# SNS COLLEGE OF PHYSIOTHERAPY
# COIMBATORE-35

**COURSE : BPT**
**SUBJECT : PT – NEURO**
**TOPIC :MOTORCONTROL**
**UNIT : II**

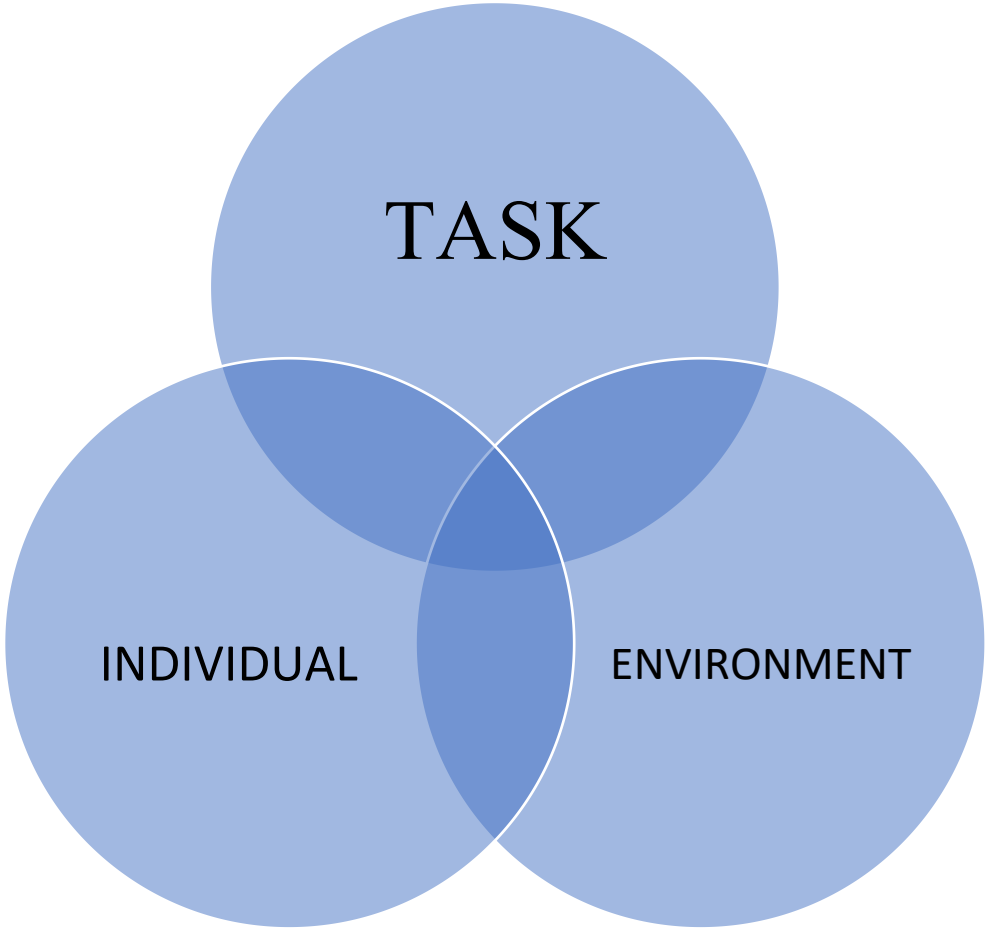
**PREPARED BY : MURSHIDHA YASMINE**
**ASSISTANT PROFESSOR**

# MOTOR CONTROL

# DEFINITION

- It is defined as the ability to regulate or direct the mechanisms essential to movement.
- It is the systematic regulation of movement in organisms that possess a nervous system.

# NATURE OF MOVEMENT



# FACTORS WITHIN THE INDIVIDUAL THAT CONSTRAIN MOVEMENT

- Movement emerges through the cooperative effort of many brain structures and processes.
- Main factors are

1. Perception
2. Cognition
3. Action

# I. MOVEMENT AND ACTION

- Movement is often described within the context of accomplishing a particular action.
- Eg., walk, run, talk, smile, reach, or stand still

# II. MOVEMENT AND PRECEPTION

- Perception is the integration of sensory impressions into psychologically meaningful information.
- Sensory/ perceptual systems provides information about the state of the body and features within the environment critical to the regulation of movement

# III. MOVEMENT AND COGNITION

- Cognition process includes attention, motivation and emotional aspects of motor control the underlie the establishment of intent or goals.

# Classification based on task analysis

- Tasks can be analyzed and classified using specific attributes that are inherent in the task
- **Discrete vs continuous tasks:**
- **Discrete movement** tasks has a recognizable beginning and end.
- Eg., kicking or throwing a ball, moving from sitting to standing, and lying down in bed.
- The end point in a discrete task is an inherent attribute of the task itself and cannot be arbitrarily defined by the performer.
- **Continuous movements** have no recognizable beginning or end.
- The end point of the task is nota an inherent characteristic of the task but is decided arbitrarily be the performer.
- Eg., walking, running, swimming, and biking

# Classification based on task analysis

- **Serial movements** are defined as a series of discrete movements that are performed together.
- At first they appear as a continuous but are actually composed of an ordered series of discrete movements.
- Eg., dressing, cooking, grooming, and toileting

# STABILITY VS MOBILITY TASKS

- Stability/mobility: Base of support is still or in motion.
- Stability eg., sitting, standing
- Mobility eg., walking, running
- Between these two ends are tasks that entail more complex movements over a modified  base of support such as moving from sitting to standing.

# MANIPULATION CONTINUUM

- Movement tasks have also been classified using a manipulation component.
- Manipulation involved in the task can range from none to relatively simple manipulation tasks that do not have a large accuracy component to more complex tasks that may require both speed and accuracy.
- Manipulation tasks that require both speed and accuracy increase the demands on the postural system,

# OPEN VS CLOSED TASKS

- It is based on the task-environment interaction.
- **Open tasks:** Essential attributes are variability and flexibility, since they are performed in unpredictable environments,
- The are performed in a constantly changing environment making the ability to plan a movement difficult.
- Eg., playing soccer, tennis
- Open tasks require performers to adapt their behavior to a constantly changing environment.
- Performer must develop a broad repertoire of movements allowing quick and responsive adaptation to changing environmental conditions.

- **Closed tasks:** characterized by fixed, habitual patterns of movement with minimal variations that are performed in relatively fixed environments.
- They are relatively **stereotyped**, showing little trial to trial variation.
- Because of their stereotyped nature, closed movement tasks may have lower information processing and attentional demands than open movement tasks, which place larger demands on information processing systems.
- Between these two extremes, some movements are carried out in the Semi-predictable environments, for eg., walking and carrying a bag of groceries or walking a dog that is fairly well behaved on leash.

# Taxonomy of movement tasks

- A taxonomy of movement tasks can provide a framework for functional examination, since it allows a therapist to identify  the specific kinds of tasks that are difficult for the patient.
- Serve as a progression for retraining functional movement in the patient with a neurological disorder.

# MOVEMENT ANALYSIS

- Three  levels of analysis
- **Analysis at the Action level**
- Examines the behavioral outcome that results from the interaction of the individual, the task, and the environment.
- Eg., was the patient able to get out of bed when attempting to do so.
- **Analysis at the Movement level**
- Used to perform the functional tasks
- Eg., movement strategy used to move from lying supine in bed  to standing next to the bed can be described.
- **Analysis at the Neuromotor level**
- Goal directed behavior can be analyzed from the perspective of the underlying processes that contribute to the movement being performed.
- Eg., examining the integrity of individual systems important  to movement such as sensation, perception, motor coordination, and strength.

# THEORIES OF MOTOR CONTROL

- A theory of motor control is a group of abstract ideas about the control of movement.
- A theory is a set of interconnected statements that describe unobservable structures or processes and relate them to each other and to observable events.

# THEORIES OF MOTOR CONTROL

- Reflex theory
- Hierarchial theory
- Motor programming theory
- Systems theory
- Dynamical action theory
- Ecological theory

# Advantages and disadvantages of using theories in clinical practice

- A framework for interpreting behavior :
- But the theory has not helped you as a clinician if it has limited your ability to explore other possible explanations for your patient's behavior
- A guide for clinical action:
- New ideas: dynamic and evolving
- Working hypothesis for examination and intervention