

# The Energy Equation

**This basic “energy in, energy out” relationship can be expressed in the form of a simple equation:**

**Energy storage = Energy intake – Energy output**

- **In other words, the amount of excess energy stored by our body is the difference between the amount of energy taken in and the amount of energy expended.**

# Energy Nutrients and Calories

**The three energy nutrients in food supply calories in different amounts:**

- **1 gram of carbohydrate provides 4 calories**
- **1 gram of protein provides 4 calories**
- **1 gram of fat provides 9 calories**

# Sustaining Bodily Functions

- The energy that needs to be consumed in order to sustain essential bodily functions is known as one's **metabolic rate** (MR).
  - Bodily functions include such things as heartbeat, breathing, nervous system activity, active transport, and secretion.
  - Age, gender, weight, lean muscle mass, and general level of physical fitness affect your metabolic rate.

# Basal and Resting Metabolic Rate

**Two terms are used, sometimes interchangeably, to refer to metabolic rate.**

- **Basal metabolic rate (BMR)** is the term used when MR is measured using rigorous (laboratory) conditions, typically 12 to 14 hours after the last meal, with the individual completely at rest (but not asleep), and a background temperature of 26 to 30°C.
- **Resting metabolic rate (RMR)** is the term used to refer to an estimate of metabolic rate under less rigorous conditions.

# The Harris-Benedict Equation

The Harris-Benedict equation, dating back to 1918, is still widely used to arrive at a reasonably accurate estimate of RMR. The formula varies slightly for males and females:

- **Males**

$$\text{RMR} = 66.5 + (5 \times H) + (12.7 \times W) - (6.8 \times A)$$

- **Females**

$$\text{RMR} = 66.5 + (1.9 \times H) + (9.5 \times W) - (4.7 \times A)$$

In this equation, *W* equals a person's weight in kilograms; *H* equals height in centimetres; and *A* equals age in years. The result can then be multiplied by an "activity factor" to arrive at one's daily caloric need.

# A Quick Method for Calculating Daily Caloric Need

---

There is an easier way to calculate daily caloric need: First, roughly estimate your RMR—adult males can multiply their weight in kilograms by 24.2; adult females can multiply their weight in kilograms by 22.0. This RMR figure can then be multiplied by an “activity factor” to estimate your daily caloric need requirements. For example:

- A person who is relatively sedentary could multiply his or her RMR by a factor of 1.4.
- A person who is relatively active could multiply his or her RMR by a factor of 1.6.
- A person who is highly active could multiply RMR by a factor of 1.8.

# Body Mass Index (BMI)

**BMI is widely used to assess the extent to which individuals are underweight or overweight. It is calculated as the ratio of a person's weight to the square of his or her height:**

$$\text{BMI} = \text{WEIGHT (KG)} / \text{HEIGHT (M}^2\text{)}$$

## **Generally:**

- **People with a BMI of 25 to 30 are considered to be overweight.**
- **Those with a BMI score of 30 or more are considered obese.**
- **Individuals with a BMI of 18.5 or lower are considered to be underweight.**

# What's Flawed About the BMI Index?

**BMI is used worldwide to estimate body weight and to make comparisons across population groups.**

- **The main reason for this widespread use is that BMI is easy to measure and to compute.**
- **However, BMI does not distinguish between muscle mass and fat. Athletic individuals who may have heavy muscle mass could have a BMI indicating that they are obese.**
- **BMI is also not adjusted across population groups. Factors such as age and gender can make a big difference.**
- **Nevertheless, keep in mind that BMI is normally the calculation used around the world and in Canada in relation to body weight comparisons.**



# The Effect of Exercise on Fat Loss and Muscle Gain

---

**For most people, excess body weight impairs performance of physical activity.**

- **However, rapid and extreme weight loss can have many detrimental consequences.**
- **Total energy intake combined with energy expenditure are the most important things to consider in adjusting one's body weight.**
- **A gradual weight loss program ensures maximum fat loss along with the preservation of lean muscle tissue.**

# Is There An “Internal” Control Mechanism?

**Set-point theory suggests that individuals who are dieting become more obsessed with food as their body tries to regain its “set-point.” Therefore, the theory maintains, dieting can be pointless and frustrating.**

- **Whether you support this theory or not, it actually underlines the importance of a combined approach to altering body weight through limiting caloric intake and increasing physical activity**
- **Exercise, some experts believe, contributes to a lower “set-point” level.**
- **Exercise also increases the amount of muscle mass, which increases RMR.**