METABOLISM MATTERS!.....BUT WHAT IS IT?

Metabolism is sum of the processes in the body that help to maintain life- including the **conversion of foods into energy**. Understanding your metabolism, both at rest and during exercise, is key to successfully managing your weight, health, and fitness level.

How big of a role does metabolism play on weight gain?

The fundamental cause of obesity and overweight is an energy imbalance between ***caloric intake*** and ***caloric expenditure.*** Your metabolism determines how much energy (calories) you use to function, eat, and exercise. If you consume more calories (intake) than you burn in day (living and exercise), you create an imbalance in favor of excess caloric intake, and you gain weight! For example, if your Total Energy Expenditure is 2000 calories per day, and you eat 2500 calories a day, you will gain 1 pound by the end of the week (3500 calories = 1 pound of fat, 500 x 7 = 3500)!

Total Energy Expenditure (TEE) is composed of three sources of energy expenditure throughout the day:

1. **Resting Metabolic Rate (RMR):** This is how many calories you burn through your everyday body functioning and living activities.
   - This includes energy (calories) used for heartbeats, respiration, maintaining body temperature, and basic activities such as standing and essential walking.(60-70% of TEE).
   - This number tells you how many calories you need to eat per day (excluding exercise, see below) in order to MAINTAIN YOUR CURRENT WEIGHT. **RMR is very important for prescribing exercise and diet plans for weight management programs (weight loss, gain, or maintenance).**
   - This number *varies greatly from person to person*, but can be MEASURED in the ISU Exercise Physiology Lab using our **BODY GEM**!
     - A 5'7 150 lb. female bodybuilder would have a HIGHER RMR than her sedentary counterpart of the same height and weight, because the bodybuilder would require more energy to maintain her metabolically active muscles. The bodybuilder would be able to eat more food and not gain weight.

2. **Thermal effect of Feeding (TEF):** This is energy your body uses to digest food (10% of TEE) – small, frequent meals throughout the day will keep your TEF elevated throughout the day, burning more calories!

3. **Energy expended through Physical Activity:** This is the energy used for exercise and extra physical activity throughout the day (20-30% of TEE).
   - In order to burn 1 pound of fat, you must create a caloric deficit (calories expended are GREATER than calories consumed!) of 3500 calories (through diet and/or exercise). To lose 1 pound in 1 week, it would be reasonable to create a 500 calorie deficit per day (500 x 7 =3500).
   - By eating 200 calories less than TEE, and burning 300 calories through exercise per day, this goal can be achieved **– but how do you know if you have burned 300 calories?**
   - Exercise Energy Expenditure varies greatly from person to person, based on body weight, fitness level, and movement efficiency
   - **At ISU, we can MEASURE Exercise Energy Expenditure using the BODYBUGG or Sensormedics!**

HOW CAN THE ISU EXERCISE PHYSIOLOGY LAB HELP?

To get started on a weight management program:

1. Determine your baseline Body Composition (ratio of lean mass to fat mass):
    - See if you are at a healthy body composition, or to create a plan to get you to a healthy level to reduce your risk of cardiorespiratory and metabolic diseases. To measure your Body Composition, we will the **BodPod**:
    - The **Bod Pod** is the latest technology in body composition testing. It uses air displacement to measure body volume and then predict percentage of body fat. It requires you sit calmly in the Bod Pod for <1 minute wearing a swimwear or spandex clothing and a cap. It is highly accurate, very easy and provides instant results.

2. Measure your Resting Metabolic Rate using the **Body Gem**:
    - The **Body Gem** is a hand-held device that the client breathes into for 5-10 minutes, which measures the volume and rate of oxygen consumption at rest, which is directly related to the way they use burn calories (using oxygen for energy)

3. Monitor your exercise metabolic rate and determine your cardiovascular fitness with the **BodyBugg** and **Sensormedics** Technologies:
    - The **BODYBUGG** is worn as armband during exercise, and measures caloric expenditure through a number of physiological sensors, including an accelerometer, heat flux, galvanic skin response, and skin temperature. The data these 4 sensors collect, in conjunction with the wearer's specific body parameters (age, gender, height, weight) enable the most accurate estimation of energy expenditure on the market today outside of a clinical setting.

    - Our **Sensormedics Vmax** metabolic cart uses breath-by-breath measurement capabilities to collect extremely accurate gas exchange information. This system enables us to view and interpret real-time oxygen uptake, substrate use, and caloric expenditure among other variables during exercise. Using this system, we are able to measure your **VO2max** (the fastest rate that your body can process and use oxygen for aerobic energy - best measure of cardiovascular fitness), your **ventilatory threshold** (or aerobic threshold, the intensity at which your body switches from aerobic to anaerobic metabolism), and your **caloric expenditure at different exercise intensities**. While exercising, you will wear a headpiece, a noseclip, and breathe into a mouthpiece that will allow your gas exchange to be measured.