

Physiological Testing for Distance Athletes

Overview

Successful endurance performance, particularly in long distance events, depends on the interaction between several physiological variables, including a high maximal oxygen uptake ($VO_2\text{max}$), high speed at lactate threshold, and a low energy cost to exercise at a particular speed. Additionally, a well-developed anaerobic system is critical for success in middle distance events. Therefore, the primary aim of physiological testing is to measure each of these key determinants of performance. Finally, based on the data collected during testing we are able to establish specific training zones which can be used to individualise training in the future.

Considering these benefits, the purpose of this document is to provide you with an overview of the different components of the testing and offer some guidance to help with preparation for the test.

Test protocol

There are three separate components to this testing battery and depending on which of the above-mentioned physiological variables you would like information on you can select which components you would like to complete.

- **Submaximal step test** - The purpose of this longer progressive, intermittent running test is to determine current aerobic and anaerobic thresholds and running economy. This data can be used to help establish training zone intensities (heart rates and speeds) to be used during submaximal training. The test contains 4 min segments (steps) at a constant speed, with each separate step increasing in intensity by 1 km.hr. During the test each step will take you through a range of intensities, from very “easy” jogging to a “hard” threshold effort. In between there will be a 1 min rest period where a small sample of blood is taken from your finger/ear lobe to determine the net blood lactate concentration.
- **Fast ramp test to aerobic capacity ($VO_2\text{max}$)** – Similar to the step test this is a progressive test. However, this component contains shorter (usually 1 min) steps and is continuous (so without rest periods between steps). The purpose of this test is to ramp you quickly to $VO_2\text{max}$ to avoid excessive fatigue and potentially an underestimation of your speed at $VO_2\text{max}$.
- **Anaerobic (glycolytic) capacity** - Finally the addition of the 400 m timed trial and measurement of peak net lactate post time trial can be done to capture your approximate peak glycolytic capacity and give you an idea of your maximal rate of glycolytic production.

All testing can be completed in one session, and each is done with 10mins rest between. Therefore, testing should take 1-1.5hrs.

Preparation for testing

Training prior - To get an accurate gauge of your current physiological profile it is recommended that you are fresh and well rested when you arrive at testing. Therefore, athletes and coaches are advised to come to testing rested, having completed easy training and no heavy weight training within the 24-48hrs prior.

Food and supplements - Additionally, no caffeine or other ergogenic aids (i.e. sodium bicarbonate or beta alanine) should be consumed prior to testing. A light meal can be consumed ~2 hours prior unless you would like to gain an understanding of your substrate (fat and or carbohydrate) use during exercise. If you are interested in substrate utilization you will need to come to the lab fasted (having not eaten the day of testing). If this is the case it is recommended you test in the morning. Please advise your tester that you would like this analysis done.

Warm up prior to testing - If completing the submaximal step test no warmup is needed prior to testing. A lite jog on the treadmill can be done if you are not familiar with the treadmill. However, the purpose of testing is to take you through a range of intensities (from very easy jogging to a “hard” threshold effort) and therefore the early stages of the test will be easy enough to be used as a warmup.

Who should test? Although testing is a great opportunity for you to get a deeper understanding of your physiological make up it may not be for everybody. As a guide your overall training development and maturation can be taken into consideration to assess whether physiological testing is appropriate. For example, those who are new to formal training may gain more benefit from concentrating on achieving consistency in their training before focusing on any finer details like individualization of heart rate or speed zones. Additionally, those who are under the age of 16 may be experiencing such rapid changes in their physiology through maturation that it is probably not advised to invest in testing as the results may soon not be applicable.

When is it good to test? It has been shown that your physiology can change throughout the year depending on whether you are coming off a break or the types of training you have been focusing on lately. Therefore, it can be good to test 2-3 times a season to capture these changes and adjust your training. However, testing can be expensive and therefore depending on your goals it is also an option to test less regularly (i.e., once per season). Hopefully some of the considerations below may help with your decision making:

- **Have at least 3 weeks of consistent training in your legs before you test** - Changes in your exercising heart rate can occur quickly with an extended break. Therefore, if heart rate zones are an important metric you are wanting to assess during testing it is better to have some consistent training in your legs to ensure your heart rate has restabilized after a break.
- **Testing at the start of the specific preparation period and/or after the season** – A good time to test is after a good general preparation phase. Testing at this time point may help you understand what

your physiological levels or strengths and/or weaknesses are before starting more specific training during the specific preparation period.

Another good time to test is after the competition phase is over. This way you can assess what changes were achieved because of the specific preparation and competition phases. It is advised that you do this testing after the season in case the intensity of the testing has an impact on preparation for more important races. Alternatively, testing can be used in place of a race or time trial during the competition phase. If you are only able to test once per season an end of season test is a good option. Doing this can give you a chance to relate your physiological levels to your performance during the competition phase.

- **Test when you are well rested** – Testing requires you to be well rested and therefore it is advised that you try to test either at the end of a deload week or early into the week following a deload week. This will hopefully allow you to freshen up and avoid any suppression (i.e. reduced HR and or lactate) that can occur with excess fatigue from a high training week/mesocycle. Additionally, testing is hard and therefore it may be advised that you test later into a deload week or during the following week to not impact recovery during the deload week.

Contacts

If you require any further information about the testing, have any questions, or would like contacts for your nearest regional physiological testing laboratory please contact:

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