Submitted: 02 March, 2024 Accepted: 17 April, 2024 Online Published: 30 August, 2024 DOI:10.22514/jomh.2024.126

ORIGINAL RESEARCH

JOMH Journal of Men's Health

Exploring the correlation between moderate-intensity physical activity and lifestyle habits in unmarried South Korean men

Wonsang Shin[1], Wi-Young So[2,*], Jeonga Kwon[3,*]

[1]Planning and Administration Office, Korea Paralympic Committee (KPC), 05540 Seoul, Republic of Korea
[2]Department of Sports Medicine, College of Humanities, Korea National University of Transportation, 27469 Chungju-si, Republic of Korea
[3]Department of Elementary Education, College of First, Korea National University of Education, 28173 Cheongju-si, Republic of Korea

***Correspondence**
wowso@ut.ac.kr
(Wi-Young So);
gilddong1234555@knue.ac.kr
(Jeonga Kwon)

Abstract

The purpose of this study is to examine the effects of moderate-intensity physical activity on obesity prevention, stress, smoking, and alcohol consumption among unmarried Korean men. Such a study is necessary since it seeks to understand the health behavior of unmarried Korean men and suggests the right direction for health management. In particular, this study investigated the association of the frequency of participation in moderate-intensity physical activity with lifestyle variables, such as body mass index (BMI), perceived stress, smoking and alcohol consumption, among unmarried men in the Republic of Korea. To this end, a second cross-sectional study was conducted by collecting data from unmarried men in Korea who participated in the 2022 Korea Community Health Survey. The data was then analyzed using SPSS for Windows (version 23.0; IBM Corp., Armonk, NY, USA) for frequency analysis, chi-square test, and multivariate logistic regression analysis. The findings revealed that a majority of unmarried Korean men do not participate in moderate-intensity physical activity. Unmarried men were also more likely to have moderate, overweight, and obese BMIs than those who did not engage in moderate-intensity physical activity. Conversely, the likelihood of smoking and drinking alcohol decreased with an increase in the number of days they engaged in physical activity. These findings highlight the importance of creating a social environment that encourages unmarried men to participate in moderate-intensity physical activity. The results of this study can be used to develop health management strategies and health-related policies for unmarried men in the Republic of Korea.

Keywords

Body mass index; Drinking; Perceived stress; Physical activity; Smoking

1. Introduction

Physical activity decreases the risk of chronic diseases and increases longevity [1]. Furthermore, it decreases morbidity and mortality associated with cardiovascular diseases and various types of cancer; improves brain health; reduces obesity and falls; and provides benefits during pregnancy and peripartum period, arthritis, and comorbid diseases, such as diabetes, hypertension, and multiple sclerosis [2]. The Centers for Disease Control and Prevention along with the American College of Sports Medicine have categorized moderate physical activity as an activity with metabolic equivalents ranging from 3.0–6.0 kcal/min and 3.5–7.0 kcal/min, respectively, while vigorous activity is defined as an activity with metabolic equivalents $>$6.0 kcal/min and $>$7 kcal/min, respectively [3]. According to global guidelines on physical activity, adults should target doing 150–300 min of moderate-intensity and 75–150 min of vigorous-intensity physical activity per week. This has been increased from previous guidelines, which focused on achieving at least 150 min of moderate-intensity or 75 min of vigorous-intensity activity per week [4].

Overweight and obesity, which are associated with several serious health conditions, are significant public health concerns [5]. Exercise positively affects body weight and cardiovascular disease risk factors among overweight or obese people, particularly when it is combined with diet. Even in the absence of weight loss, exercise enhances health [5]. Stress is a risk factor for cardiovascular diseases, and acute psychological stress is associated with factors that contribute to the development of atherosclerosis, endothelial dysfunction, inflammatory reactivity, and oxidative stress [6]. Studies examining the relationship between exercise and stress have shown evidence of the preventive or stress-reducing effects of physical activity [7]. Physically active individuals show reduced reactivity to physical stressors and reduced susceptibility to the adverse effects of life stress [8]. Physically active men show lower cortisol increases, lower cardiovascular reactivity, and more rapid cardiovascular recovery in response

to psychological laboratory stressors compared to their lesser active counterparts [9].

Smoking, a major public health issue, harms not only the smoker's physical and mental health but also that of passive smokers [10]. It is implicated in a wide array of diseases, such as cancer, respiratory, cardiovascular, infectious, and neurological diseases. Furthermore, it is associated with several fatal diseases and can cause a major decline in overall health [11]. Physical activity may be helpful for individuals who want to reduce their smoking consumption. Some studies have suggested that engaging in physical activity induces feelings of pleasure or euphoria due to the release of endogenous opioids and dopamine [12]. However, other studies have reported that physical activity has no significant effect on smoking [13].

In general, Korean men enjoy consuming alcohol and are more likely than women to participate in social and economic activities (*i.e.*, jobs) that result in high levels of stress, leading to consuming alcohol often as a way to cope [14, 15]. Alcohol consumption is a major risk factor for chronic diseases, such as alcohol dependence, cirrhosis, diabetes, cardiovascular disease and cancer, and has negative effects on the majority of the body [16]. It is worth noting that several previous studies have reported that participation in physical activity has a significant effect on the reduction of alcohol consumption [17, 18].

Overall, the effects of physical activity on obesity prevention, stress, smoking, and alcohol consumption have differed based on the characteristics of the study population. In particular, participation by unmarried men in physical activity often leads to behaviors that have adverse effects on health, such as smoking and alcohol [19]. Therefore, studies are needed to look at how participation in moderate-intensity physical activity in unmarried men affects body mass index (BMI), perceived stress, level of smoking, and alcohol consumption. Examining the effect of moderate-intensity physical activity on obesity prevention, stress, smoking and alcohol consumption among unmarried Korean men, and then disseminating the findings, may encourage them to engage in healthy behaviors. This study can provide valuable insight into related research, such as the development of research hypotheses on whether and how the number of days of moderate-intensity physical activity in unmarried men have a positive effect on BMI, perceived stress, level of smoking, and alcohol consumption. The results of this study can also serve as a foundation for developing national health management strategies and health-related policies for unmarried Korean men.

2. Materials and methods

2.1 Data collection

To perform this study, we extracted the data of 22,522 unmarried men who participated in the 2022 Korea Community Health Survey. The 2022 Korea Community Health Survey was conducted on adults aged 19 and over living in South Korea, and samples were selected by stratification based on region and housing type. The variables used in the questionnaire items in this study were utilized in accordance with the development and validation of International Physical Activity Questionnaires [20]. This survey was executed by conducting computer-assisted personal interviews at each household using an electronic questionnaire stored on a tablet. We requested the raw data of this survey and utilized it post-approval (https://chs.kdca.go.kr/chs/rdr/rdrInfoProcessMain.do).

2.2 Measures

2.2.1 Independent variable

The independent variable was the "frequency (number of days) of participation in moderate-intensity physical activity in a week". Data for this variable was collected by asking respondents, "In the past week, on how many days have you engaged in at least 10 min of moderate physical activity that is slightly more strenuous than usual or causes slight shortness of breath?". The responses were categorized as "never", "1–2 days a week", "3–4 days a week" and "5 or more days a week".

2.2.2 Dependent variables

The dependent variables were BMI, perceived stress, smoking and alcohol consumption. BMI was calculated based on the respondent's height and weight (kg)/height (m^2). A BMI of $<$18.5 kg/$m^2$was categorized as "underweight", between 18.5 and 23 kg/m^2 as "healthy", between 23 and 25 kg/m^2 as "overweight" and $>$25 kg/m^2 as "obese". We classified participants into five groups based on their BMI, which was according to the World Health Organization Western Pacific Region guidelines and the Korean Practice Guidelines [21–23].

Perceived stress was assessed by asking respondents, "How much stress do you experience in daily life?". The response options were "very much", "a lot", "a little" and "almost none". We used these responses without modifications. Smoking was assessed by asking respondents, "How many cigarettes did you smoke in the last week?". The response options were "less than 5 packs (100 cigarettes) a week", "5 packs or more a week" and "none". We also used these responses without modifications. Alcohol consumption was assessed by asking, "In the past year, how much alcohol did you consume on one occasion?". The response options were "did not drink", "1–2 cups on one occasion", "3–4 cups on one occasion", "5–6 cups on one occasion", "7–9 cups on one occasion" and "10 or more cups on one occasion". We categorized the responses as "none", "1–2 cups on one occasion", "3–4 cups on one occasion" and "5 or more cups on one occasion".

2.2.3 Covariate variables

The covariate variables were engagement in economic activity, frequency of breakfast consumption (number of days), age, ability to perform daily activities, self-care ability, exercise ability, pain-discomfort and anxiety-depression. These covariate variables could be categorized into economic activity, daily activities, and exercise ability. As these variables are highly related to the lifestyle of the research participants, they have a great influence on the independent and dependent variables. Therefore, they were used in multivariate logistic regression analyses. Specifically, engagement in economic activity was measured by asking respondents, "In the past week, have you engaged in any paid work for more than an hour or any unpaid work for a family member for more than 18 hours?". The response options were "yes" and "no". We used these

responses without modifications. The frequency of breakfast consumption was determined by asking, "In the last year, how many days a week did you eat breakfast?". The response options were "5–7 times a week", "3–4 times a week", "1–2 times a week" and "almost never", and we used the responses without modifications. We categorized respondents' ages as 19–39 years, 40–59 years and ≥60 years. Regarding ability to perform daily activities, self-care ability, exercise ability, pain-discomfort and anxiety-depression, the respondents were asked to mark the items that best described their health that day. The response options for ability to perform daily activities were "no impediments to daily activities", "some impediments to daily activities" and "unable to carry out daily activities". The response options for self-care ability were "no problems with bathing or dressing", "no difficulty in bathing or dressing alone" and "unable to bathe or dress alone". The response options for exercise ability were "no problem in walking", "some trouble in walking" and "must lie down all day". The response options for pain-discomfort were "none", "a little" and "severe". The response options for anxiety-depression were "none", "a little" and "severe".

2.3 Data analysis

A second cross-sectional study was conducted by collecting data from unmarried men in Korea who participated in the 2022 Korea Community Health Survey. We used SPSS for Windows (version 23.0; IBM Corp., Armonk, NY, USA) for data analysis. First, we conducted a frequency analysis on the characteristics of the study population. Second, we conducted a chi-square test to determine differences in the characteristics of the study population based on their participation in moderate-intensity physical activity in a week. Third, we performed multivariate logistic regression analysis to analyze the association of "frequency of participation in moderate-intensity physical activity in a week" with lifestyle variables, such as BMI, perceived stress, smoking and alcohol consumption. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated, and statistical significance was set at $p < 0.05$.

3. Results

3.1 Characteristics of the study population

Table 1 shows the characteristics of the study population. A majority of respondents did not participate in moderate-intensity physical activity (56.7%). Among those did participated, most were active for ≥5 days a week. Furthermore, many respondents were obese (41.3%), and most experienced a little stress in daily life (57.2%), smoked five or more packs of cigarettes in a week (51.7%), and drank five or more cups of alcohol on one occasion (54.9%).

3.2 Differences in the characteristics of the study population based on frequency of participation in moderate-intensity physical activity in a week

Table 2 presents the results of an analysis examining the differences in the characteristics of the study population based on their frequency of participation in moderate-intensity physical activity in a week. Statistically significant differences were found in respondents' BMI ($\chi^2 = 88.528$, $p < 0.001$), perceived stress ($\chi^2 = 51.208$, $p < 0.001$), smoking ($\chi^2 = 107.403$, $p < 0.001$), alcohol consumption ($\chi^2 = 224.288$, $p < 0.001$), age ($\chi^2 = 278.963$, $p < 0.001$), anxiety-depression ($\chi^2 = 59.913$, $p < 0.001$), pain-discomfort ($\chi^2 = 56.801$, $p < 0.001$), ability to perform daily activities ($\chi^2 = 184.559$, $p < 0.001$), self-care ability ($\chi^2 = 120.402$, $p < 0.001$), exercise ability ($\chi^2 = 167.901$, $p < 0.001$), frequency of breakfast consumption ($\chi^2 = 223.275$, $p < 0.001$) and engagement in economic activity ($\chi^2 = 210.457$, $p < 0.001$) based on their weekly participation in moderate-intensity physical activity.

3.3 Association between the frequency of participation in moderate-intensity physical activity in a week and body mass index

Table 3 presents the results of analysis examining the association between the frequency of participation in moderate-intensity physical activity in a week and BMI. The average OR (95% CI) indicating the relationship between moderate-intensity physical activity and being healthy was 1.600 (1.213–2.112; $p = 0.001$) and 1.754 (1.291–2.384; $p < 0.001$) among respondents who participated in the activity for ≥5 days a week and 3–4 days a week, respectively. The average OR (95% CI) of the relationship between moderate-intensity physical activity and being overweight was 1.938 (1.465–2.564; $p < 0.001$), 2.023 (1.485–2.758; $p < 0.001$) and 1.535 (1.155–2.039; $p = 0.003$) among those who participated in moderate-intensity physical activity for ≥5 days a week, 3–4 days a week and 1–2 days a week, respectively. The average OR (95% CI) of the association between moderate-intensity physical activity and being obese was 1.725 (1.309–2.272; $p < 0.001$), 1.731 (1.275–2.349; $p < 0.001$) and 1.431 (1.083–1.891; $p = 0.012$) among those who participated in moderate-intensity physical activity for ≥5 days a week, 3–4 days a week and 1–2 days a week, respectively. These results showed that unmarried men were more likely to have moderate, overweight, and obese BMIs than those who did not engage in moderate-intensity physical activity.

3.4 Association between the frequency of participation in moderate-intensity physical activity in a week and perceived stress

Table 4 shows the results of the analysis examining the association between the frequency of participation in moderate-intensity physical activity in a week and perceived stress. No statistically significant OR was found among respondents who perceived very much stress and a little stress. The average OR (95% CI) of the association between moderate-intensity physical activity and perceiving almost no stress was 1.145

TABLE 1. Characteristics of the study population (n = 22,522).

Characteristic	Categories	n (%)
Number of days of participation in moderate-intensity physical activity in a week		
	5 or more days a week	3728 (16.6%)
	3–4 days a week	3049 (13.5%)
	1–2 days a week	2981 (13.2%)
	Never	12,764 (56.7%)
Body mass index		
	Underweight	600 (2.7%)
	Healthy	7354 (32.6%)
	Overweight	5274 (23.4%)
	Obesity	9294 (41.3%)
Perceived stress		
	Very much	735 (3.3%)
	A lot	4244 (18.8%)
	A little	12,872 (57.2%)
	Almost none	4671 (20.7%)
Smoking		
	Less than 5 packs (100 cigarettes) a week	1134 (5.0%)
	5 packs or more a week	11,645 (51.7%)
	None	9743 (43.3%)
Alcohol consumption		
	None	4151 (18.4%)
	1–2 cups on one occasion	2770 (12.3%)
	3–4 cups on one occasion	3233 (14.4%)
	5 or more cups on one occasion	12,368 (54.9%)
Age		
	19–39 years	16,228 (72.1%)
	40–59 years	5501 (24.4%)
	60 years or older	793 (3.5%)
Anxiety-depression		
	None	20,547 (91.2%)
	A little	1823 (8.1%)
	Severe	152 (0.7%)
Pain-discomfort		
	None	19,113 (84.9%)
	A little	3203 (14.2%)
	Severe	206 (0.9%)
Ability to perform daily activities		
	No impediments to daily activities	21,690 (96.3%)
	Some impediments to daily activities	753 (3.3%)
	Unable to carry out daily activities	79 (0.4%)

TABLE 1. Continued.

Characteristic	Categories	n (%)
Self-care ability		
	No problems with bathing or dressing	22,182 (98.5%)
	No difficulty in bathing or dressing alone	294 (1.3%)
	Unable to bathe or dress alone	46 (0.2%)
Exercise ability		
	No problem in walking	21,564 (95.7%)
	Some trouble in walking	913 (4.1%)
	Must lie down all day	45 (0.2%)
Frequency of breakfast consumption (number of days)		
	5–7 times a week	8172 (36.3%)
	3–4 times a week	2412 (10.7%)
	1–2 times a week	2373 (10.5%)
	Almost never	9565 (42.5%)
Engagement in economic activity		
	Yes	15,420 (68.5%)
	No	7102 (31.5%)

TABLE 2. Differences in the characteristics of the study population based on their participation in moderate-intensity physical activity.

Characteristic	Categories	Number of days of participation in moderate-intensity physical activity in a week				χ^2 (p)
		5 or more days a week	3–4 days a week	1–2 days a week	Never	
Body mass index						
	Underweight	62 (10.3%)	49 (8.2%)	61 (10.2%)	428 (71.3%)	88.528 (<0.001***)
	Healthy	1148 (15.6%)	987 (13.4%)	921 (12.5%)	4298 (58.5%)	
	Overweight	946 (17.9%)	773 (14.7%)	727 (13.8%)	2828 (53.6%)	
	Obesity	1572 (16.9%)	1238 (13.3%)	1272 (13.7%)	5212 (56.1%)	
Perceived stress						
	Very much	119 (16.2%)	71 (9.7%)	98 (13.3%)	447 (60.8%)	51.208 (<0.001***)
	A lot	677 (16.0%)	555 (13.1%)	554 (13.0%)	2458 (57.9%)	
	A little	2105 (16.3%)	1843 (14.3%)	1797 (14.0%)	7127 (55.4%)	
	Almost none	827 (17.7%)	580 (12.4%)	532 (11.4%)	2732 (58.5%)	
Smoking						
	Less than 5 packs (100 cigarettes) a week	168 (14.8%)	173 (15.3%)	187 (16.5%)	606 (53.4%)	107.403 (<0.001***)
	5 packs or more a week	2046 (17.6%)	1403 (12.0%)	1381 (11.9%)	6815 (58.5%)	
	None	1514 (15.6%)	1473 (15.1%)	1413 (14.5%)	5343 (54.8%)	
Alcohol consumption						
	None	607 (14.6%)	390 (9.4%)	403 (9.7%)	2751 (66.3%)	224.288 (<0.001***)
	1–2 cups on one occasion	457 (16.5%)	372 (13.4%)	359 (13.0%)	1582 (57.1%)	
	3–4 cups on one occasion	508 (15.7%)	501 (15.5%)	480 (14.9%)	1744 (53.9%)	
	5 or more cups on one occasion	2156 (17.4%)	1786 (14.4%)	1739 (14.1%)	6687 (54.1%)	

TABLE 2. Continued.

Characteristic	Categories	Number of days of participation in moderate-intensity physical activity in a week				χ^2 (p)
		5 or more days a week	3–4 days a week	1–2 days a week	Never	
Age						
	19–39 years	2812 (17.3%)	2422 (14.9%)	2296 (14.2%)	8698 (53.6%)	278.963 (<0.001***)
	40–59 years	807 (14.7%)	565 (10.3%)	647 (11.7%)	3482 (63.3%)	
	60 years or older	109 (13.8%)	62 (7.8%)	38 (4.8%)	584 (73.6%)	
Anxiety-depression						
	None	3472 (16.9%)	2837 (13.8%)	2735 (13.3%)	11,503 (56.0%)	59.913 (<0.001***)
	Sometimes	242 (13.3%)	200 (11.0%)	235 (12.9%)	1146 (62.8%)	
	Very severe	14 (9.2%)	12 (7.9%)	11 (7.2%)	115 (75.7%)	
Pain-discomfort						
	None	3171 (16.6%)	2667 (14.0%)	2605 (13.6%)	10,670 (55.8%)	56.801 (<0.001***)
	Sometimes	531 (16.6%)	365 (11.4%)	361 (11.3%)	1946 (60.7%)	
	Very severe	26 (12.6%)	17 (8.3%)	15 (7.3%)	148 (71.8%)	
Ability to perform daily activities						
	No impediments to daily activities	3654 (16.9%)	2995 (13.8%)	2933 (13.5%)	12,108 (55.8%)	184.559 (<0.001***)
	Some impediments to daily activities	71 (9.4%)	54 (7.2%)	48 (6.4%)	580 (77.0%)	
	Unable to carry out daily activities	3 (3.8%)	0 (0%)	0 (0%)	76 (96.2%)	
Self-care ability						
	No problems with bathing or dressing	3700 (16.7%)	3036 (13.7%)	2972 (13.4%)	12,474 (56.2%)	120.402 (<0.001***)
	No difficulty in bathing or dressing alone	27 (9.2%)	13 (4.4%)	8 (2.7%)	246 (83.7%)	
	Unable to bathe or dress alone	1 (2.2%)	0 (0%)	1 (2.2%)	44 (95.6%)	
Exercise ability						
	No problem in walking	3638 (16.9%)	2983 (13.8%)	2915 (13.5%)	12,028 (55.8%)	167.901 (<0.001***)
	Some trouble in walking	85 (9.3%)	65 (7.1%)	65 (7.1%)	698 (76.5%)	
	Must lie down all day	5 (11.1%)	1 (2.2%)	1 (2.2%)	38 (84.5%)	
Frequency of breakfast consumption (number of days)						
	5–7 times a week	1549 (18.9%)	1019 (12.5%)	922 (11.3%)	4682 (57.3%)	223.275 (<0.001***)
	3–4 times a week	386 (16.0%)	409 (17.0%)	383 (15.8%)	1234 (51.2%)	
	1–2 times a week	316 (13.3%)	390 (16.4%)	447 (18.9%)	1220 (51.4%)	
	Almost never	1477 (15.4%)	1231 (12.9%)	1229 (12.9%)	5628 (58.8%)	
Engagement in economic activity						
	Yes	2799 (18.1%)	2189 (14.2%)	2184 (14.2%)	8248 (53.5%)	210.457 (<0.001***)
	No	929 (13.1%)	860 (12.1%)	797 (11.2%)	4516 (63.6%)	

****p < 0.001, assessed using chi-square test.*

TABLE 3. Association between the frequency of participation in moderate-intensity physical activity in a week and body mass index.

Variable	Body mass index (odds ratios and 95% confidence interval)		
	Healthy	Overweight	Obesity
Frequency of participation in moderate-intensity physical activity in a week (number of days)			
5 or more days a week	1.600 (1.213–2.112) $p = 0.001$**	1.938 (1.465–2.564) $p < 0.001$***	1.725 (1.309–2.272) $p < 0.001$***
3–4 days a week	1.754 (1.291–2.384) $p < 0.001$***	2.023 (1.485–2.758) $p < 0.001$***	1.731 (1.275–2.349) $p < 0.001$***
1–2 days a week	1.321 (0.998–1.750) $p = 0.052$	1.535 (1.155–2.039) $p = 0.003$**	1.431 (1.083–1.891) $p = 0.012$*
Never	1.000	1.000	1.000

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, assessed using multivariate logistic regression analysis.*

TABLE 4. Association between the frequency of participation in moderate-intensity physical activity in a week and perceived stress.

Variable	Perceived stress (odds ratios and 95% confidence interval)		
	Very much	A little	Almost none
Number of days of participation in moderate-intensity physical activity in a week			
5 or more days a week	1.107 (0.884–1.388) $p = 0.375$	1.050 (0.948–1.162) $p = 0.350$	1.145 (1.015–1.292) $p = 0.028$*
3–4 days a week	0.793 (0.604–1.042) $p = 0.096$	1.109 (0.994–1.238) $p = 0.063$	0.958 (0.838–1.096) $p = 0.531$
1–2 days a week	1.070 (0.839–1.366) $p = 0.585$	1.111 (0.995–1.239) $p = 0.061$	0.911 (0.795–1.044) $p = 0.180$
Never	1.000	1.000	1.000

$p < 0.05$, assessed using multivariate logistic regression analysis.

(1.015–1.292; $p = 0.028$) among those who participated in moderate-intensity physical activity ≥5 days a week. As a results, unmarried men were more likely to feel almost no stress as they did not engage in moderate-intensity physical activity.

3.5 Association between frequency of participation in moderate-intensity physical activity in a week and alcohol consumption

Table 5 presents the results of analysis examining the association between the frequency of participation in moderate-intensity physical activity in a week and alcohol consumption. The average OR (95% CI) of the association between moderate-intensity physical activity and no alcohol consumption was 0.792 (0.713–0.880; $p < 0.001$), 0.595 (0.526–0.673; $p < 0.001$) and 0.652 (0.577–0.737; $p < 0.001$) among those who participated in moderate-intensity physical activity for ≥5 days a week, 3–4 days a week and 1–2 days a week, respectively. The average OR (95% CI) of the association between moderate-intensity physical activity and drinking 1–2 cups of alcohol on one occasion was 0.876 (0.771–0.995; $p = 0.042$) among those who participated in moderate-intensity physical activity for 3–4 days a week. There was no statistical significance for the association between 3–4 cups of alcohol on one occasion and any frequency of participation in moderate-intensity physical activity. As a result, unmarried men were found to have a decrease in alcohol consumption as the number of days they participated in physical activity increased compared to those who did not participate in moderate-intensity physical activity.

3.6 Association between the frequency of participation in moderate-intensity physical activity in a week and smoking

Table 6 shows the results of the analysis of examining the association between the frequency of participation in moderate-intensity physical activity in a week and smoking. The average OR (95% CI) of the association between moderate-intensity physical activity and smoking five or more packs of cigarette a week was 0.754 (0.629–0.903; $p = 0.002$) and 0.667 (0.559–0.796; $p < 0.001$) among those who participated in moderate-intensity physical activity for 3–4 days a week and 1–2 days a week, respectively. No statistically significant OR was found among those who did not smoke with any frequency of participation in moderate-intensity physical activity. As a result, unmarried men were found to have a decrease in smoking as the number of days they participated in physical activity increased compared to those who did not participate in moderate-intensity physical activity.

TABLE 5. Association between the frequency of participation in moderate-intensity physical activity in a week and alcohol consumption.

Variable	Alcohol consumption (odds ratios and 95% confidence interval)		
	None	1–2 cups on one occasion	3–4 cups on one occasion
Number of days of participation in moderate-intensity physical activity in a week			
5 or more days a week	0.792 (0.713–0.880) $p < 0.001$***	0.943 (0.838–1.060) $p = 0.326$	0.936 (0.837–1.047) $p = 0.246$
3–4 days a week	0.595 (0.526–0.673) $p < 0.001$***	0.876 (0.771–0.995) $p = 0.042$*	1.081 (0.965–1.212) $p = 0.178$
1–2 days a week	0.652 (0.577–0.737) $p < 0.001$***	0.890 (0.782–1.012) $p = 0.075$	1.080 (0.962–1.212) $p = 0.191$
Never	1.000	1.000	1.000

*$p < 0.05$, ***$p < 0.001$, assessed through multivariate logistic regression analysis.*

TABLE 6. Association between the frequency of participation in moderate-intensity physical activity in a week and smoking.

Variable	Smoking (odds ratios and 95% confidence interval)	
	5 packs or more a week	None
Number of days of participation in moderate-intensity physical activity in a week		
5 or more days a week	1.111 (0.928–1.331) $p = 0.253$	1.009 (0.840–1.211) $p = 0.925$
3–4 days a week	0.754 (0.629–0.903) $p = 0.002$**	0.989 (0.825–1.185) $p = 0.905$
1–2 days a week	0.667 (0.559–0.796) $p < 0.001$***	0.892 (0.748–1.064) $p = 0.205$
Never	1.000	1.000

**$p < 0.01$, ***$p < 0.001$, assessed using multivariate logistic regression analysis.*

4. Discussion

4.1 Interpretation of the findings

This study explored the association of the frequency of participation in moderate-intensity physical activity with BMI, perceived stress, smoking, and alcohol consumption among unmarried men. The results showed that unmarried men were more likely to have moderate, overweight, and obese BMI than those who did not engage in moderate-intensity physical activity. In addition, unmarried men were more likely to feel almost no stress as they did not engage in moderate-intensity physical activity. Notably, unmarried men were found to have a decrease in alcohol consumption and smoking as the number of days they participated in physical activity increased compared to those who did not participate in moderate-intensity physical activity.

We first found that 56.7% of unmarried Korean men do not participate in moderate-intensity physical activity. This study confirmed that participation in moderate-intensity physical activity is significantly related to stress reduction and reduced likelihood of smoking and drinking alcohol among unmarried men, which significantly affects health behavior. It is well-established that moderate-intensity physical activity such as aerobic fitness, cycling, doubles tennis, badminton, table tennis, slow swimming increases the average lifespan, reduces the causes of death, increases muscle strength and cardiorespiratory fitness, positively affects obesity, and lowers the risk of metabolic syndrome and various diseases [24–26]. In addition, it improves health and reduces the risk of morbidity and mortality more effectively than low levels of activity or fitness [27]. Despite the positive effects of moderate-intensity physical activity, the participation rate of unmarried men remains low. This could be related to Korea's social and cultural background, where men engage in more social activities than women and are greatly influenced by environmental factors, such as work and interpersonal relationships at work [28]. Moreover, middle-aged individuals have an increased interest in health and are more likely to practice health behaviors [29]. In this study, 72.1% of respondents were between the ages of 19 and 39 years. Despite this, participation in physical activity was low. Therefore, fostering a social and cultural environment in which unmarried Korean men can consistently participate in moderate-intensity physical activities can improve their physical, mental, and social health.

Second, we found that the likelihood of being healthy, overweight, or obese increases with an increase in the frequency of participation in moderate-intensity physical activity in a week among unmarried Korean men. Many studies have reported that participating in physical activity significantly reduces BMI [30, 31]. However, our finding contradicts those of previous studies. So *et al*. [30] found a significant association between physical activity participation and BMI among Korean men. Chan *et al*. [31] found that participation in physical activity is inversely related to overweight and obesity among Malaysian

men. They emphasized the importance of participating in moderate-intensity physical activity to reduce overweight and obesity. Trinh *et al*. [32] argued that participation in moderate-intensity physical activity is closely related to reduced BMI among overweight and obese children. Another study found that participating in moderate-intensity physical activity is effective in reducing the risk of obesity and diminishing the body fat percentage in overweight and obese individuals [33]. This leads to a reduction in medical costs and the possibility of diseases other than obesity, thus providing benefits in the mid-to-long term [34]. Previous studies differed from the results of this study because it was found that participation in moderate-intensity physical activity had a positive effect on BMI reduction. Given the discrepancy between our findings and those of previous studies, further research is warranted in this regard.

Third, we found that the likelihood of experiencing almost no stress increases with an increase in the frequency of participation in moderate-intensity physical activity in a week among unmarried Korean men. This suggests that the more they participate in moderate-intensity physical activity, the more is the reduction in stress levels. This finding aligns with the findings of previous studies that found that physical activity significantly reduces perceived stress and increases resilience to stress [35–37]. It also aligns with the finding of Pengpid *et al*. [35], who found that participation in vigorous physical activity is associated with reduced perceived stress among university students from 23 low- and middle-income countries. Mücke *et al*. [36] conducted a systematic literature analysis and found that higher levels of physical activity are associated with weakened responses to psychosocial stress. Lachance *et al*. [37] found that participating in moderate-intensity physical activity effectively reduces work stress, consistent with our finding. The significant effect of moderate-intensity physical activity participation in unmarried men on stress reduction appears to be due to the normalization of neural activity by increasing the release of endorphins and the activity of norepinephrine and serotonin [38]. Therefore, unmarried men who experience high stress should frequently participate in moderate-intensity physical activity.

Fourth, we found that the likelihood of drinking alcohol decreases with an increase in the frequency of participation in moderate-intensity physical activity in a week among unmarried Korean men. This implies that their participation in moderate-intensity physical activity causes them to drink less alcohol. This finding contradicts that of Niedermeier *et al*. [39], who found no relationship between physical activity and alcohol consumption. Our finding also contradicts that of West *et al*. [40], who found that people who exercise frequently consume greater amounts of alcohol. Buscemi *et al*. [17] found that the relationship between physical activity and drinking alcohol differs according to sex, with the correlation between physical activity and drinking alcohol being more positive for men than for women, confirming the results of this study. Musselman *et al*. [18], however, found that physically active students drink less alcohol, consistent with our finding. Furthermore, individuals who endorsed being physically active had higher odds of being in 12-month remission from alcohol use problems than people who were physically inactive [41]. Therefore, participation in moderate-intensity physical activity among unmarried men in South Korea is effective in reducing their alcohol intake. Health policies should encourage unmarried men who want to reduce their alcohol intake to consistently engage in moderate-intensity physical activity.

Fifth, we found that the likelihood of smoking decreases with an increase in the frequency of participation in moderate-intensity physical activity in a week among unmarried men. This suggests that their participation in moderate-intensity physical activity causes them to smoke less. This finding contradicts that of Kaczynski *et al*. [13], who conducted a systematic literature analysis of the relationship between physical activity and smoking and found that the relationship between the two is weak. However, our finding is partially consistent with that of Audrain-McGovern *et al*. [42], who found that participating in physical activity is effective in smoking cessation. Smokers spend significantly lesser time on sports, leisure, and aerobic activities and have lower levels of physical activity than non-smokers, suggesting that regular exercise can reduce the risk of developing tobacco-related diseases [43]. Because participation in moderate-intensity physical activity helps to reduce the frequency of smoking, unmarried men who wish to quit smoking should frequently participate in moderate-intensity physical activity.

4.2 Limitation

This study had several limitations. First, because it was a cross-sectional study, the causal relationship between frequency of participation in moderate-intensity physical activity in a week with lifestyle variables among unmarried Korean men could not be investigated. Therefore, future studies should explore these relationships in detail. Second, because data on participation in moderate-intensity physical activity and lifestyle variables were self-reported, a recall bias and/or response bias may have been introduced. However, the researcher visited the home and conducted the survey in the form of an interview, in order to minimize the limitations of the self-report method. Unfortunately, it is difficult to independently verify the accuracy of self-reported data. This is because variables such as the number of days of moderate-intensity physical activity, the amount of smoking, the amount of alcohol consumed, and the perceived stress used in this study were collected by asking about the participants' experiences over the past week and past year (a considerable recall time). Nevertheless, this study is valuable because it identified the effects of participation in moderate-intensity physical activity on BMI, perceived stress, smoking, and alcohol consumption among 22,522 unmarried Korean men. The results of this study can be used as foundational data for developing policies concerning health management strategies for unmarried Korean men.

5. Conclusions

An increase in the frequency of participation in moderate-intensity physical activity in a week among unmarried Korean men increases their likelihood of being healthy, overweight, or obese and of experiencing almost no stress, as per the results of this study. These findings are contrary to the results of

previous studies, so future research is needed. It also decreases their likelihood of smoking and drinking alcohol. Despite these positive effects of moderate-intensity physical activity, the participation rate among unmarried men in Korea was found to be low. Consequently, it is imperative to foster a social environment that encourages their participation in moderate-intensity physical activity. Unmarried men should be made aware of the effects of moderate-intensity physical activity participation on BMI, perceived stress, smoking and alcohol consumption so that they can be encouraged to engage in moderate-intensity physical activity. For example, the results of this study may be used to develop and apply physical activity promotion programs for unmarried men. This study is salient because it encourages healthy behaviors among unmarried Korean men and provides foundational data for the development of health management policies.

ABBREVIATIONS

BMI, body mass index; CI, confidence interval; OR, odds ratio.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS

WS—conceptualization; methodology; data collection; formal analysis; investigation; project administration; writing–original draft preparation. WYS—methodology; data collection; writing–review and editing; visualization; validation; supervision. JK—methodology; data collection; writing–review and editing; data collection; formal analysis; investigation. All the authors contributed to the reading and approval of the submitted version.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The 2022 Community Health Survey did not collect identifier information such as home addresses, telephone numbers, and social security numbers, ethical approval was not required and was conducted in accordance with the Declaration of Helsinki. All participants and their guardians were informed about the study procedure and its purpose and voluntarily signed an informed consent form.

ACKNOWLEDGMENT

Not applicable.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest. Wi-Young So is serving as one of the Editorial Board members of this journal. We declare that Wi-Young So had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to DM.

REFERENCES

[1] Bouchard C, Blair SN, Haskell WL. Physical activity and health. 2nd edn. Human Kinetics: Champaign. 2012.
[2] Singh R, Pattisapu A, Emery MS. US physical activity guidelines: current state, impact and future directions. Trends in Cardiovascular Medicine. 2020; 30: 407–412.
[3] Vuori I. World Health Organization and physical activity. Progress in Preventive Medicine. 2018; 3: e0012.
[4] Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, *et al*. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. British Journal of Sports Medicine. 2020; 54: 1451–1462.
[5] Martin SB, Morrow JR Jr, Jackson AW, Dunn AL. Variables related to meeting the CDC/ACSM physical activity guidelines. Medicine and Science in Sports and Exercise. 2000; 32: 2087–2092.
[6] Buckworth J, Dishman RK, O'Connor PJ, Tomporowski PD. Exercise psychology. 2nd edn. Human Kinetics: Champaign. 2013.
[7] Huang CJ, Webb HE, Zourdos MC, Acevedo EO. Cardiovascular reactivity, stress, and physical activity. Frontiers in Physiology, 2013; 4: 314.
[8] Rimmele U, Zellweger BC, Marti B, Seiler R, Mohiyeddini C, Ehlert U, *et al*. Trained men show lower cortisol, heart rate and psychological responses to psychosocial stress compared with untrained men. Psychoneuroendocrinology. 2007; 32: 627–635.
[9] Rimmele U, Seiler R, Marti B, Wirtz PH, Ehlert U, Heinrichs M. The level of physical activity affects adrenal and cardiovascular reactivity to psychosocial stress. Psychoneuroendocrinology. 2009; 34: 190–198.
[10] Zhang J, Cao Y, Mo H, Feng R. The association between different types of physical activity and smoking behavior. BMC Psychiatry. 2023; 23: 927.
[11] Taucher E, Mykoliuk I, Lindenmann, J, Smolle-Juettner FM. Implications of the immune landscape in COPD and lung cancer: smoking versus other causes. Frontiers in Immunology. 2022; 13: 846605.
[12] Kendzor DE, Dubbert PM, Olivier J, Businelle MS, Grothe KB. The influence of physical activity on alcohol consumption among heavy drinkers participating in an alcohol treatment intervention. Addictive Behaviors. 2008; 33: 1337–1343.
[13] Kaczynski AT, Manske SR, Mannell RC, Grewal K. Smoking and physical activity: a systematic review. American Journal of Health Behavior. 2008; 32: 93–110.
[14] Yang N, Park S, Park H, Lee H. The effect of job stress on sleep difficulties in male office workers: mediated moderation effect of optimism and age. Discourse and Policy in Social Science. 2023; 16: 117–139.
[15] Lee DE, Lim SW, Shin DW, Oh KS, Shin YC. Job stress associated with problematic alcohol drinking in Korean employees. Anxiety and Mood. 2017; 13: 39–45.
[16] Organisation for Economic Co-operation and Development. OECD policy responses to coronavirus (COVID-19). The effect of COVID-19 on alcohol consumption, and policy responses to prevent harmful alcohol consumption. OECD Publishing: Paris, France. 2021.
[17] Buscemi J, Martens MP, Murphy JG, Yurasek AM, Smith AE. Moderators of the relationship between physical activity and alcohol consumption in college students. Journal of American College Health. 2011; 59: 503–509.
[18] Musselman JRB, Rutledge PC. The incongruous alcohol-activity association: physical activity and alcohol consumption in college students. Psychology of Sport and Exercise. 2010; 11: 609–618.
[19] Lee YS. Marital status, health behaviors and health status for middle-aged

men and women in Korea. Korea Journal of Population Studies. 2012; 35: 103–131.

[20] Sember V, Meh K, Sorić M, Starc G, Rocha P, Jurak G. Validity and reliability of International Physical Activity Questionnaires for adults across EU countries: systematic review and meta analysis. International Journal of Environmental Research and Public Health. 2020; 17: 7161.

[21] WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. The Lancet. 2004; 363: 157–163.

[22] Kim MK, Lee W, Kang J, Kang J, Kim BT, Kim SM, *et al*. 2014 clinical practice guidelines for overweight and obesity in Korea. Endocrinology and Metabolism. 2014; 29: 405–409.

[23] Park HJ, Cho JH, Kim HJ, Park JY, Lee HS, Byun MK. The effect of low body mass index on the development of chronic obstructive pulmonary disease and mortality. Journal of Internal Medicine. 2019; 286: 573–582.

[24] Knaeps S, Bourgois JG, Charlier R, Mertens E, Lefevre J, Wijndaele K. Ten-year change in sedentary behaviour, moderate-to-vigorous physical activity, cardiorespiratory fitness and cardiometabolic risk: independent associations and mediation analysis. British Journal of Sports Medicine. 2018; 52: 1063–1068.

[25] Bennie JA, De Cocker K, Teychenne MJ, Brown WJ, Biddle SJH. The epidemiology of aerobic physical activity and muscle-strengthening activity guideline adherence among 383,928 U.S. adults. International Journal of Behavioral Nutrition and Physical Activity. 2019; 16: 34.

[26] Wessel TR, Arant CB, Olson MB, Johnson BD, Reis SE, Sharaf BL, *et al*. Relationship of physical fitness *vs* body mass index with coronary artery disease and cardiovascular events in women. JAMA. 2004; 292: 1179–1187.

[27] Blair SN, Connelly JC. How much physical activity should we do? The case for moderate amounts and intensities of physical activity. Research Quarterly for Exercise and Sport. 1996; 67: 193–205.

[28] Jo N, Seong C. Effects of stress and self-esteem on depression in middle-aged women and middle-aged men. Journal of the Korea Convergence Society. 2016; 7: 89–97.

[29] Han GH, Lee JH, Ryff C, Marks N, Ok SW, Cha SE. Health status and health behavior of middle-aged Korean men and women focused on dender and age-group differences. Journal of the Korean Home Economics Association. 2003; 41: 213–229.

[30] So WY, Choi DH, Yonn YJ. Effects of 14-week circuit weight training on body composition, cardiorespiratory function, fitness, physical self-efficacy scale, Beck Depression Inventory, and SF-36 in men in their twenties. Korean Journal of Health Promotion. 2009; 9: 321–328.

[31] Chan YY, Lim KK, Lim KH, Teh CH, Kee CC, Cheong SM, *et al*. Physical activity and overweight/obesity among Malaysian adults: findings from the 2015 National Health and morbidity survey (NHMS). BMC Public Health. 2017; 17: 733.

[32] Trinh A, Campbell M, Ukoumunne OC, Gerner B, Wake M. Physical activity and 3-year BMI change in overweight and obese children. Pediatrics. 2013; 131: e470–e477.

[33] Drenowatz C, Prasad VK, Hand GA, Shook RP, Blair SN. Effects of moderate and vigorous physical activity on fitness and body composition. Journal of Behavioral Medicine. 2016; 39: 624–632.

[34] Wang F, McDonald T, Reffitt B, Edington DW. BMI, physical activity, and health care utilization/costs among Medicare retirees. Obesity Research. 2005; 13: 1450–1457.

[35] Pengpid S, Peltzer K. Vigorous physical activity, perceived stress, sleep and mental health among university students from 23 low-and middle-income countries. International Journal of Adolescent Medicine and Health. 2018; 32: 20170116.

[36] Mücke M, Ludyga S, Colledge F, Gerber M. Influence of regular physical activity and fitness on stress reactivity as measured with the trier social stress test protocol: a systematic review. Sports Medicine. 2018; 48: 2607–2622.

[37] Lachance J, Corbière M, Hains-Monfette G, Bernard P. Clearing your mind of work-related stress through moderate-to-vigorous and leisure-time physical activity: what 'dose' it take? Applied Research in Quality of Life. 2022; 17: 1583–1596.

[38] Han JH, Lee JE, Park JH, Lee SH, Kang HS. Effect of a 12 week-aerobic exercise program on physical fitness, depression, and cognitive function in the elderly. Exercise Science. 2014; 23: 375–385.

[39] Niedermeier M, Frühauf A, Kopp-Wilfling P, Rumpold G, Kopp M. Alcohol consumption and physical activity in Austrian college students—a cross-sectional study. Substance Use & Misuse. 2018; 53: 1581–1590.

[40] West AB, Bomysoad RN, Russell MA, Conroy DE. Daily physical activity, sedentary behavior and alcohol use in at-risk college students. Annals of Behavioral Medicine. 2022; 56: 712–725.

[41] Damian AJ, Mendelson T. Association of physical activity with alcohol abuse and dependence in a nationally-representative U.S. sample. Substance Use & Misuse. 2017; 52: 1744–1750.

[42] Audrain-McGovern J, Strasser AA, Ashare R, Wileyto EP. Reinforcing value of smoking relative to physical activity and the effects of physical activity on smoking abstinence symptoms among young adults. Experimental and Clinical Psychopharmacology. 2015; 23: 477–485.

[43] Klesges RC, Eck LH, Isbell TR, Fulliton W, Hanson CL. Smoking status: effects on the dietary intake, physical activity, and body fat of adult men. The American Journal of Clinical Nutrition. 1990; 51: 784–789.

How to cite this article: Wonsang Shin, Wi-Young So, Jeonga Kwon. Exploring the correlation between moderate-intensity physical activity and lifestyle habits in unmarried South Korean men. Journal of Men's Health. 2024; 20(8): 24-34. doi: 10.22514/jomh.2024.126.