How is the Autonomic Nervous System Organised?

Worksheet

The ANS has three divisions: sympathetic (thoracolumbar T1-L2), parasympathetic (craniosacral S2-S4 + CN III, VII, IX, X), and enteric (gut). They use acetylcholine (ACh) or noradrenaline (NA) and often have opposite physiological effects on the same organ.

Questions

1. Which spinal levels carry sympathetic fibres?

A) C1-C8
B) T1-L2
C) L3-S5
D) S1-Co1

2. A patient's pupil does not dilate in dim light. Which system is impaired?

A) Parasympathetic
B) Sympathetic
C) Somatic motor
D) Sensory

3. The vagus nerve (CN X) carries parasympathetic fibres that slow the heart via which neurotransmitter?

A) Noradrenaline
B) Dopamine
C) Acetylcholine
D) Serotonin

4. A patient presents with a dilated, unresponsive pupil and cannot focus (accommodation). Which system is blocked?

A) Sympathetic (to the eye)
B) Parasympathetic (to the eye)
C) Somatic motor
D) Afferent sensory

5. Why does your heart rate increase during a sprint, and how does it return to normal after?

6. Why does your mouth dry during anxiety, but salivate when eating food?

7. A patient takes a beta-blocker (sympathetic antagonist). What physiological changes occur?

8. Define: What are the two main divisions of the autonomic nervous system?

9. Define: Where does the sympathetic nervous system originate?

10. Define: Which cranial nerves carry parasympathetic fibres?

Answer Key

1. B) T1-L2 - Sympathetic fibres arise from thoracolumbar T1-L2 spinal cord. The term 'thoracolumbar outflow' describes this origin.

2. B) Sympathetic - Pupil dilation (mydriasis) is a sympathetic effect via noradrenaline on radial muscle. Impaired sympathetic pupils cannot dilate in dim light.

3. C) Acetylcholine - CN X (Vagus) releases acetylcholine (ACh) onto cardiac muscarinic receptors, decreasing heart rate. This is the vagal brake effect.

4. B) Parasympathetic (to the eye) - Parasympathetic CN III controls iris constriction and lens accommodation. Anticholinergic drugs or CN III palsy cause dilated, unresponsive pupils.

5. Sprint activates sympathetic nervous system (T1-L2): - Noradrenaline on sinoatrial (SA) node increases heart rate - Increased cardiac output supports muscle activity After sprint, parasympathetic (vagus, CN X) dominates: - Acetylcholine on SA node decreases heart rate - Calm signal via vagal tone restores baseline

6. Anxiety activates sympathetic system: - Noradrenaline inhibits salivary glands - Mouth dries (sympathetic prioritises other organs) Eating food activates parasympathetic: - Acetylcholine (from CN VII, CN IX) enhances salivary glands - Saliva secretion aids digestion

7. Beta-blockers block noradrenaline at cardiac receptors: - Heart rate decreases - Cardiac force decreases - Blood pressure drops - Useful in hypertension and angina, but can cause fatigue

8. Sympathetic ('fight-or-flight') and parasympathetic ('rest-and-digest'). They often have opposing effects on organs.

9. The thoracolumbar region: T1-L2 spinal cord segments. Fibres exit via thoracic and lumbar spinal nerves.

10. CN III (Oculomotor), CN VII (Facial), CN IX (Glossopharyngeal), and CN X (Vagus). Together they supply parasympathetic functions to the head and trunk.