

CALCULATING YOUR DAILY CALORIC EXPENDITURES

Introduction

The Calorie is a unit of energy. Actually, the Calorie used to describe the energy content of foods is sometimes known as the "big Calorie" because it is really equal to 1000 "little calories" (note how the "big Calorie" is capitalized, but the "little calorie" is not). Thus sometimes we refer to the "big Calorie" as being equal to one kilocalorie (abbreviated "kcal"; note the prefix "kilo" means "one thousand"). A "little calorie" is enough energy to raise the temperature of one gram of water (one gram of water is about one quarter of a teaspoon) by one degree centigrade or Celsius. Thus a "big Calorie", or one kcal, is enough energy to raise the temperature of 1000 grams of water (= one liter or a little more than one quart) by one degree centigrade or Celsius.

From here on out, we will refer to the "big Calorie" merely as "Calorie." But keep in mind, some of your nutrition sources may refer to "kilocalories" or "kcal" instead of "Calories."

Calories are stored in the biological molecules that make up the food we eat. By "burning" these biological molecules through cellular respiration we release this energy for energy-requiring processes (e.g., normal metabolism and physical activity). When we eat more Calories than we burn, then the excess Calories may be stored as biological molecules (e.g., glycogen and/or fats) in our tissues and organs. Consequently, we gain weight.

If we burn more Calories than we eat, stored biological molecules in our tissues and organs must be used to meet these expenditures. As biological molecules are used through cellular respiration this way, we begin to lose weight.

This situation means that acquiring and maintaining a healthy body weight is really just a matter of balancing Caloric intakes with Caloric expenditures. You can calculate your Caloric intakes by adding up the Caloric contents of the food you eat. To calculate your Caloric expenditures, you need to calculate your resting metabolic rate (RMR) and the energy consumed due to exercise, or your thermal effect of exercise (TEE). These calculations are explained below.

Estimating Your Resting Metabolic Rate

Your resting metabolic rate (RMR) is the energy you expend while at rest (in Calories per day). Its actual value depends upon a number of factors including age, sex, body weight, and individual genetic factors. We will ignore the genetic factors and use a simplified approach to estimating your RMR based upon your age, sex, and body weight. The charts that follow present equations to use for calculating your daily RMR (in Calories per day).

But first you need to know your body weight expressed in kilograms (kg). To do this divide your weight in pounds (lbs) by 2.2. For example, a person weighing 154 lbs

weighs $154/2.2 = 70$ kg. You will use your weight in kilograms (kg) in the formulae presented in the charts below.

Estimating RMR in Males

Age Range (years)	Equation for RMR (Calories/day)
0-3	$(60.9 \times \text{weight}) - 54$
3-10	$(22.7 \times \text{weight}) + 495$
10-18	$(17.5 \times \text{weight}) + 651$
18-30	$(15.3 \times \text{weight}) + 679$
30-60	$(11.6 \times \text{weight}) + 879$
>60	$(13.5 \times \text{weight}) + 487$

Estimating RMR in Females

Age Range (years)	Equation for RMR (Calories/day)
0-3	$(61.0 \times \text{weight}) - 51$
3-10	$(22.5 \times \text{weight}) + 499$
10-18	$(12.2 \times \text{weight}) + 746$
18-30	$(14.7 \times \text{weight}) + 496$
30-60	$(8.7 \times \text{weight}) + 829$
>60	$(10.5 \times \text{weight}) + 596$

For example, if you are female, age 32, weighing 154 lbs, the formula to use is:

$$(8.7 \times \text{weight}) + 829$$

Since 154 lbs equals 70 kg, the equation becomes:

$$(8.7 \times 70) + 829,$$

which equals 1438 Calories/day.

Estimating Your Thermic Effect of Exercise

Your thermic effect of exercise (TEE) is the energy expended due to activity over and above your RMR. To estimate your total daily Caloric expenditure you need to add your TEE to your RMR.

As implied by its name, your TEE depends on how active you are. To simplify the estimation of your TEE we will define five levels of activity: Sedentary, Lightly Active, Moderately Active, Very Active, and Extremely Active. These levels are defined below.

Sedentary: Sometimes under the care of someone else. Resting metabolic rate plus a factor for minimal activities - playing cards, watching TV, reading, etc.

Lightly Active: Most students, office workers, and professionals; lawyers, doctors, shop workers, teachers, drivers, lab workers, playing a musical instrument, housewives/househusbands with mechanical appliances, unemployed persons. This includes eight hours sleep and 16 hours of sitting or standing. Three of the 16 hours must include light activity (walking, laundry, golf, ping pong) and one hour must be moderate activity (tennis, dancing, walking briskly, aerobics, etc.).

Moderately Active: Most persons in light industry, electrical, carpentry and building trades (excluding heavy laborers), many farm workers, soldiers not in active service, commercial fishermen, housewives/househusbands without mechanical appliances. If you have an office or driving occupation (see Lightly Active category), you may have to average 1.5 to 2 hours of exercise per day (like jogging 5 to 6 miles/day) to be "Moderately Active."

Very Active: Full time athletes, unskilled laborers, some agricultural workers (especially peasant farming), forestry workers, army recruits and soldiers in active service, mine workers, steel workers. This level requires moderate intensity activity for most of the work day or exercise comparable to running 9 to 13 miles/day.

Extremely Active: Lumberjacks, blacksmiths, female construction workers, heavy manual digging, rickshaw pullers, and coal mining. Moderate to high level of physical activity for most of the work day or exercise comparable to running 14 to 17 miles/day.

The table below presents activity factors used to calculate your TEE:

Level of Activity	Activity Factor	
	Men	Women
Sedentary	0.3	0.3
Lightly Active	0.6	0.5
Moderately Active	0.7	0.6
Very Active	1.1	0.9
Extremely Active	1.4	1.2

To calculate your TEE, multiply your RMR times the appropriate activity factor from the table above. For example, if you are a lightly active women, the activity factor to use is 0.5. If your calculated RMR is 1438 Calories/day (see above for calculation), then your TEE is calculated as follows:

$$\begin{aligned} \text{TEE} &= \text{RMR} \times \text{activity factor} \\ \text{TEE} &= 1438 \times 0.5 = 719 \text{ Calories/day.} \end{aligned}$$

Note that if you fall between the activity categories listed in the table estimate a value for your activity factor by extrapolating between the appropriate table values. For example, if you are a women whose activity level falls halfway between Lightly Active and Moderately Active, choose a value halfway between 0.5 and 0.6, or 0.55.

Estimating your Total Daily Caloric Expenditure

Follow the steps below to estimate your total daily caloric expenditure:

1. Get the sum of RMR and TEE.
2. Tack on another 10% of this sum for TEF*.
3. This total is your Total Daily Caloric Expenditure.
*TEF = Thermic Effect of Food (don't worry about what this means)

An example using the values for the 32 year old, 154 lb woman presented above is illustrated below:

1. $RMR + TEE = 1438 + 719 = 2157$
2. $TEF = 10\% \text{ of } 2157 = 0.1 \times 2157 = 215.7 \text{ (rounded off to 216)}$
3. $\text{Total Daily Caloric Expenditure} = 2157 + 216 = 2373 \text{ Calories/day}$