

The Effects of Walking on Cardiovascular Health in Adults and the Elderly: A Systematic Review

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Received: 10 August 2024, Accepted: 13 September 2024, Published: 31 December 2024

Abstract

This systematic review aimed to comprehensively examine the effects of walking on the cardiovascular health of adults and elderly individuals. By evaluating the impacts of various forms and durations of walking on cardiovascular parameters, this study synthesizes findings from the existing literature. Conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, the study involved a thorough review of articles identified through searches in electronic databases, including PubMed, Google Scholar, Cochrane, MEDLINE, and Web of Science, using predefined keywords. A total of 15 articles meeting the inclusion criteria were analyzed. The findings indicate that walking generally exerts positive effects on cardiovascular health and plays a significant role in preventing cardiovascular diseases, particularly in elderly individuals. Walking at low to moderate intensities was highlighted for its beneficial effects on cardiovascular parameters. However, the lack of efficacy observed in some studies appears to be influenced by individual differences, frequency, duration, and the design of walking protocols. Future research should focus on longer-term studies with protocols tailored to individual characteristics to achieve clearer and more generalizable outcomes.

Keywords Late adulthood, Aging, Cardiovascular Health, Walking

1. 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]–[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.

2. Methods

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

2.1. 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 2024. With the understanding that cardiovascular health is a broad term in the present scientific literature, we identified papers investigating the effects of walking on cardiovascular health using the following keywords: “cardiovascular health” OR “cardiovascular fitness” OR “cardiovascular risk (factors)” OR “heart 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.

2.2. 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 cardiovascular 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 co-authors.

2.3. 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 transferred into Table 1.

2.4. 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.

3. 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 December 10th, 2024. Title and abstract screening resulted in 174 articles of interest, of which 15 were identified for inclusion in systematic review (Figure 1).

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

4. 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

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	Questionnaire (light+moderate+vigorous)	ABI IMT CAC	ABI↑ IMT, CAC ∅
Gray et al. [16]	n=48	37 F 11 M	51.3±8.3	UK	STEP with pedometer >1.56m/s (HJ-109E Step-O-Meter, Omron Healthcare UK)	BMI SBP DBP STEP	STEP↑ BMI, SBP,DBP ∅
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,DBP∅F
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	SBP∅ DBP∅ 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↓ SBP∅ DBP∅

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 - systolic blood pressure; DBP - diastolic blood pressure, STEP - step count; BL - blood lipids; SF -submaximal fitness; BM - body mass;TR - triglycerides

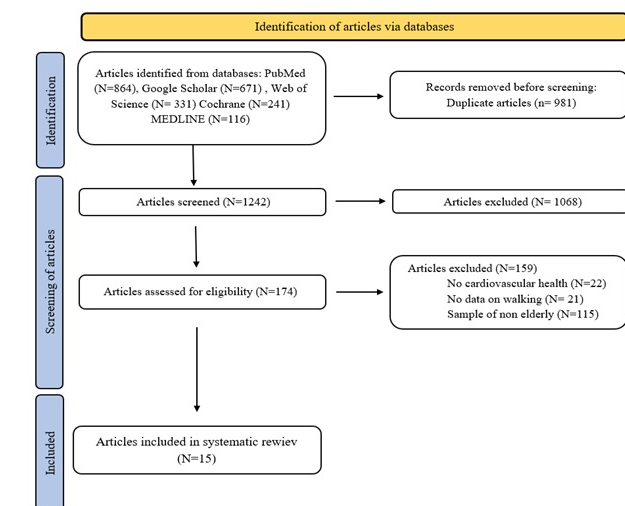


Figure 1: PRISMA Flowchart of search and eligible study selection

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. [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.

5. 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.

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