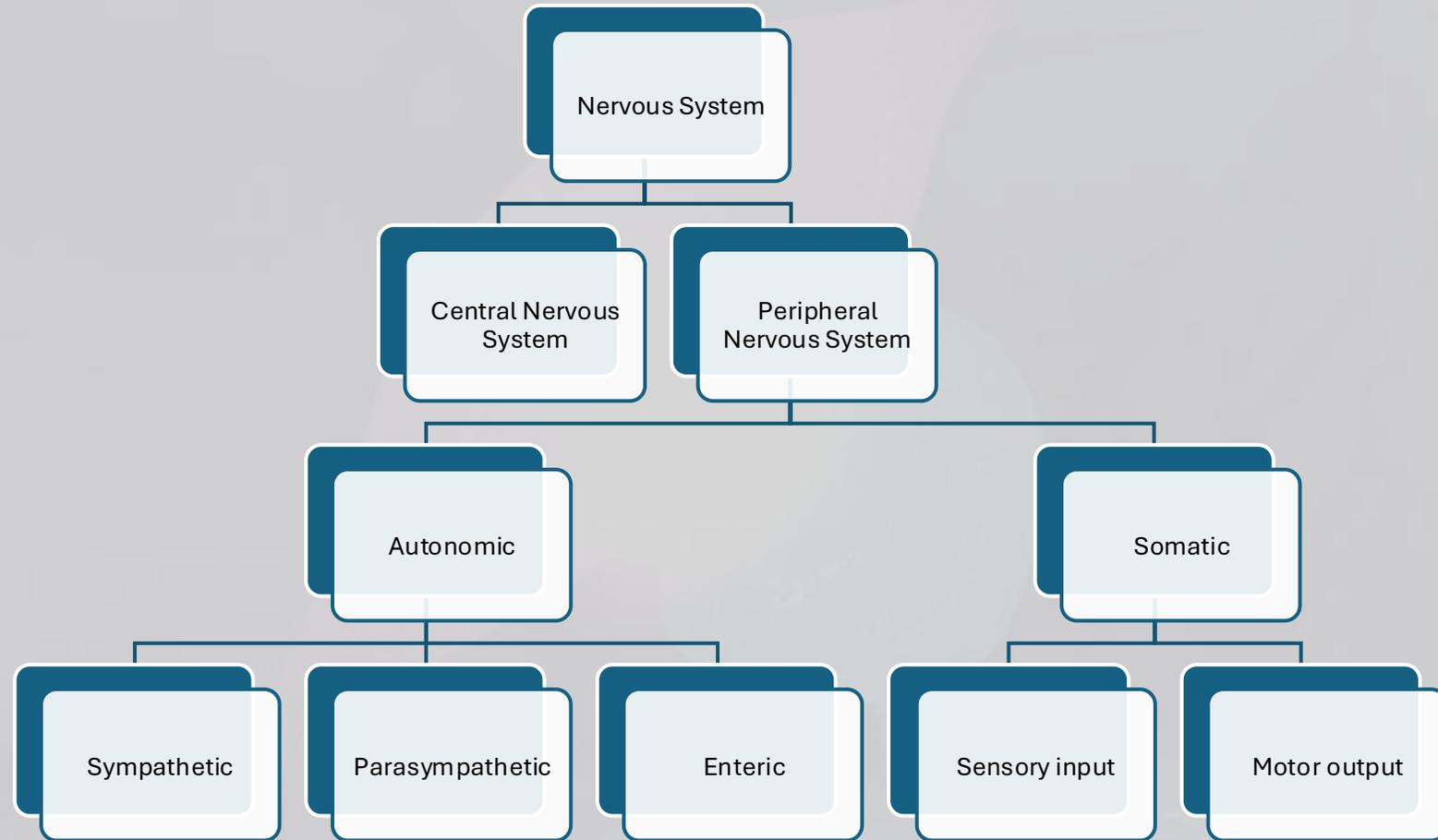Nervous System Essentials

Nervous System Overview

Central Nervous System (CNS)

Role: command centre – processing, integration, meaning-making

Brain

- Interprets sensory input
- Generates motor output
- Regulates emotion, cognition, memory, behaviour
- Coordinates autonomic regulation via brainstem & hypothalamus

Spinal cord

- Main communication highway between brain and body
- Coordinates reflexes (fast, protective responses)
- Integrates sensory input with motor output segmentally

Peripheral Nervous System (PNS)

Role: communication network – linking CNS with the rest of the body

Includes **all nerves outside the brain and spinal cord.**

PNS – Cranial Nerves (12 pairs)

Role: direct brain–body communication, especially head & viscera

Originate from the brain / brainstem

Innervate:

- Eyes, face, jaw, tongue
- Hearing & balance
- Smell & taste
- Heart, lungs, digestive organs (via vagus nerve)

Carry **sensory, motor, and parasympathetic fibres**

Clinically & somatically relevant: vision, facial expression, swallowing, vocal tone, vagal regulation.

PNS – Spinal Nerves (31 pairs)

Role: segmental organisation of body–brain communication

Emerge from spinal cord

Each spinal nerve contains:

- **Sensory fibres** (from body → CNS)
- **Motor fibres** (from CNS → muscles)
- **Autonomic fibres** (to organs, vessels, glands)

Organised by spinal level (cervical, thoracic, lumbar, sacral)

PNS – Peripheral Nerves

Role: distribution & coordination

- Formed from spinal nerve branches
- Travel long distances to limbs and organs
- Examples: sciatic, femoral, median, ulnar nerves
- Mixed nerves (sensory + motor + autonomic)

Somatic Nervous System

Role: conscious interaction with the world

Voluntary + conscious

- Skeletal muscle control (movement, posture)

- Conscious sensation:
  - Touch
  - Pain
  - Temperature
  - Proprioception (position & movement)

- Fast, precise signalling

This is where movement practices, motor learning, and body awareness live.

Autonomic Nervous System (ANS)

Role: regulation, survival, internal balance

Involuntary + mostly unconscious

Controls:

- Heart rate & blood pressure
- Breathing rhythm
- Digestion & elimination
- Immune & inflammatory tone
- Hormonal stress responses

ANS – Sympathetic Nervous System

- Mobilisation
- Action, alertness, protection
- Increases heart rate, redirects blood to muscles

ANS - Parasympathetic Nervous System

- Restoration
- Digestion, repair, social engagement
- Slows heart rate, supports gut & immune function
- Major nerve: **vagus nerve**

ANS – Enteric Nervous System

- Intrinsic nervous system of the gut
- Can function independently
- Deeply interconnected with emotion, stress, immunity

Sensory Systems (inpout side)

Role: information gathering – shaping perception, regulation, response

Types of sensory input:

- **Exteroception**
  - Information from the external world
  - Touch, sound, light, temperature
- **Proprioception**
  - Position, movement, force
  - Muscle spindles, joint receptors
  - Foundational for coordination & safety
- **Interoception**
  - Internal state sensing
  - Breath, heartbeat, hunger, visceral tone
  - Central to emotional regulation & self-awareness

Sensory Systems - Vestibular System

Role: Balance, orientation, movement in space

- Head position and motion
- Strong links to posture, coordination, and autonomic state

Placement:

- **Peripheral sensory organ** (inner ear)
- Signals travel via **cranial nerve VIII** (vestibulocochlear nerve)
- Project directly to:
    - Brainstem (autonomic integration)
    - Cerebellum (coordination)
    - Cortex (conscious awareness of movement)
- This bypasses higher cortical processing early on – fast, reflexive, protective.

Importance:

- Vestibular input directly shapes **arousal and regulation**
- Fast, unpredictable movement can be activating
- Slow, rhythmic, orienting movement tends to be organising
- Rocking, spirals, head-neck relationships, and changes in orientation are powerful tools – but require pacing

This is one of the quiet bridges between **movement, safety, and regulation**.