

Intensity Training

by Eric Lewis, PDXFit Assistant Coach (1997 – 2006)

Key points

- Time, Distance and Intensity are the key factors
- Tools for measuring key factors
- Everyone is different
- Determining optimal intensity level

Time, distance and intensity

Time, distance and intensity are the key factors for maximizing any training workout. Measuring the success of a marathon training program is usually done with the athlete's marathon finish time (all marathons are the same distance 26.2 miles). Unfortunately, using time and distance, without intensity, to measure each training workout usually leads to a less than successful result. Measuring the intensity needs to be included for all training workouts. The body needs to rest after each workout for a specific amount of time, based on the intensity of the workout. If an athlete knows the workout intensity level, then they can determine the proper rest needed for the maximum improvement. The athlete can succeed with a training program by utilizing specific tools to measure the time, distance and intensity.

Tools for measuring key factors

Time can be easily measured by using a watch. The watch can be started at the beginning of the workout and stopped at the end of the workout. Time is an absolute measurement. Yes, there may be some inaccuracy caused by the start and stop buttons being pressed, but with modern watches, accuracy is very high. A 30 minute workout, is equivalent to 1800 seconds. If the start and stop buttons were pressed 10 seconds early, late or both, then the maximum inaccuracy would be $20/1800$ or 0.011 or 1.1%.

Distance can easily be measured by using a calibrated cyclometer or a Jones counter¹. Distance is an absolute measure. Yes, there may be some inaccuracy based on the route traveled, but an accurate distance can be measured in inches. A typical 30 minute workout, at a 10 minute/mile pace, will cover 3 miles. The distance covered during that workout in feet would be 3 miles X 5280 feet/mile or 15840 feet. If the measured distance was inaccurate by approximately 175 feet, then the maximum inaccuracy would be $175/15840$ or 0.011 or 1.1%.

Intensity can be measured by the RPE (rating of perceived exertion) method (on a scale of 6 to 19; where 7 is *very, very light* and 19 is *very, very hard*²). The RPE is a perception of the person performing the work. It is NOT an absolute scale, but a relative scale. The scale is relative to the individual person and how that person feels, which has no basis for being accurate or consistent between different people. A typical 30 minute workout at a 11 – *fairly light* level versus a 15 – *hard* can be inaccurate by 4 points over the 13 point scale, which would result in an inaccurate rating of $4/13$ or 0.308 or 30.8%!

Intensity can also be measured using the heart rate. The higher the heart rate, the higher the workout intensity. Heart rate is an absolute measurement. Heart rate can be measured accurately using a heart

¹ *Course Measurement and Certification Procedures Manual* – Third Edition, by the Road Running Technical Council, published by USA Track & Field, Copyright 1999-2001 by USA Track & Field, Pg 5.

² *Exercise Physiology, Energy, Nutrition, and Human Performance* - Fourth Edition, by William D. McArdle, Frank I. Katch and Victor L. Katch, Published by Williams & Wilkins, Copyright 1996 Williams & Wilkins, Pgs. 405-6.

rate monitor. It is the same for all persons. The accuracy of a heart rate monitor is good enough to use for monitoring intensity. If a person has a resting heart rate of 40 beats per minute (bpm) and a maximum heart rate of 200, then the accuracy would be $2 \text{ bpm} / (200 \text{ bpm} - 40 \text{ bpm})$ or 0.012 bpm or 1.2%. This accuracy is similar to the precision found using the watch and the cyclometer.

Here is a summary of the measuring tools and their % error.

<u>Key Training Factor</u>	<u>Measuring Tool</u>	<u>Error Example</u>	<u>% Error</u>
Time	Watch	20 seconds	1.1%
Distance	Cyclometer or Jones counter	175 feet	1.1%
Intensity	RPE	4 ratings	30.8%
	Heart Rate Monitor	2 bpm	1.2%

Using the RPE scale for workouts that are designed to build endurance (11 – Fairly light) versus increasing pace (15 – Hard), the athlete’s intensity could be inaccurate by 30%! Using a heart rate monitor, the endurance workout might be at 110 bpm and the speed workout at 160 bpm. The athlete’s intensity might be inaccurate by 1.2%.

This means that using the RPE method, an athlete might think they are actually completing an endurance workout, when they are actually completing a speed workout! This type of inaccuracy would eventually cause overtraining and possible injury to the athlete.

Everyone is different

Heart rate monitoring could be a great solution for measuring intensity, but everyone is different! Just because one person’s optimal endurance heart rate is at 110 bpm, does not mean that everyone else’s is the same bpm. Yes, the heart rate monitor is going to accurately read the current athlete’s heart rate, but that does not mean that the optimal intensity level is the same from athlete to athlete. In addition, the optimal endurance and speed heart rates are going to change as the athlete completes their training program. If the athlete is using the correct intensity for their current fitness level and they are completing the training program, their optimal endurance and speed intensity levels will increase. This is result of the overloading principle.

Determining optimal intensity level

Determining each person’s optimal intensity level for endurance and pace workouts can be completed with either one of two basic tests. The first test is the Lactate Threshold (LT) test. This test results in a intensity level that can be used for endurance workouts below the level and speed workouts above the level. The second test is the Anaerobic Threshold (AT) test. Modern AT testing equipment will not only provide the AT intensity level, but the Aerobic Threshold (AeT) intensity level also. The AT level is used for speed workouts and the AeT level is used for endurance workouts.

Once the athlete has been tested using the AT method, a heart rate monitor can be used to determine the level of intensity for endurance and speed workouts. The athlete is to complete all endurance runs at the AeT level +/- 5 bpm and all speed workouts at the AT level +/- 5 bpm.

Testing an athlete should be done by a professional that is experienced in the testing procedure and equipment. The tests typically last about one (1) hour, which includes: test protocol instructions, a warm-up period, the actual test period, a cool-down period and a test results review session. The tests typically will cost from \$100 to \$250, depending on the geographical location and the level of medical professionals on staff.

Summary

Using a heart rate monitor is the most accurate way to determine the correct intensity for completing endurance and speed workouts. AT testing allows the correct intensity level to be determined for both endurance and speed workouts.

About the author: Eric Lewis is a Senior Instructor for HeartFit. He has been helping marathon runners and cyclists to improve their health, fitness and performance with heart rate monitors since the late 1990's. He conducts an eight (8) hour workshop titled "*Maximizing Performance with a Heart Rate Monitor*". You can find more information about heart rate monitoring and the workshop at www.StressThenRest.com.