



## Making Your Cardio Program Efficient

### **Maximize Your Cardio Program: Cellular Adaptations**

Here we will address the different adaptations that occur in the body as a result of four different levels of cardiovascular conditioning. When you understand how the different energy systems in your body work, you will be able to manipulate type, volume and intensity of your cardiovascular program to achieve optimum results and avoid plateaus, boredom, and injury. For example, a session that stresses  $VO_2\text{max}$  improvement will not necessarily optimize increases in aerobic enzyme activity within the cells. Different volumes and intensities of cardiovascular exercise produce different results. We will examine the volume and intensity of exercise required to achieve cellular adaptations, increased lactate threshold, increased aerobic ( $VO_2\text{max}$ ) capacity, and increased speed and economy beginning with cellular adaptation training.

From your first workout through your 100<sup>th</sup> workout and beyond, you accelerate your body's energy producing mechanisms at the cellular level. Exercising muscle cells demand increased blood supply and increased efficiency in their production of energy. The density of capillaries surrounding muscle cells increases to bring more nutrient rich blood to exercising muscles. The muscle cells increase the number, size, and distribution of mitochondria (sites of aerobic metabolism) within the cells to meet energy needs. Furthermore, the muscle cells increase enzyme activity, or chemicals that aid energy production. This increased energy production is a chronic adaptation to regular exercise. It occurs gradually over time as you continually challenge your body's capacity to work.

Fortunately, these desirable cellular adaptations do not require high intensity exercise. Furthermore, increasing your intensity might produce more fatigue depending on your volume, but it will not necessarily stimulate greater cellular adaptations. You can achieve significant cellular adaptations working at a pace of about 70% of your  $VO_2\text{max}$ . Your  $VO_2\text{max}$  is the maximum volume of oxygen your body uses per minute to produce energy. You do not need to precisely measure your  $VO_2\text{max}$  to determine when you reach 70% of your  $VO_2\text{max}$ . This level is called "conversational." In other words, you should be able to speak a couple of sentences clearly at this level of exercise. This is the level you would use for warm ups, cool downs, long sessions and recovery sessions. The length of a "long" session depends on your fitness level and goals but typically means more than 30 minutes of steady, continuous activity. Recovery sessions usually are about 30 to 40 minutes of steady, continuous activity.

If you simply want to maintain your current cardiovascular fitness level, decrease your risk of developing chronic diseases or increase your volume of work at your current level, your cardiovascular program could primarily consist of easy sessions at 70%  $VO_2\text{max}$ . Because of the many benefits resulting from the 70%  $VO_2\text{max}$  level of conditioning, this type of training is often called "base conditioning." It produces a consistent, baseline level of fitness from which you could build greater volume and intensity. It strengthens the ligaments and tendons supporting exercising bones and muscles to prepare the joints for increased work. Endurance athletes train at this level for weeks and months before introducing higher intensity work. Easy sessions train endurance athletes to maintain a desired pace throughout a race and stay competitive through the middle of the race.

However, to increase the amount of oxygen your body can absorb, convert to energy, and burn more calories, you will need to work at higher intensities. Similarly, endurance athletes who want to sprint at the end of a race or climb hills without excessive fatigue need to incorporate higher intensity training into their program. Next we will discuss the next intensity level of cardiovascular training: your lactate threshold where you stress your body's ability to produce energy via aerobic pathways. You will learn what the burning sensation in your muscles mean and how to increase your capacity to work longer or harder before feeling uncomfortable.

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### **Make Your Cardio Program Efficient: Lactate Threshold Training**

Above we discussed how you can achieve changes in your body at the cellular level, such as increased capillary density, increased aerobic enzyme activity, and increased density and distribution of mitochondria within cells, by training at a moderate pace of about of your 70%  $VO_2$ max. In practice, this means you can increase your energy output and increase your work capacity by performing continuous large muscle group exercise at a conversational pace for the entire length of your workout.

However, to increase your efficiency to allow you to do more work for the same amount of effort, you need to work at higher intensities for about 10 percent of your total training time. Higher intensity work will increase your tolerance for harder work. This type of training is called lactate threshold training. Your lactate threshold is the highest intensity at which you can work while producing energy aerobically. For example, elite endurance runners race just below lactate threshold. They are extremely efficient and work aerobically at paces that novice athletes consider sprinting. However, the highly trained athlete racing at lactate threshold is working at a pace that is no more stressful for him than a novice athlete working at lactate threshold but at a much slower pace.

If you work at an intensity higher than lactate threshold, your body's capacity to produce energy with oxygen exceeds the demand for energy. The higher demand for energy requires your body to produce energy via one of the short-duration anaerobic pathways. You will be able to work through anaerobic conditions for a short time, possibly only seconds or minutes. Your body increases into lactic acid production to use the acid to produce energy. The increased acid causes pain and fatigue in the muscles and decreases performance. Hence, endurance athletes strive to increase their aerobic energy production capacity and steadily increase their tolerance for higher intensities and longer duration of exercise.

However, even non-athletes benefit from increasing lactate threshold. Stay-at-home moms probably would agree that they could never have too much energy to keep up with their children. Increasing your lactate threshold allows you to climb stairs, crawl on the floor, wipe up messes, and pick up little ones hundreds of times a day without back-breaking fatigue. A commuting office worker might need to run to catch a train and avoid waiting an hour for the next one. In a sense, we all are endurance athletes trying to increase our daily efficiency. We can never have too much energy.

Fortunately, anyone can increase their efficiency in a relatively short amount of time each week. Here are some guidelines:

Work at a "comfortably uncomfortable" pace which equals about 80 – 85% of your  $VO_2$ max. This is about 1 to 2 steps up from your conversational pace required to increase cellular adaptations. Work hard but not too hard. You should be able to say a few words at one time but not carry on a conversation;

Keep the duration of threshold training to about 10 percent of the total cardiovascular training volume

*for the week; typically, this means 20 to 40 minutes of activity at threshold intensity but varies depending on total volume;*

*You may perform continuous threshold training or split the time into intervals; intervals are periods of threshold work alternated with periods of lower intensity recovery; start interval training with short threshold intensity periods followed by longer recovery periods such as 2 minutes threshold/ 4 minutes low intensity and gradually decrease the rest periods.*

*You do not need to sprint like Carl Lewis; just challenge yourself to do a little more than you are comfortable;*

*You do not necessarily need to increase speed; walking or jogging uphill might stress your cardiovascular system as much as increasing speed on flat terrain. Listen to your body.*

*Always warm up and cool down at least 10 minutes each before and after threshold training; perform about 1 session of threshold training per week for 3 to 4 weeks and then take a break from threshold work for a week.*

*Your body will tell you if you did too much. If you feel sore beyond one day after exercise, you probably worked too hard and need to cut back intensity for a session or two. If you do not feel sore, but you are tired and cranky, that is also a sign you are doing too much too soon. Remember, the goal is to do just enough to increase your energy.*

*For More Help In Ensuring Your Cardio Program Design Is Effective & Efficient, Contact:*

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