Application of HIT to people with metabolic disorders

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High-intensity interval training (HIT) can serve as an effective alternate to traditional endurance-based training, inducing similar or even superior physiological adaptations in both healthy individuals and people with metabolic disorders, at least when compared on a matched-work basis or when estimated energy expenditure is equivalent (Hwang *et al.*, 2011; Kessler *et al.*, 2012). Less is known regarding the effects of low-volume HIT, however growing evidence suggests this type of training stimulates physiological remodeling comparable to moderate-intensity continuous training despite a substantially lower time commitment and reduced total exercise volume (Gibala *et al.*, 2012). These findings are significant from a public health perspective, given that "lack of time" remains one of the most commonly cited barriers to regular exercise participation.

Many low-volume HIT studies have employed demanding "all out" protocols (*e.g.*, repeated Wingate tests) that may not be safe, tolerable or appealing for some individuals and particularly those afflicted with chronic diseases. Recent work has therefore examined the effectiveness of more "practical" models of low-volume HIT, which are time efficient but might have wider application to different populations including people with metabolic disorders. By way of example, one specific model tested at our institution consists of 10×60 s work bouts at a constant-load intensity that elicits ~85-90% of maximal heart rate, interspersed with 60 s of recovery. As little as three sessions per week of this type of training, involving ≤10 minutes of intense exercise and a total time commitment of ≤30 minutes per session including warm-up, recovery periods between intervals and cool down, has been shown to be effective and well-tolerated in people with type 2 diabetes (Little *et al.*, 2011) and coronary artery disease (Currie *et al.*, 2013). In both studies, beneficial adaptations were realized even though the weekly training time commitment was much lower than common public health guidelines that generally call for at least 150 min of moderate to vigorous exercise per week to promote health.

The preliminary evidence from small, proof-of-principle studies are intriguing, however large-scale studies are clearly needed to resolve whether low-volume HIT is a realistic, time-efficient exercise alternative to reduce the risk of cardiometabolic disease or improve health and wellbeing in patients with chronic diseases. Future work involving long-term (*i.e.*, months to years) interventions in a variety of clinical cohorts are urgently needed to better understand how manipulating the exercise stimulus impacts on cardiovascular and musculoskeletal remodeling and health outcomes in these populations.

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