

Evaluating the Physiological Effects of Eccentric Exercises in Adults and Older Adults With Cardiovascular Disease: A Narrative Review

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Introduction: Eccentric (ECC) exercise is a unique method in the rehabilitation field due to its lower metabolic demands and greater power output. It is considered a safe tool for participants and patients with low exercise tolerance. Cardiovascular disease (CVD), a leading cause of global mortality, continues to rise. During the rehabilitation phase, ECC exercise may be especially beneficial for CVD patients because of its reduced demands on the cardiorespiratory system. This narrative review aims to evaluate the physiological effects of ECC exercises in adults and older adults with CVD and to explore which ECC modalities are feasible and safe for this population.

Methods: A literature search was carried out in PubMed, Web of Science, and Scopus databases to identify relevant studies investigating the acute and chronic effects of ECC exercise interventions in CVD patients.

Results: The review analysed 13 studies involving 362 predominantly male participants with CVD, focusing on ECC exercise, mainly ECC cycling, with varying intensities and settings. Findings showed that ECC exercise is generally safe, with low heart rate (HR) and perceived exertion even at increasing workloads. Chronic ECC training led to improved cardiac function, reduced HR, and enhanced functional capacity, such as better performance in the 6-minute walk test and stair descent, despite lower oxygen consumption. While some studies reported no significant changes in $\dot{V}O_{2peak}$ or vascular function, overall results support ECC training as a feasible and effective modality for cardiovascular rehabilitation.

Discussion: ECC exercise has shown notable advantages for individuals with CVD, offering higher power output with reduced cardiovascular strain compared to concentric (CON) training. Despite some variability in HR responses – likely due to differences in training intensity and adaptation over time – ECC consistently results in lower $\dot{V}O_2$ consumption, making it metabolically efficient and well-suited for CVD patients. Studies also highlight ECC's positive impact on functional capacity, strength, and mobility, particularly in frail older adults, without increasing thrombotic risk. These findings support ECC as a safe and effective rehabilitation modality for improving both cardiovascular tolerance and physical function in at-risk populations.

