

VO2 Max



What is VO2?

Fitness can be measured by the volume of oxygen one can consume while exercising at maximum capacity. VO2 max is the maximum amount of oxygen in milliliters one can consume per kilogram of body weight per minute. It is an important test for evaluating the cardiovascular capacity of an athlete. Highly trained athletes generally have a higher VO2 max than untrained individuals. The body's ability to extract and utilize oxygen at the cellular level enables an athlete to train with greater intensity, simultaneously buffering the body's lactate production, resulting in an increased resistance to fatigue.

Why is VO2 max beneficial?

Knowing one's VO2 max enables an athlete to determine his/her endurance capability. A sports specific program can be designed to increase the aerobic capacity and performance capability.

How is VO2 max measured?

Quest Sports Science Center measures VO2 max on the most scientific and reliable human performance testing equipment in the nation. The same equipment is currently used at NASA, US Olympic Training Centers and numerous University Human Performance Labs worldwide. Currently, Quest measures VO2 on the treadmill and bicycle, but soon will be able to test on a rowing ergometer and in a swim flume. The VO2 test is a progressive test that increases in intensity with time. As the intensity increases, the body's ability to extract and utilize oxygen increases until you reach your maximum threshold. At this point, an increase in intensity is not matched by a corresponding increase in oxygen consumption—this is the athlete's upper limit--the VO2 max. VO2 max is expressed relative to a person's weight in ml/kg/min.

Lactate Threshold



What is Lactate?

During intense exercise the development of the “burn” in muscles has generally been referred to as lactic acidosis. In fact, this theory is still taught in many physiology courses throughout the world. To help set the record straight, recent research is now disputing this popular explanation. Let’s look briefly at some basic physiology that will help explain the causes of muscular fatigue.

During the demands of high intensity exercise, the cell utilizes a substantial amount of glucose and glycogen (stored glucose). The bi-product of the glucose breakdown is lactate. This increase in lactate coincides with an increase in blood and muscle acidosis therefore; lactate is an excellent indirect marker of cellular fatigue or the “burn.”

What is the Lactate Threshold?

At rest and under steady-state exercise conditions, there is a delicate balance between blood lactate production and blood lactate removal. The lactate threshold therefore, refers to the intensity of exercise at which there is an abrupt increase in lactate levels.

Why Lactate Threshold beneficial?

Lactate Threshold testing is considered to be the single most important determinant of success in endurance related activities. Training at the right intensity is important to help prevent over or under training.

How is Lactate Threshold measured?

Quest Sports Science Center measures Lactate Threshold using a state-of the art lactate analyzer. An athlete will be subjected to a graded exercise test on a specific ergometer (bike/treadmill) for a standard period of time. Each exercise stage will increase in intensity challenging the athlete’s energy systems. Blood draws, using a finger stick, will be taken during each stage and evaluated and recorded using a blood lactate analyzer. At the termination of the test, the athlete’s recovery lactate levels will be drawn every 2, 5, 8, 20 minutes. This will determine the athlete’s rate of lactate clearance, an important marker of recovery. The results will be discussed with the athlete along with recommendations for improvement.

Nutrition

Quest Sports Science Center understands that an athlete's goals are achieved not only through hard work and determination, but proper training and good nutrition. At Quest we offer only the best in sports nutrition. We provide comprehensive sports nutrition services that are individualized to help the athlete meet his/her performance goals.

What is a Registered Dietitian?

A Registered Dietitian is health care professional with an extensive scientific background in food, nutrition, biochemistry, and physiology. This knowledge is applied to promoting health, preventing disease, and providing counseling and education. A RD must complete 1) at least a four-year degree at an American Dietetic Association (ADA) accredited college program; 2) a supervised practice program or internship; 3) a national examination from the Credentialing Board of Dietetic Registration (CDR); 4) mandatory continuing professional education.

Nutrition Analysis

What is nutrition analysis?

A comprehensive evaluation of an individual's regular eating habits.

Why is nutrition analysis beneficial?

A nutrition analysis is important to help tailor a nutrition program to your genetics, lifestyle, and sports specific goals.

How is nutrition analysis measured?

Quest Sports Science Center asks each client to first provide the Registered Dietitian with a complete three-day food record. A three-day food record consists of recording all the foods and beverages one has consumed over a 3-day period. This data is then compiled and analyzed using the most up-to-date nutrition software. The information will be reviewed and the athlete will be provided with the following:

- Total Nutrient Intake
- Calorie Distribution
- Energy Expenditure Analysis
- Nutrient Breakdown of Foods in Analysis v. Daily Recommended
- Intake
- Recommendations for Improvement
- Shopping List/Recipes

Body Composition Analysis (BCA)/BMI

What is Body Composition Analysis?

Body Composition Analysis measures the percentage of fat mass v. lean body mass.

Why is Body Composition Analysis beneficial?

Every athlete should know his/her body composition (fat v. lean body mass). Body composition directly impacts sports performance. Lack of lean body mass, impedes strength and endurance and increases susceptibility to injury. To improve lean body mass ratios, it is important for an athlete to engage in a sports specific nutrition program. It is important to engage a Registered Dietitian to help design and implement a sports specific nutrition program.

Body composition varies for men and women. Average body fat levels for men are 15-18% and 22-25% for women. Athletes often times are lower than average, but are not recommended to fall below 5% for men or 12% for women. If body fat levels drop too low or become too high, this may cause health problems and decrease athletic performance. Body composition directly correlates with sports performance. Several studies have proven that body fat adversely effects maximal aerobic capacity and performance during endurance events.

How is Body Composition measured?

Quest Sports Science Center measures an athlete's body composition with a computerized skindex body composition analyzer. Calipers are used to measure various skinfold sites on the body. These measurements are then calculated to determine overall lean body mass. This test will be conducted in private by one of our highly trained staff members. This test only takes a few minutes to complete. Its accuracy correlates to within +/- 2% of the "gold standard," hydrostatic underwater weighing.

Resting Metabolic Rate (RMR)

What is Resting Metabolic Rate (RMR)?

Resting Metabolic Rate is the energy needed to carry out your body's functions—such as respiration, circulation, and thermal regulation. There are several factors that influence RMR, including sex, height, weight and the percentage of lean muscle mass. RMR is the amount of calories you burn at rest during a 24-hour period and this number is unique to you.

Why is Resting Metabolic Rate beneficial?

Knowing your RMR is beneficial because it will help you regulate and maintain your body's ideal weight. RMR is approximately 70% of your caloric intake, therefore, is a critical measure when trying to achieve your weight goal to optimize athletic performance.

How is Resting Metabolic Rate measured?

RMR is a simple, non-invasive test. The test is measured using a sophisticated breath analysis technique (oxygen to carbon dioxide ratio), lasting approximately 30 minutes. In order to ensure accurate results you should:

1. Avoid eating a meal 1 hour prior to the test.
2. Avoid exercising the day of your test.
3. Avoid the use of stimulants (such as caffeine) on test day.

Wingate Power Test

What is the Wingate Power Test?

The Wingate Power Test was developed during the 1970's at the Department of Research and Sports Medicine of the Wingate Institute for Physical Education and Sport in Israel. Since its introduction, the test has become the "gold standard" around the world to assess muscle power, muscle endurance and fatigability. The test has been used as a reproducible standardized method to analyze physiological responses to high intensity exercise.

Why is the Wingate Power Test important?

The Wingate Power Test allows the tester to evaluate the athlete's peak power, mean power and muscle fatigability. For example, a cyclist navigating a steep hill during a race would require maximal or near maximal force to advance. Training for maximum power output is the difference between the cyclist being in the middle or at the head of the pack.

How is The Wingate Power Test measured?

Quest Sports Science Center will conduct the Wingate Power Test on our state-of-the-art Position cycle using the most current Wingate Software. After a thorough warm-up the athlete will, on command, cycle at maximum effort for the duration of 30 seconds. In this test the highest 3-5 seconds of power output will be used to determine peak power, and the average 30-seconds power output will be used to determine mean power. Muscle fatigability will be graphed depicting percent decreases in muscle power output over time. After 15-20 minutes of complete recovery a second test will be administered, as needed. All data is graphed in a user-friendly format and the physiologist will review the results with the athlete. The Wingate Power Test is also available for measuring upper torso power, especially useful for athletes including rowers, swimmers, sailors, and any athlete that wants to improve upper torso power.

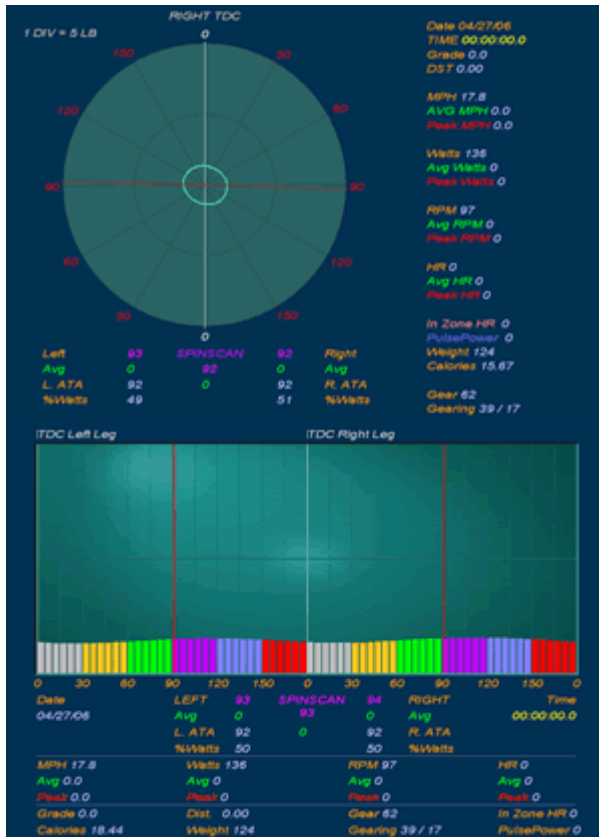
Bike Fit/SpinScan

What is the Bike Fit/SpinScan?

A bike fit is important not only to find a comfortable position on the bike, but to ensure the athlete maximizes efficiency and power. In conjunction with the bike fit, a SpinScan analysis, an exclusive feature of the CompuTrainer and Velotron system, will analyze the athlete's pedal stroke. This provides precise adjustments that will guarantee increased efficiency and power output more than a bike fit alone.

Why is the Bike Fit/SpinScan important?

From Racermate Inc., A dynamic bike fit utilizing the SpinScan pedal stroke analyzer of the CompuTrainer system is an excellent way to take the subjectivity and guesswork out of the bike fit process. After an initial bike fit and pedal stroke evaluation with the SpinScan, most athletes improve their efficiency by 20-25% in their first session alone. Additional improvements of 10-15% are possible using the feedback from SpinScan while riding courses and doing drills that address the weak areas of the pedal stroke.



How is the Bike Fit/SpinScan measured?

Quest Sports Science Center will measure the athlete using the state-of-the-art PositionCycle bike and will fit the bike to each individual’s anthropometrics (body build). Quest can design a sports specific training program to improve, as much as 30%, cycling economy in athletes.

Running Economy Test

What is the Running Economy Test?

Running Economy is a powerful predictor of successful performance. It is the amount of oxygen one uses to achieve a specific level of effort...the less you use the more efficiently you perform. Running economy can vary between 1 and 4% from day to day in runners.

Why is the Running Economy Test important?

Running Economy measures how much energy is used for a specific submaximal speed of running (this is standardized to take body mass into account). Research has demonstrated that economical runners generally outperform less economical runners who are similar in other physiological measures, because they consume less oxygen for an identical work rate. In other words, at a given speed of running, they do not need to work as hard.

How is the Running Economy Test measured?

Quest Sports Science Center measures running economy on a treadmill using individual submaximal work loads based upon the athlete's body mass. Quest can design a sports specific training program to improve running economy in athletes.

Glucose Uptake Test

There are numerous accounts of athletes "bonking" during training and competition. *This is preventable!* Quest Sports Science Center has developed a method of assessing the athlete's ability to absorb carbohydrate during exercise. The outcome of this assessment is guaranteed to help prevent premature fatigue and help the athlete fuel their body properly for training and competition.

What is a Glucose Uptake Test? A glucose uptake test is an assessment that will determine the rate of circulating glucose appearance after consuming a carbohydrate source.

Why is a Glucose Uptake Test important? Research has demonstrated that the appearance of glucose into the circulation after carbohydrate feeding depends upon numerous factors including: type, quantity, liquid v. solid, gut absorption, intensity of exercise, and individual tolerance

How is the Glucose Uptake Test measured? The test will comprise of 30 minutes of exercise, run or cycle, at 70% of the athlete's VO₂ max. During the evaluation, a carbohydrate source will be ingested and the absorption rate into the circulation will be determined by a periodic blood analysis (finger stick using a glucometer). The data generated will be utilized to determine individual differences in glucose uptake into the circulation, meaning the data will be able to provide critical information to the athlete regarding their nutritional status during exercise. **A strategy (amount of carbohydrate and timing of intake) will be formulated to help the athlete optimize their sports nutrition status during training and competition.**

Sweat Test

What is a Sweat Test?

The sweat test is an invaluable method of determining sweat and electrolyte losses from the athlete during training and competition.

What is a Sweat Test beneficial?

It is well documented in the scientific literature the effects that dehydration and electrolyte losses have on the thermoregulatory and cardiovascular systems of the body.

Sweat losses of 2% of total body weight can significantly reduce aerobic capacity and negatively impact core temperature regulation. Sweat losses of 1-2 liters/hour with sodium losses of 300mg/liter have been documented in endurance events lasting longer than 60 minutes.

How is the Sweat Test measured?

Quest Sports Science Center offers a sweat test in our lab to include the following:

1. Pre-exercise weight and urine specific gravity.
2. 60 min of running or cycling at 70% VO₂ Max, 80 degrees F and 50% relative humidity.
3. Ad libitum fluid consumption during testing.
4. Post-exercise weight to include weight of fluid consumed during exercise.
5. Sodium (Na) concentration assessment test.

The athlete will be debriefed on the results of the test to include:

1. Weight of fluid lost during exercise for 60 minutes at 80 degrees F and 50% humidity.
2. Sodium (Na) concentration losses over the 60 minutes.
3. Protocol will be developed for the athlete to replace sodium and fluids lost during events lasting 60 minutes or longer.

Individual Program Design

What is Individual Program Design?

Individual Program Design is a program designed to meet the specific needs of individual to enhance sports performance. The program utilizes a needs analysis approach looking at both the athlete and sport. The athlete's experience level and injury history along with the biomechanical, energy system, muscular and neuromuscular requirements of the athlete's sport will be evaluated. These results will be used to tailor a program that will maximize gains during training.

Why Individual Program Design?

Individual Program Design is important to each athlete's success. The program will be designed to address speed, power, strength, agility, endurance, coordination and balance. This is not personal training. Individual Program Design focuses on sports specific scientific principles that will ensure better performance, reduce injury potential and lead to a higher level of athletic success.

How will the Individual Program Design be implemented?

After a detailed needs analysis, each client will be provided a workout plan detailing an array of skills, drills and exercises for enhancing performance in their particular sport. These exercises will target both upper and lower body extremities ensuring maximal

development. Technique training will be provided to the athlete upon request and can be conducted in a field setting.

Types of Program Design include:

1. Strength- periodized sport specific strength training
2. Power- for anaerobic power and capacity
3. Speed- multi directional
4. Agility- for quick, precise directional change
5. Proprioception- for balance and coordination