International Journal of Physical Education and Sports (IJPES)
Volume 5, Issue 2, July-December 2024, pp. 13-16. Article ID: IJPES_05_02_003
Available online at https://iaeme.com/Home/issue/IJPES?Volume=5&Issue=2
ISSN Online: 2291-9082, Journal ID: 4011-0805
Impact Factor (2024): 6.14 (Based on Google Scholar Citation)

EFFECTS OF HIGH INTENSITY INTERVAL TRAINING IN SEDENTARY, RECREATIONAL AND HIGHLY TRAINED INDIVIDUALS

Dr. Manoj Kumar Dhadwal
Assistant Director Physical Education, BBAU, Lucknow, India

Dr. Sangeeta Rani
Maa Omwati College of Education, Palwal, Haryana, India

ABSTRACT

Effects of High Intensity Interval Training in Sedentary, Recreational, and Highly Trained Individuals. Currently the benefits of High-Intensity Interval Training (HIIT), have aroused the interest of health professionals and researchers, as it has become shown to be efficient for health promotion. From this, the objective of this brief review is to demonstrate the physiological adaptations resulting from HIIT in highly trained individuals and sedentary and recreational individuals. Research demonstrated in the literature clearly indicates the benefits of practice of HIIT both for already highly trained athletes and for people who are sedentary and moderately active.

Keywords: High-Intensity Interval Training (HIIT); Performance; and Health

Cite this Article: Manoj Kumar Dhadwal and Sangeeta Rani, Effects of High Intensity Interval Training in Sedentary, Recreational and Highly Trained Individuals, International Journal of Physical Education and Sports (IJPES), 5(2), 2024, pp. 13–16.
https://iaeme.com/MasterAdmin/Journal_uploads/IJPES/VOLUME_5_ISSUE_2/IJPES_05_02_002.pdf

INTRODUCTION

In recent decades we have seen the emergence of several methods of training, whether in search of improved performance or to health promotion. Within this context, interval training was proposed as a new method that could improve the performance of athletes who already had great physical fitness. Currently the benefits of interval training, especially high-energy interval training intensity (HIIT), have aroused the interest of professionals and health researchers, as it has been shown to be efficient for health promotion. Therefore, the objective of this brief review is to demonstrate the physiological adaptations resulting from HIIT in individuals already highly trained and in sedentary and recreational individuals. HIIT when performed by sedentary and recreational individuals improves the endurance performance to a greater extent than training submaximal continuum alone. This improvement appears to be due, in part, to an improvement in the contribution of both aerobic and anaerobic metabolism for energy demand, which increases the availability of ATP and improves the energy status in the working muscle.

However, improvements in the capacity aerobic metabolism, resulting from the increased expression of type-I fibers, capillarization and oxidative enzymatic activity is more common for HIIT in untrained, moderately active individuals than for athletes who already have a high aerobic fitness.

Harmer et al. (2000) has reported that sprint training (4 to 10 sprints on the bike at the highest speed possible, with 3 to 4 minutes of rest, 3 times per week for 7 weeks) improves time to fatigue (+21%; $p < 0.001$) at 130% of the VO_2 Max of the pre-training load. This increase in capacity was attributed to reduced anaerobic ATP generation, and increased aerobic contribution to energy supply. What can be justified by increased mitochondrial oxidation of fatty acids demonstrated in greater quantity for HIIT than for training submaximal continuous (p<0.0.5).

In addition to the better metabolic response, some studies have demonstrated positive adaptations on cardiac variables, mainly due to the increase in systolic volume, since the maximum heart rate remains unchanged in response to endurance training, this change leads to an increase in the ability to deliver oxygen to the muscle during high-intensity exercise. Stroke volume can increase through high ventricular contractility left and/or through an increase in cardiac filling pressure, which increases the end-diastolic volume resulting in an also high volume systolic. Potential changes in stroke volume and plasma volume in response to HIIT in already highly trained athletes have not been examined. In untrained individuals, sympathetic nervous muscle activity is shown attenuated during exercise after training, suggesting a reduced sympathetic flow for the same submaximal load.

Despite this, the capacity for norepinephrine release during a progressive test appears to be higher after HIIT. Some studies have devoted greater attention to physiological adaptations promoted by HIIT in already highly trained athletes, VO_2 Max. over 60 mL/kg/min-1, finding more satisfactory results than when compared to continuous exercise methods.

Laursen and collaborators (2007) reported changes in variables cardiorespiratory and performance after 4 HIIT sessions (20 × 60 seconds at peak power, 2 minutes recovery) after 02 weeks in 07 highly trained cyclists (VO_2 Peak = 68.7 ± 1.3 mL/kg/min). Those individuals can perform a greater number of sprints and complete greater total work at the end of training. The improvement in performance in HIIT was accompanied by a reduction in both respiratory exchange ratio and 1 minute of HR recovery from the first to fourth HIIT session ($p < 0.05$); the ventilatory threshold and peak power obtained during the progressive test also improved because of four HIIT sessions ($p < 0.05$). Another potential mechanism that may be responsible for the improvement in endurance performance after HIIT in highly trained athletes is an improvement in heat tolerance via an increase in blood flow skin and sweat rate. Although HIIT trial sessions are normally completed under thermoneutral environments, high-energy exercise intensity produces high internal temperature. Due to the strong association that has been established between fatigue and high temperatures, it is possible that highly trained athletes can adapt, which means improved temperature regulation. Furthermore, HIIT can improve the burden of heat tolerance in physically active individuals, but this needs to be more well investigated in highly trained athletes. The fact that athletes' endurance training has a greater ability to sweat and better Cutaneous blood flow supports this as a possible adaptive response to HIIT.

Regarding metabolic adaptations in highly trained athletes, Billat (2001) demonstrated that HIIT promotes greater use of fatty acids. Supporting this possibility, Shepley and collaborators while examined the effects of "tapering" (reduction in volume before endurance competition) on endurance performance and citrate activity synthase in highly trained middle-distance runners, showed that a high-intensity taper (3 to 5 sprints × 500m at 120% VO2peak, 800m of recovery, 5 times a week) improved the time to exhaustion in ~115% VO2peak (+22%) and increased citrate synthase activity (+18%), compared to low intensity taper ($p < 0.05$).

Other potential benefits of High-intensity interval training (HIIT) are:

- **Improved cardiovascular health**: HIIT can strengthen your heart and lungs, and improve your cardiovascular endurance. The repetitive stress and recovery during HIIT can help reduce blood pressure.
- **Better aerobic capacity**: HIIT can improve your aerobic capacity, or VO2 max, which is the maximum amount of oxygen your body can use during intense exercise.
- **Increased calorie burn**: HIIT can burn more calories and fat than a steady-state session of the same length.
- **Improved brain health**: Research suggests that HIIT can improve memory and brain volume in older adults.
- **Better insulin sensitivity**: HIIT can improve insulin sensitivity.
- **Reduced cholesterol**: HIIT can reduce cholesterol.
- **Preserved muscle**: HIIT can help preserve muscle.
- **Afterburn effect**: HIIT can create an afterburn effect, also known as excess post-exercise oxygen consumption (EPOC), which is the oxygen your body needs to restore itself after a workout.

CONCLUSION

From the research demonstrated above, we can assume that it is clear the benefits of practicing HIIT for both already highly trained athletes, as well as for sedentary and moderately active people. We recommend Furthermore, this type of training method can be used in training programs that seek improvements in cardiorespiratory fitness, due to its already demonstrated physiological efficiency and its stimulation of variation in training methods when planning training for all non-pathological populations.

REFERENCES

[1] ARMSTRONG, L. E.; MARESH, C. M. Effects of training, environment, and heat factors on the sweating response to exercise. Int J Sports Med v. 19, Suppl. 2, p. S103-105, 1998.

[2] BILLAT, L. V. Interval training for performance: a scientific and empirical practice. Part I: aerobic interval training. Sports Med v. 31, p. 13-31, 2001.

[3] CHILIBECK, P. D.; BELL, G.J.; FARRAR, R. P. et al. Higher mitochondrial fatty acid oxidation following intermittent versus continuous endurance exercise training. Can J Physiol Pharmacol.; v. 76, p. 891-894, 1998

[4] GISOLFI, C. V. Work-heat tolerance derived from interval training. J Appl Physiol. v. 35, p. 349-354, 1973.

[5] GONZALEZ-ALONSO, J.; TELLER, C.; ANDERSEN, S. L., et al. Influence of body temperature on the development of fatigue during prolonged exercise in the heat. J Appl Physiol. v. 86, p. 1032-1039, 1999.

[6] HARMER, A. R.; MCKENNA, M.J.; SUTTON, J.R.; et al. Skeletal muscle metabolic and ionic adaptations during intense exercise following sprint training in humans. J Appl Physiol. v. 89, p. 1793-1803, 2000

[7] HENRIKSSON, J.; REITMAN, J. S. Time course of changes in human skeleton muscle succinate dehydrogenase and cytochrome oxidase activities and maximal oxygen uptake with physical activity and inactivity. Acta Physiol Scand. v. 99, p. 91-97, 1977.

[8] LAURSEN, P. B.; BLANCHARD, M. A.; JENKINS, D. G. Acute high-intensity interval training improves Tvent and PPO in highly trained males. Can J Appl Physiol. 2007. In press

[9] LINOSSIER, M. T.; DENNIS, C.; DORMOIS, D.; et al. Ergometric and metabolic adaptation to a 5-s sprint training program. Eur J Appl Physiol. v. 67, p. 408414, 1993.

[10] MACDOUGALL, J. D.; HICKS, A. L.; MACDONALD, J. R.; et al. muscle performance and enzymatic adaptations to sprint interval training. J Appl Physiol. v. 84, p. 2138-2142, 1998.

[11] NEVILL, M. E.; BOOBIS, L. H.; BROOKS, S.; et al. Effect of training on muscle metabolism during treadmill sprinting. J Appl Physiol. v. 67, p. 2376-2382, 1989.

[12] NIELSEN, B.; HALES, J. R.; STRANGE, S.; et al. Human circulatory and thermoregulatory adaptations with heat acclimation and exercise in a hot, dry environment. J Physiol. v. 460, p. 467-485, 1993.

[13] PANDOLF, K. B. Effects of physical training and cardiorespiratory physical fitness on exercise-heat tolerance: recent observations. Med Sci Sports. v. 11, p. 60-65, 1979.

[14] RAY, C. A. Sympathetic adaptations to one-legged training. J Appl Physiol. v. 86, p. 1583-1587, 1999.

[15] RODAS, G.; VENTURA, J. L.; CADEFAU, J. A.; et al. A short training programme for the rapid improvement of both aerobic and anaerobic metabolism. Eur J Appl Physiol. v. 82, p. 480-486, 2000.

[16] ROWELL, A. L. Human cardiovascular control. New York: Oxford University Press, 1993.

[17] https://www.strengthlog.com/benefit-of-strength-training

Citation: Manoj Kumar Dhadwal and Sangeeta Rani, Effects of High Intensity Interval Training in Sedentary, Recreational and Highly Trained Individuals, International Journal of Physical Education and Sports (IJPES), 5(2), 2024, pp. 13–16

Article Link:
https://iaeme.com/MasterAdmin/Journal_uploads/IJPES/VOLUME_5_ISSUE_2/IJPES_05_02_002.pdf

Abstract Link:
https://iaeme.com/Home/article_id/IJPES_05_02_002

editor@iaeme.com