

Interval Training

Interval training is alternating higher-intensity exercise with periods of lower-intensity exercise or rest as the recovery. Low-volume interval training are relatively short exercise sessions less than or equal to 10 minutes of intense exercise as compared to common generally recommended moderate-intensity continuous training (MICT) (Gibala, Gillen, & Percival, 2014). Gibala et al. (2014) also pointed out the distinction between "high intensity interval training" and "sprint interval training" according to a newly proposed classification scheme by Weston et al. (as cited in Gibala et al., 2014, p. 128). "High intensity interval training" or HIIT refers to "near maximal" effort or 80-90% of maximal heart rate; "sprint interval training" or SIT refers to "all out" or supramaximal effort or "workloads greater than what is required to elicit 100% of maximal oxygen uptake (VO_{2max})" (Gibala et al., 2014, p. 127).

HIIT and SIT training have the potential to elicit positive adaptations in aerobic energy metabolism capacity and physiological remodeling similar to MICT training, but with much less time commitment.

HIIT and SIT training have shown to increase various mitochondrial markers (including citrate synthase, pyruvate dehydrogenase, and 3-hydroxyacyl-CoA dehydrogenase) and reduce the utilization of muscle glycogen and phosphocreatine during submaximal exercise in previously sedentary individuals (Gibala et al., 2014). Many of the signaling pathways involved in mitochondrial biogenesis and which are activated during MICT exercise were also similarly found in HIIT and SIT exercise (Gibala et al., 2014).

After 6 weeks of low-volume SIT and MICT training, Burgomaster et al. (as cited in Gibala et al., 2014, p. 129) found similar improvements in peripheral vascular function (with the benefit of SIT requiring much less training time than MICT). Similarly, both SIT and MICT equally improved skeletal muscle microvascular density and enzyme content despite the differences in training volumes (Gibala et al., 2014).

SIT has also shown to improve cardiorespiratory fitness (VO_{2max}) in as little as 6 SIT sessions over 2 weeks regardless of initial fitness level of the participants (sedentary, untrained, trained) and regardless of modality (cycling, running, rowing) (Gibala et al., 2014). SIT has the potential to be a training option for the generally healthy population (i.e. non-athletes) as reported in a meta-analysis of 19 studies by Sloth et al. (as cited in Gibala et al., 2014, p. 130) where VO_{2max} increased by 4-13% after 2-8 weeks of SIT exercise in healthy sedentary/untrained adults.

Babraj et al. (as cited in Gibala et al., 2014, p. 130) reported that 6 SIT sessions over 2 weeks improved insulin sensitivity in young active men. Richards et al. (as cited in Gibala et al., 2014, p. 130) also reported similar findings where insulin sensitivity was improved 72 hours after a 2-week SIT period in healthy men and women. Low-volume SIT has shown potential to improve body composition as well by increasing fat mass and increasing lean mass in healthy, untrained men and women (Gibala et al., 2014).

Little et al. (2011) found that low-volume HIIT was able to reduce hyperglycemia, improve glycemic regulation, and increase muscle oxidative capacity in individuals with type 2 diabetes. Some of the benefits of HIIT were realized in as little as 6 HIIT sessions (30 min sessions or a total of 75min/week) over 2 weeks (Little et al., 2011). Furthermore, reduced mitochondrial content and function have been found in individuals with insulin resistance or type 2 diabetes (Little et al., 2011). It is possible that low-volume SIT or HIIT which stimulates mitochondrial biogenesis can also improve mitochondrial function in those individuals (Little et al., 2011).

While more research is needed, low-volume SIT and HIIT have a place as a training option for many types of individuals including sedentary and untrained persons (not just athletes). It is also important to remember that "intensity" is relative to the individual and what may "seem" like the picture of "high-intensity" for some, is not the case for all.

References

Gibala, M., Gillen, J., & Percival, M. (2014). Physiological and health-related adaptations to low-volume interval training: Influences of nutrition and sex. *Sports Medicine, 44*, 127-137.

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