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A Role for High Intensity Interval Training (Hiit) for Improving Cardiometabolic Health Outcomes

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Obesity, insulin resistance, and type 2 diabetes (T2D) are inseparably linked to one another, as over 80% of individuals with T2D are also classified as overweight or obese [1]. Furthermore, obesity- and T2D-related healthcare costs now exceed $150 billion dollars per year in the US alone [2].Thus, it is imperative to identify novel treatments that can reduce the prevalence of obesity, T2D, and associated adverse cardiometabolic health conditions. Exercise training is one treatment that has been clinically proven to delay and in many instances prevent adverse health conditions associated with chronic cardiometabolic diseases. However, it remains difficult for exercise physiologists and healthcare professionals to convince individuals to adhere to current exercise recommendations of at least 150 minutes/week of moderate-intensity or 75 minutes/week of vigorous-intensity aerobic exercise. Given that perceived 'lack of time' is the most common cited reason for participation in regular exercise [3], there is an urgent need to identify novel modes of exercise training that can provide cardiometabolic health benefits and improve exercise adherence.

Recent studies by our group [4] and others [5-7] have compared low volume, high intensity interval training (HIIT) (consisting of 20-30 second sprints separated by recovery intervals) with traditional continuous moderate intensity training (MIT) programs (45-60 minutes of continuous cycling at 55-65% VO_2peak). These studies have demonstrated similar improvements in insulin sensitivity, % body fat, total blood cholesterol, triglycerides, and skeletal muscle mitochondrial content between the HIIT and MIT groups despite HIIT requiring ~25% of the overall time commitment as MIT [4-7]. For many years it was thought that exercise duration and total energy expenditure achieved during and after the exercise bout may be more important for improving many aspects of cardiometabolic health than exercise intensity [8,9], however emerging evidence suggest that HIIT may be as effective as MIT despite substantially lower energy expenditure[4,5].

While HIIT clearly provides a potent physiological stimulus for improving cardiometabolic health, there are many questions that remain. MIT has been shown to be the most effective mode of training to reduce fat mass, whereas resistance training is more effective for increasing lean body mass [10]. One of the issues when performing aerobic exercise alone for reducing body weight is the fact that there is a reduction in fat mass, however there is no change [10] or even a decrease in lean muscle tissue [11]. It has been widely accepted that lean muscle mass is important for regulating multiple metabolic processes, therefore it is critical to identify modes of exercise training that can result in loss of fat mass while also preserving lean mass or even building lean mass. We have previously demonstrated that HIIT can elicit up to a 60-fold increase in growth hormone that persists up to two hours during recovery [12]. Thus, HIIT appears to provide a potent anabolic response that is uniquely different than MIT, in which a catabolic response is observed. Future long term HIIT studies in obese individuals are needed to assess the effects of HIIT on changes in body composition.

The primary challenge health professionals face when determining the efficacy of exercise treatments is getting individuals to adhere to the exercise program. Adherence to exercise training is often thought to be reduced with higher exercise intensities [13], however more recent research using the low volume HIIT protocol has demonstrated greater enjoyment and adherence following HIIT as compared to MIT [14,15]. Thus, HIIT may be an effective mode of exercise that improves cardiometabolic health and possibly increase exercise adherence. Future long-term clinical trials should be conducted in multiple health populations to refine training duration and intensity in order to identify optimal doses to target specific health benefits.

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