

# Exercise Training Recommendations for Adults With and Without Chronic Disease to Improve Endothelial Health

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## Abstract

The endothelium is the innermost layer of the blood vessels and is responsible for the production of chemicals that are used to regulate arterial diameter in response to changes in blood flow. Dysfunction of the endothelium is a key precursor for cardiovascular disease. However, exercise training may mitigate this dysfunction and promote endothelial health. Therefore, this infographic illustrates findings from an umbrella review (review of reviews; 10.1007/s40279-023-01837-w) that investigated the impact of any exercise training intervention (intervention) on adults with or without chronic disease (population), with, or without a comparator group (comparison), on endothelial function (outcome) using evidence from 27 reviews, including 19 meta-analyses (5464 unique participants). Overall, the included reviews provided evidence that the type of training to optimally improve endothelial function may vary based on disease condition. Specifically, the evidence suggests that healthy adults benefitted most from high intensity aerobic training and/or more frequent low-moderate resistance training. In addition, adults with type 2 diabetes benefitted most from low-intensity resistance or low-moderate aerobic exercise training, whereas those with cardiovascular conditions (i.e., heart transplant patients, peripheral artery disease, heart failure, hypertension, and cerebrovascular disease) should consider engaging in higher-intensity aerobic training to improve endothelial function, although may still need to consult a healthcare provider. Exercise training also improves endothelial function in other chronic conditions including cancer and autoimmune rheumatic disease, but the evidence is insufficient to provide specific guidelines. Although insufficient data exists to determine specific intervention characteristics (i.e., frequency, intensity, type, time), this information provides a high level of evidence to support exercise training, including aerobic, resistance, and combined training as effective strategies to improve endothelial-dependent vasodilatory function in adults. These findings should help guide the design of specific exercise programs or recommendations.

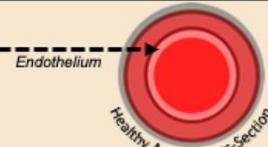
*Keywords:* Endothelial function; Guidelines; Aerobic training; Resistance training

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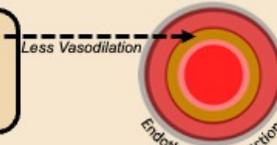
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The **endothelium** is the innermost layer of blood vessels. Endothelial cells are highly responsive to changes in blood flow and produce chemicals that regulate arterial diameter.



## THE ISSUE:

Dysfunction of the endothelium is a key precursor of **cardiovascular disease**. Specific exercise training interventions that may mitigate this dysfunction are unclear.



## POTENTIAL SOLUTIONS:

Based on reviewing existing evidence, exercise training can ↑ endothelial function in:



Type 2 Diabetes Mellitus



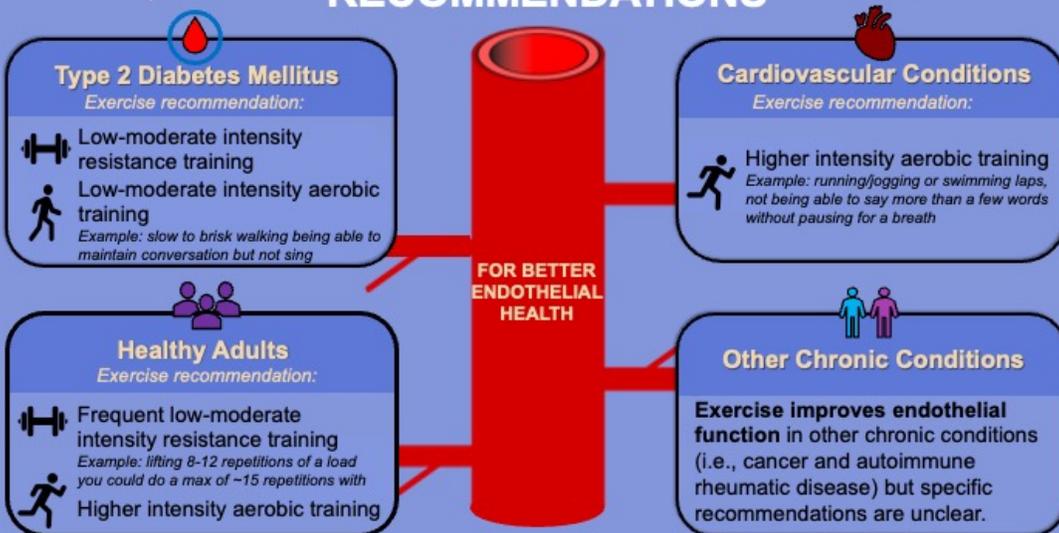
Cardiovascular Conditions

Example: Peripheral artery disease, heart failure, etc.



Healthy Adults

## RECOMMENDATIONS



## TAKE-AWAYS

Exercise recommendations to promote endothelial health for adults with and without chronic disease are based on a **high level of evidence**.



Presented information is based off an umbrella review of 27 reviews including 5464 unique participants (10.1007/s40279-023-01837-w).