

heart transplant recipients,⁸ including those in maintenance (1-8 years after heart transplant) as well as de novo (7-16 weeks after heart transplant).^{9,10} In maintenance of patients with heart transplant with or without cardiac allograft vasculopathy, high-intensity interval training versus usual care resulted in significantly lower rates of cardiac allograft vasculopathy progression at 1 year,¹¹ but these effects were no longer present on long-term (3-5 years) follow-up, suggesting that continued intermittent periods of high-intensity interval training may be necessary to maintain the initial benefits.^{12,46,47} One observational study showed an association between the dose of

CR sessions and survival in patients with heart transplant.⁴⁸

Similarly, patients with spontaneous coronary artery dissection (SCAD) who participated in CR, compared with those who did not, had lower MACE and lower rates of recurrent MI with favorable trends in physical, emotional, and mental domains.¹⁴⁻¹⁷ For patients with CCD and concomitant HF, CR is also recommended as a Class 2a recommendation, LOE B-NR (see 2022 ACC/AHA/HFSA heart failure guideline).³⁸

4.2.11. Physical Activity

Recommendations for Physical Activity
Referenced studies that support the recommendations are summarized in the [Online Data Supplement](#).

COR	LOE	RECOMMENDATIONS
1	A	1. For patients with CCD who do not have contraindications, an exercise regimen is recommended, including ≥150 minutes/wk of moderate-intensity aerobic activities or ≥75 minutes/wk of higher-intensity aerobic activities to improve functional capacity and QOL, and to reduce hospital admission and mortality rates. ¹⁻³
1	B-R	2. For patients with CCD who do not have contraindications, resistance (strength) training exercises are recommended on ≥2 days/wk to improve muscle strength, functional capacity, and cardiovascular risk factor control. ⁴⁻⁶
2a	B-NR	3. For patients with CCD who do not have contraindications, lower-intensity lifestyle activities (eg, walking breaks at work) to reduce sedentary behavior (ie, sitting time) are reasonable to improve functional capacity and reduce cardiovascular risk, especially in individuals with low levels of habitual leisure time physical activity. ⁷⁻⁹

Synopsis

Habitual physical activities—including nonexercise lifestyle activities, aerobic (cardiovascular) exercise training, and resistance (strength) training—are associated with improved outcomes in individuals with CVD, including functional capacity, QOL, and mortality and morbidity rates.¹⁻⁹ Moving individuals from sedentary lifestyle habits to at least lower-intensity physical activities can improve metabolic and cardiovascular health.⁹⁻¹¹ Health benefits occur even with lower doses (eg, frequency, duration, and intensity) of physical activity and increase with increasing doses of physical activity.⁷ Mechanisms of the benefits from physical activity and exercise training include anti-atherosclerotic, antiarrhythmic, antithrombotic, anti-ischemic, and antidepressant effects.¹²

Exercise is contraindicated in patients with severe, life-threatening, and unstable conditions. Contraindications include unstable angina, other high risk cardiovascular conditions (eg, high-grade arrhythmias, decompensated heart failure, active thromboembolic disease), or other unstable or life-threatening noncardiovascular conditions such as active infection, uncontrolled diabetes, end-stage cancer, or unstable psychological issues.

Recommendation-Specific Supportive Text

1. Moderate-to-higher intensity exercise training in individuals with CCD, which is done in CR programs, improves functional capacity, health-related QOL, cardiovascular risk factor control, and mortality rates.^{2,3,13,14} In addition to continuous, moderate-intensity exercise training, high-intensity interval training also appears to be an effective and safe approach to aerobic exercise training in individuals with CCD.^{15,16} US guidelines recommend that adults who do not have contraindications to exercise should do at least 150 to 300 minutes per week of moderate-intensity aerobic physical activity, or at least 75 to 150 minutes per week of vigorous (higher)-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity.
2. Muscle-strengthening (resistance training) activities are recommended on ≥2 days a week.¹⁷ Resistance training to safely improve muscular strength improves functional capacity and QOL.^{5,6,18} Resistance training may also reduce mortality rates in individuals with CCD.¹⁹