**Omni Athletics**

**Calculator**

Version 1.0.0

Property of Omni Athletics

# OMNI Athletics Calculator

# Strength Calculator

## ACSM 1RM Predictor

### About

The golden standard assessment for testing athletes’ strength is the 1 rep max test. However, many factors such as time, experience, injury, fatigue, safety and more means that the 1 rep max test isn’t always a viable option. This is where strength coaches can supplement 1RM protocols for 1RM predictor protocols. The American College of Sports Medicine outline the ACSM 1RM predictor protocol as a viable predictor of 1RM’s in multi joint exercises.

ACSM 1RM Predictor Protocol:

1. Establish maximum reps at a load (aim to use a weight that’s around your 10RM).
2. Multiply the number of repetitions you can perform on an exercise to failure by 2.5. For example, a load you can lift 10 around.
3. Subtract that number from 100 to determine the percentage of your 1RM.
4. Divide the above number by 100 to get a decimal value.
5. Divide the weight you lifted by the decimal value to get your estimated 1RM.

### Equation

1RM = Loading / ((100 – (Reps x 2.5)) / 100)

Unit = kg

## Dynamic Strength Index

### About

The dynamic strength index is the ratio between an athlete’s ballistic peak force and their dynamic peak force giving an overall idea of an athlete’s strength potential and their ability to utilize it in ballistic movements. An example of a ballistic peak force test is a maximal force production counter movement jump and a dynamic peak force test could be a 1RM squat.

DSI Protocol:

1. Perform and measure dynamic peak force test (eg 1RM)
2. Perform and measure ballistic peak force test (eg Counter movement jump using a force plate)

### Equation

DSI = BPF / DPF

Unit = ratio

## Loading Tool

### About

Strength coaches prescribe different loadings for exercise sets dependent on the movement, athlete, equipment, training goals and more. The loadings are represented as % of 1RM. Therefore multiple percentage equations take place over a given training session making calculation set loadings an important process to streamline.

### Equation

Loading = % / 100 \* 1RM

Unit = Kg

## Eccentric Utilisation Ratio

### About

The EUR test is a low fatigue test that examines stretch shortening cycle utilization in athletes. The eccentric utilisation ratio is the ratio between countermovement jump and squat jump heights and is a great indicator of lower-extremity stretch-shortening cycle (SSC) performance in athletes. The EUR is great for exposing an athlete’s lack of ability to utilize the SSC. Note that most athletes should have an EUR greater than 1.

### Equation

EUR = CMJ Height / SJ Height

Unit = ratio

# Power Calculator

## Power Zones

### About

Power is defined by the ability of the neuromuscular system to produce force quickly. Maximum power occurs across a ‘bandwidth’ of loads with factors such as fibre types, Individual differences, experience and exercise influence the peak power zone.

Many scientific studies including Bourque (2003) conclude the following.

Peak Power Zones:

Lower body

* + 0-40% 1RM for peak power

Upper body

* + 40-70% 1RM for peak power

### Equation

Lower body Power Zone = Loading = 0 / 100 \* 1RM to 40 / 100 \* 1RM

Upper body Power Zone = Loading = 40 / 100 \* 1RM to 70 / 100 \* 1RM

## Rate of Force Development

### About

Rate of force development is an expression of explosive strength and is representative of isometric, concentric and eccentric contractions within acceleration phases.

### Equation

Average RFD = Peak Force(N) / Time to achieve peak force

Unit= N. s^-1

## Lower Body Peak Power Predictor

### About

Power is defined by the ability of the neuromuscular system to produce force quickly. Predicting peak power in the lower body is more accurate with squat jumps compared to counter movement jumps.

### Equation

Power (W) = 60.7x (jump height cm) +45.3 x (body mass [kg])-2055.

Unit = W

# Anaerobic Calculator

## Wingate

### About

Wingate is a 30 second maximal effort anaerobic laboratory test performed on a cycle ergometer commonly using the monarch. The test measures anaerobic power and capacity.

### Equation

Peak Power Output:

This should be calculated every 5-seconds of the test (providing a total of 6 PPO’s).

PPO = force (kg) \* distance (m) ÷ time (s)

Distance = number of revolutions during the 5-seconds \* distance per revolution (m)

Unit = W

Fatigue Index:

AF = ((peak power – lowest power) ÷ (peak power)) \* 100

Anaerobic capacity:

AC = Sum of each 5 second PPO

## RAST

### About

Developed at the University of Wolverhampton the Running Based Anaerobic Sprint Test RAST is designed to measure anaerobic power and capacity.

### Equation

Fatigue Index

FI = (max power – min power) / total time for the 6 sprints

Anaerobic Capacity:

AC = Sum of all sprint PPOs

## Phosphate Recovery Test

### About

**The Phosphate Recovery Test is an anaerobic fitness test, assessing the ability to recover between sprints and produce the same level of power repeatedly.**

### Equation

**Drop off distance = Distance covered in last sprint – Distance covered in first sprint**

**Unit = m**

# Aerobic Calculator

## Yoyo Intermittent Recovery Test Level 1

### About

The Yo-Yo test is a maximal aerobic endurance fitness test, involving running between markers placed 20 meters apart, at increasing speeds, until exhaustion.

### Equation

|  |  |  |
| --- | --- | --- |
| rating | meters | level |
| elite | > 2400 | > 20.1 |
| excellent | 2000-2400 | 18.7-20.1 |
| good | 1520-1960 | 17.3-18.6 |
| average | 1040-1480 | 15.7-17.2 |
| below average | 520-1000 | 14.2-15.6 |
| poor | < 520 | < 14.2 |

## VO2 Max Validator

### About

The use of V02MAX as a measure of cardiorespiratory fitness is widespread throughout the fields of exercise physiology, physiology and medicine. VO2MAX is described as the maximal rate of oxygen consumption and is validified by a plateau of oxygen consumption (VO2). Important validity criteria include blood lactate (La) >8mmol/L, a respiratory exchange ratio (RER) >1.15, a rating of perceived exertion (RPE) > 17, and an age-predicted maximal heart rate (APMHR) ±10 beats/min from predicted using 220-age.

# Nutrition Calculator

## FFMI

FFMI (Fat-free mass index) is a body composition measure capable of quantifying the amount of muscle mass on your body relative to height and accounting for exclusion of body fat.

FFMI = Fat free mass (FFM) in kg was determined from the following equation (FFM= Body mass- (Body mass x DEXA BF%)). Additionally, FFMI was determined from the equation (FFMI=FFM (kg)/m2).

## BMI

Body mass index is a body composition tool for analysing total body size with the value derived from the mass and height of a person.

BMI = weight(kg) / Height(m) 2

## Protein Index

RDA (amount required to avoid deficiency) = 0.8 g.kg.d

Athletes = 1.2 – 2.0 g.kg.d

Weight loss = 2.3 – 3.1 g.kg.d

## Metabolic Rate

**The caloric demand (also known as the calorie requirement or kcal requirement) is the number of calories that must be supplied daily through food.**The energy provided in meals must be adequate for energy expenditures caused by basic metabolic processes, such as respiration and digestion.

Here is the simplest formula needed to calculate your kcal requirements:

For women: BMR = 655 + (9.6 × body weight in kg) + (1.8 × body height in cm) - (4.7 × age in years);

For men: BMR = 66 + (13.7 × weight in kg) + (5 × height in cm) - (6.8 × age in years).

# Biomechanics Calculator

## Horizontal Projection Velocity

The horizontal component of the projection velocity = projection velocity COS \* projection degrees

## Angular Velocity

ω = θf -θi / tf - ti

Convert from deg to rads.

Unit = rad/s

## Angular Acceleration

Convert from deg to rads.

ω f - ω I / tf - ti

unit: rad/s2

## Inertia

I = mr2

Unit: kgm2

## Torque

Torque = F x r

# UML Diagram