# Newsletter

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## Physiological adaptations to low-volume, high-intensity interval training in health and disease. / The potential for high-intensity interval training to reduce cardiometabolic disease risk.

## Physiological adaptations to low-volume, high-intensity interval training in health and disease.

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J Physiol. 2012 Mar 1;590(Pt 5):1077-84. Epub 2012 Jan 30. Abstract

Exercise training is a clinically proven, cost-effective, primary intervention that delays and in many cases prevents the health burdens associated with many chronic diseases. However, the precise type and dose of exercise needed to accrue health benefits is a contentious issue with no clear consensus recommendations for the prevention of inactivity-related disorders and chronic diseases. **A growing body of evidence demonstrates that high-intensity interval training (HIT) can serve as an effective alternate to traditional endurance-based training, inducing similar or even superior physiological adaptations in healthy individuals and diseased populations,** at least when compared on a matched-work basis. While less well studied, **low-volume HIT can also stimulate physiological remodelling comparable to moderate-intensity continuous training despite a substantially lower time commitment and reduced total exercise volume**. Such findings are important given that 'lack of time' remains the most commonly cited barrier to regular exercise participation. Here we review some of the mechanisms responsible for improved skeletal muscle metabolic control and changes in cardiovascular function in response to low-volume HIT. We also consider the limited evidence regarding the potential application of HIT to people with, or at risk for, cardiometabolic disorders including type 2 diabetes. Finally, we provide insight on the utility of low-volume HIT for improving performance in athletes and highlight suggestions for future research.

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## The potential for high-intensity interval training to reduce cardiometabolic disease risk.

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Sports Med. 2012 Jun 1;42(6):489-509. Abstract

In the US , 34% of adults currently meet the criteria for the metabolic syndrome defined by elevated waist circumference, plasma triglycerides (TG), fasting glucose and/or blood pressure, and decreased high-density lipoprotein cholesterol (HDL-C). **While these cardiometabolic risk factors can be treated with medication, lifestyle modification is strongly recommended as a first-line approach. The purpose of this review is to focus on the effect of physical activity interventions and, specifically, on the potential benefits of incorporating higher intensity exercise.** Several recent studies have suggested that compared with continuous moderate exercise (CME), high-intensity interval training (HIT) may result in a superior or equal improvement in fitness and cardiovascular health. **HIT is comprised of brief periods of high-intensity exercise interposed with recovery periods at a lower intensity. The premise of using HIT in both healthy and clinical populations is that the vigorous activity segments promote greater adaptations via increased cellular stress, yet their short length, and the ensuing recovery intervals, allow even untrained individuals to work harder than would otherwise be possible at steady-state intensity.** In this review, we examine the impact of HIT on cardiometabolic risk factors, anthropometric measures of obesity and cardiovascular fitness in both healthy and clinical populations with cardiovascular and metabolic disease. The effects of HIT versus CME on health outcomes were compared in 14 of the 24 studies featuring HIT. Exercise programmes ranged from 2 weeks to 6 months. All 17 studies that measured aerobic fitness and all seven studies that measured insulin sensitivity showed significant improvement in response to HIT, although these changes did not always exceed responses to CME comparison groups. A minimum duration of 12 weeks was necessary to demonstrate improvement in fasting glucose in four of seven studies (57%). A minimum duration of 8 weeks of HIT was necessary to demonstrate improvement in HDL-C in three of ten studies (30%). No studies reported that HIT resulted in improvement of total cholesterol, low-density lipoprotein cholesterol (LDL-C), or TG. At least 12 weeks of HIT was required for reduction in blood pressure to emerge in five studies of participants not already being treated for hypertension. A minimum duration of 12 weeks was necessary to see consistent improvement in the six studies that examined anthropometric measures of obesity in overweight/obese individuals. In the 13 studies with a matched-exercise-volume CME group, improvement in aerobic fitness in response to HIT was equal to (5 studies), or greater than (8 studies) in response to CME. Additionally, HIT has been shown to be safe and effective in patients with a range of cardiac and metabolic dysfunction. In conclusion, HIT appears to promote superior improvements in aerobic fitness and similar improvements in some cardiometabolic risk factors in comparison to CME, when performed by healthy subjects or clinical patients for at least 8-12 weeks. Future studies need to address compliance and efficacy of HIT in the real world with a variety of populations.