Choosing the Most Effective Level of Intensity for Cardiovascular Exercise

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If done correctly, cardiovascular exercise—such as running, cycling, or inline-skating—offers an abundance of health benefits such as increased metabolism, reduced body fat percentage, increased immune function, increased alertness, and improved general well-being. Moreover, it should be considered that cardiovascular disease is the number one killer in the developed world today. By exercising aerobically, the risk of cardiovascular disease can be reduced significantly. Furthermore, aerobic training helps to reduce the chance of several medical conditions including diabetes, stroke, and osteoporosis. However, this only applies if it is done correctly. It is not sufficient to simply run for a few minutes and wait for all those positive and healthy adaptations to take place. If done incorrectly, exercising might even put one’s health at risk. So the question is not whether you should exercise aerobically or not, but rather how you should do it. Each person should individually evaluate his or her own circumstances and develop a training program based on the knowledge of current science. Based on the findings of sports science research we know that there are four main factors directly influencing the way a training program should be designed. Those factors are:

1. Goals: Do you exercise in order to maximally improve your physical fitness or do you rather put the emphasis on burning as much fat as possible?
2. Age: Maximum heart rate decreases with age. As maximum heart rate is one of the factors used to calculate training intensity, a person’s age must always be taken into account.
3. Level of conditioning: If you already are in a decent or even advanced state of aerobic conditioning, you can and you should apply higher amounts of intensity than somebody who is just getting started.
4. Time: Another aspect that has to be considered is the amount of time you are going to be able to devote to your training program. It does make a difference how long and how often you exercise.
Putting all that together:

**Intensity**
It is generally recommended that one should run at 60 – 85% of maximum heart rate in order to maximally improve cardiovascular fitness. On the other hand, it has been stated many times that running at 40 – 55% of maximum heart rate is more effective for fat burning. However, the statement “More fat is burned at lower levels of intensity” is absolutely false. It is true that a higher percentage of fat is burned when low or medium levels of intensity are applied. The absolute amount of fat burned during exercise, however, is definitively higher when intensity is increased1. The following sample calculation makes this pretty obvious:

Two people of comparable body mass and level of physical fitness are running for the same amount of time. One person runs at 40% of maximum heart rate and burns 400 Calories, 70% of which are fat and 30% of which are carbohydrates. The other person runs at 80% of maximum heart rate, runs for a much longer distance in the same amount of time, and burns 700 Calories (50% fat and 50% carbohydrates). The person who ran at an intensity of 40% burned 31 grams of fat (70% of 400 kcal, divided by 9 kcal per gram, the amount of energy in 1 gram of fat). The other person who ran at an intensity of 80% burned 39 grams of fat (50% of 700 kcal, divided by 9 kcal per gram)4. Whereas the first person exercising at 40% burned a higher percentage of fat, the second person who ran with a pulse rate twice as high burned significantly more fat. The bottom line is: If you run at 60 to 80% of your maximum heart rate, you will improve your cardiovascular fitness and burn more fat than you would at lower levels of intensity. In addition to that, you burn more fat after exercising at a higher level of intensity, even when you are resting. An intensity of 60 to 80% of maximum heart rate is therefore called “target heart rate zone” because this is the level of intensity at which one should train aerobically. It does not imply, however, that an even higher level of intensity would be even better. Generally speaking, 75 to 80% of maximum heart rate should not be exceeded. If intensity is 85% or more, fat burning hardly takes place at all because this kind of training intensity can only be realized anaerobically, with the consequence that glycogen (carbohydrates that are stored in the human body, most of it is stored in the muscles and in the liver) is burned instead of fat.

**Rule no. 1:** Low intensity is out, the ideal level of intensity is in. Read on to find out how to calculate your individual Target Heart Rate (THR) and always exercise within 90 to 110% of your THR.

**Age**
Everybody who is older than 35, or has not exercised for more than a year, should see a physician and get a health check-up before starting any training program. This is absolutely necessary in order to make sure you do not suffer from any illnesses or diseases you are not aware of. There are a few conditions in which aerobic exercise is potentially dangerous and only your doctor can find that out.

In order to find your target heart rate, i.e. the heart rate at which you should run, your age is an important factor. In general, maximum heart rate decreases with age, so does one’s target heart rate because it is based on maximum heart rate. You can predict your maximum heart rate by subtracting your age from 220. For a 30-year old person maximum heart rate is 190.

**Rule no.2:** Subtract your age from 220 to predict your maximum heart rate (MHR).

**Level of Conditioning**
When you are just starting a running program or any other kind of cardiovascular training, or have not exercised for several months, you should start with an intensity of 60% of MHR. This is important, as your body has to gradually adapt to the new kind of stress that it is exposed to. And make no mistake, training means stress to your body. However, if done correctly, it is a positive kind of stress, called “eustress” in the scientific literature (the Ancient Greek syllable “eu” means “good”). You also have to keep in mind that it is not only your heart that has to adapt to the training program, but your whole body. That means that the whole cardiovascular system (heart, lungs, blood vessels etc.) and the muscular system have to adapt as well as all your bones and tendons.

Although starting a cardio training program might seem very simple, it is important to watch these points. If you feel good exercising regularly, that’s fine. You may even feel like doing more, i.e. exercising at higher levels of intensity. You may gradually increase intensity by 5% every other month you exercise regularly. That means that if you started at an intensity of 60%, you may increase intensity gradually until you reach 75%. Do not increase intensity in months in which you have not exercised at least twice a week.

Take your resting pulse (RP) every day. An ideal moment to do that is immediately after waking up when you are still in bed, because at that time of the day there have not yet have been factors such as food, drink, or work which might elevate your resting pulse. If you keep up your training as suggested, you should see a steady decrease in RP after the first few months of training.

**Rule no.3:** Beginners start at 60% of MHR and gradually increase intensity by five percent for every eight weeks of regular training.

**Time**
In order to find out how long your cardiovascular training sessions should be, you have to take into consideration how many times per week you have time to exercise. A rule of thumb for beginners is that you should train for at least one hour a
week. If you cannot spend that much time training, you will hardly see any progress. One hour a week could mean half an hour twice a week, or twenty minutes every other day. Intermediate or advanced trainers need to do more than that. However, 90 minutes per session should not be exceeded unless you are already in outstanding shape.

If your training sessions are rather long (lasting one hour or more to complete) it might be beneficial to train every second day to provide your body with sufficient rest between training sessions. If you also work out with weights you can alternate weight training and cardio days. On a training schedule that includes both anaerobic (weight training) and aerobic (cardio) training, it may be necessary to include at least one day per week when you do not train at all. Combined with healthy nutrition, this allows you to fill up the glycogen stores in your body. Skipping the off day does not only increase the risk of overtraining, but also prevents you from restoring enough glycogen to effectively work out with weights. It has been shown in many studies that training intensity and efficiency suffer if muscular stores of glycogen are too low. In the worst case, the athlete working out at low glycogen stores is unable to achieve the necessary training intensity to induce gains in strength and muscle mass and burns off even more glycogen in a workout. This does not do anything to improve his present level of fitness.

If fat burning is your priority you should do at least four cardio sessions per week as this has been shown to be beneficial for effectively losing subcutaneous fat (fat which is stored under the skin). For maximum fat burning you could alternate weight training and cardio sessions. In addition to training aerobically every second day, one should add another 30 minutes after each weight training session. This approach is ideal for fat burning as weight training workouts burn a lot of glycogen. If cardio sessions are then done after most of the glycogen has already been burned, the body has to rely on fatty acids to fuel the cardio training.

Rule no. 4: Beginners should try to train at least an hour a week, not exceeding 90 minutes per session.

Your individual target heart rate (THR)
Experienced athletes as well as beginners should always stay within 90 – 110 percent of THR.

How to calculate your THR

Beginners

\[(220 \text{- age} - \text{RP}) \times 0.6 + \text{RP} = \text{THR}\]

Example: A 35-year old beginner with an RP of 80 beats per minute, has a THR of 143.

\[(220-35-80) \times 0.6 + 80 = 143\]

Intermediate and advanced trainers

You are considered an intermediate if you have been training for at least six months doing at least two cardio sessions per week.

\[(220-\text{age} - \text{RP}) \times 0.75 + \text{RP} = \text{THR}\]

Example: A 46 year old athlete with an RP of 60 has a THR of 146 and should exercise at a pulse of 131 to 161.

\[(220-46-60) \times 0.75 + 60 = 146\]

These formulas take your resting pulse (RP) into consideration which makes the calculation much more exact: As your body adapts to the cardio training program, your RP may decrease due to your improved level of cardiovascular fitness. Always calculate your THR based on your current RP.

The Program

If you have never done any kind of cardio before, you may follow the following program:

1st week
Start by walking 10 – 15 minutes each day. Be sure to stretch the muscles of your legs after a thorough warm-up. By the end of the week, you should have increased walking to 30 minutes each day. After walking, stretch again.

2nd week
At the beginning of each training session walk for 10 or 15 minutes, then start to run slowly. Whenever your pulse exceeds your optimum THR by more than ten beats per minute, slow down and walk again. Walk/run for 30 minutes but no more than 45 minutes a day. Rest one day after each training day if you feel sore or exhausted. If you feel fine, daily training sessions are okay.

3rd week
Walk for 10 minutes and then start running. Always watch your pulse. If it rises to more than ten beats above your THR, slow down and walk for a minute or two. Try to run for at least five minutes at a stretch.

4th week
Start your training sessions by running slowly; try to stay below your THR for the first five to ten minutes. You should have built up enough stamina by now so there will be no need to walk at the beginning of your running sessions.

5th week
Run at least three or four times per week for 30 – 40 minutes each session. Stretch before and after running.
6th week  
Do the same as in week 5. If you are able to run at your THR for more than 45 minutes you may reduce training frequency to three days a week. If you find it hard to run for more than 30 minutes, make sure to include at least three training sessions a week.

During your running program always keep the following rules in mind:

• Choose whatever time of the day for your training that suits your personal situation best.
• It is essential to stay within 90 – 110 per cent of your THR to make sure you improve your cardiovascular fitness and burn fat instead of carbohydrates. If you go too fast, you end up burning carbohydrates, possibly resulting in a condition called hypoglycemia (condition of feeling extremely exhausted and sometimes dizzy because all glycogen available has been burned). This can easily be avoided by not exceeding 110 per cent of THR.
• Take your RP every morning right after waking up. You only need to take your pulse for 15 seconds and then multiply the number of heartbeats by four. An increase of RP is okay during the first few days after starting your training but should decline the following days. If it continues to increase, take one or two additional rest days.
• Always drink after exercising in order to replenish the liquid you lose by sweating.

References

About the Author  
Jurgen Giesing, PhD, EdD is a certified physical education teacher. He received his doctor’s degree in sports science from the University of Tuebingen, Germany and a doctor’s degree in pedagogic from the University of Marburg. After working as a sports therapist in a hospital he taught physical education as the head of the physical education department of a secondary school in Germany. Dr. Giessing currently teaches at the University of Marburg.