

# KNOW YOUR ENGINE



by Alexis Williams, RD

Have you ever counted calories or followed a meal plan? Many athletes have done this at one time or another, either to improve performance, or more commonly, to reach a weight goal. Counting calories can be tedious but it is the only way to really assess the amount of energy you are fuelling your body with.

If you've ever been on a website to calculate your caloric expenditure, you have likely entered your age, height and weight as well as your average activity level. A number will be computed using a formula (the Harris Benedict Equation is the most common), which estimates your caloric expenditure. In many cases, this is a great starting point to understanding your energy needs but there are many more variables that can change your caloric expenditure drastically. The actual caloric needs of an individual are based on a number of variables including:

- Age
- Height
- Weight
- Gender
- Body composition
- Activity level (during exercise as well as the rest of your day)

The formula above starts off with an estimate of your *Resting Metabolic Rate (RMR)*, which is approximately the amount of calories you need if you are sitting in a rested state all day. Since very few people do this (especially not runners) the RMR number is multiplied by an *activity factor* is used to estimate caloric requirements.

If you look at the equation you see that weight, age and height determines the caloric needs. The body weight does not distinguish between lean body mass or body fat. Lean muscle burns many more calories than body

fat, a reason that motivates many people to get leaner. So herein lies the problem for using this formula with athletes, their caloric needs may be drastically different than someone who is inactive due to their body composition.

There are other formulas that can be used for athletic individuals such as the Cunningham equation but it depends on knowing an accurate measure of your lean body mass, which is challenging to obtain and the equation is still ultimately estimation.

The only way to know how much you really need is to have your resting metabolic rate tested. While it sounds scientific, it's a service that is becoming more and more accessible each day.

In the past RMR testing was reserved to lab settings where a subject was placed in a metabolic chamber that measured all gases inspired and expired. This method, known as *direct calorimetry*, was used mainly for research and was not practical for general use.

According to Dr. Carla Geurts, an exercise physiologist at the McMaster University's Human Performance Lab, *indirect calorimetry* is the second best way to measure RMR. Indirect calorimetry estimates energy expenditure by measuring expired respiratory gases only. Since it is focused on gases and is therefore independent on body size, body composition, age, gender, or race, it reduces the margin of error present when using an estimated equation.

Simple equations based on height, weight, age, body composition, and even race are great for groups but can over or underestimate your RMR by as much as 25% (Foster et al. 1988). This means that if you base your diet on this number you could either lose or gain less or more weight than intended, depending on your goal.

If you have been unsuccessful with following a caloric controlled diet as a way to lose weight, you should consider having your RMR tested. I do recommend that you rule other factors which are common causes of poor success on plans such as under-estimating food intake, low thyroid function or other hormonal problems.

Once you have your RMR estimated, you still need to accurately estimate your caloric expenditure outside of rest. There are several options available for this including:

- Multiplying your measured RMR by an activity factor (sedentary, moderate, active, very active)—this would be considered the least accurate method
- Estimating your calories burned in activities and daily expenditure using a table such as that available from: [www.my-calorie-counter.com](http://www.my-calorie-counter.com)
- Using a heart rate monitor to track your expenditure during exercise, such as the Polar OwnCal® functionality, and combining that with an estimate of your daily activities outside of exercise
- Use a good quality pedometer, accelerometer, or a monitor such as the Bodybugg® or Sensewear® pro armband devices.

Since we live a life of mixed activity levels, it may be necessary to combine a couple of the above options in order to get a complete picture. Here is an example using the above methods for calculating the calorie needs for a 140 lb office worker who runs approximately 30 minutes per day.

1) Measured RMR = 1550 calories (from indirect calorimetry testing)

## About Alexis

Alexis Williams is a registered dietitian and personal trainer in Burlington, Ontario. She is an avid runner and triathlete. Visit her website [www.transitionhealth.ca](http://www.transitionhealth.ca) for articles and tips or to contact Alexis for online or in-person nutrition coaching services. You can get recipes and nutrition tips by becoming a fan of Transition Health on Facebook or follow her on Twitter at @alexisrd.



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- 2) Office work, 8 hours/day = 764 calories (using website estimation)
- 3) Running, 30 minutes/day = 330 calories (using heart rate monitor calorie estimation)

Total expenditure = adjusted RMR (24 hours - 8.5 hours doing other activities) = 15.5 hours = 1001 calories  
Add in other expenditure = 1001 + 764 + 330 = 2095 calories burned per day

You can often get your RMR tested by the same clinics that test aerobic power (VO2 max). It involves much less effort than a VO2 max test, in fact you have to sit still and breathe into a mask for about 10-20 minutes. The test typically is conducted in the morning because you have to follow preliminary instructions such as:

- Fasted for at least 8 to 12 hours
- No caffeine or alcohol for at least 8 hours prior
- Well-hydrated
- No exercise for 12 hours prior

Many professionals who conduct tests offer packages of getting the VO2max test done right after the RMR test. This can be challenging and may lead to an incorrect VO2 assessment because you will be fasted and asked to go at full throttle without any gas in the tank. I would recommend scheduling these tests for different days.

What to look for in an RMR test:

The person testing has a university degree in Kinesiology, Exercise Physiology or Nutrition and can interpret the test results accurately

- The testing is done in a quiet place where a resting state can be achieved
- The equipments is serviced regularly

The typical cost for an RMR tests is \$100-\$250 depending on your location.

The RMR results may shock you. I have seen athletes whose actual results are more than 500 (see reference below) calories different than their predicted expenditure. To illustrate the importance of this knowledge, think of if you were training for a marathon. You are trying to eat 1800 calories but you really

need 2400 to fuel. You'd feel sluggish, tired and not necessarily know you weren't eating enough.

Like anything else in exercise and nutrition science, the more information you know about yourself, the more scientifically you can train. ❖

RMR comparison as determined by estimate vs. metabolic measurement of subjects of same height, weight, gender and age.

	1	2	3	4	5
Calories:					
Estimation	1724	1740	1743	1744	1743
Measured	1263	1523	1778	1979	2252
Difference	-461	-217	+65	+235	+509

\*Foster, GD et al. Metabolism 1988; 37 (5): 467-472

Foster G.D., T.A. Wadden, J.L. Mullen, A.J. Stunkard, J. Wang, I.D. Feurer, et al. "Resting Energy Expenditure, Body composition and Excess Weight in the Obese." Metabolism 1988; 37:467-72.

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