


The Autonomic Nervous System


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Autonomic Nervous System

- ▶ motor division of the PNS
- ▶ controls visceral activities
- ▶ maintain internal homeostasis
- ▶ consists of two divisions
 - 1) parasympathetic
 - 2) sympathetic
 - exert antagonistic effects


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Dual Innervation

- ▶ innervated by both sympathetic and parasympathetic fibers
- ▶ innervation received by most visceral organs
- ▶ divisions are partially active
 - produce dynamic antagonism
 - allows visceral activity to be precisely controlled


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Parasympathetic Division

- ▶ also known as the resting-digesting system
- ▶ conserves body energy and maintains body activities at basal levels (rest)


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Parasympathetic Division

- ▶ parasympathetic effects (*p. 530*)
 - pupillary constriction
 - glandular secretion
 - increased digestive mobility
 - smooth muscle activity leading to elimination of feces and urine


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Sympathetic Division

- ▶ activates the body under conditions of emergency (extreme stress or fear)
- ▶ called the fight-or-flight system


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Sympathetic Division

- ▶ sympathetic responses (*p. 530*)
 - dilated pupils
 - increased heart and respiratory rates
 - increased blood pressure
 - dilation of the bronchioles of the lungs
 - increased blood glucose levels
 - sweating


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Parasympathetic vs Sympathetic

- ▶ Parasympathetic Division
 - “D” Division
 - digesting, defecation, diuresis (urination) division
- ▶ Sympathetic Division
 - “E” Division
 - exercise, excitement, embarrassment division
- ▶ Table 14.4 (*p. 526*) & Handout notes


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Effects of Aging

- ▶ decline in the efficiency of the ANS
 - partly due to structural changes of some preganglionic axonal terminals
- ▶ constipation
 - due to reduced GI tract motility


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Effects of Aging

- ▶ diminished tear formation
 - leads to dry eyes and frequent eye infections
- ▶ fainting episodes
 - due to orthostatic hypotension
 - form of low BP
 - sympathetic vasoconstrictor center responds more slowly to position changes


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Sensation vs Perception

- ▶ Sensation
 - awareness of changes in the internal and external environment
- ▶ Perception
 - conscious interpretation of those stimuli
 - it determines how one responds to stimuli


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Sensation vs Perception

- ▶ Example
 - ▶ a pebble kicked up into your shoe
- ▶ causes the sensation of localized deep pressure
- ▶ your perception of it is an awareness of discomfort and you decide to take your shoe off in a hurry


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Modality

- ▶ refers to the type of sensation such as sound, light or pressure
- ▶ the brain can tell the difference between hearing and seeing a bird
 - because the brain can tell from which part of your body the nerve message came


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Modality

- ▶ the brain interprets:
 - ▶ an impulse arriving from the vestibulocochlear nerve as a bird's song AND
 - ▶ an impulse arriving from the optic nerve as an image of the bird
 - although both impulses consist of identical APs (from -70 mV to +30 mV)


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Epileptic Seizures

- ▶ reflect abnormal electrical discharges of groups of brain neurons
 - loss of consciousness
 - uncontrollably jerking body
 - no other messages can get through
- ▶ epilepsy affects 1% of the population


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Epileptic Seizures

- ▶ not associated with, nor does it cause, intellectual impairments
- ▶ causes
 - genetic factors
 - blow to the head
 - stroke
 - infections
 - abnormal immune system activity
 - high fever
 - tumors


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Spatial Discrimination

- ▶ allows us to identify the site or pattern of stimulation
- ▶ evaluated using the two-point discrimination test
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Two Point Discrimination Test

- ▶ common tool for studying in the laboratory
- ▶ determines how close together two points on the skin can be and still be perceived as two points by the somatosensory cortex when stimulated, rather than one


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Two Point Discrimination Test

- ▶ provides a crude map of the density of tactile receptors in the various regions of the skin
- ▶ the distance between perceived points varies
 - from less than 5 mm on highly sensitive body areas
 - (tip of the tongue and of the index finger)
 - to more than 50 mm on less sensitive areas
 - (back and posterior neck)


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Adaptation

- ▶ decreased response to a continuous or unchanging stimulus
- ▶ receptor membranes become less responsive with time
 - results in a decline (or complete stoppage) in the frequency of the receptor potentials

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Adaptation

- ▶ occurs in all general sensory receptors
 - exception - pain and proprioceptors
- ▶ some receptors adapt rapidly
 - pressure, touch and smell receptors
- ▶ explains why we are not usually aware (after a short period) of the feel of our clothing against our skin

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Adaptation

- pain receptors and proprioceptors respond more or less continuously to threshold stimuli
 - nonadaptability is important
 - pain receptors warn of tissue damage
 - proprioceptors are important for balance and coordinated skeletal muscle activity

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