

spinal nerve pairs

Numbered by level of vertebral column at which they emerge

8 Cervical nerve pairs (C1-C8)

12 Thoracic nerve pairs (T1-T12)

5 Lumbar nerve pairs (L1-L5)

5 Sacral nerve pairs (S1-S5)

1 Coccygeal nerve pair

4 major nerve plexuses

cervical plexus located in neck (C1-C4); individual nerves that come out from cervical plexus they supply muscles and skin of neck, upper shoulders and part of head with nerves; phrenic nerve exit plexus to innervate diaphragm

brachial plexus located deep in shoulder; ventral rami C5 to T1; individual nerves from brachial plexus innervate lower part of shoulder and entire arm

lumbar plexus located in lumbar region of back; L1 to L4; femoral nerve exits; divides into branches and innervates thigh and leg

sacral plexus located in pelvic cavity; L4 to S4; innervates skin of leg, posterior thigh muscles leg and foot muscles

coccygeal plexus (S4-S5) skin of coccyx bone

Motor Autonomic Pathways

preganglionic neuron impulses from CNS to autonomic ganglion

Motor Autonomic Pathways (cont)

postganglionic neuron lies outside CNS, synapses with a preganglionic neuron, terminates in a visceral effector

AUTONOMIC NERVOUS SYSTEM

Sympathetic Effects (fight or flight)	structure	Parasympathetic Effects (rest and repair)
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Dilation of pupil	eye	constriction of pupil
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Stop secretion	salivary glands	secrete saliva
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speed up heartbeat	heart rate	Slow down heartbeat
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secrete adrenaline	suprarenal glands	None – not innervated
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dilate bronchioles	respiratory system	constrict bronchioles
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increase force of breakdown	skeletal muscles	non not innervated
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lipid breakdown	adipose tissue	none not innervated
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delay emptying	urinary system	empty bladder
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decrease motility	digestive system	increase motility
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Interaction of ANS Divisions

Sympathetic and parasympathetic divisions work together to keep many body functions within homeostatic range

Both divisions innervate many same organs where actions antagonize one another--dual innervation

Interaction of ANS Divisions (cont)

Allows sympathetic division to dominate during physically demanding periods

Parasympathetic division preserves homeostasis in same organs between periods of increased physical activity

AUTONOMIC TONE: neither division ever completely shut down • Constant amount of activity from each division

Autonomic NTs: Acetylcholine

Axon terminal of autonomic neurons release one of two NTs

1 Acetylcholine (Ach) cholinergic fibres

a. Released by preganglionic sympathetic neurons (excitatory)

b Released by pre- & postganglionic parasympathetic neurons

Termination of Ach action is by acetylcholinesterase (AChE)

Two types of cholinergic receptors:

1 Nicotinic receptors – excitatory, found in ganglia (on postganglionic neuron)

2 Muscarinic receptors – excitatory or inhibitory, found in synapses with effector organs and sweat glands

2 Norepinephrine released by adrenergic fibres; Released by most postganglionic sympathetic neurons

Termination of actions of NE:

1 Monoamine oxidase (MAO): enzyme breaks up NT for reuptake

Autonomic NTs: Acetylcholine (cont)

2 Catechol-O-methyl transferase (COMT): enzyme metabolizes remaining NT

spinal nerve attaches to spinal cord 2 short roots

1 a ventral motor root

2 a dorsal sensory root

dorsal root swelling in dorsal root of ganglion each spinal nerve

all spinal nerves are mixed nerves carrying sensory and motor fibers

dermatomes vs myotomes

dermatome region of skin surface area supplied by sensory fibers of a spinal nerve

myotome skeletal muscle supplied by motor fibers of a spinal nerve

cranial nerves

name = function ; number = order of emergence

sensory axons of sensory neurons

cranial nerve

motor mostly axons of motor neurons

cranial little amt of sensory fibers

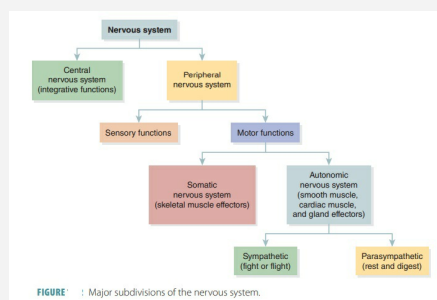
nerve

mixed axons of sensory and motor neurons

cranial neurons

nerve

divisions of PNS



reflexes

Occurs over pathways- reflex arcs

Cranial center of reflex arc is in brain

Spinal center of reflex arc is in spinal cord

Results in

Somatic contraction of skeletal muscles

autonomic (visceral) contraction of smooth or cardiac muscle or secretion by glands

somatic reflexes

knee jerk (patellar reflex) extension of lower leg in response to tapping patellar tendon

ankle jerk (achilles reflex) extension of foot in response to tapping Achilles tendon; muscle relaxation

plantar reflex plantar flexion of all toes, slight turning in and flexion of anterior part of the foot; Response to stimulation of outer edge of the sole

Babinski sign extension of great toe, possible fanning of toes, in response to stimulation of outer margin of sole of foot; Present in normal infants until ~18 mo. then becomes suppressed when corticospinal fibers become fully myelinated; In adults, a positive Babinski sign indicates upper motor neuron disorder

somatic reflexes (cont)

Abdominal reflex drawing in of abdominal wall in response to stroking side of abdomen; Decreased or absent reflex may involve lesions of upper motor neurons

Corneal reflex Winking in response to cornea being touched; Mediated by reflex arcs with cranial nerve V fibres, centers in pons, and motor fibres in cranial nerve VII

Gag reflex triggered when visceral sensory nerve endings cranial nerve IX in posterior throat are stimulated

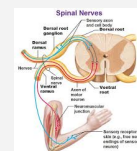
spinal nerves

ramus large branches that form after spinal nerve emerges from spinal canal

dorsal ramus intercostal and thoracic nerves

ventral ramus form networks of nerves called plexuses

spinal nerves



classify CNs

Some Say Marry Money, But My Brother Says Big Business Makes Money

olfactory nerve CN I sense of smell; in nasal mucosa terminate in olfactory bulbs



classify CNs (cont)

Optic Nerve CN II	carries info from eyes to top of brain
Oculomotor nerve CN III	motor fibres mid brain to eye muscles; nerves of superior medial and inferior rectus and inferior oblique; control amt of light entering eye (up, down, medial, roll eyes)
Trochlear Nerve CN IV	smallest cranial nerve; motor fibers from midbrain to superior oblique muscles of eye (down and in)
trigeminal nerve CN V	3 branches: 1 ophthalmic, maxillary, mandible; sensory neurons impulses from skin and mucosa of head and teeth; motor fibers extend to muscles of mastication through mandibular nerve (close jaw for chewing and swallowing)
abducens nerve CN VI	motor nerve lateral rectus muscle in eye; side to side movement
facial nerve CN VII	motor fibres originate from pons to superficial muscles of face and scalp; sensory taste buds to anterior 2/3 of the tongue

classify CNs (cont)

vestibulo-cochlear nerve CN VIII	vestibular nerve fibres originate in semicircular canals in inner ear and transmit impulses that result in sensations of equilibrium (Balance)/ cochlear nerve fibres originate in organ of corti in cochlea of inner ear and transmit impulses resulting in sensation of hearing
glosso-pharyngeal nerve CN IX	sensory fibres to taste buds in posterior 1/3 of tongue // motor fibres to the pharynx for swallowing
vagus nerve CN X	innervates most thoracic and abdominal viscera / swallowing and speaking
accessory nerve CN XI	motor nerve that is an "accessory" tp the vagus nerve; innervates muscles of speech, head and shoulders
hypoglossal nerve CN XII	motor fibres innervate muscles of tongue and provide voluntary control

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