

High-Intensity Interval Training: Applications for General Fitness Training

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SUMMARY

HIGH-INTENSITY AEROBIC INTERVAL TRAINING (HIIT) IS A POPULAR STRATEGY FOR IMPROVING CARDIORESPIRATORY FITNESS AND HEALTH, AS WELL AS REDUCING BODY FAT LEVELS. THIS ARTICLE WILL EXPLORE THE BENEFITS OF HIIT AND DISCUSS ITS APPLICATION FOR FITNESS TRAINING.

High-intensity aerobic interval training (HIIT) is a popular strategy for improving cardiorespiratory fitness and health, as well as reducing body fat levels. A standard HIIT protocol involves alternating bouts of both high- and low-intensity exercise to increase the amount of high-intensity work performed during an acute bout of training. High-intensity intervals are typically performed

above the lactate threshold, close to $\dot{V}O_2\max$, and then carried out to a point just before the onset of volitional fatigue. This high-intensity bout is then followed by a low-intensity recovery period that allows the body to buffer and clear lactic acid from the blood, thereby allowing the individual enough time to recover and perform another high-intensity interval.

BENEFITS OF HIGH-INTENSITY AEROBIC INTERVAL TRAINING

Many traditional exercise training programs focus on the use of steady-state aerobic activity for the purpose of substrate utilization. This makes sense because the longer the duration of an activity, the greater the amount of relative percentage of calories used that come from fat storage. However, HIIT confers several advantages over steady-state aerobic training. Research indicates that cardiovascular adaptations to exercise are intensity dependent, and improvements in cardiovascular function via HIIT may be superior when compared with more traditional training protocols (6,12). HIIT has shown greater improvements in $\dot{V}O_2\max$, endothelial function, blood pressure, cardiac contractility, insulin signaling, and contraction coupling when compared with moderate-intensity aerobic exercise (5,6,10). This has important implications not only for possibly preventing the onset of cardiovascular disease but also in potentially reversing the risk of certain comorbidities for those suffering from cardiac and metabolic disorders.

HIIT also has been shown to be superior when compared with steady-state training for those attempting to lose weight. While moderate-intensity steady-state aerobic exercise (the so-called “fat-burning zone”) results in an increased percentage of fat burned during a workout, total caloric expenditure and lipolysis (i.e., fat breakdown) are substantially greater in an HIIT protocol. The resulting effects on fat loss are significant. This was apparent in a study by Tremblay et al. (11), who compared 2 groups of subjects: an endurance-trained group versus an HIIT-trained group. Despite a significantly lower energy cost of the HIIT workout at the end of the study (120.4 versus 57.9 MJ), participants in the HIIT group experienced a 9-fold greater reduction in skinfold thickness. Several factors appear to contribute to this lipolytic advantage. For one, HIIT increases the body’s potential to use lipids as an energy substrate to a greater extent than steady-state aerobic exercise, with an increased upregulation of enzymes responsible for beta-oxidation (11). There also is an increased growth hormone response attributed to HIIT, likely mediated through the significant lactate accumulation associated with this type of training (4). In addition, HIIT heightens the extent of excess postexercise oxygen consumption (also known as the “afterburn”), which has been shown to be positively correlated with exercise intensity (1).

Table
Thirty-minute sample HIIT routine

Interval, min	RPE (scale of 1-10)
3 (warm-up)	3
4	5
1	7
3	5
1	8
1	5
1	9
1	5
1	9
1	5
1	9
1	5
1	9
2	5
1	8
3	5
1	7
3 (cooldown)	3

HIIT = high-intensity aerobic interval training; RPE = rating of perceived exertion.

Finally, HIIT is a very time-efficient form of training. As few as 6 sessions of HIIT over a 2-week period for a total of about 15 minutes of very intense exercise (equating to approximately 600 kJ or 143 cal) have been shown to increase skeletal muscle oxidative capacity and alter metabolic control during aerobic-based exercise (3). And 7 HIIT sessions performed over 2 weeks significantly heightened whole body and skeletal muscle capacity for fatty acid oxidation during exercise in moderately active women (9). For those who have limited time to work out, this makes HIIT an intriguing option.

PERFORMANCE ISSUES

The general prescription for interval training is to employ 3- to 5-minute work bouts with a work to rest (W:R)

ratio of 1:1 (7). These recommendations, however, are based on athletic populations. For the general population, a variety of W:R ratios can be employed in an HIIT routine. A 1:2 W:R ratio, for instance, has been shown to produce favorable responses that enhance both aerobic and anaerobic energy system development (8). For those who are less fit, a 1:4 W:R ratio would probably be more appropriate, allowing acclimation into a more intense HIIT routine. W:R ratios can be varied throughout the course of a workout based on individual fitness levels (see sample routine in the Table).

Because of the intense nature of the routine, those engaging in HIIT need to be cognizant of the potential for overtraining. A study by Billat et al. (2) noted that, despite an increase in plasma noradrenaline, performance variables were not altered by 4 weeks of intensive training at $\dot{V}O_{2max}$. Longer periods of sustained interval training have not been studied, however, and might increase the risk of an overtrained state.

While HIIT has been shown to significantly improve cardiovascular function and stimulate greater weight loss compared with traditional steady-state aerobic training protocols, caution should be exercised when using it as a prescription for the general fitness population, particularly in those with cardiovascular disorders. It is important that a solid base of cardiorespiratory fitness be established prior to integrating HIIT into a client's strength and conditioning program.

In sum, HIIT can be a time-efficient means to improve cardiorespiratory fitness and reduce body fat levels over and above what is possible through steady-state aerobic training. However, given the high-intensity nature of the protocol, HIIT may be associated with an increased potential for overtraining, especially when combined with regimented resistance training. It is therefore essential to consider the previous training experience and abilities of the trainee and integrate HIIT within the

context of his/her current fitness program as a whole.

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