Basal Metabolic Rate

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Basal Metabolic Rate (BMR)

Basal Metabolic Rate (BMR) is the amount of energy expended while at rest in a neutrally temperate environment, in the post-absorptive state (meaning that the digestive system is inactive, which requires about 12 hours of fasting in humans). BMR is influenced by various factors including age, gender, weight, height, and body composition.

Simplified version:

Your body is like a car that's always running—even when you're chilling on the couch! **BMR** is the energy (or calories) your body uses just to keep you alive and working while you're totally resting. Think breathing, pumping blood, or staying warm.

To measure BMR, scientists check how much energy you use after you've rested in a comfy room (not too hot or cold) and haven't eaten for about 12 hours (like after sleeping!).

Harris-Benedict equation

There are several formulas used to estimate BMR, with the **Harris-Benedict equations** being among the most well-known. Here are the formulas for estimating BMR:

1. **For Men:**

$$BMR = 88.362 + (13.397 \times \text{weight in kg}) + (4.799 \times \text{height in cm}) - (5.677 \times \text{age in years})$$

2. **For Women:**

$$BMR = 447.593 + (9.247 \times \text{weight in kg}) + (3.098 \times \text{height in cm}) - (4.330 \times \text{age in years})$$

Total Daily Energy Expenditure (TDEE)

Once you have calculated your **BMR**, you can use it to estimate your **Total Daily Energy Expenditure (TDEE)** by multiplying it by an activity factor that represents your daily physical activity level. The commonly used activity factors are:

- Sedentary (little or no exercise): **BMR × 1.2**
- Lightly active (light exercise/sports 1-3 days/week): **BMR × 1.375**
- Moderately active (moderate exercise/sports 3-5 days/week): **BMR × 1.55**
- Very active (hard exercise/sports 6-7 days a week): **BMR × 1.725**
- Extremely active (very hard exercise/sports & physical job or 2x training): **BMR × 1.9**

So, the formula for TDEE would be:

$$TDEE = BMR \times \text{Activity Factor}$$

Calculating TDEE - Example

Let's go through an example to calculate the Total Daily Energy Expenditure (TDEE) for a hypothetical person named Alexa. Alexa is a 30-year-old woman who weighs 70 kilograms, is 165 centimeters tall, and engages in moderate exercise 3-5 days a week.

Constant for woman

1. **Calculate BMR using the Harris-Benedict equation for women:**

$$BMR = 447.593 + (9.247 \times \text{weight in kg}) + (3.098 \times \text{height in cm}) - (4.330 \times \text{age in years})$$

$$BMR = 447.593 + (9.247 \times 70) + (3.098 \times 165) - (4.330 \times 30)$$

$$BMR \approx 447.593 + 647.29 + 511.47 - 129.9$$

$$BMR \approx 1476.453 \text{ calories per day}$$

2. **Calculate TDEE by multiplying BMR by the activity factor:**

Since Alex engages in moderate exercise 3-5 days a week, let's use the activity factor of 1.55.

$$TDEE = BMR \times \text{Activity Factor}$$

$$TDEE = 1476.453 \times 1.55$$

$$TDEE \approx 2289.014 \text{ calories per day}$$

Homework

Calculate TDEE for each individual of your family.