

Lecture 1 – introduction to energy expenditure

What is sport and exercise physiology?

The study of biological function and regulation. It concerns the mechanisms involved and the control of the changes and processes of the body. This can be viewed at different levels:

- Molecular
- Cellular
- Tissue
- systems
- whole organisms

Energy

The supply can be described using the 1st law of thermodynamics which is that, **energy can be transformed but never created or destroyed.**

Energy is measured in **Joules (J) or kilocalories (Kcal)**, (1Kcal = 4186J)

When using energy, heat is produced. **The expenditure of a fixed amount of energy always equals the production of a fixed amount of heat.**

How do we measure energy expenditure?

Calorimetry (DIRECT OR INDIRECT) – based on the assumption that **energy releasing actions in the body ultimately depend on oxygen**

- The caloric equivalent of oxygen = respiratory exchange ratio (RER)
- $RER = VCO_2 \text{ produced} / VO_2 \text{ consumed}$
- Energy expenditure = volume of oxygen consumed X kcal equivalent or:
- $EE(\text{kcal}/\text{min}) = VO_2 (\text{L}/\text{min}) \times RER (\text{kcal}/\text{L})$

Daily energy expenditure

At rest we consume:

- Per minute = 0.3L (equivalent to a can of coke)
- Per hour = 18L
- Per day = 432L

RER at rest = 2074 kcal/day + energy for normal daily tasks (1800 – 3000)