

Performance Training Center Article Series

Phase One: Testing and Assessment 1

By Mark McLaughlin

Think your team is in great condition? *Prove it!*

I'm always amazed when I hear coaches or trainers talk about how good their players' conditioning is. When the topic comes up, two things come to mind:

First off, I want to ask them where their facts are, and by "facts," I mean test results that directly relate to the sports their teams play. Secondly, if these numbers exist, do they translate to better performance on the playing field or court?

In this series of articles, I'll talk about two field tests – one of which is specific to soccer – that can be used to determine aerobic power, speed at anaerobic threshold and anaerobic power. With very few reliable field tests available, it's important to understand how such testing can benefit programs for acyclic speed/strength team sports. I'll show you how to run these tests, and once you have the scores, I'll show you how to build a sport specific fitness program geared to improve athletic performance. These tests require only a stopwatch – preferably an electric timer – a heart rate monitor and someone to write down the times. I'll also give you some real world examples of tests, documenting changes I've made in our training to positively impact the performance of our athletes.

Performance evaluation is prevalent in all areas of life. We have the SAT's, driving tests, and all manner of things we use to see where people stand. With training, everyone has his own test for maximum strength (1RM), explosive power (vertical or broad jump), flexibility, and knee/ankle/hip evaluations. When these tests are done on a periodic basis, we get a clear picture of how our program is working and whether it's moving toward the desired goals of our training. If it's not, we make changes, train for a period of time, then test again to see what changes have occurred.

Soccer-Specific Aerobic Power Test

To develop a sport-specific fitness program, the energy demands of that sport have to be determined. Soccer, for example, is characterized by periodic bouts of anaerobic high intensity layered over aerobic exercise. Since soccer alternates between anaerobic and aerobic work, and since aerobic endurance plays such a major role in the game, we must have a test to determine the state of conditioning of the athlete's aerobic fitness.

When determining aerobic endurance, VO₂ max is considered the gold standard. Lactate threshold and running economy are other key markers. Of particular importance is a test to determine aerobic power and its correlation with high speed running (>21.6 km/hr) during a soccer game. The answer for this is the

Synthesis Test (Proietti, R. 1999).

Objective: To meet the need to have a test that would satisfy the following criteria:

- To measure metabolic properties in conditions of intermittent work in the field.
- To approximate the soccer player's method of running from a biomechanical standpoint.
- To, without special machines (with the exception of heart rate monitors), provide information on the athlete's fitness level and enable the coach to customize physical conditioning workloads by measuring the athlete's maximum heart rate.

Equipment Needed: Heart rate monitor and stopwatch.

Execution: The test is comprised of eleven 20 meter sprints with a 20 second recovery period between sprints, followed by an 8 minute run at maximum speed over a 20-40-60-80-100 meter shuttle track. Over the last minute of the run, the athlete should sprint at maximum speed in order to reach exhaustion and his/her maximum heart rate.

Using the Collected Data: Aerobic power is calculated with the following formula:

$$\text{VO}_2 \text{ max} = (\text{meters run in 8 minutes} \times 0.01635) + 27.353$$

$$\text{Anaerobic Threshold} = (\text{meters} \times 0.00705) + 1.7592$$

"There are significant positive correlations between the results obtained here and those obtained in the Canadian version of the Leger test ($p < 0.05$; $r 0.95$) and the Mongnoni test ($p < 0.05$; $r 0.85$). These results demonstrated that subjects with a high maximum VO₂ can run longer distances over the eight minutes. There is also significant correlation between the maximum heart rate measured at the end of this test and the maximum heart rate measured in the Leger test ($p < 0.05$; $r 0.90$)."

Assessment of Results:

Meters run in 8 Minutes	Assessment	Max VO ₂	Anaerobic Threshold
<1,500	Poor	<52ml/kg/min	<12.3 km/h

1,500 – 1,600	Adequate	52 – 53.5	12.3 – 13
1,600 – 1,700	Fairly good	53.5 – 55	13 – 13.7
1,700 – 1,800	Good	55 – 57	13.7 – 14.4
1,800 – 1,900	Very Good	57 – 58.5	14.4 – 15.1
> 1,900	Excellent	>58.5	>15.1

This assessment chart is appropriate for elite soccer players. When these tests are conducted with younger – high school age – athletes, a “poor” or “adequate” test result does not accurately reflect the state of fitness for an athlete on that particular level. The research associated with this rating system is a result of testing with first division players. It’s of paramount importance that coaches understand this and adjust their programs accordingly.

In my second article, we’ll look at the RAST test and how it can be utilized in building sport-specific training programs for a wide variety of team sports.

References:

1. Proietti, R. Energy system requirements of soccer player. Correlation between game analysis and aerobic/anaerobic power test. *Magazine Preparazione Atletica* (www.calciatori.com) November 2007.

