



# UPDATE ON HIGH-INTENSITY INTERVAL TRAINING FOR ATHLETES AND HEALTH AND WELLNESS

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Habitual exercise elicits changes in the structure and function of physiological systems that are associated with improved performance and health. Interval training describes an intermittent style of exercise in which repeated bouts of relatively intense effort are interspersed with recovery periods within a single session. The basic premise is simple but responses depend on many variables, including the intensity, duration, and frequency of work bouts, and overall training volume.<sup>1-3</sup> In addition to its historical application in competitive athletics, interval training has long been studied as a method to enhance physical conditioning in non-athletes including healthy sedentary individuals and people with cardiometabolic diseases.

## KEY POINTS: INTERVAL TRAINING FOR ATHLETES

- An ~80-to-20 ratio of low-intensity to high-intensity/interval training (HIIT) is commonly recommended to optimize performance in already well-trained athletes who compete in events that require a high rate of aerobic energy provision.<sup>4,5</sup>
- Improved endurance performance after HIIT in athletes often cannot be attributed to changes in the traditional main determinants of endurance performance including maximal oxygen uptake ( $VO_{2max}$ ), fractional utilization of  $VO_{2max}$ , or work economy.<sup>6,7</sup>
- The mechanisms responsible for performance improvements in endurance athletes are likely complex and may include other factors such as increased buffering capacity.<sup>8</sup>
- Data are scarce on the HIIT strategy to optimize performance in athletes but recent work has demonstrated superior performance improvements in highly-trained and elite cyclists following short- ("sprint"-type) interval as compared to effort-matched long-interval training.<sup>9,10</sup>

## KEY POINTS: INTERVAL TRAINING FOR HEALTH AND WELLNESS

- Brief, vigorous exercise in less-trained individuals is a potent stimulus to increase  $VO_{2max}$ , a direct measure of the clinical correlate cardiorespiratory fitness, which is a strong predictor of mortality and risk for many chronic diseases.<sup>11</sup>
- Systematic reviews and meta-analyses have affirmed that "sprint"-type interval training can increase  $VO_{2max}$  like traditional endurance training and often despite a reduced total exercise volume and time commitment.<sup>12,13</sup>
- Brief, intense training for at least several weeks likely improves  $VO_{2max}$  in part by increasing maximal cardiac output and expanding blood volume. Increased capillary and mitochondrial density may contribute to this response via enhanced skeletal muscle oxygen extraction and/or increased muscle diffusing capacity.<sup>14,15</sup>
- Recent work has demonstrated the potential for "exercise snacks" — brief, isolated bouts of vigorous exercise spread throughout the day — to improve cardiorespiratory fitness and indices of cardiometabolic health in previously inactive adults.<sup>16</sup> Other work has focused on the potential health benefits of regular intermittent bouts of vigorous intensity incidental physical activity done as part of daily living.<sup>17</sup>

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