

THE RELATIONSHIP BETWEEN WALKING HABITS AND CARDIOVASCULAR HEALTH IN OFFICE WORKERS

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ABSTRACT

Background: Office workers generally have low levels of physical activity due to the dominance of sedentary behavior during working hours, which increases the risk of cardiovascular health problems. Walking is a light physical activity that can be easily incorporated into daily life and may contribute to better cardiovascular health. This study aimed to determine the relationship between walking habits and cardiovascular health among office workers.

Methods: This quantitative analytic study employed a *cross-sectional* design involving 165 office workers. Walking habits were assessed based on frequency, duration, and intensity. Cardiovascular health was evaluated through measurements of blood pressure, resting heart rate, and cardiorespiratory fitness. The relationship between variables was analyzed using the *Spearman correlation* test.

Results: The results showed a significant relationship between walking habits and overall cardiovascular health ($p < 0.001$; $r = 0.302$), indicating a weak positive correlation. No significant relationship was found between walking habits and blood pressure ($p = 0.091$; $r = 0.132$). However, significant relationships were observed between walking habits and resting heart rate ($p = 0.005$; $r = 0.216$) as well as cardiorespiratory fitness ($p < 0.001$; $r = 0.348$).

Conclusion: Walking habits are associated with cardiovascular health among office workers, particularly in terms of resting heart rate and cardiorespiratory fitness. These findings suggest that regular walking may contribute to maintaining cardiovascular health in office workers.

Keywords: walking; cardiovascular health; office workers.

INTRODUCTION

Technological advancement and digitalization have transformed the working patterns of modern society, particularly in office environments. Office workers tend to spend most of their working hours in a sitting position, whether while working on computers, attending meetings, or completing administrative tasks. This condition contributes to a sedentary lifestyle, characterized by low levels of physical activity during working hours. Office workers have been reported to spend up to 82% of their working time sitting without engaging in meaningful physical activity breaks, making office-based occupations one of the major contributors to the increasing prevalence of sedentary behavior.¹

Sedentary lifestyle is closely associated with an increased risk of cardiovascular disease (CVD). Insufficient physical activity can reduce the efficiency of the cardiovascular system, elevate blood pressure, and promote the accumulation of lipids within blood vessels. Prolonged sitting time has been linked to a higher incidence of cardiovascular events and mortality, even after adjusting for other established risk factors.² Globally, CVD remains the leading cause of death, and in Indonesia, heart disease and stroke are among the leading causes of mortality due to non-communicable diseases.^{3,4}

One of the modifiable risk factors for CVD is physical inactivity. Low levels of physical activity also contribute to an increased risk of cardiometabolic diseases, such as type 2 diabetes mellitus, through their effects on blood pressure, lipid profile, and body mass index.⁵ Therefore, simple and

practical interventions are needed to increase physical activity levels, particularly among office workers.

Walking is a light-intensity physical activity that is easy to implement, relatively safe, and does not require special equipment. It has been reported to reduce the risk of stroke and contribute to the reduction of coronary heart disease risk factors, especially when supported by workplace-based interventions. In addition to its physical benefits, walking has also been shown to improve mental health and overall quality of life.^{6,7}

However, studies investigating the relationship between walking and cardiovascular health have yielded inconsistent findings. Some studies have demonstrated improvements in blood pressure and aerobic capacity, whereas others have not found consistent effects across all cardiovascular indicators.⁸ Therefore, further research is needed to comprehensively examine the relationship between walking habits and cardiovascular health among office workers.

This study aimed to determine the relationship between walking habits and cardiovascular health among office workers, as assessed through blood pressure, resting heart rate, and cardiorespiratory fitness. The findings of this study are expected to provide evidence for the development of health promotion strategies and physical activity programs in workplace settings to support and improve the cardiovascular health of office worker

MATERIALS AND METHODS

This study was a quantitative analytical study with a cross-sectional design aimed at analyzing the relationship between walking habits and cardiovascular health among office workers. Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Medicine and Health Sciences, Alauddin State Islamic University, under ethical clearance number E.133/KEPK/FKIK/XI/2025.

The study was conducted in November 2025 at the Regional Office of the Ministry of Religious Affairs of South Sulawesi Province, Indonesia. The study population consisted of all office workers employed at the Regional Office of the Ministry of Religious Affairs of South Sulawesi Province, totaling 286 individuals. The sampling process began with the identification of eligible workers based on institutional employment records. Subsequently, respondents were screened according to the predefined

inclusion and exclusion criteria. Eligible participants were office workers aged 22–55 years who had been actively employed for at least six months and were willing to participate by providing written informed consent. Individuals with a previously diagnosed history of heart disease, those receiving medications that could affect the cardiovascular system, those with musculoskeletal disorders limiting their ability to walk, and those who provided incomplete data or withdrew from the study were excluded.

The sample size was calculated using Slovin's formula with a 5% margin of error based on the total population of 286 office workers, resulting in a minimum required sample size of 165 respondents. Participants who met the eligibility criteria were selected using a purposive sampling technique. During the study period, all 165 eligible respondents successfully completed the data collection process and were included in the final analysis.

Walking habits were assessed using a researcher-developed questionnaire that had undergone validity and reliability testing. Blood pressure was measured using a digital sphygmomanometer and recorded in millimeters of mercury (mmHg) according to standard measurement procedures. Resting heart rate was measured manually for one minute after participants had been in a resting condition. Cardiovascular fitness was evaluated through the estimation of maximal oxygen consumption ($\text{VO}_2 \text{ max}$) using the Tanaka formula.

Primary data were collected through questionnaire administration and direct measurements performed by the researchers. Data analysis included univariate analysis to describe respondents' characteristics and the distribution of study variables. Bivariate analysis was conducted using Spearman's rho correlation test to assess the relationship between walking habits and cardiovascular health. Statistical significance was determined at a p-value of less than 0.05 ($p < 0.05$).

RESULTS

This study involved 165 office workers from the Regional Office of the Ministry of Religious Affairs of South Sulawesi Province in 2025. Based on Table 1, the characteristics of the respondents showed a diverse distribution in terms of age, sex, lifestyle factors, and health history.

Table 1. Distribution of Respondents' Characteristics

Characteristic	Frequency (n)	(%)
Age		
Late Adolescence	14	8
Young Adulthood	33	20
Middle Adulthood	58	35
Older Adulthood	60	36
Sex		
Female	101	61
Male	64	39
Smoking History		
Smoker	28	17
Non-smoker	137	83
Family History of Heart Disease		
Yes	23	14
No	126	76
Unkwon	16	10
Total	165	100

Source : Primary Data, 2025

Based on the respondents' characteristics presented in Table 1, the majority of participants were classified as older adulthood (36%) and middle adulthood (35%). Most respondents were female (61%), non-smokers (83%), and did not have a family history of heart disease (76%).

The distribution of respondents according to the study variables is presented in Table 2, including blood pressure,

resting heart rate, cardiorespiratory fitness, cardiovascular health status, and walking habits. These data provide an overview of the respondents' cardiovascular condition and walking activity patterns prior to the analysis of the relationships between the study variables.

Table 2. Distribution of Respondents' Univariate Variables

Characteristic	Frequency (n)	(%)
Blood Pressure		
Normal	69	42
Prehypertension	51	31
Hypertension 1	36	22
Hypertension 2	9	5
Resting Heart Rate		
Bradycardia	5	3
Normal	152	92
Tachycardia	8	5
Cardiorespiratory Fitness		
Excellent	2	1
Very Good	19	12
Good	22	13
Fair	31	19
Poor	91	55
Cardiovascular Health		
Good	18	11
Fair	63	38
Poor	84	51
Walking Habits		
Low	54	33
Moderate	84	51
High	27	16
Total	165	100

Source : Primary Data, 2025

The univariate analysis presented in Table 2 showed that the majority of respondents had normal blood pressure (42%), although prehypertension (31%) and hypertension

(27%) were also observed. Most respondents had a normal resting heart rate (92%). Cardiorespiratory fitness was predominantly classified as fair (55%). Walking habits were

generally at a moderate level (51%). Overall, the largest proportion of respondents were categorized as having poor cardiovascular health (51%), followed by good

cardiovascular health (38%) and fair cardiovascular health (11%).

Table 3. Association Between Walking Habits and Cardiovascular Health

Walking Habits	Cardiovascular Health						Total		p-value
	Poor		Fair		Good				
	n	(%)	n	(%)	n	(%)	n	(%)	
	Low	35	64.8	17	31.5	2	3.7	54	
Moderate	38	42.5	38	42.5	8	9.5	84	100	
High	11	40.7	8	29.6	8	29.6	27	100	
Total	84		63		18		165		
Spearman's rho test result $\rho<0.001$ (r=0.302)									

Source : Primary Data, 2025

Table 3 shows that respondents with low walking habits were more likely to have poor cardiovascular health, whereas those with moderate to high walking habits demonstrated a greater proportion of fair and good cardiovascular health. Spearman's rho correlation analysis

yielded a correlation coefficient of $r = 0.302$ with a significance value of $p < 0.001$, indicating a statistically significant positive association between walking habits and cardiovascular health. However, the strength of the correlation was classified as weak

Table 4. Association Between Walking Habits and Blood Pressure

Walking Habits	Blood Pressure								Total		p-value
	Hyper tension 2		Hyper tension 1		Pre-Hypertension		Normal				
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	
Low	4	7.4	14	25.9	16	29.6	20	37	54	100	0.091
Moderate	4	4.8	16	19	27	32.1	37	44	84	100	
High	1	3.7	6	22.2	8	29.6	12	44	27	100	
Total	9		36		51		69		165		
Spearman's rho test result ρ=0.091 (r=0.132)											

Source : Primary Data, 2025

Table 4 shows that across all levels of walking habits, the majority of respondents had normal blood pressure, accounting for 37% of those with low walking habits and 44% of those with moderate-to-high walking habits. Spearman's rho correlation analysis yielded a correlation

coefficient of $r = 0.132$ with a p-value of 0.091 ($p > 0.05$), indicating that there was no statistically significant association between walking habits and blood pressure. Nevertheless, a positive trend was observed, although the strength of the relationship was very weak.

Table 5. Association Between Walking Habits and Resting Heart Rate

Walking Habits	Resting Heart Rate						Total		<i>p-value</i>
	Tachycardia		Normal		Bradycardia				
	n	(%)	n	(%)	n	(%)	n	(%)	
Low	5	9.3	49	90.7	0	0	54	100	0.005
Moderate	1	1.2	82	97.6	1	1.2	84	100	
High	2	7.4	21	77.8	4	14.8	27	100	
Total	8		152		5		165		
Spearman's rho test result ρ=0.005 (r=0.216)									

Source : Primary Data, 2025

Table 5 shows that the majority of respondents had a normal resting heart rate across all levels of walking habits.

Spearman's rho correlation analysis yielded a correlation coefficient of $r = 0.216$ with a p-value of 0.005 ($p < 0.05$),

indicating a statistically significant positive association between walking habits and resting heart rate. However, the

strength of the correlation was classified as weak

Table 6. Association Between Walking Habits and Cardiorespiratory Fitness

Walking Habits	Cardiorespiratory Fitness										Total	p-value	
	Poor		Fair		Good		Very Good		Excellent				
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n		(%)
Low	40	74.1	7	13	4	7.4	3	5.6	0	0	54	100	<0.001
Moderate	43	51.2	17	20.2	15	17.9	9	10.7	0	0	84	100	
High	8	29.6	7	25.9	3	11.1	7	25.9	2	7.4	27	100	
Total	91		31		22		1		2		165		
Spearman's rho test result ρ=<0.001 (r=0.348)													

Source : Primary Data, 2025

Table 6 shows that respondents with low and moderate walking habits were predominantly classified as having poor cardiorespiratory fitness, accounting for 74.1% and 51.2%, respectively. In contrast, respondents with high walking habits demonstrated a more varied distribution of cardiorespiratory fitness, with a greater proportion categorized as fair, good, and very good. Spearman's rho correlation analysis revealed a statistically significant positive association between walking habits and cardiorespiratory fitness ($r = 0.348$, $p < 0.001$). However, the strength of the correlation was considered weak.

DISCUSSION

The findings of this study demonstrated that walking habits were significantly associated with overall cardiovascular health, although the strength of the association was weak and the direction of the relationship was positive. This finding suggests that an increase in walking habits tends to be accompanied by improvements in respondents' cardiovascular health. However, the weak strength of the association indicates that cardiovascular health is a multifactorial condition and cannot be determined by a single factor alone.

Factors such as age, sex, nutritional status, smoking habits, dietary patterns, stress levels, and the presence of comorbidities also contribute to variations in individual cardiovascular health. Consequently, the influence of walking habits may be relatively limited when these factors are not adequately controlled. This finding is consistent with the report by Ahmadi et al. (2024), which stated that the relationship between walking activity and cardiovascular disease risk is strongly influenced by the total volume and consistency of physical activity performed.⁹

From a physiological perspective, walking, as a form of light-to-moderate aerobic exercise, has the potential to improve endothelial function, enhance vasodilation, and reduce oxidative stress and vascular inflammation. A systematic review by Tao et al. (2023) demonstrated that regular aerobic exercise can increase nitric oxide bioavailability and improve vascular function; however, these effects are generally more pronounced when physical

activity is performed with sufficient intensity and duration.¹⁰ This suggests that the physiological benefits derived from walking largely depend on the quality of its implementation, particularly regarding exercise intensity and consistency.

The relatively light, unstructured, or inconsistent walking habits observed among respondents in this study may have limited the magnitude of physiological adaptations, thereby resulting in only a weak association with overall cardiovascular health. A meta-analysis by Kunutsor and Laukkanen (2024) confirmed that light-intensity physical activities, including walking, remain significantly associated with reduced cardiovascular disease risk and cardiovascular mortality.¹¹ These findings indicate that although the effects may be modest, walking continues to play an important role in health promotion and disease prevention due to its accessibility and feasibility for widespread implementation.

Regarding blood pressure, this study did not identify a statistically significant association with walking habits. The majority of respondents across all walking habit categories had normal blood pressure levels, resulting in a relatively homogeneous distribution and potentially creating a floor effect that limited the ability to detect statistically significant differences. Gu et al. (2021) reported that the blood pressure-lowering effects of physical activity are generally more evident among individuals with hypertension than among normotensive individuals.¹² Therefore, the predominance of normotensive respondents in the present study may have influenced the observed findings.

Furthermore, the intensity of walking performed by the respondents may not have reached the level required to induce substantial hemodynamic adaptations. Previous studies have shown that reductions in blood pressure are more consistently observed following structured moderate-to-vigorous aerobic activities, such as brisk walking.^{13, 14} Blood pressure is also influenced by numerous confounding factors, including sodium intake, occupational stress, sleep quality, body mass index, and genetic predisposition, which were not examined in detail in this study.¹⁵

In contrast to blood pressure, walking habits were significantly associated with resting heart rate, although the strength of the relationship was weak. Increased walking habits tended to be associated with a more efficient resting heart rate profile, reflected by a higher proportion of normal resting heart rates and the presence of mild bradycardia among respondents with high walking habits. This phenomenon can be explained as a physiological adaptation of the heart to regular physical activity, whereby increased stroke volume and enhanced parasympathetic nervous system activity reduce the need for a higher resting heart rate. These findings are consistent with studies by Al Ashkar et al. (2025) and Guo and Wang (2025), which reported that individuals with higher levels of physical activity generally exhibit lower and more stable resting heart rates.^{16, 17} Mild bradycardia among physically active individuals is typically non-pathological and reflects greater cardiac efficiency.¹⁸ Nevertheless, resting heart rate is also influenced by other factors, including age, stress level, sleep quality, nutritional status, and smoking behavior, indicating that its relationship with walking habits remains multifactorial.

Additionally, walking habits were significantly associated with cardiorespiratory fitness, with a weak-to-moderate positive correlation. Increased walking habits were accompanied by improvements in cardiorespiratory fitness categories, particularly among respondents with moderate to high levels of walking activity. This finding supports existing evidence demonstrating that regular aerobic physical activity can enhance cardiorespiratory fitness by improving oxygen uptake capacity, cardiac efficiency, and the ability of the cardiovascular system to meet the body's metabolic demands. A meta-analysis by Men et al. (2025) reported that physical activity performed at least three times per week for up to 60 minutes per session significantly improves cardiorespiratory fitness.^{19, 20} However, the relatively modest strength of the association observed in this study suggests that cardiorespiratory fitness is influenced not only by walking habits but also by other factors such as age, body mass index, dietary patterns, participation in other forms of physical activity, and overall health status.

Overall, the findings of this study indicate that walking habits were significantly associated with cardiovascular health, resting heart rate, and cardiorespiratory fitness, but not with blood pressure. The generally weak-to-moderate strength of the observed associations highlights that walking is one of several lifestyle factors contributing to cardiovascular health rather than a sole determinant. Nevertheless, the positive associations observed suggest that regular walking remains a promising and practical strategy for supporting cardiovascular well-being. To achieve greater cardiovascular benefits, walking should be performed consistently with adequate intensity and duration and should be combined with the management of other risk factors, including a healthy diet, effective stress management, and an overall physically active lifestyle.

CONCLUSION

1. This study demonstrated a significant positive association between walking habits and cardiovascular health among office workers, although the strength of the association was weak.
2. The respondents' walking habits were generally classified as low to moderate, indicating that walking activity had not yet been optimally and consistently performed.
3. Most respondents had normal blood pressure and resting heart rate, whereas cardiorespiratory fitness was predominantly categorized as poor to fair, particularly among those with low walking habits.
4. No significant association was found between walking habits and blood pressure.
5. Walking habits were significantly associated with resting heart rate and cardiorespiratory fitness, with weak but positive correlations.

SUGGESTION

The findings of this study are expected to serve as a basis for institutions in developing workplace health promotion programs that encourage light physical activities, such as walking, to support the cardiovascular health of office workers. In addition, these findings may help raise individual awareness of the importance of adopting an active lifestyle. Future research is recommended to include additional variables, larger and more diverse study populations, and intervention-based designs to further evaluate the effectiveness of walking habits in improving cardiovascular health.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICAL APPROVAL

This study was approved by the Health Research Ethics Committee of the Faculty of Medicine and Health Sciences, Universitas Islam Negeri Alauddin Makassar (No. E.133/KEPK/FKIK/XI/2025). Written informed consent was obtained from all participants prior to enrollment in the study.

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