Also, in physically demanding work, smoking can serve as a justification for breaks and as a stimulant for physical stress [32], which may be related to the reduced intention among blue collar workers. Workplace cultures, which are more supportive of smoking and more tolerant of second-hand smoking, may influence smoking [33]. According to a study by Sorensen at al. [34], blue collar workers have less non-acceptability for smoking from coworkers. They also showed that blue collar workers reported having less pressure to quit smoking and less social support for quitting, which were associated with the reduced intention to quit smoking [34].

In both office workers and blue collar workers, attempt to quit smoking was associated with the intention to quit smoking. This result is similar to previous studies [35,36], suggesting that those who have previously tried to quit smoking are familiar with the process and methods of smoking cessation and thus are more likely to have an intention to quit smoking. Although previous studies have reported significant associations between smoking amount and the intention to quit smoking, our analysis found no significant trend between these factors. Fagan et al. [37] reported that in young adults, those who smoked more than 5 cigarettes per day were less likely to have the intention to quit than those who smoke 5 cigarettes or fewer per day. Additionally, Ham et al. [31] presented that in blue collars, workers with lower smoking intensity (≤ 20 cigarettes per day) had increased likelihood of smoking cessation at 1 month. Also, our analysis did not show meaningful relation between intention to quit smoking and smoking initiation age in both office and blue collar workers. This result is similar with previous study, which reported that there was no association between smoking initiation age and the intention to quit smoking in Korean males [38]. However, regarding smoking cessation, the smoking initiation age has been suggested to be a predictor of successful smoking cessation [39].

This study has some limitations. First, we were not able to assess the detailed characteristics of office workers and blue collar workers including individual occupations, physical load, smoking culture, and other variety of factors in the workplace. Second, female workers were not included in this study due to scarce number of smoking female subjects. Further studies will be beneficial, considering the increasing trend of smoking among women in South Korea [3]. Third, our study was mostly based on questionnaire items, which could have led to recall bias.

CONCLUSIONS

Long working hours per week was positively associated with a lower intention to quit smoking among male office workers. Further studies are needed considering more work-related variables such as job stress, physical load, and smoking related environments in the workplace.

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