# Heart Rate Zone Training to Look and Feel Fantastic!

Randy Zarecki, BS, ACSM, ACPT

## Introduction

I personally started heart rate zone training back in 1999 when I began getting more serious about and competitive with mountain bike racing. I found several informative, well written, and helpful resources on the topic. And then more. I found additional references to cycling, cycle racing, and performance training that added to the wealth of information available to athletes looking to become more competitive.

But then it finally hit me. While dozens, if not hundreds of volumes of heart rate zone training have been written for ***athletes to become competitive***, very little had been written about how an average exercising adult can use heart rate zone training effectively to simply look and feel better. You can and will find plenty of information about what the fat burning zone is, and what the cardio zone is ... even easily calculate estimated ranges for yourself. Thousands if not tens of thousands of aerobics class instructors will have students monitor heart rate, but not supply a lot of context around the significance of the rate. There just isn't much available for how to digest all of this data into an effective heart rate zone training program to reduce bodyfat, lower blood pressure, relieve stress, and feel like superstars! Until now.

## Get to know your Heart!

Heart Disease is the leading cause of death in the US; Stoke the 3rd leading cause. The American Heart Association (AHA) states that 67M Americans currently have Heart Disease. Another 47M Americans show 3 or more symptoms of Heart Disease, according to Center for Disease Control (CDC). Together, these 114 million Americans are 40% of the entire population. That's 2 out of 5! Wow! Furthermore, Heart Disease currently affects 50% of all women.

With such staggering statistics, what's even more incredible is that as a population we don't really know our hearts all that well. Ask the 1st 10 people you meet today what their resting heart rate is and chances are good you'll get 8 dunno's. I work with people daily who need to be taught how to measure, understand, and train their heart. The fact that most of my clients learn this in mid-life is nothing short of a **tragic failure of our public education systems** and a **costly oversight by the entire US heath care system** as we know it. But without stepping onto that soap box, let's get started with step one for looking and feeling better than you have in years (if not decades) by introducing you to

the hardest working muscle in your body: Your Heart.

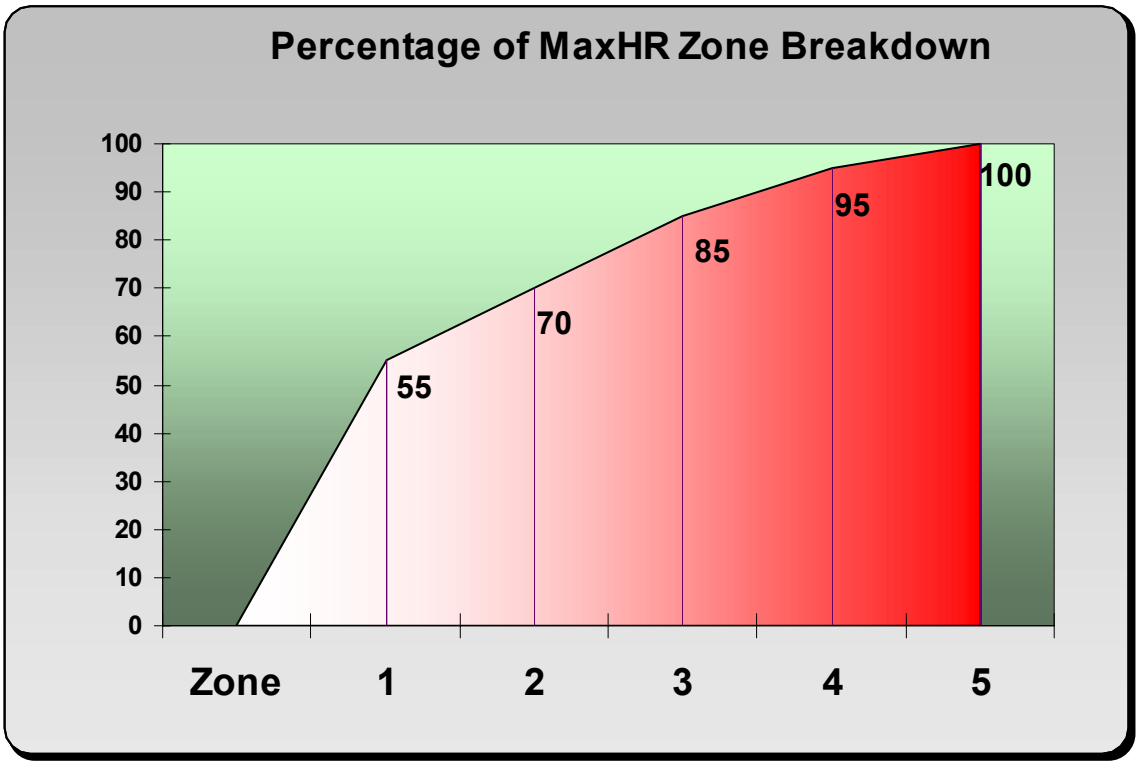
The average heart will beat approximately 3 billion times in its lifetime. Separated in to 4 chambers, the right side of the heart pumps oxygen depleted blood to the lungs where it picks up oxygen. The oxygen enriched blood then returns to the left side of the heart where it is immediately sent to the rest of the body to nourish muscle and skeletal tissues.

The most commonly used measurement of this lung-to-heart efficiency is "Uptake Volume of Oxygen" or **VO2.** It represents liters of oxygen "taken up" per minute (and is the value on the cardiovascular capacity page of your Fitness Together Fitness Assessment Report). While it's value is interesting, measuring VO2 is not nearly as straightforward as measuring heart rate. As a result, it is rarely used in defining or guiding cardiovascular programs. Further, oxygen uptake is almost NEVER the limiting factor in physical activity. As it turns out, the heart, muscles, and/or energy systems fail or fatigue well before VO2 thresholds are reached.

Heart Rate, therefore, is used almost exclusively for cardiovascular training programs. **Heart Rate**, the term, is rather self explanatory ... it is quite simply the frequency with which your heart beats, usually expressed in beats per minute (BPM). The fastest it will ever beat is your maximal heart rate. **Maximum Heart Rate (MaxHR)** is completely dependent on age and hereditary factors - you simply cannot change it with training.

The slowest hour heart beats is called your **Resting Heart Rate.** A proper resting heart rate is determined only by taking your heart rate immediately upon awakening and before you rise to do anything else in the morning. It is frequently confused with **Ambient Heart Rate** which is the rate at which your heart beats when you are at rest during the day. It is typically 4 to 10 BPMs higher than your resting HR. Both resting and ambient heart rates can be directly and dramatically influenced with an effective exercise program. Lowering your heart rate can ***save yourself years of heartbeats*** (check our math here).

**Heart rate zones** are ranges of heart beat rates where the heart, lungs, and circulatory system convert energy sources to energy uniquely within each range. Between your Maximum Heart Rate (MaxHR) and Ambient Heart Rate are four (or five or seven, depending on who you ask) heart rate zones. For our purposes ... to reduce your risk of developing heart disease and shrink your waistline ... we will define 5 as is shown here:




Recognize that these zones are ***percentage*** of Maximum Heart Rate zones. They will vary from individual to individual based on your MaxHR. Determining your MaxHR can be either very straightforward, or somewhat difficult. A common formula used to find your MaxHR is 220 minus your age. While a reasonable place to start for most people, this method of determining MaxHR can be highly inaccurate. We'll work with it within the context of this discussion, but check with your fitness expert to determine a more accurate number for yourself.

## Introduction to Heart Rate Zone Training

**Zone One**, The Recreational & Occupational Zone

The 1st Heart Rate Zone, the range of heart beat frequencies above the Ambient Heart Rate, and up to 60% of your MaxHR is generally ignored in most training programs. You spend a lot of time in this zone with daily activities like shopping, gardening, and walking. You also spend significant time in this zone immediately after a strength training session due to increased metabolic rates dealing with recovery from your workout. Spending time in this zone can be helpful in consuming a (comparatively) few calories, and does have some benefit to otherwise sedentary individuals, though it normally adds little to cardiovascular fitness level enhancement. Fats are the primary energy source for this zone, providing 75%-85% of all energy utilized in this zone. Zone 1, however, is almost never referred to as a 'fat burning' zone ... probably because of the very

minimal energy demands.

**Zone 2, The** Fat Burning Zone

The next zone - from 60% of your MaxHR to 70% of your MaxHR - is, however, called the Fat Burning Zone. It is also called zone 2. Energy requirements for exercise in this zone are greater than from Zone 1, though only marginally. It is typically referred to as the fat burning zone because it is generally considered to be the 1st genuine zone of *exercise.* All Zone 1 efforts, despite duration, are really considered *activities.* Zone 2 exercise consumes fat sources faster than Zone 1 does, and can account for up to 60% of the total calories spent with exercise at this pace. The rest comes from carbohydrates.

**Zone 3**, The Cardio Zone

Above the fat burning zone, with heart rates of 70% to 80% of MaxHR is Zone 3, also commonly known as the 'Cardio' zone. More demanding than the fat burning zone, energy still comes from a fat/carbohydrate blend. Because oxygen is utilized it is considered *aerobic.* This is the primary training zone for improving your cardiovascular fitness level, and where you can safely and effectively burn a lot of calories. Between 60% and 90% of your total weekly cardio training effort should be spent in this zone. You'll know that you haven't exceeded the upper boundary of this zone (without a heart rate monitor) if you can you can comfortably carry on a conversation at this pace without choking on words or air: ie, pass the 'talk test:' Spending time in this zone also triggers positive adaptations to the heart, lungs, vascular, and skeletal systems. Endorphins, the friendly little hormones that give us that feel good feeling after a workout, are also very actively released in this zone.

**Zones 4, The Anaerobic Zone**

Above Zone 3 are two zones (4 & 5) that demand energy so quickly that energy sources must be converted into energy without the benefit of oxygen. They are therefore called ***an*aerobic zones**. Zone 4 includes heart rates of between 80% and 90% of you MaxHR. In this zone you'll feel shortness of breath, and experience accelerated production of lactic acid (a byproduct from metabolism). Energy in this zone comes primarily from glycogen - broken down carbohydrate that is stored in the liver, bloodstream, and muscle tissues. Sustaining this pace is difficult. Most people can only store enough glycogen to support about 90 minutes of exercise at this pace. This is why endurance athletes (cyclists, runners, nordic skiers) will be seen consuming energy drinks and liquid carbohydrates for races greater than 100 minutes. While significant fitness benefits come from time spent in this zone, time spent here also needs to be

carefully moderated and managed: too much time in this zone can lead to over training and catabolism (conversion of muscle tissue to energy). Depending on your level of fitness and your fitness goals, you'll want to spend 5%-15% of your total cardio effort in this zone.

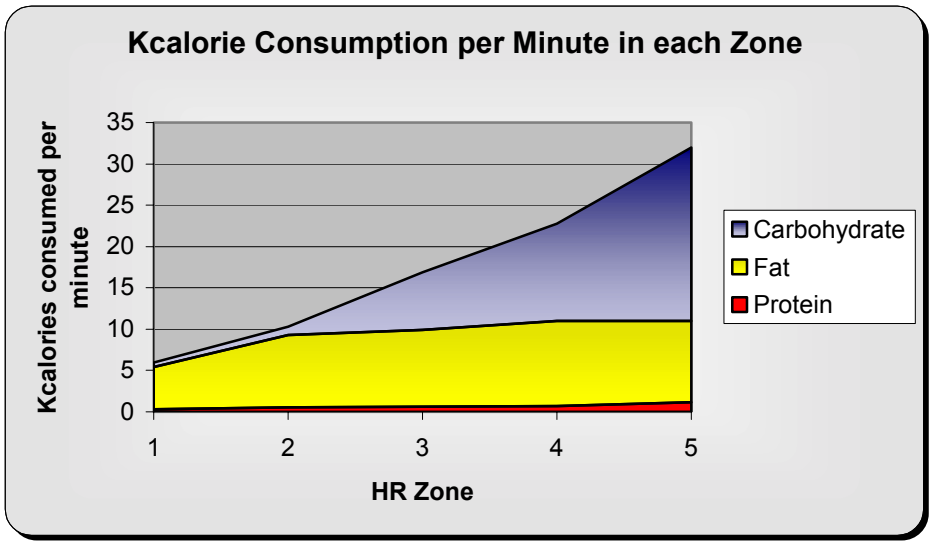
**Zone 5, The Redline, or Hot Zone.**

The final, and top training zone, where heart rates exceed 90% of MaxHR is known as **Zone 5**, or the **Red zone.** At this rate, fuel comes completely and exclusively from the purest form of energy ... a broken down glycogen molecule called adenosine triphosphate, or ATP. Zone 5 ATP stores are depleted at this pace within just 5 to 35 seconds (depending on fitness level). At that point your body will tell you in no uncertain terms that you must slow down or stop to utilized more moderate energy systems and replenish the depleted ATP levels. Like anaerobic exercise in zone 4, zone 5 metabolism also generates a lot of lactic acid.

Even world class aerobic anomalies like Lance Armstrong can only hold the red zone for a few minutes before needing to back off and replenish the ATP debt. Of course, with a 200 BPM MaxHR and an anaerobic threshold near 95% of that, Lance is burning fat while most of us are depleting ATP! As you can imaging, time in this zone must be carefully managed. For the most part only 1% to 2% of your total weekly training time should be spent in this zone. Most athletes train this zone with interval training: carefully prescribed short but high intensity exercise followed by lengthier 'recovery' periods between. More on interval training below.

This is also the zone where fat utilization is completely maxed out. Train harder and you will burn no more fat. Train faster and you burn no more fat. Train longer and you burn no more fat. You will, however, burn carbohydrates and burn calories. And, at the end of the day, if it's bodyfat reduction you're looking for, the end game is calories. You simply need to spend more calories than you consume to loose weight. As a result, this zone is where you need to spend some time if you're looking to reduce bodyfat! Which is exactly where we spend the majority of time during your FT workout.

This fat consumption limit and the total calorie demand is summarized in the following chart: which will be explained in more detail in the Energy Source Section below.




Within the anaerobic zone, however, lactic acid accumulates more quickly than within the aerobic zones, and the nervous system begins stretching a bit for other resources. In particular, it recruits additional muscle to assist with the effort. But there's also a catch ... some of that muscle will actually produce lactic acid even more quickly! Learn more about muscle fiber recruitment and muscle fiber types in my Anaerobic Zone EBook.

The good news is that total calorie expenditure in this zone can be double of what is required in the cardio zone ... and quadruple of what is used in the fat burning zone! Some pain is good.

## The Hot Zone

The uppermost heart rate zone, where your heart beats in excess of 90% of MaxHR is frequently called the 'red' zone or 'hot' zone, or, sometimes, just Zone 5.

Life is quite miserable in this zone: your body begs for mercy from pain associated with high concentrations of lactic acid; breathing is labored; and your nervous system tells you in no uncertain terms (though pain) to slow down. And you must slow down, because the only energy available at this pace is cellular ATP (adenosine tri-phosphate) and you only have sufficient supplies for a minute or so of exercise at this intensity. Even world class athletes like Lance Armstrong can only remain in this zone for brief periods of time (perhaps 3

minutes for Lance) before, necessarily, pulling back to recover a bit and rebuild ATP supplies. Of course, if you're as fit as Lance, you don't actually go anaerobic until 95% of MaxHR and 'red' until 97%! (speculating, but probably very close to actuals).

The rest of us puny humans reach the red zone with much less effort and need to be very careful of time spent here. And special attention needs to be given to recovery from training in this zone: failure to allow the body to recover sufficiently, both within the exercise period and within training period can easily lead to over training and injury. Most individuals will spend less than 1% of your total time in the red zone. However, if you're highly fit and want to get fitter, you'll need to spend more! Additionally, time spent in the red zone burns up to *10 times* as many calories per minute as time in the cardio zone. Training at this level of intensity also triggers the release of human growth hormones (HGH) which stimulate the hypermyopia and hyperplasia mentioned earlier. So the benefits are very real, but again, the associated risks require diligence and caution.

## Energy Consumption & Energy Sources

The human body, at a very basic level, is nothing more than a heat producing system. Oxygen, nitrogen, carbon, hydrogen and other elements combine in various ways to allow for the contraction of muscle tissues. Muscle tissue contractions achieve various physical movements, which result in the production of *heat*. The international unit of measurement for heat production is the calorie: the amount of energy required to raise 1 g of water 1 degree Celsius.

One Thousand of these (lower case 'c') calories is a Kilo calorie. Kilo calories, frequently just called Kcals, are the actual (upper case 'C') *Calories* number seen on typical nutritional labels. Nutritionists conveniently converted the upper case K from Kilo calories to an upper case C and did away with the 'ilo-' part of the physics term.

This energy to perform all of this physical movement comes from three and only three sources: carbohydrates; fats; and proteins. Proteins can contribute up to 5% of our total energy requirements, while the remaining 95% comes from some ***blend*** of carbohydrate and fat. Both carbohydrate and fat are burned in each heart rate zone. What proportion of each, and what role oxygen plays varies from zone to zone.

The 1st three heart rate zones, from resting heart rate to the cardio zone (zone 3) are considered aerobic zones. Conversion of energy *sources* to energy is completed with the benefit of oxygen within these moderate zones. As mentioned in our May 2004 newsletter, fat is a primary energy source in the

lowest two heart rate zones (1 & 2). While working in these zones does contribute to overall health benefits, it is a poor way to consume calories, and thus a poor way to reduce bodyfat.

**Fat as an energy source**

Fat sources include the both stored fat and immediately available fat. Stored fat is referred to as adipose or cellulite tissue ... the flabby stuff on our bodies most of us aspire to eliminate. Available fat is fat that is circulating throughout the blood stream, also known as fatty acid. Fatty Acids come from either the digestion of fatty foods, or through the breakdown of adipose. Fatty acids, incidentally, are required to exist ... they transport various minerals like zinc throughout the body, and we mere humans would perish without them. Not all fats are created equally, however. To reduce bodyfat and maintain a healthy lifestyle it is important to both *eliminate* (or severely limit) 'bad' fat intake, and to *limit* 'good' fat intake. For more on good fat versus bad fat, refer to the FT Mpls June 2003 skinny on fats article.

**Carbohydrates as an Energy Source**

To be used as an energy source, fatty acids must be further converted to a more usable form of energy called glucose. Oxygen is required to convert a fatty acid to glucose, so the process is considered ***Aerobic*** (with oxygen). The highest two zones, Zones 4 and 5 (discussed below) require energy so fast that muscles can't wait for oxygen to participate in the energy conversion process and are, therefore, called ***Anaerobic*** (without oxygen).

Strength training techniques that incorporate short, intense, powerful or near maximal efforts are also anaerobic. The strength training techniques we use at Fitness Together (trisets, monster sets, and circuits), you may have guessed, are both aerobic and anaerobic. Resistances and repetitions are high enough to stimulate hypertrophy and hyperplasia (muscle toning and growth), while simultaneously engaging and training aerobic systems.
As exercise intensity increases, carbohydrates become the primary energy source and significantly more calories are burned.

Just beyond the cardio zone, as intensities are increased to ~ 80% of MaxHR we approach what is known as the **anaerobic threshold**. The anaerobic threshold is a point at which energy demands exceed the ability of the aerobic system to fulfill that demand, and *some* energy must be supplied *without* the benefit of oxygen, or **anaerobically.** The anaerobic zone technically includes all heart rates in excess of 80% of MaxHR. However, because the uppermost zone (zone 5), where heart rates exceed 90% of MaxHR has some additional and special properties, we will refer to the anaerobic zone as that which lies *between* 80% and 90% of MaxHR.

Within the anaerobic zone things are much different than they are within the tidiness of the aerobic zones. Starving muscle tissues can no longer wait for the elegant process of converting carbohydrates and fats to glucose (and, ultimately to ATP, the cellular level energy molecule), and must begin to rely on more readily available sources. Glucose and Glycogen are just those sources. Technically both carbohydrates as well, glucose is blood sugar and glycogen is a stored form of glucose harbored in the liver and muscle tissues. Unlike fat and other carbohydrates, they are more readily metabolized (burned) and can be used without oxygen. Unfortunately, they're also in comparatively short supply and can only provide 60-90 minutes of energy.

Operating within this oxygen debt also *accelerates* the accumulation of a metabolic byproduct called lactic acid. Lactic acid is continually produced as energy is spent. It is also the critter responsible for that burning sensation you experience after your 4th set of lunges! Strength training to exhaustion or muscle group failure is indeed anaerobic. Within the cardio zone, or between your strength training sets, the body is highly effective at removing lactic acid before it becomes damaging to muscle tissues or demands a response (like stopping).

**I want to loose fat!**

If your goal, like many of my clients, is to look and feel better, and reduce bodyfat, you might be thinking then that the Fat Burning zone is exactly where you need to spend time to reduce bodyfat. And, ironically, you would be mostly ***in-***correct. While an appropriately designed cardiovascular program will indeed require significant time in all three of the 1st three HR zones (fat burning included), bodyweight is either gained or lost through calorie surplus or calorie deficit.

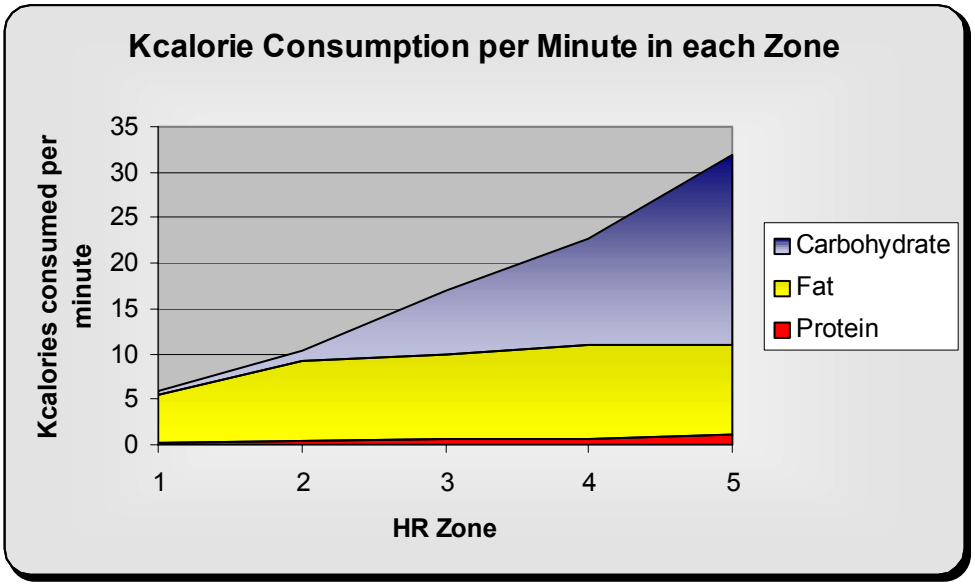
Energy for exercise is always provided as a blend of protein, carbohydrate, and fat. How much of each is used depends on the zone. As you work your way up and through each of the cardiovascular zones, more and more calories are consumed, but there is a distinct limit to how much energy comes from fat.

Consider the following: Jane, a 5'7" 170# 48 year old female wants to loose 35 pounds. She spends 90 minutes per week strength training at a fast pace to increase strength, increase lean body mass, tone muscle groups, increase bone density, look better, and, consequently... burns more calories while at rest.

To burn off additional calories, she spends 120 minutes on aerobic activities. Choosing to spend time in the Fat Burning zone with moderate paced walking (@ 1.6 calories/minute) or low intensity elliptical machine usage (2.2 cals/min), or slow jogging (3.8 cals/min) she will burn between 96 and 228 calories per hour.

Conversely, more vigorous Zone 3 exercises like fast paced weight lifting (4.9 cals/min), moderately fast elliptical machine usage (4.1 cals/min), or biking at an 18 mph pace (6.6 cals/min) will require between 246 and 400 calories per hour ... ***burning off <u>two to three times</u> as many calories*** for the same time commitment!

Once again, this increasing demand for Calories can be seen with this graph:




So, while you will indeed consume less fat with increasing heart rates (in the upper zones), you burn considerably more ***Calories*** in these upper zones. Additionally, with time spent in these upper zones you also earn what I call a ***residual metabolic dividend:*** to recover from such high intensity effort, your body maintains an elevated (typically Zone 1+ or Zone 2) heart rate for many minutes (sometimes hours) after exercise ... burning even more calories!

So you say "Whoa! Look at all those Calories being consumed in Zones 4 and 5! And that residual metabolic dividend sounds great to me! Zones 4 and 5 are where I need to be!!" You would be mostly correct. While it is indeed necessary to spend *some* time in these zones, the physical demands of these zones must be carefully managed to prevent injury or over training. Sedentary individuals need training to graduate to this level, and regularly exercising individuals need to carefully advance into these zones. Further, despite the willing intention (if not eagerness) of thousands of weekend warrior athletes, the physical body is simply not capable of continued exercise at the highest levels of intensity for very long.

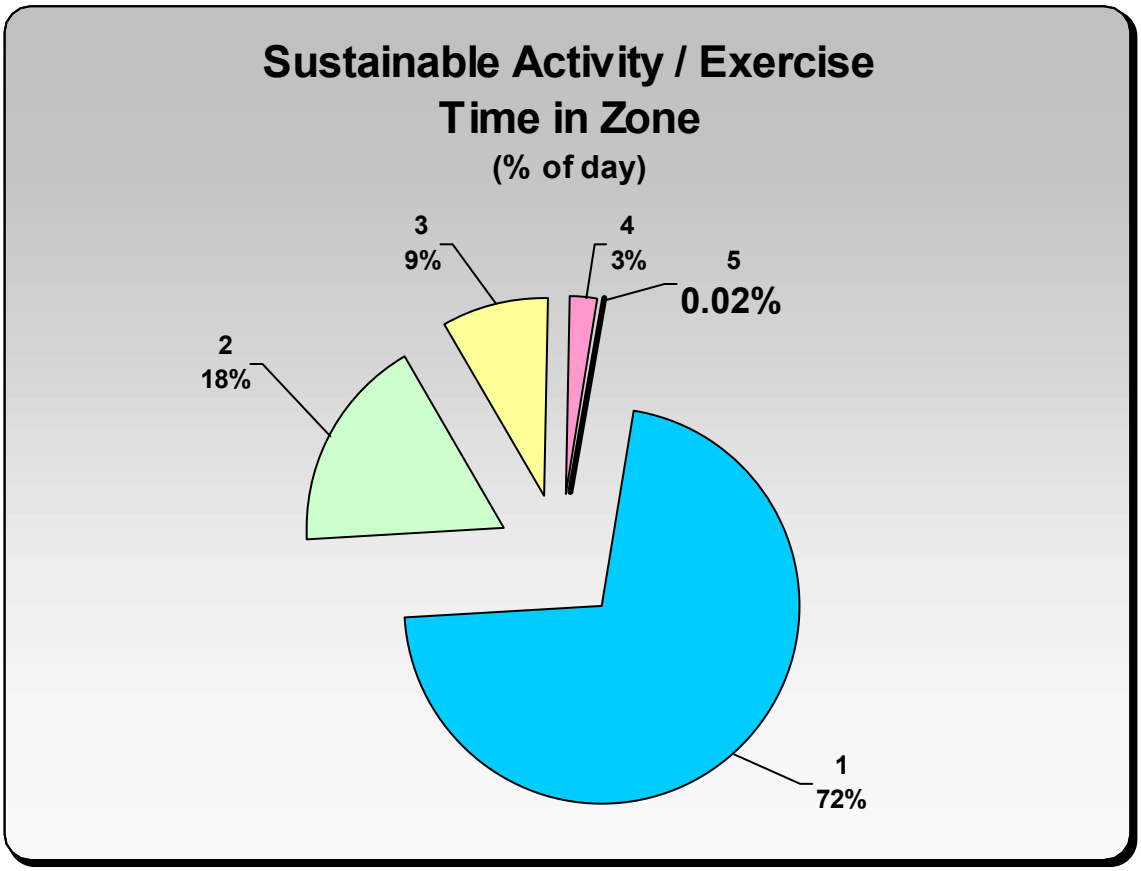
You can (and do) spend most of your living days in zones 1 & 2. Most fit adults

are capable of several hours in the cardio (zone 3), but can only sustain anaerobic (zone 4) activity for several (perhaps up to 90) minutes. The highest levels of activity (zone 5) are only sustainable for seconds!

You can think of the sustainable durations of each zone in terms of our basic time units:

| Zone | Typical Unit of Measurement |
|---|---|
| One | Years |
| Two | Days |
| Three | Hours |
| Four | Minutes |
| Five | Seconds |

Exercise and activity time spent in a typical day in the life of a relatively fit, exercising adult could then be split like this:




Notice that Zone 5 isn't 2%, but ***2 hundredths of 1 percent***!

# What to do, what to do ...

**Cardio Training and Heart Rate Zone Efforts**

Cardio respiratory. Cardiovascular. Or just cardio. It's really all the same, and it's the efficiency with which your circulatory system (heart, lungs, and blood vessels) bring oxygen into the blood stream and convert energy sources to energy. It's a key part of good health, and one of the five managed Fitness Together fitness metrics:  along with muscular strength, muscular endurance, body composition, and flexibility.

While the benefits of strength training have been widely recognized and continue to be the core of FT fitness programming, a complete fitness program also includes 90 to 120+ minutes of cardio work each week.  Just how much total time and how much time should be spent in each zone depends on your age,

gender, level of fitness, and body composition (including level of bodyfat). No one program can adequately prescribe a safe and effective program for a population. Specific individual abilities, limitations, and other conditions must be considered.

That said, there are some guidelines that will apply to most exercise programs looking to reduce bodyfat. The 1st step is to always **check with your physician** before beginning any exercise program. For the most part, you need to **get past the fat burning zone**. Unless you have physical limitations or doctor's orders, time in this zone doesn't burn enough calories to reduce bodyfat.

**Lean Body Mass is Key**

From our earlier discussion of Kcalories and physical muscle energy requirements, it should be obvious that the total amount of lean body mass you carry can have a highly influential effect on the rate of Calorie consumption. Muscle tissue is the physical site at which all energy is consumed, so the more lean muscle mass you have, the more calories you will burn! Not only will increased lean muscle mass allow you to move more quickly, avoid injury, and burn more calories while you exercise, but it will also burn more calories while you're at rest! If you want to look and feel fantastic, ***you absolutely must*** combine cardiovascular training with a regular strength training regimen.

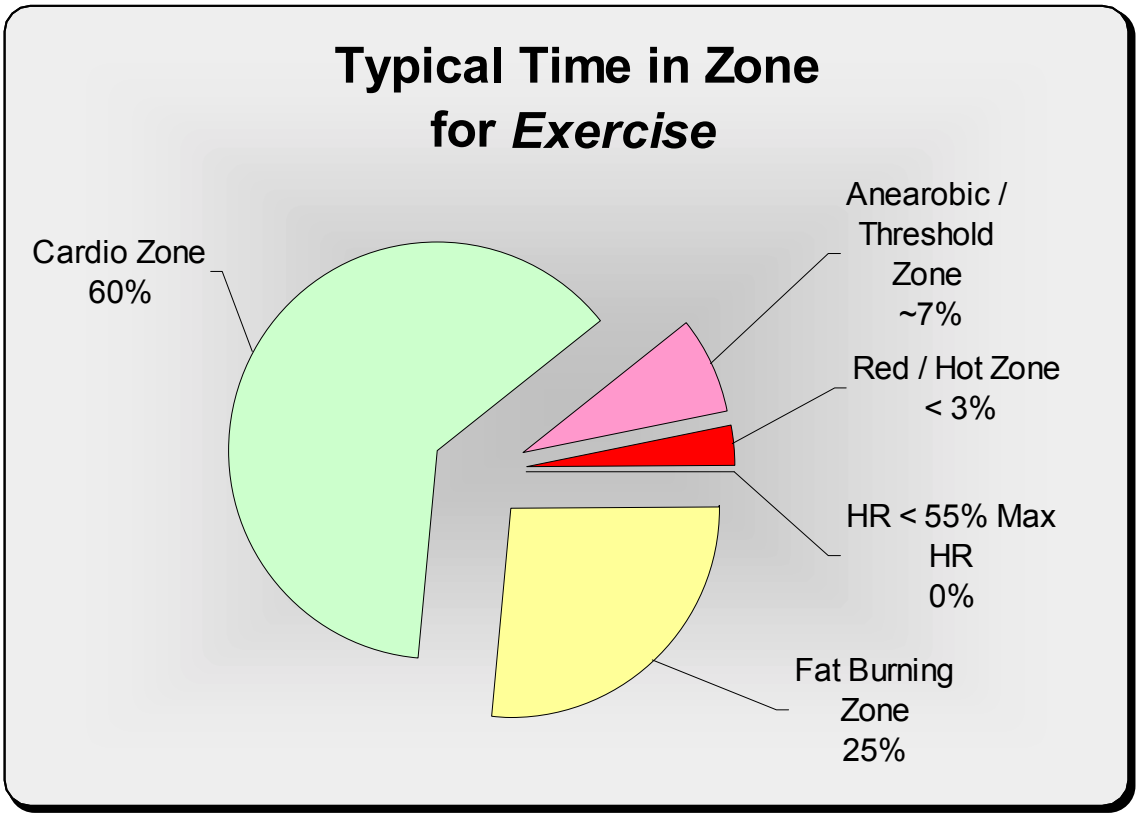
Most of your cardiovascular effort will be spent in the Cario Zone, or Zone 3. Anything less should be considered *activities*, not exercise. Oh, you'll burn a few Calories there, and contribute to overall health improvements, but you won't loose that tube on your waist unless you step it up a bit.

**A Fat Burning Trick**

There is one exception to this rule, and a little known trick for optimizing the fat burning zone. I call it the top of the morning workout. Exercise performed within the fat burning zone at the break of dawn and *without a breakfast* can more effectively burn fat than later in the day. Blood and muscle glycogen levels have been depleted overnight and, as a result, your body will more quickly and readily utilize fats for energy. There are, however, three strict rules that must be followed for this trick to be safe and effective: 1) You must keep your heart rate within the fat burning zone ... **absolutely no higher;** 2) the total amount of exercise cannot exceed 60 minutes; and 3) you must immediately follow this exercise with a completely balanced snack/meal with something higher in protein, but generous in fat and carbohydrate. A 45% protein, 35% carbohydrate, and 20% (10 g) fat snack would be ideal. ADD TO (but don't replace) your cardio efforts with a top of the morning fat burning workout!

You should also spend time in the uppermost heart rate zones. A typical

program would look like this:




Check with a fitness professional, or stay tuned to the free reports section on my website for "The Anaerobic Zone Guide to Bodyfat Reduction", coming soon.

So don't just wing it. If you're new to zone training, or exercise in general, check with an expert before risking injury or over training. Consider hiring a personal trainer: you could try many things for many months and still not achieve results with a random or poorly managed program. You can also check the free reports section of my website.

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