

# Steps per Day and Arterial Stiffness: Systematic Review and Meta-Analysis

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Arterial stiffness has emerged as an independent predictor of cardiovascular morbidity and mortality. Furthermore, objectively monitored steps per day is widely perceived to be beneficial for controlling health risk factors, and for preventing morbidity and mortality. The aim of this review was to determine the relationship between steps per day and arterial stiffness, as measured by its reference standard, pulse wave velocity (PWv). We systematically searched for cross-sectional data from studies addressing the association between steps per day and PWv. The DerSimonian and Laird method was used to compute pooled estimates of correlation and their respective 95% CI. Additionally, we used a regression model to estimate the pooled mean PWv by categories of physical activity behavior: sedentary <5000; low active 5000 to 7499; active 7500 to 9999; and highly active 10 000+. Twenty published studies were included in the systematic review, but only 10 studies in adults and older adults could be incorporated in the meta-analysis. Steps per day was inversely correlated with arterial stiffness measured by PWv in adults and older adults ( $r=-0.18$ ; 95% CI: -0.27 to -0.10;  $P<0.001$ ), with substantial heterogeneity ( $I^2=77.9\%$ ;  $P<0.001$ ). The regression model showed that the pooled PWv was lower with a corresponding higher level of steps per day, influenced primarily by low PWv values for the highly active lifestyle category ( $P_{trend}=0.005$ ). This systematic review and meta-analysis demonstrates a clinically meaningful association between objectively monitored steps per day and PWv, an accepted indicator of arterial stiffness and an early subclinical risk factor for cardiovascular disease. Systematic Review Registration - PROSPERO CRD42018088228. © 2018 American Heart Association, Inc.

adult

cardiovascular disease

exercise

pulse wave analysis

vascular stiffness

arterial stiffness

autism

childhood obesity

chronic obstructive lung disease

human

hypertension

lifestyle

non insulin dependent diabetes mellitus

physical activity

practice guideline

priority journal

pulse wave

Review

sedentary lifestyle

step count

systematic review

adolescent

adult

aged

cardiovascular disease

child

exercise

meta analysis

middle aged

risk factor

young adult

Adolescent

Adult

Aged

Cardiovascular Diseases

Child

Exercise

Humans

Middle Aged

Pulse Wave Analysis

Risk Factors

Vascular Stiffness

Young Adult