Measuring your metabolic rate

Dear Alice,

Can you tell me a way to figure out my basic metabolism?

Answer

Dear Reader,

By “basic metabolism,” do you mean metabolic rate? This measure typically refers to the calories used for basic physiological functions such as breathing, circulating blood, and repairing damaged cells. And, here’s something that may surprise you: these functions that you may not even really think much about account for almost 70 percent of a person’s daily calorie expenditure. There are two common metabolic rate measures: the basal metabolic rate (BMR) and the resting metabolic rate (RMR). The most accurate way of measuring either rate is by using a process called calorimetry. However, it can be a challenge because it require specific conditions and specialized equipment that may be expensive or not easily accessible to the average person (more on that in a bit). The good news is that even if a formal measurement is not in the cards, RMR can be roughly estimated through the use of a few different equations.

Before diving in, here’s a bit more about metabolism in general: when you consume any type of food or drink, your body creates energy by combining the calories the calories from what you consumed with oxygen. This energy fuels your body for various physiological processes that keep you alive and healthy, but also for other activities that require energy, such as walking from place to place or running a marathon. Another note about metabolism? it varies from person to person; it’s thought that it stems from a unique combination of genes, hormones, diet, and a person’s environment (which may include sleep patterns, physical activity levels, and stress). This is key to keep in mind when using any sort of calculation of metabolic rates.

So, how are metabolic rates determined? For a more precise measurement, either rate can be measured by direct or indirect calorimetry. Direct calorimetry measures the conversion of energy into heat using a specialized insulated chamber called a calorimeter. Indirect calorimetry measures oxygen consumption as a means of calculating energy expenditure. The indirect process has been noted as being a little less complicated and less expensive? but it’s good to keep in mind that’s in reference to it being utilized in a research setting. Back to the previously mentioned rates, certain conditions are required for each. BMR is usually
measured in very specific settings such as after a night’s sleep, on a fast, and without any physical activity, etc. While the RMR is similar to the BMR, the former is measured under less strict conditions and often doesn’t require fasting or having been asleep right before the measurement. So, when the appropriate equipment is available, RMR might be easier to determine given the more lax requirements. However, the tools and equipment to accurately measure either rate aren’t easy to access, it’s been noted that RMR can be estimated using parameters such as body weight, height, and age.

There are three common equations for estimating RMR: (1) the Harris-Benedict equation, (2) the Mifflin equation, and (3) the Cunningham equation:

**Harris-Benedict Equation** (widely used and relatively accurate for average body type):

- Males: \[ \text{RMR (in calories per day; cal/day)} = 66.47 + 6.23 \times \text{Weight in pounds (lbs)} + 12.67 \times \text{Height in inches (in)} - 6.76 \times \text{Age in years (yrs)} \]
- Females: \[ \text{RMR (cal/day)} = 655.1 + 4.34 \times \text{Weight (lbs)} + 4.69 \times \text{Height (in)} - 4.68 \times \text{Age (yrs)} \]

**Mifflin Equation:**

- Males: \[ \text{RMR (cal/day)} = 10 \times \text{Weight in kilograms (kg)} + 6.25 \times \text{Height in centimeters (cm)} - 5 \times \text{Age (yrs)} + 5 \]
- Females: \[ \text{RMR (cal/day)} = 10 \times \text{Weight (kg)} + 6.25 \times \text{Height (cm)} - 5 \times \text{Age (yrs)} - 161 \]

**Cunningham Equation** (uses fat-free mass, suggested for athletes):

- For males and females: \[ \text{RMR (cal/day)} = 500 + 22 \times \text{FFM (kg)} \]

Before you break out your calculator though, it’s good to be aware of the limitations of these equations. A key issue to point out is that they don’t work the same way in every population. For example, there hasn’t been enough research done yet on how the equations work in different ethnic groups and in elderly populations. What’s more, the Mifflin equation can predict a metabolic rate that falls within ten percent of the real rate for obese and non-obese people. Despite this relatively strong accuracy, its use is also specific to certain populations. These equations are also limited by the categorization based on sex assigned at birth. Because of the many factors that make a person unique and influence how their body functions, these equations are really best considered as an estimate of metabolism, not as a definitive measurement.

If you’d like to know more about your metabolic rate and how that factors into your overall health, consider talking with a health care provider or a registered dietitian (particularly when considering food as energy). It may also be helpful to read up on some of the Q&As in the Go Ask Alice! Nutrition and Physical Activity archives to learn more about properly fueling your body, being physically active, and your overall well-being.

Alice!

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Published date:
Jan 26, 1995
Last reviewed on:
May 26, 2017

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