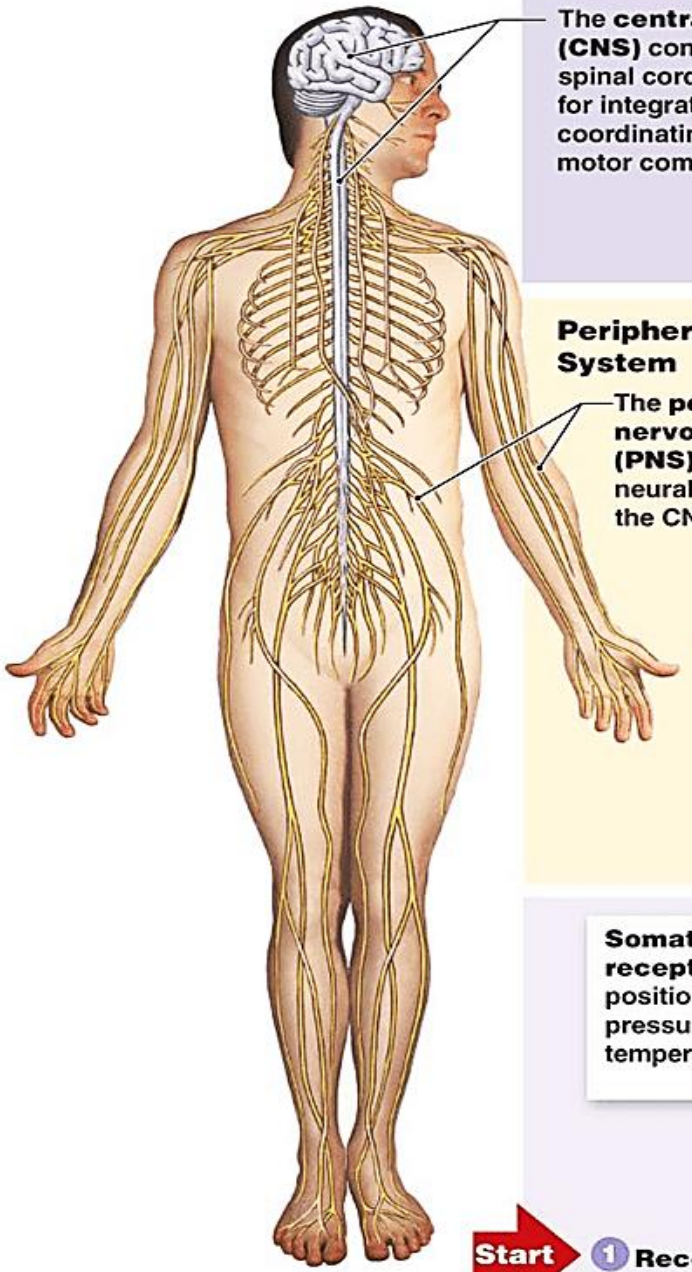
PNS

Nervous System



Central Nervous System

The **central nervous system (CNS)** consists of the brain and spinal cord and is responsible for integrating, processing, and coordinating sensory data and motor commands.

Peripheral Nervous System

The **peripheral nervous system (PNS)** includes all the neural tissue outside the CNS.

3 **Information processing** includes the integration and distribution of information in the CNS.

4 The **motor division** of the PNS carries motor commands from the CNS to peripheral tissues and systems.

includes

The **somatic nervous system (SNS)** controls skeletal muscle contractions.

The **autonomic nervous system (ANS)** provides automatic regulation of smooth muscle, cardiac muscle, glands, and adipose tissue.

2 The **sensory division** of the PNS brings information to the CNS from receptors in peripheral tissues and organs.

Somatic sensory receptors provide position, touch, pressure, pain, and temperature sensations.

Special sensory receptors provide sensations of smell, taste, vision, balance, and hearing.

Visceral sensory receptors monitor internal organs.

Skeletal muscle

- Smooth muscle
- Cardiac muscle
- Glands
- Adipose tissue

Start

1 **Receptors** are sensory structures that detect changes in the internal or external environment.

5 **Effectors** are target organs whose activities change in response to neural commands.

Peripheral nervous system

- Peripheral nervous system (PNS) is divided into a somatic nervous system (SNS) and autonomic nervous system (ANS). The ANS usually operates without conscious control. However, centers in the hypothalamus and brainstem do regulate ANS reflexes.
- Most of the nerves of the peripheral nervous system are composed of sensory nerve fibres transmitting afferent impulses from sensory organs to the brain, and motor nerve fibres transmitting efferent impulses from the brain to the effector organs, e.g. skeletal muscles, smooth muscle and glands.
- The majority of the body organs are supplied by both sympathetic and parasympathetic nerves, which have opposite effects that are finely balanced
- *Sympathetic stimulation* prepares the body for 'fight or flight' to deal with exciting and stressful situations, like danger, extreme environmental conditions. A range of emotional states, e.g. fear, embarrassment and anger, also cause sympathetic stimulation. Additional effects are an increase in the metabolic rate and increased conversion of glycogen to glucose. During exercise, e.g. fighting or running away, when oxygen and energy requirements of skeletal muscles are greatly increased, these changes enable the body to respond quickly to meet the increased energy demand.
- *Parasympathetic stimulation* has a tendency to slow down body processes except digestion and absorption of food and the functions of the genitourinary systems. Its general effect is that of a 'peace maker', allowing restoration processes to occur quietly and peacefully

Muscarinic receptors:

Receptor	G-protein	Messenger	Effect	Example Functions
M_1	G_q	Phospholipase C & IP_3 increased	elevated Ca^{++}	salivary gland & stomach secretion
M_2	G_i	cAMP decreased	decreased Ca^{++} influx & increased K^+ efflux	decreased heart rate and force
M_3	G_q	Phospholipase C & IP_3 increased	elevated Ca^{++}	constriction of vessels & bronchioles detrusor contraction (micturition)
M_4	G_i	cAMP decreased	decreased Ca^{++} influx & increased K^+ efflux	inhibitory effects
M_5	G_q	Phospholipase C & IP_3 increased	elevated Ca^{++}	present in CNS

Adrenergic receptors:

Receptor	G-protein	Messenger	Effect	Example Functions
α_1	G_q	Phospholipase C & IP_3 increased	elevated Ca^{++}	cutaneous & GI vasoconstriction; urethral sphincter contraction
α_2	G_i	cAMP decreased	decreased Ca^{++} influx	inhibition of neurotransmitter release
β_1	G_s	cAMP increased	elevated Ca^{++}	increased cardiac output (rate & force)
β_2	G_s G_i	cAMP increased cAMP decreased	elevated Ca^{++} decreased Ca^{++} influx & increased K^+ efflux	constriction of gut sphincters muscle vessel dilation; detrusor relaxation
β_3	G_s G_i	cAMP increased cAMP decreased	elevated Ca^{++} decreased Ca^{++} influx & increased K^+ efflux	adipose tissue lipolysis detrusor relaxation