ISSN 1850-1044

ARTÍCULO DE REVISIÓN (Versión en inglés)

Impacto de la caminata en la salud cardiovascular de adultos y adultos mayores: una revisión sistemática

İsmail İlbak[1,*], Tamara Ilic[2], Stefan Stojanović[2], Ratko Pavlović[3], Nikola Radulović[4], Nikolina Gerdijan[5] and Irina Kylymnyk[6]

Resumen

Esta revisión sistemática evalúa cómo la caminata afecta la salud cardiovascular en adultos y adultos mayores. Al examinar distintos tipos y duraciones de caminata y su impacto en parámetros cardiovasculares, sintetiza la evidencia de los estudios actuales. De acuerdo con las directrices PRISMA, se realizó una búsqueda exhaustiva en PubMed, Google Scholar, Cochrane, MEDLINE y Web of Science utilizando palabras clave predefinidas, identificándose 15 artículos que cumplían los criterios de inclusión. En conjunto, los hallazgos muestran que la caminata ejerce efectos predominantemente beneficiosos sobre la salud cardiovascular y contribuye a la prevención de las enfermedades cardiovasculares, especialmente en las personas mayores. La caminata de intensidad baja a moderada se asocia en particular con cambios cardiovasculares favorables. Sin embargo, la ausencia de beneficios significativos en algunos estudios parece estar relacionada con la variabilidad individual y con diferencias en la frecuencia, la duración y el diseño de los protocolos de caminata. Las investigaciones futuras deberían priorizar intervenciones de mayor duración con programas de caminata adaptados a las características individuales para obtener resultados más claros y generalizables.

Insuf Card 2024;19 (1): 20–25.

Palabras clave: adulto mayor, envejecimiento, salud cardiovascular, caminata

Summary

Impact of walking on cardiovascular health in adults and older adults: A systematic review

This systematic review evaluates how walking affects cardiovascular health in adults and older adults. By examining different types and durations of walking and their impact on cardiovascular parameters, it synthesizes evidence from current studies. Following PRISMA guidelines, a comprehensive search was conducted in PubMed, Google Scholar, Cochrane, MEDLINE, and Web of Science using predefined keywords, yielding 15 articles that met the inclusion criteria. Overall, the findings show that walking has predominantly beneficial effects on cardiovascular health and contributes to the prevention of cardiovascular disease, especially in older individuals. Low- to moderate-intensity walking is particularly associated with favorable cardiovascular changes. However, the lack of significant benefits in some studies appears to be related to individual variability and differences in walking frequency, duration, and protocol design. Future research should prioritize longer-term interventions with walking programs adapted to individual characteristics to obtain clearer and more generalizable results.

Keywords: late adulthood, aging, cardiovascular health, walking

[1]Institute of Health Sciences, İnönü University, Malatya, Türkiye
[2]Faculty of Sport and Physical Education, University of Niš, Serbia
[3] Faculty of Physical Education and Sport, University of East Sarajevo, Bosnia and Herzegovina
[4] Faculty of Sport and Physical Education, University of Novi Sad, Serbia
[5]Faculty of Physical Education and Sport, University of Banja Luka, Bosnia and Herzegovina
[6]Zaporizhzhia Polytechnic National University, Zaporizhzhia, Ukraine

Correspondencia: İsmail İlbak. Institute of Health Sciences, İnönü University, Malatya, Türkiye
E-mail: i.ilbak@gmail.com

Recibido: 19/10/2023
Aceptado: 20/01/2024

Introduction

Walking, as a form of physical activity performed at low intensities, is an accessible, cost-effective exercise with the potential to improve the overall health status of both adults and the elderly [1, 2, 3]. Its importance in the prevention and management of cardiovascular diseases is increasingly emphasized [4, 5]. Cardiovascular diseases represent a major global public health concern, significantly contributing to mortality and morbidity while adversely impacting individuals' quality of life [6, 7]. In this context, understanding the effects of regular physical activities like walking on these diseases can contribute to the development of effective preventive health strategies.

The literature highlights numerous studies underscoring the significant cardiovascular benefits of walking for adults and the elderly. Regular walking has been shown to lower blood pressure, reduce abdominal fat, improve blood lipid and lipoprotein profiles, and positively influence glucose balance [8]. Moreover, walking reduces the risk of cardiovascular diseases, type 2 diabetes, and cognitive decline in older individuals [9]. Prolonged walking exhibits protective cardiovascular effects by mitigating organ damage caused by hypertension [10]. Additionally, it decreases mortality and morbidity associated with coronary heart disease. Regular, moderate-intensity walking is not only an effective method for promoting cardiovascular health in adults and the elderly but also enhances cardiorespiratory fitness, muscle strength, and balance while reducing the risk of injury and falls [11].

However, exercise intensity plays a critical role, as excessively intense physical activities may result in adverse effects. High-intensity exercises, particularly among individuals unaccustomed to such activities, may lead to acute cardiac events and increase the risk of maladaptive cardiac remodeling [12]. Therefore, light to moderate-intensity physical activities are recommended for older adults [8].

This systematic review aims to examine the effects of walking on cardiovascular health in adults and the elderly, synthesizing existing knowledge in the literature while identifying gaps in this field. The study seeks to raise awareness of the importance of promoting physical activity at both individual and societal levels. Additionally, it is anticipated that the findings will be translated into practical recommendations that health professionals can utilize. A comprehensive exploration of the contributions of walking to cardiovascular health will guide future research and facilitate tangible steps toward improving public health. Accordingly, the primary objective of this systematic review was to investigate the cardiovascular effects of walking on adults and the elderly while compiling the existing literature and identifying knowledge gaps in this domain.

Methods

This systematic review was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.

Search strategy

Electronic database searches were conducted in PubMed, Google Scholar, Cochrane, MEDLINE, and Web of Science databases. The search was limited to papers published in English from 1999 until the 10th of December 2023. With the understanding that cardiovascular health is a broad term in the present scientific literature, we identified papers investigatin g the effects of walking on cardiovascular health using the following keywords: "cardiovascular health" OR "cardiovascular fitness" OR "cardiovascular risk (factors)" OR " hearth health" OR "cardiac health" OR "vascular health" OR "cardiometabolic health" highlighting that descriptions with no link or affinity to the focus and objective of the research were excluded. Considering walking, we used different keywords to also avoid not finding any work that is relevant to this topic: "walking" OR "strolling" OR "brisk walking" OR "step count" OR "recreative walking" OR " active transport" OR "low-impact physical activity" OR "walking cadence" OR "walking pace" OR "Leisure walking" OR "moderate/low intensity physical activity". All these broad terms were used in combination with keywords related to the target population: "elderly" OR "older adults" OR "old population". Articles were included if they (1) were original articles containing empirical data and analyzing effects of walking on cardiovascular health of elderly.

Study selection/eligibility criteria

All the studies that were published in journals in English were included if: (a) examined a group of individuals aged > 50 years; (b) included an objective measurement of walking, i.e. physical activity; (c) tested at least one measure of cardivascular health. Studies with the following characteristics were excluded: (a) review papers; (b) studies with no data on walking (pace and distance); (c) studies with no data on cardiovascular health. Two authors independently

screened titles and abstracts of potentially relevant studies (IL, TI, SS). If still potentially relevant after initial screening, two authors independently screened full texts (IL, TI, SS) to examine eligibility. Any incongruities identified in the selection process were addressed through collaborative deliberation with coauthors.

Extraction of data

Two authors extracted and synthesised data into tables (IL,TI, SS). Studies were coded for: first author, year of publication, participant characteristics (age, sex, number of participants), country, walking, measured variables and study findings. Study characteristics were manually extracted into custom Excel workbooks and then transffered into Table 1.

Data synthesis and analysis

All results of the papers that were analyzed in detail and included in the systematic review were qualitative presented. It is noteworthy that all incorporated outcome data maintained a continuous nature.

Results

Figure 1 shows the PRISMA flowchart of the search and eligible study selection. After entering keywords 2223 articles were found in initial search. After duplicates were removed, the search resulted in 1242 articles published up to Decemeber 10th, 2023. Title and abstract screening resulted in 174 articles of interest, of which 15 were identified for inclusion in systematic review (Figure 1).

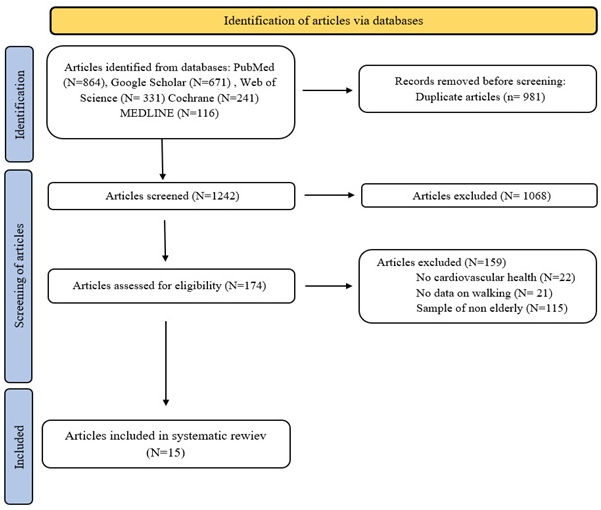

Figure 1: PRISMA Flowchart of search and eligible study selection

The results of the study are presented in Table 1 below.

Discussion

This systematic review aimed to examine the effects of walking on the cardiovascular health of adults and elderly individuals by synthesizing findings from the existing literature. It evaluated the impact of different walking patterns and durations on cardiovascular parameters. The data derived from the studies presented in Table 1 indicate that walking generally exerts positive effects and plays a significant role in preventing cardiovascular diseases, particularly in elderly individuals.

Woolf-May et al. [13] demonstrated that walking at varying durations and intensities significantly reduced LDL levels, a critical biomarker for managing cardiovascular risk. Similarly, Hakim et al. [14] and Kimata et al. [24] reported that increased daily walking distance was associated with a reduction in coronary heart disease (CHD) risk. These findings underscore the protective effects of long-distance walking on cardiovascular health. Johansson et al. [25] further supported this, showing significant reductions in both LDL levels and systolic blood pressure (SBP) following regular walking interventions.

Several studies highlighted the positive effects of walking on key cardiovascular parameters, including body mass index (BMI), SBP, and diastolic blood pressure (DBP). Johnson et al. [17], Roussel et al. [19], and Wennberg et al. [21] observed substantial improvements in these measures following structured walking programs. Johnson et al.'s 24-week program, in particular, reported significant reductions in BMI, SBP, and DBP, emphasizing the benefits of gradual and consistent walking regimens. Roussel et al. [19] also noted increases in Vo2max and reductions in BMI and body weight, indicating that moderate-intensity, long-duration walking can enhance both cardiovascular and cardiorespiratory health. Additionally, Prasertsri et al. [26] found significant improvements across multiple parameters, including reductions in BMI, SBP, DBP, resting heart rate (RHR), triglycerides (TR), and LDL levels after a 12-week walking program. This study highlights the comprehensive benefits of walking when implemented as a structured and sustained intervention.

The duration and intensity of walking emerged as crucial factors for achieving meaningful health benefits. Park et al. Park et al. [22] and Soares-Miranda et al. [23] reported significant reductions in BMI, SBP, and DBP following walking durations of 30-50 minutes and highlighted the long-term protective effects of regular walking against CHD. However, Morrison et al. [18] found that shorter walking durations (e.g.,

8 minutes) improved blood lipid profiles but were insufficient to enhance submaximal fitness levels, suggesting that extended durations are necessary to optimize health outcomes.

Gray et al. [16] reported an increase in step counts among participants using pedometers, yet no significant changes were observed in BMI, SBP, or DBP. These findings suggest that while walking may promote physical activity levels, its impact on cardiovascular parameters may require higher intensities or longer durations.

Some studies reported limited effects of walking, emphasizing the importance of tailoring walking programs to individual needs. Costello et al. [20] and Karmakar et al. [27] noted no significant changes in SBP, DBP, or resting heart rate (RHR) in their respective walking programs, except for reductions in RHR observed in the latter study. These findings suggest that walking intensity, frequency, and duration must align with participants' baseline health conditions to achieve optimal outcomes.

Bertoni et al. [15] demonstrated improvements in the ankle-brachial index (ABI), a marker of vascular health, following walking interventions. However, no significant changes were observed in carotid intima-media thickness (IMT) or coronary artery calcification (CAC). These results indicate that while walking may improve certain aspects of vascular health, its effects on structural vascular changes might require longer durations or higher intensities.

In light of this evidence, walking, particularly at low to moderate intensity, appears to have positive effects on cardiovascular health. However, the lack of efficacy observed in some studies suggests that individual differences, frequency, duration, and protocols play critical roles in producing effective results. Future research should focus on longer-term and individualized protocols to obtain clearer and more generalizable outcomes.

Conclusion

The findings of this review indicate that walking is a beneficial physical activity for improving cardiovascular health, although its effectiveness may vary depending on individual differences and implementation protocols. Future studies are recommended to explore the health impacts of walking in greater depth and develop more effective health strategies.

Referencias bibliográficas

[1] Grant, Gordon, et al. "Walking, sustainability and health: findings from a study of a walking for health group." *Health & Social Care in the Community 25.3* (2017): 1218-1226.

[2] Hulteen, Ryan M., et al. "Global participation in sport and leisure-time physical activities: A systematic review and meta-analysis." *Preventive Medicine 95* (2017): 14-25.

[3] Murtagh, Elaine M., et al. "Outdoor walking speeds of apparently healthy adults: A systematic review and meta-analysis." *Sports Medicine 51* (2021): 125-141.

[4] Hanson, Sarah, and Andy Jones. "Is there evidence that walking groups have health benefits? A systematic review and meta-analysis." *British Journal of Sports Medicine 49.11* (2015): 710-715.

[5] Murtagh, Elaine M., Marie H. Murphy, and Janne Boone-Heinonen. "Walking: the first steps in cardiovascular disease prevention." *Current opinion in cardiology 25.5* (2010): 490-496.

[6] Antman, Elliott M. *Cardiovascular Therapeutics E-Book: A Companion to Braunwald's Heart Disease*. Elsevier Health Sciences, 2012.

[7] Libby, Peter. *Braunwald's Heart Disease-E-Book: A Textbook of Cardiovascular Medicine*. Elsevier Health Sciences, 2021.

[8] Pescatello, Linda S. "Physical activity, cardiometabolic health and older adults: recent findings." *Sports Medicine 28* (1999): 315-323.

[9] Ungvari, Zoltan, et al. "The multifaceted benefits of walking for healthy aging: From Blue Zones to molecular mechanisms." *Geroscience 45.6* (2023): 3211-3239.

[10] Lyu, Yuyan, et al. "Associations of walking activity with hypertensive mediated organ damage in community-dwelling elderly chinese: the northern Shanghai study." *Frontiers in Cardiovascular Medicine 8* (2021): 734766.

[11] Schopfer, David W., and Daniel E. Forman. "Cardiac rehabilitation in older adults." *Canadian Journal of Cardiology 32.9* (2016): 1088-1096.

[12] Franklin, Barry A., and Thijs MH Eijsvogels. "A narrative review on exercise and cardiovascular disease: Physical activity thresholds for optimizing health outcomes." *Heart and Mind 7.1* (2023): 34-39.

[13] Woolf-May, Kate, et al. "The efficacy of accumulated short bouts versus single daily bouts of brisk walking in improving aerobic fitness and blood lipid profiles." *Health Education Research 14.6* (1999): 803-815.

[14] Hakim, Amy A., et al. "Effects of walking on coronary heart disease in elderly men: the Honolulu Heart Program." *Circulation 100.*1 (1999): 9-13.

[15] Bertoni, Alain G., et al. "The association between physical activity and subclinical atherosclerosis: the Multi-Ethnic Study of Atherosclerosis." *American Journal of Epidemiology 169.4* (2009): 444-454.

[16] Gray, Stuart R., et al. "The effect of a 12 week walking intervention on markers of insulin resistance and systemic inflammation." *Preventive Medicine 48.1* (2009): 39-44.

[17] Johnson, S. T., et al. "Improved cardiovascular health following a progressive walking and dietary intervention for type 2 diabetes." *Diabetes, Obesity and Metabolism 11.9* (2009): 836-843.

[18] Morrison, Kimberley, et al. "Effect of a sand or firm-surface walking program on health, strength, and fitness in women 60–75 years old." *Journal of Aging and Physical Activity 17.2* (2009): 196-209.

[19] Roussel, Michel, et al. "Influence of a walking program on the metabolic risk profile of obese postmenopausal women." *Menopause 16.3* (2009): 566-575.

[20] Costello, Ellen, Kerry Raivel, and Raina Wilson. "The effects of a twelve-week home walking program on cardiovascular parameters and fatigue perception of individuals with multiple sclerosis: a pilot study." *Cardiopulmonary Physical Therapy Journal 20.1* (2009): 5-12.

[21] Wennberg, Patrik, et al. "Reduced risk of myocardial infarction related to active commuting: inflammatory and haemostatic effects are potential major mediating mechanisms." *European Journal of Preventive Cardiology 17.1* (2010): 56-62.

[22] Park, Jong-Hwan, et al. "Low-volume walking program improves cardiovascular-related health in older adults." *Journal of Sports Science & Medicine 13.3* (2014): 624.

[23] Soares-Miranda, Luisa, et al. "Physical activity and risk of coronary heart disease and stroke in older adults: the cardiovascular health study." *Circulation 133.2* (2016): 147-155.

[24] Kimata, Chieko, Bradley Willcox, and Beatriz L. Rodriguez. "Effects of walking on coronary heart disease in elderly men with diabetes." *Geriatrics 3.2* (2018): 21.

[25] Johansson, Melker Staffan, et al. "Can we walk away from cardiovascular disease risk or do we have to 'huff and puff'? A cross-sectional compositional accelerometer data analysis among adults and older adults in the Copenhagen City Heart Study." *International Journal of Behavioral Nutrition and Physical Activity 17* (2020): 1-18.

[26] Prasertsri, Piyapong, et al. "Effects of Long-Term Regular Continuous and Intermittent Walking on Oxidative Stress, Metabolic Profile, Heart Rate Variability, and Blood Pressure in Older Adults with Hypertension." *Journal of Environmental and Public Health 2022.1* (2022): 5942947.

[27] Karmakar, Palash, et al. "Enhancing Physical and Psychosocial Health of Older Adults in Saudi Arabia through Walking: Comparison between Supervised Group-Based and Non-Supervised Individual-Based Walking." *European Journal of Investigation in Health, Psychology and Education 13.11* (2023): 2342-2357.

Table 1: Qualitative summary of studies examining the effects of walking on cardiovascular health of elderly

Study (first author/year)	Sample characteristics			Country	Walking (pace and distance)	Measured variables	Study findings
	n	Sex	Mean age ± SD				
Woolf-May et al. [13]	n =56	19 M 37 F	50 - 66	UK	4.8 km/h LW - 20-40 min/bout IW - 10-15 min/bout SW - 5-10 min/bout (XELG70; Woodway, Weil am Rhein, Germany)	HR LDL	LW, IW, SW ↓ LDL↓
Hakim et al. [14]	n=2678	M	71 - 93	USA	<0.25 mile/d 0.25 – 1.5 mile/d >1.5 mile/d	CHD	<0.25 CHD↓ (5.1%) 0.25 – 1.5 CHD↓ (2.5%) >1.5 CHD↓ (2.5%)
Bertoni et al. [15]	n=6482	3393 F 3089 M	62.4±10.3	USA	Questionnarie (light+moderate+vigorous)	ABI IMT CAC	ABI↑ IMT, CAC Ø
Gray et al. [16]	n=48	37 F 11 M	51.3±8.3	UK	STEP with pedometar >1.56m/s (HJ-109E Step-O-Meter, Omron Healthcare UK)	BMI SBP DBP STEP	STEP↑ BMI, SBP,DBP Ø
Johnson et al. [17]	n=41	24F 17M	56.5 ± 7.2	Canada	24 week- 2 phases 12 weeks- subjective pace and distance 12 weeks – 3 days weekly, 30 min walking (10% increase every 3 weeks)	BMI SBP DBP HR	BMI↓ SBP ↓ DBP↓ HR↓
Morrison et al. [18]	n=38	F	65 - 70	Australia	8-min walk at 4.5 km/hr	BL SF	BL↑ SF↓
Roussel et al. [19]	n=153	F	50 - 65	France	45-min walt at 60% of HR	Vo2max BMI BW	Vo2max↑ BMI,BW↓
Costello et al. [20]	n=15	7 M 8 F	51.3±6.1	USA	12 weeks – 3 days weekly, 30 min walking (speed individualised determined by HR)	RHR SBP DBP	RHR,SBP,DBPØF
Wennberg et al. [21]	n=531	M	50.0 ±7.3	Sweden	Walking (low+moderate+vigorous)	SBP DBP BMI	SBP↓ DBP↓ BMI↓
Park et al. [22]	n=28	9 M 19 F	>60	Japan	30-40 min for 2.5-3.5 km 30-50 min for 3.5-4.5 km	BM BMI SBP DBP	BM↓ BMI↓ SBP,DBP↓
Soares-Miranda et al. [23]	n=2407	1249F 798M	73.1 ± 6.2	USA	Last 6 weeks, walking at subjective pace and distance	CHD	CHD↓
Kimata et al. [24]	n=2637	M	71-93	USA	<0.25 mile/d 0.25 – 1.5 mile/d >1.5 mile/d	CHD	<0.25 CHD↓ (27.1 vs. 12.7/1000 person years) >1.5 CHD↓ (12.2 vs. 9.1/1000 person-years)
Johansson et al. [25]	n=280	154 M 126 F	>65	Denmark	Walking with accelerometers 24h/7days (ActiGraph GT3X+; sampling frequency: 30 Hz; ActiGraph, Pensacola, Florida, USA)	SBP LDL	SBP↓ LDL↓
Prasertsri et al. [26]	n=43	22F 21M	71.2±5.0	Thailand	12 weeks, 3 days a week, 30 min walking	BMI RHR SBP DBP TR LDL	SBPØ DBPØ BMI↓ RHR↓ TR↓ LDL↓
Karmakar et al. [27]	n=107	65M 42F	62.5±4.9	Saudi Arabia	15 weeks, 3x weekly, 50-70min	RHR SBP DBP	RHR↓ SBPØ DBPØ

Legend: ↓ - decrease; ↑ - increase; = - no changes M – male; F – female; LW- long walkin; IW – intermediate walking; SW – short walking; HR – heart rate; RHR – resting heart rate LDL – lipoprotein; CHD – coronary heart disease; ABI - ankle-brachial index; IMT - carotid intima-media thickness; CAC - coronary artery calcification; BMI -body mass inde; SBP – sistolic blood preassure; DBP – diastolic blood preasure, STEP – step count; BL – blood lipids; SF -submaximal fitness; BM – body mass;TR - triglycerides