



# **SNS COLLEGE OF TECHNOLOGY**

**An Autonomous Institution  
Coimbatore – 35**

Accredited by NBA – AICTE and Accredited by NACC – UGC with 'A+ Grade  
Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai.

## **DEPARTMENT OF AGRICULTURE ENGINEERING**

**19AGE307 – ERGONOMICS OF FARM MACHINERY AND IMPLEMENTS**

**III – YEAR VI SEMESTER**

**UNIT 1 – INTRODUCTION**

**TOPIC – BASAL METABOLISM AND WORK METABOLISM**



## Basal Metabolic Rate (BMR)

- This is the energy expended in the resting fasting state, and is the energy required to carry out normal body functions such as breathing.
- It is the energy that the person would use simply lying in bed all day



## Basal Metabolic Rate (BMR)

### Measurement of BMR

- **Measure 12-18 hrs after eating**
- **At complete physical and mental rest**
- **In a comfortable environment**
- **Free from anxiety**



## Basal Metabolic Rate (BMR)

- BMR serves as the baseline for energy expenditure. It represents the minimum amount of energy required to sustain life and is influenced by factors such as age, gender, body composition, and genetics.
- BMR is typically measured under controlled conditions, such as waking up in the morning after a period of rest and in a thermally neutral environment. The Harris-Benedict equations and indirect calorimetry are common methods for estimating BMR.
- Factors influencing basal metabolism include age, gender, body composition, genetics, and hormonal factors. Individuals with higher muscle mass tend to have higher basal metabolic rates.



## Basal Metabolic Rate (BMR)

- Understanding basal metabolism is essential for determining the baseline energy requirements of individuals. It helps in assessing the minimum energy needed for maintaining basic physiological functions, which is critical for designing work-rest schedules and evaluating the overall energy demands of work tasks.
- Knowledge of basal metabolism and work metabolism is used to design appropriate work-rest schedules. Balancing periods of physical activity with adequate rest intervals helps prevent fatigue and promotes overall worker well-being.



# Work Metabolism

- Work metabolism refers to the additional energy expended during physical activities or work tasks beyond the basal metabolic rate. It includes the energy required for occupational activities, exercise, and other physical efforts.
- Work metabolism can be measured using various techniques, including indirect calorimetry, which assesses oxygen consumption and carbon dioxide production during physical activities. Heart rate monitoring and subjective assessments like the Rating of Perceived Exertion (RPE) may also be used.
- The energy expended during work tasks depends on the intensity, duration, and type of activity. Factors such as body posture, lifting and carrying loads, repetitive movements, and the overall physical demands of the job contribute to work metabolism.



# Work Metabolism

- Work metabolism is crucial in ergonomics for assessing the energy demands of specific tasks and designing work environments that consider the physiological requirements of the job. Understanding work metabolism helps prevent overexertion, fatigue, and injuries.
- Understanding work metabolism is essential for evaluating the physiological demands of specific job tasks. It allows ergonomists to assess whether the energy demands are within acceptable limits and helps in designing workstations and tasks that minimize the risk of fatigue and musculoskeletal disorders.



## Factors affecting BMR

- 1) **Age:** During the period of active growth, BMR is high. It reaches a maximum by five years of age. BMR is lowered in old age.
- 2) **Sex :** Males have higher BMR than females.
- 3) **Environmental temperature:** BMR increases in cold climate as a compensatory mechanism to maintain body temperature.
- 4) **Exercise :** Due to increased cardiac out, BMR increases in exercise.





# Integration in Ergonomic Assessments



## ➤ Total Daily Energy Expenditure (TDEE):

The sum of basal metabolism, work metabolism, and other components such as the thermic effect of food represents the total daily energy expenditure (TDEE). TDEE provides a comprehensive view of the energy demands placed on individuals throughout the day.

## ➤ Work-Rest Schedules:

Knowledge of basal metabolism and work metabolism is used to design appropriate work-rest schedules. Balancing periods of physical activity with adequate rest intervals helps prevent fatigue and promotes overall worker well-being.



*Thank You!*