



SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

Vision Tit 2

Vision Title 3

Course Name: 19BMB301 Diagnostic & Therapeutic Equipment

III Year : V Semester

Unit IV – SENSORY EQUIPMENT

Topic : Psycho-Physiological Measurements



Psycho-Physiological Measurements

Psycho-physiological measurements are techniques used to assess the relationship between psychological states and physiological responses. They provide valuable insights into emotional, cognitive, and physiological processes. Common measurements include EEG, ECG, SCR, respiration rate, and pupil dilation. These techniques are used in various fields, including psychology, neuroscience, and human-computer interaction.



Types of Psycho-Physiological Measurements

- Central Nervous System Measures
- Cardiovascular Measures
- Peripheral Nervous System Measures
- Other Measurements



Central Nervous System Measures

Electroencephalography (EEG)

- **Purpose:** Measures electrical activity in the brain.
- **Applications:** Studying cognitive processes (e.g., attention, memory, problem-solving), emotional states (e.g., anxiety, stress, happiness), and arousal levels.
- **Advantages:** High temporal resolution, non-invasive, relatively inexpensive.
- **Limitations:** Susceptible to noise from muscle activity and external interference.



Magnetoencephalography (MEG)

- **Purpose:** Records magnetic fields produced by electrical currents in the brain.
- **Applications:** Similar to EEG but offers better spatial resolution.
- **Advantages:** Non-invasive, high spatial resolution, less susceptible to noise from muscle activity.
- **Limitations:** More expensive and requires specialized equipment.



Cardiovascular Measures

Electrocardiography (ECG)

- **Purpose** : Records the electrical activity of the heart.
- **Applications** : Assessing heart rate, rhythm, and abnormalities.
- **Advantages** : Widely used, relatively inexpensive
- **Limitations** : Can be influenced by movement and external interference.



Blood Pressure

- **Purpose** : Measures the pressure exerted by the blood against the walls of the arteries.
- **Applications** : Assessing cardiovascular health, stress responses, and autonomic nervous system function.
- **Advantages** : Widely used, relatively inexpensive.
- **Limitations** : Can be influenced by factors such as anxiety and cuff placement.



Heart Rate Variability (HRV)

- **Purpose** : Analyzes the fluctuations in heart rate.
- **Applications** : Assessing autonomic nervous system activity, stress levels, and emotional states.
- **Advantages** : Sensitive to subtle changes in physiological state.
- **Limitations** : Requires specialized analysis techniques.



Peripheral Nervous System Measures

Skin Conductance Response (SCR)

- **Purpose** : Measures changes in the electrical conductivity of the skin.
- **Applications** : Assessing arousal, emotional responses, and autonomic nervous system activity.
- **Advantages** : Sensitive to subtle changes in emotional state, relatively inexpensive.
- **Limitations** : Can be influenced by factors such as temperature and humidity.



Respiration Rate and Depth

- **Purpose** : Measures the rate and depth of breathing.
- **Applications** : Assessing arousal, emotional states, and stress levels.
- **Advantages** : Relatively easy to measure.
- **Limitations** : Can be influenced by factors such as physical activity and anxiety.



Pupil Dilation

- **Purpose** : Measures changes in pupil size.
- **Applications** : Assessing arousal, attention, and emotional states.
- **Advantages** : Non-invasive, can be measured remotely.
- **Limitations** : Can be influenced by factors such as lighting conditions and individual differences.



Other measurements

- **Electromyography (EMG)** : Measures the electrical activity of muscles, providing information about muscle tension and arousal.
- **Salivary Cortisol** : Measures cortisol levels in saliva, a hormone associated with stress and arousal.
- **Blood Oxygen Level Dependent (BOLD) Signal** : Used in functional magnetic resonance imaging (fMRI) to measure changes in blood flow related to brain activity.