

Orthopaedic Observations

A Matter of Medicine...

TM Pending

Sprint Interval Training - Obtain the Ideal Body with HIIT

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There is no secret that movement is vital in order to maintain a healthy human body. More than two thousand years ago, Hippocrates stated, "If we could give every individual the right amount of nourishment and **exercise**, *not too little and not too much*, we would have found the safest way to health". (4) Without proper exercise the body will become deconditioned.

Deconditioning affects various systems in the body that can result in a decrease in functional abilities and disease. (6) In today's fast paced society, little time is set aside for proper daily exercise and conditioning. The number one excuse for not completing an exercise program heard by physical therapists is **lack of time**. The majority of the population believes that a significant amount of time is required to increase cardiovascular endurance, strength, and lose weight. Little do most know that this is in fact false. Most believe that low moderate intensity continuous training (LMICT) is the best and only form of exercise but recent research is showing that high intensity interval training (HIIT) can produce the same results, if not better, in less time.

High intensity interval training is a form of training that involves brief high intensity intermittent exercise followed by periods of recovery or low activity. Key factors for an individual's tolerance to this type of exercise are one's level of fitness and tolerance to exertion. (4) It is important to keep in mind that walking at 4 miles per hour may be all out for one person, while running at 10 miles per hour may be all out for another. Now you may be thinking what is the importance of this type of exercise? And how is it more beneficial than low to moderate intensity exercise?

The majority of the general population is motivated to exercise to lose weight and to obtain the "ideal figure". Unfortunately, most do not know that exercise is needed to improve cardiovascular endurance. According to the American Heart Association, cardiovascular disease af-

fects 80 million Americans a year, resulting in an estimated cost of \$475 billion for the year of 2009. (1) This is a lot of money especially with the current healthcare debacle. Fortunately though, cardiovascular endurance and a decrease in body fat are usually directly related. So as individuals are working towards that "ideal figure" they are improving their cardiovascular endurance.

The idea of low to moderate intensity exercise began with the jogging craze of the 1970's. At this same time, research began on the effects of low to moderate intensity exercise. For that reason the majority of the research that was published from this time until the mid 1990's focused on LMICT. The concepts and findings from these research articles influenced many in the healthcare community and fitness industry. From this research and the affect LMICT exercise had on the cardiovascular and metabolic systems it was termed cardio or aerobic exercise. (4)

Before HIIT is further discussed I want you to stop and think of sports other than swimming, distance running, and cycling that consist of low intensity long duration activity? Did you come up with anything? It was probably more difficult than you thought. Sports such as soccer, basketball, football, tennis, and hockey to name a few consist of short bouts or intervals of high intensity activity.

It is important to keep in mind that this article is not being written to say that there are no benefits to LMICT but rather to discuss the increased benefits when it comes to HIIT and the significantly less time it takes. In 1996, research by Tabata et al. demonstrated that both methods, HIIT and LMICT, increased aerobic capacity. But HIIT also increased anaerobic capacity by 28%. (4, 5) Anaerobic means in the absence of oxygen and it is essential to obtain maximum fat loss. Anaerobic exercise benefits include: increased metabolism, increased bone strength, increased energy level, decreased blood sugar levels, and increased athletic performance. (3) This study demonstrated that HIIT has the same aerobic improvement as LMICT in significant less time. Furthermore, it demonstrated that high intensity interval training is effective in Improving an individual's ability to perform endurance

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training. So HIIT consisting of a workout lasting 4 minutes has the same benefit as 60 minutes of endurance training!!

When an individual gives maximal effort during exercise in short bouts it causes the cardiovascular system and aerobic metabolism to work on full blast to provide the needed energy. But when it depletes itself and cannot provide further energy, anaerobic metabolism takes over to provide the energy needed. Now after HIIT, an individual would be breathing very hard. The reason for this is that the body needs additional oxygen to replenish energy stores and to decrease the lactate acid build up in the muscles. (4) HIIT has demonstrated elevated oxygen consumption up to 3 hours post exercise. At this same time it has been shown that the rate of fat oxidation is higher. It must be kept in mind that fat can only be metabolized aerobically so this increase in oxygen consumption would help utilize fat as the fuel for energy post training. So an individual will have a continuous training effect after the training has ended.

Up to this point, the discussion and benefits of HIIT has focused on cardiovascular training and fat loss. Below is a list of other benefits of HIIT:

- Increased high density lipoprotein cholesterol levels (the “good cholesterol”)
- Positive changes in mood (Note: This occurs with LMICT, but requires increased time)
- Anti-inflammatory effects
- Improved lactate intolerance
- Improved insulin signaling
- Improved cardiac contractility
- Improved blood pressure (2,3,7)

The excellent benefits of LMICT are well known but one can not ignore the time efficiency of HIIT and the effect it has on anaerobic metabolism thus making it the far superior form of training.

So now you may be thinking, how do I employ this form of training? First, two important concepts of HIIT must be discussed. Most individuals believe that long duration exercise full of many repetitions is a must in order to increase strength, build muscle, and lose weight. As the repetitions and duration increases proper technique of each exercise suffers. Thus the *quality* of the exercise is more important than the *quantity*. What this simply means is that proper technique is far more important than the amount of repetitions. For example 6 squats with excellent technique are better than 12 squats with poor technique.

Second, as an exercise gets easier one must go harder and not longer. A commonly made mistake with HIIT, is that as a workout regimen gets easier most will perform more repetitions or increase the amount of exercises they are doing. When in fact they need to increase the intensity of the workout and not the duration. A basic rule of general physiology is that our bodies adapt to the stresses that are placed on it. So, if the intensity stays the same over a period of the time, the body will not be stressed to change. Furthermore, it is just as important to not over train after a HIIT workout, because gains in strength and endurance occur during the rest/recovery period.

There are many ways that HIIT can be implemented. The easiest and least expensive would be sprinting up stairs or a hill, but if this is not ideal one can use a treadmill or stationary bike. A one to one work/recovery ratio is recommended when implementing HIIT. According to Dr. Mark Smith “some practical options with this approach are: (1) six, 10-second sprints with 10 seconds of recovery between each sprint; (2) three, 20-second sprints with 20 seconds of recovery; (3) two, 30-second sprints with 30 seconds of recovery; or (4) one 60-second sprint”. (4) Four to eight of one of the above intervals would be performed with a one to four minute rest between each interval. During the rest period other activities may be performed that work on strength or flexibility but they must not challenge an individual’s metabolism as much as the interval training does. Also, training days should be followed with one to two days rest before performing again.

The above approaches are basic HIIT regimens and they may be modified as necessary per individual and they are not the only means in which HIIT can be performed. The above approaches could be applied to the stairs, stationary bike, treadmill, or with using a hill. In order to be provided with an appropriate HIIT program, due to varying conditioning levels, it would be important to see a physical therapist, personal trainer, athletic trainer, etc. that is familiar with the concepts of high intensity interval training. And as always before beginning any form of exercise it is important to first consult with your doctor if any underlying medical problems are present.

The above article provides a brief, but strong argument for the use of HIIT over LMICT. The basic benefits of HIIT have been discussed in this article and more in depth reading is available due to an increase in the research on HIIT. If anything should stick out with HIIT compared to the more popular LMICT it should be the significant decrease in the investment of time that is required and the additional benefits it has on one’s anaerobic metabolism.

(Author’s bio and article bibliography on next page...)

Jonathan graduated from Quinnipiac University with a Bachelor's degree in Health and Science Studies in 2006 and then with his Master's degree in Physical Therapy in 2007. He started with The Orthopaedic Group, LLC in 2004 as a physical therapy aide while pursuing his Master's degree at Quinnipiac. Jonathan's participation in sports throughout his life as well as various athletic injuries has led him into the orthopedic field. He has a par-

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