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Monthly news

About Testing by Ed McNeely, MSc.

. He has been a consultant to 17 Canadian National and professional sports teams. Ed is the author of three books, *One Hundred Strength Exercises*, *Training for Rowing*, and *Skillful Rowing*. He has published over 100 articles on training and athlete conditioning covering topics such as strength training, plyometrics, making weight, assessing fitness, speed and power development, planning and periodization, and aerobic fitness. He is a frequent resource for other writers, acting as an expert for articles in *Muscle & Fitness*, *Outside Magazine*, the *Georgia Tech Sports Medicine Newsletter*, the *Rowing News*, the *Globe and Mail*, *Ottawa Citizen* and the *Discovery Channel*. Ed has an extensive background in performance and occupational research having been involved in studies that analyzed the physical demands of and developed fitness test protocols.

Every year you spend countless hours cycling, swimming, running and lifting weights. You read all the articles and books you can get your hand on, you consult with coaches and others athletes on the best type of training, and yet you are probably missing the most important piece of the puzzle: what you, as an individual, needs to do when you train, and how to focus your training properly.

Cycling in triathlon is roughly 90 per cent aerobic and 10 per cent anaerobic, with some variation on these proportions depending on the distance of the event. So it would seem logical that you need to improve aerobic fitness to improve your performance. What type of aerobic training should you do, though? In a standard program you will focus on low intensity base work first and then add higher intensity work later in the year. But is it right for you? It is possible that you need a different approach to your training. Determining your individuals needs is a matter of something called proportional fitness.

Proportional fitness is an examination of how peak anaerobic, VO₂ max, Anaerobic threshold and aerobic threshold compare to each other. In a ideal situation, you would expect to see the following relationship: Power at anaerobic threshold should be 80-85% of VO₂ max power, aerobic threshold power should be 65-70 % of VO₂ max power, and Vo₂ max power should be 40-45 % of the peak power.

The ideal way to determine these relationships is with a fitness test that includes both lactate and oxygen analysis. A standard VO₂ max test with lactates measures can give you the score you will need for VO₂, anaerobic threshold and aerobic threshold. A Wingate bike test, which is a 30 second all-out sprint with a predetermined load, usually done on Monark bike, will give you your peak power score. (Note: we do have a protocol to perform it on the CompuTrainer).

If you went to an exercise physiology lab and had all these variables measured you could get a very accurate picture of where you stand, but this isn't possible for everyone. They are several sample tests you can perform on your own that will give you a start at estimating your proportional fitness. You will need to determine all your data in watts, so you will need access to a CompuTrainer or another type of bike that can provide wattage scores.

John Wooden ; 'When opportunity comes, it's too late to prepare'

Pierre Hustebaut: 'fail to plan = plan to fail''



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VO2 max can be estimates as the average watts from a three minute time trial. Anaerobic threshold is close to the average watts used during a 30 minute all-out sprint. Peak power is the maximum

wattage you see during a 30 second all-out sprint. Unfortunately there is no good field test to determinate aerobic threshold, so you will not be able to get a complete picture unless you get some professional test done. unless you get some professional test done. You should do each of these tests on a separate day so that fatigue from one test does not interfere with the results of another test.

Interpreting the data

Let's assume you do all the tests and come up with the following data:

TABLE 1. SAMPLE DATA	
TEST	WATTAGE
VO2 max power	400 watts
Anaerobic threshold power	295 watts
Aerobic threshold power	180 watts
Peak power	750 watts

From this data we can calculate:

TABLE 2. COMPARING THE SAMPLE TO THE IDEAL		
	ACTUAL	IDEAL
VO2 vs. Peak power	53 %	40-45 %
Anaerobic threshold vs. VO2	74 %	80-85 %
Aerobic threshold vs. VO2	45 %	65-70 %

To understand the data we need to understand the relationship between the physiological points we are discussing and the concept of ceilings. Table 1 shows the relationship between the physiological points. Each of these physiological points can only get so close to the point above before you stop seeing progress. For instance, if your anaerobic threshold gets to 85 per cent of your Vo2 max, it becomes very difficult to move it any higher. This is not to say that you couldn't get it to 90 per cent but it may years to do so. You would probably get better race results by focusing your training elsewhere. Table 2 shows the results of our example and the ideal relationships between the physiological variables.

Looking at the results we see that VO2 max is a higher percentage of peak power than it should be, 53 per cent versus the 45 per cent ideal, suggesting that this person needs to improve their peak power or they will have difficulty improving their VO2 max any further. Anaerobic threshold is 74 per cent of VO2 max as opposed to the 85 per cent ideal. This means the person in our example also needs to raise his or her anaerobic threshold.

Finally, we can also see that aerobic threshold, as measured by the 75-90 minute test, is 45 per cent of VO2 max instead of the 70 per cent ideal, indicating a need for more low-intensity, long duration work.

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Setting your training focus

Now that you have the data and have determined what needs to be trained you can now set training priorities. Your first priority is to train the area with the biggest percentage difference between your score and the ideal. In the case of our example this would be aerobic threshold, which is 25 per cent away from where it should be. The second priority is anaerobic threshold and the third is peak power. Fortunately training at low intensity, to improve aerobic threshold, will have some carry-over effects to anaerobic threshold, improving it as well.

If all the variables are close to the same percentage away from the ideal, use the following guidelines:

1. Work aerobic threshold first, particularly during the winter months. This will help you get ready for the higher intensity work to follow.
2. Peak power is the second priority since it will limit everything below it. Raising peak power gives more room for everything else to move up. Keep in mind that it doesn't take long to see improvements in peak power – four to six weeks of short sprint training combined with a year-round strength program.
3. Anaerobic threshold will be improved through the low-intensity long duration work and only needs to be trained one to two times per week for every one below an elite level.
4. VO2 max will be improved through all of the training methods above and therefore doesn't need a lot of focus training. Most research suggest that dedicating more than 5 per cent of your yearly training hours to VO2 max may hinder your performance more than help.

It is difficult for anyone to admit to weaknesses but in sport it is the only way to improve and reach your full potential. Identifying your training priorities through proper testing and data interpretation will help you focus your training on those areas that will give you the biggest return on your time investment.

