Wardlaw 7th Edition

direct calorimetry A method of determining a body's energy use by measuring heat released from the body. An insulated chamber is usually used.

indirect calorimetry A method to measure energy use by the body by measuring oxygen uptake. Formulas are then used to convert this gas exchange value into energy use.

Estimates of Energy Needs

As covered in Chapter 2, the Food and Nutrition Board has published a number of formulas to estimate energy needs, called Estimated Energy Requirements (EER). Those for adults are shown here (remember to do multiplication and division before addition and subtraction). (Formulas for pregnant women, lactating women, children, and teenagers, are listed in Chapters 14 and 15.) The calories used for basal metabolism are already factored into these formulas.

Estimated Energy Requirement Calculation for Men 19 years and older

$$EER = 662 - (9.53 \times AGE) + PA \times (15.91 \times WT + 539.6 \times HT)$$

Estimated Energy Requirement Calculation for Women 19 years and older

$$EER = 354 - (6.91 \times AGE) + PA \times (9.36 \times WT + 726 \times HT)$$

The variables in the formulas correspond to the following:

EER = Estimated Energy Requirement
AGE = age in years
PA = Physical Activity Estimate (see following table)
WT = weight in kilograms (pounds ÷ 2.2)
HT = height in meters (inches ÷ 39.4)

Formula

Physical Activity

Physical Activity (PA) Estimates

Activity Level	PA (Men)	PA (Women)
Sedentary (e.g., no exercise)	1.00	1.00
Low activity (e.g., walks the equivalent of 2 miles per day at 3 to 4 mph)	1.11	1.12
Active (e.g., walks the equivalent of 7 miles per day at 3 to 4 mph)	1.25	1.27
Very active (e.g., walks the equivalent of 17 miles per day at 3 to 4 mph)	1.48	1.45

Example

The following is a sample calculation for a man who is 25 years old, 5 feet, 9 inches (1.75 meters), 154 pounds (70 kilograms), and has an active lifestyle. His EER is:

$$EER = 662 - (9.53 \times 25) + 1.25 \times (15.91 \times 70 + 539.6 \times 1.75) = 2997 \text{ kcal}$$

The next equation is a sample calculation for a woman who is 25 years old, 5 feet, 4 inches (1.62 meters), 120 pounds (54.5 kilograms), and has an active lifestyle. Her EER is:

$$EER = 354 - (6.91 \times 25) + 1.27 \times (9.36 \times 54.5 + 726 \times 1.62) = 2323 \text{ kcal}$$

You have determined the man's EER to be about 3000 kcal and the woman's EER to be about 2300 kcal per day. Remember that this is only an estimate; many other factors, such as genetics and hormones, can affect actual energy needs.

A simple method of tracking your energy expenditure, and thus your energy needs, is to use the forms in Appendix E. Begin by taking an entire 24-hour period and listing all activities performed, including sleep. Record the number of minutes spent in each activity; the total should equal 1440 minutes (24 hours). Next record the energy cost for each activity in kcal per minute following the directions in Appendix E. Multiply the energy cost by the minutes. This gives the energy expended for each activity. Total all the kcal values. This gives your estimated energy expenditure for the day.

Chart

MyPyramid Calorie Guidelines

Children	Sedentary →	Active
2–3 years	1000 →	1400

Females	Sedentary →	Active
4–8 years	1200 →	1800
9–13	1600 →	2200
14–18	1800 →	2400
19–30	2000 →	2400
31–50	1800 →	2200
51+	1600 →	2200

Males	Sedentary →	Active
4–8 years	1200 →	2000
9–13	1800 →	2600
14–18	2200 →	3200
19–30	2400 →	3000
31–50	2200 →	3000
51+	2000 →	2800

CONCEPT CHECK

Energy use by the body can be measured as heat given off by direct calorimetry or as oxygen used by indirect calorimetry. A person's Estimated Energy Requirement can be calculated based on the following factors: gender, height, weight, age, and amount of physical activity.

Feel the burn — calories, that is

The truth is that you can exercise for five hours a day and not lose a pound if you are consuming everything in your cupboards each day. In order to lose weight or body fat, you need to burn more calories than you consume.

There are many ways to burn calories. There is exercise, which is the best way to burn a lot of calories in a short period of time and has many other benefits. The more you exercise, the more your metabolism will increase and the more muscle that you have, the more calories you will burn.

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You can also burn calories at rest. This is your natural body temperature and daily activities that will also help you burn calories, but it is not much to mention.

Consuming food, breathing, sleeping and talking are all examples of your internal furnace working. Exercise is an external factor that will help increase your chances of burning more calories.

The best way to exercise to burn calories is to vary your workouts between cardiovascular training and weight training.

The exercise program should vary each day in intensity, with the lower-intensity days producing longer workouts. Choose a few cardio activities that you enjoy and rotate them.

One day, do 30 minutes of high-intensity training; your heart rate should be in the 75-80 percent range of your target heart-rate zone. Do two days of medium-intensity training for 45 minutes (70 percent) and another day of low-intensity training for approximately one hour (60 percent-65 percent). Three times a week, do strength training on your shorter cardio days.

Calculating how many calories you are burning and consuming is the most important part. A person who is 5-foot-5 and weighs 160 pounds with 9 percent body fat will burn more calories than a person who is 5-5, weighs 160 and has 20 percent body fat. The more lean body mass you have, the more your body will burn.

To lose 1 pound of fat, you need to burn approximately 3,500 calories.

You can safely lose up to 2 pounds a week doing a one-hour cardio and weight-training program four days a week. You will burn approximately 300-500 calories per session.

The best way to achieve a 1- to 2-pound weight loss is to create a calorie deficit of 500 per day through exercise and proper meal planning. If you burn 300-350 calories in each workout, you will need to cut approximately 150-200 calories from your meal plan to lose 1 pound per week. To lose 2 pounds, you would need to add more exercise and/or cut your calories by 600-700 a day.

Use the worksheet in the rail to calculate the number of calories you need to maintain your current weight. Reduce that number by 500 calories a day to figure your goal intake for losing weight.

In order to maintain your weight loss or to make sure that you are not losing muscle while dieting, you should never lose more than 2 pounds per week. You may lose more than 2 pounds in the first week or two, however, because of water loss — not fat or muscle. That is all right.

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AT A GLANCE

FITNESS MATH

Figuring your target heart rate zone:

1. Start at 220.
2. Subtract your age.
3. Multiply that number by the percentage of targeted heart rate.

Example: For a 20-year-old working at a 60 percent target heart rate, the formula would be 220-20=200, 200x.60=120 beats a minute.

Figuring your calories per day:

1. Divide your weight in pounds by 2.2.
2. Mulitply your height in inches by 2.54.
3. Take the answer of step one and multiply by 9.6
4. Take the answer of step two and multiply by 1.8.
5. Multiply your age by 4.7.
6. Add 655 to the answer of step three and the answer of step four. Then subtract the answer of step five. This is your resting metabolic rate.
7. Multiply your resting metabolic rate (the answer to step six) by the appropriate activity factor. If you are sedentary (little or no activity), multiply by 1.2. If you are slightly active (light exercise one to three days per week), multiply by 1.375. If you are moderately active (moderate exercise/sports three to five days per week), multiply by 1.55. If you are very active (strenuous exercise six to seven days per week), multiply by 1.725.

The answer to this step is the minimum number of calories you need each day to maintain your present weight.

8. Start with the answer to step seven and subtract 500. This is the minimum number of calories you need each day to lose one pound per week.

PERSONAL CHALLENGE

For two weeks, at least twice a week, take out one of your favorite treats.

By cutting out small treats each day but still rewarding yourself at the end of the week, you will be able to cut 500 calories easy.

FIT TIP

Regular salad dressing is approximately 140 calories and 14 grams of fat per two tablespoons, and we all know that nobody uses only two tablespoons of dressing on their salad. If you were to substitute that with balsamic vinegar and a sugar substitute, you could meet your 500-calorie deficit.

— Michelle Rotell

Michelle Rotell Formula