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Anatomy Quiz 3

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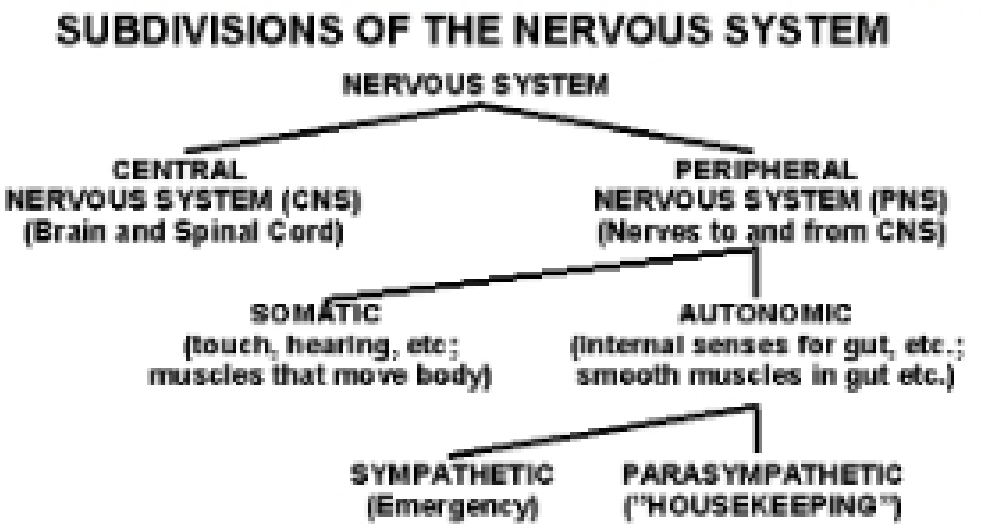
Magnitude of Opposing Force	Type of Tension/Contraction	Result
Less	Concentric	Acceleration
Equal	Isometric	No motion
Greater	Eccentric	Deceleration

- External forces can be gravity or just weight
- Efferent end and the resistance end
- If a muscle is able to produce more force than resisting force, then the muscle will contract and shorten → concentric
- If the forces are equal, no movement happens and no mechanical work is done → isometric
    - Energy goes to heat not movement
- If external force is greater, the muscle lengthens → eccentric

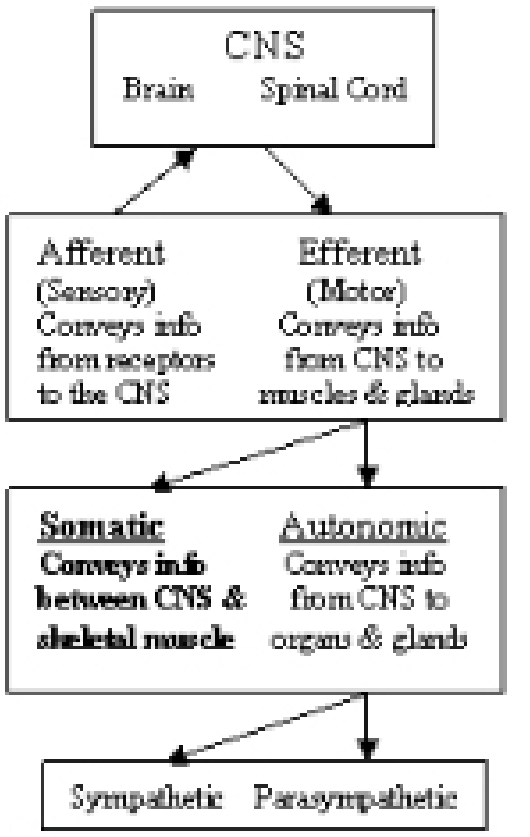
Example: pulling a man up a mountain with a rope, or controlling his movement down

- For a given amount of muscle force, you use the most muscle fibers for concentric contractions, then isometric, then eccentric
- But, you can generate more force in lbs. with eccentric contractions – you can lower more force than you can lift (40-100% stronger)
- Muscles are strongest isometrically at resting length, slightly stretched anatomical position
    - Lose force as you approach minimum and maximum length
- The faster the velocity of muscle shortening, the less the resistance, the less the force
    - Eccentric contractions have negative velocity and concentric have positive
    - Slower contractions are more difficult because the force is greater
    - Eccentrically it has less of an effect on the resistance
    - Eccentrically forces are greater
    - Velocity of lengthening has less to do with resistance
- People with osteoarthritis are weaker and have strength deficits
    - Treat with high intensity resistance training
    - Lower force production can be corrected
- For a given workload, concentric movement uses more oxygen and more muscle fibers

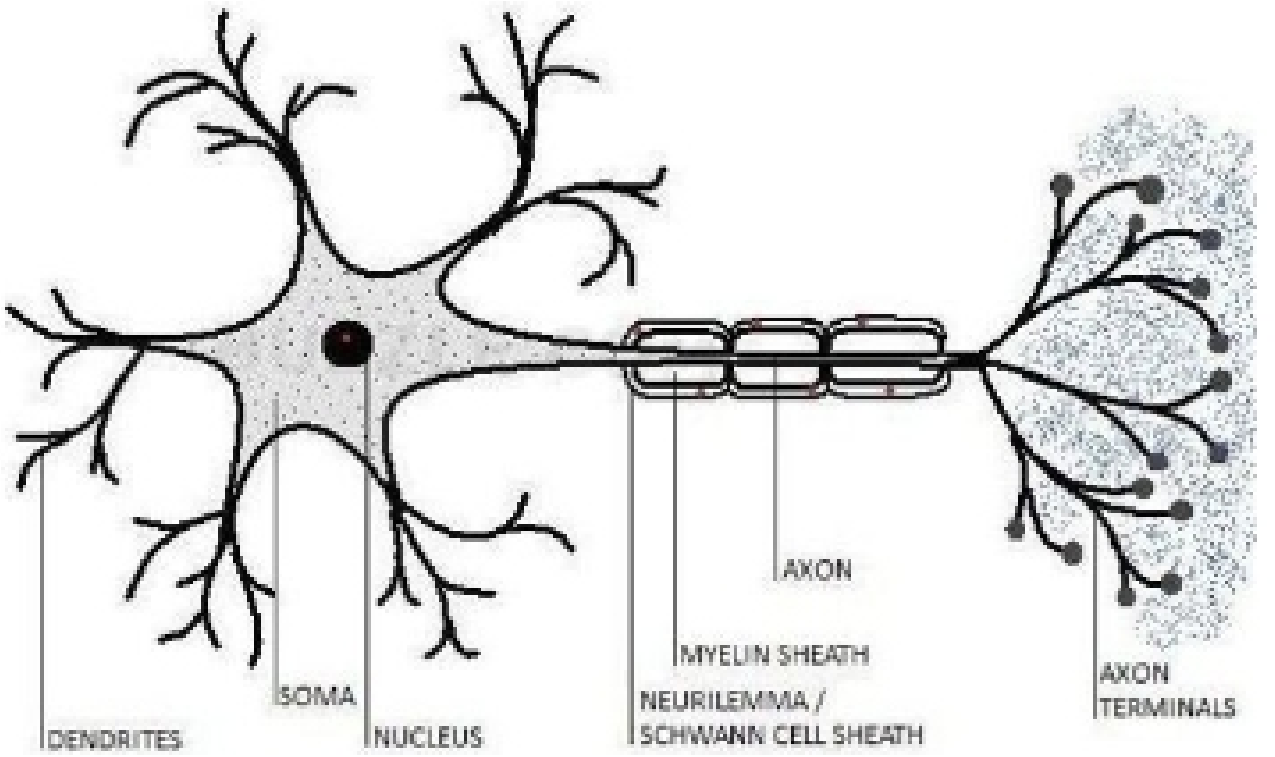
Neuromuscular system



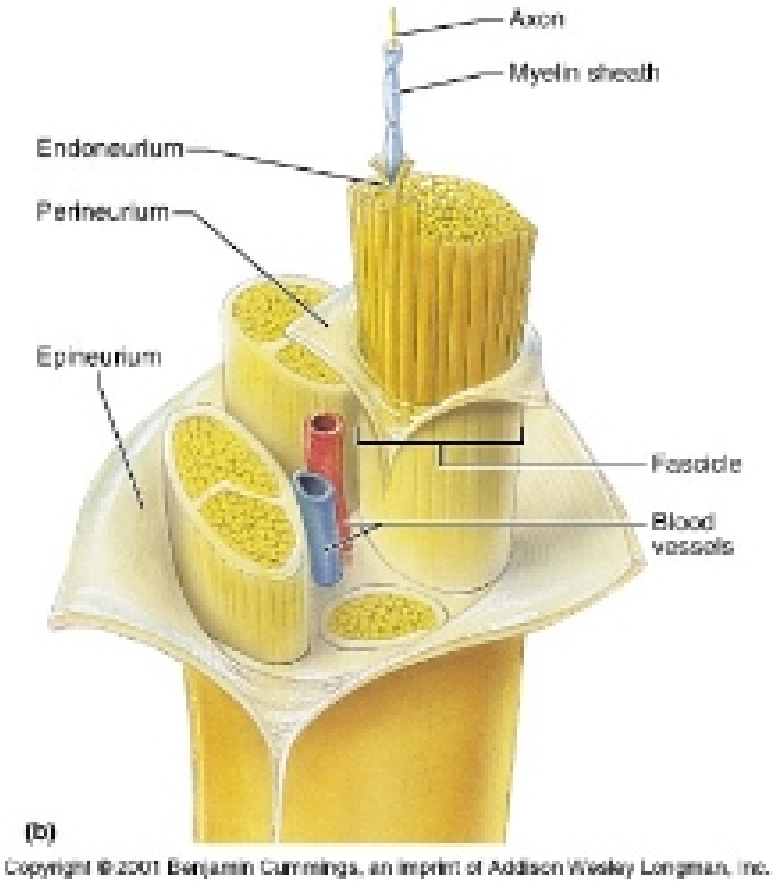
- For a person to move, muscle force must be generated
  - Skeletal muscle creates muscle force
  - Receive signals from motor nerves
  - Without signals, no movement would occur
- Brain to the skeletal system to the muscular system and nerves
- CNS consists of the brain and spinal cord
- PNS consists of the 31 spinal nerves and 12 cranial nerves
  - Cranial nerves originate in cranial cavity and spinal nerves in vertebral canal
  - Pursue most of their course outside of these cavities
- Autonomic
  - Functional subdivision of the nervous system
  - Innervates smooth muscle of viscera, cardiac muscles, and glands
  - Operates without conscious control
  - Sympathetic – speeds everything up
  - Parasympathetic – slows down bodily activities
- Somatic
  - CNS going to skeletal muscles



- Nerve cell: neuron, basic anatomic and functional unit of the nervous system
- Types of neurons
  - Sensory (afferent): impulses originate in organs/glands, conducted to CNS
  - Motor (efferent): impulses originate in CNS and are conducted to glands/organs
  - Association (interneurons): located between sensory and motor neurons; bridge or connect
- Cell body
  - Nucleus, mitochondria
  - Needs O2 to survive
  - Most are protected in CNS
  - Clusters of cell bodies in CNS are called nuclei
  - Clusters of cell bodies outside, in PNS, are called ganglei
  - Dendrites: receive impulses, conduct them towards the cell body; sensory, many
  - Axons: conduct impulses away from the cell body, up to 3 feet in length, only 1 per cell body
    - Covered by supportive lipid myelin in the CNS and PNS, helps with conduction
    - In PNS, myelin is Schwann cells
      - Made of lipid material
      - Covering them is the neurilemma, which is responsible for the regeneration of axon
      - Nodes are where branches can connect



- Each axon is surrounded by CT, called the endoneurium
    - Nerve fiber = axon + endoneurium
- Groups of fibers bound together by perineurium = fascicles
- Fascicles bound together with epineurium + blood vessels = nerve



- Demyelination of nerves: nerve transmission is slow and will gradually disappear
    - Lose control of muscles, like in the case of multiple sclerosis

- The bigger the cell body, the longer the axon, the faster it can conduct impulses
- Most nerves are mixed, sensory and motor
- Some cranial nerves are either motor or sensory
- Nerves and axon within the CNS cannot regenerate
    - Due to the formation of scar tissue which forms faster than the axon can regenerate
- Factors that affect regeneration (CNS and PNS)
    - Closer the injury is to the cell body, the less chance of regeneration (most cell bodies in the CNS)
    - Amount of scar tissue formed at the lesion
    - Length of nerve fiber involved
        - Regeneration occurs at 15 mm a day
        - Farther from end organ, the longer it takes to regenerate
        - Closer to end organ, the less it will take to regenerate
    - Nerves regenerate best when they are put on slack, not used, possibly in a cast
    - Nerve cell bodies lose their ability to reproduce
    - Segment between injury and cell body is called the proximal stump