Unit 6:5

MUSCULAR SYSTEM

OBJECTIVES

- Compare the three main kinds of muscles by describing the action of each
- Differentiate between voluntary and involuntary muscles
- List at least three functions of muscles
- Describe the two main ways muscles attach to bones
- Demonstrate the five major movements performed by muscles
- Describe at least three diseases of the muscular system

Questions to you

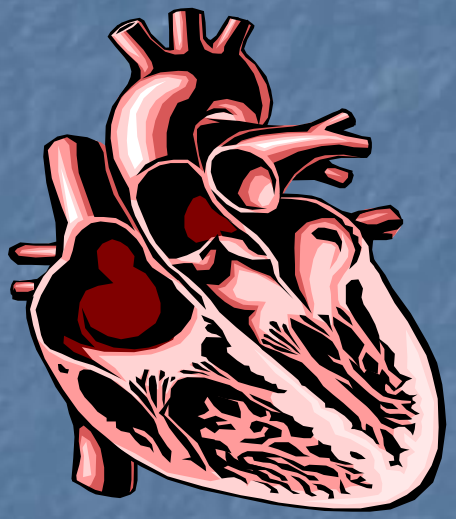
- Why do people lift weights?
- Do you think it is a waste of time?
- Why do we exercise specific muscles?
- What are muscles?
- Should you care about your muscles now when you are young?

Introduction

- Over 600 muscles make up the muscular system
- Muscles are made of bundles of muscle fibers that are held together by connective tissue
- Properties of characteristics of muscles
  - Excitability or irritability: ability to receive and respond to a stimulus such as a nerve impulse
  - Contractibility
    - When muscle fibers are stimulated by nerves, they contract or become short and thick
    - This causes movement
  - Extensibility: ability to be stretched or extended
  - Elasticity: allows the muscle to return to its original shape after it has contracted or stretched (rubber band)

3 kinds of muscles

- Cardiac (striated)
  - Form the walls of the heart
  - Contract to circulate blood
  - Involuntary: function without conscious thought or control (self-contracting with neural regulation)
- Visceral or smooth (not striated)
  - Found in the internal organs of the body such as the digestive system, respiratory system, blood vessels, and eyes
  - Does not tire easily
  - Contract to cause movement in these systems
  - Involuntary: function without conscious though or control



3 kinds of muscles

- Skeletal (striated)
  - Attached to bones and 40% of body mass
  - Cause body movement by contracting rapidly
  - Tires easily
  - Voluntary: person has control over their action
  - 75% of energy used escapes as heat to maintain temperature; 25% is used for cellular activities
  - Skeletal muscles are dependant on its
    - Nerve supply because it cannot contract without nerve stimulation
    - Blood supply because it uses tremendous amounts of energy which requires delivery of oxygen & glucose and it gives off lots of wastes that must be removed

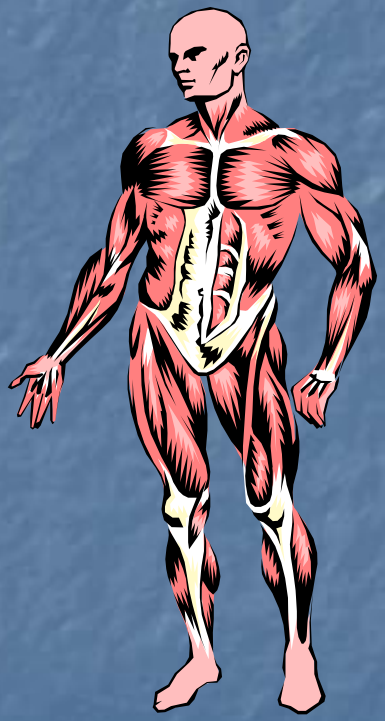
Functions of skeletal muscles

- Attach to bones to provide voluntary movement
- Produce heat and energy
- Help maintain posture
- Stabilization of joints
- Protection of some internal organs
- Provide entry & exit points for blood vessels & nerves (can't contract w/out nerve stimulation)

Methods of attachment to bones

- Tendon
  - Strong, tough connective tissue cord which attaches muscles to bones
  - Example, achilles tendon, which attaches the gastrocnemius muscle on the calf of the leg to the heel bone
- Fascia
  - Tough, sheetlike membrane
  - Covers and protects the tissue
  - Example: lumbodorsal fascia, which surrounds the deep muscles of the trunk and back

Origin and Insertion points



- When muscles attach to bones, one end becomes the origin and the other end becomes the insertion point
- How do we know which is which?
- Origin: end that does not move; it's a fixed attachment or less moveable
- Insertion: end that moves when muscle contracts and is put into action

Muscle Movements review

- Prime mover: The performer of a movement
- Antagonist: The muscles that produces an opposite movement
- Adduction: moving a body part toward the midline
- Abduction: moving a body part away from the midline
- Flexion: decreasing the angle between two bones or bending a body part
- Extension: increasing the angle between two bones or straightening a body part
- Rotation: turning a body part around its own axis; turning the head from side to side
- Circumduction: moving in a circle at a join; moving one end of a body part in a circle while the other end remains stationary; swinging the arm in a circle

Muscle Tone

- Muscles are partially contracted at all times even though they may not be in use
- This state of partial contraction is called "muscle tone"
- Also described as a state of readiness to act
- Loss of muscle tone
  - Can occur in severe illness such as paralysis
  - When muscles are not used for a long period of time, they can atrophy or waste away
  - Lack of use can also result in a contracture
    - Severe tightening of a flexor muscle
    - Results in a bending of a joint
    - Foot drop is a common contracture
    - Fingers, wrists and knees, as well as other joints, can be affected

Diseases and abnormal conditions

- Fibromyalgia
  - Chronic, widespread pain in specific muscle sites
  - Symptoms: muscle stiffness, numbness or tingling in the arms or legs, fatigue, sleep disturbances, headaches, and depression
  - Etiology unknown, but stress, weather, and poor physical fitness affect the condition
  - Treatment
    - Directed toward pain relief
    - Physical therapy, massage, exercise, stress reduction
    - Medication to relax muscles and relieve pain

Diseases and abnormal conditions

- Muscular dystrophy
  - Group of inherited diseases
  - Leads to a chronic progressive muscle atrophy (muscles shrink in size and lose strength)
  - Usually appear in total disability and early death
  - Physical therapy is used to slow progress of disease

Muscle cell

Diseases and abnormal conditions

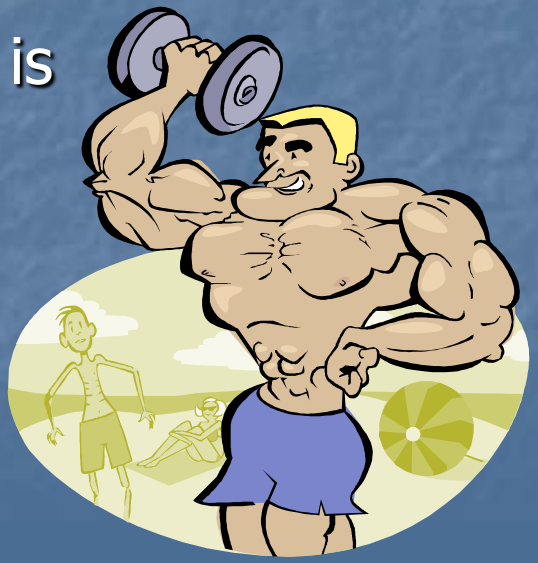
- Myasthenia gravis
  - Chronic condition in which nerve impulses are not transmitted properly to the muscles
  - Leads to progressive muscular weakness and paralysis
  - Fatal which it affects respiratory muscles
  - Etiology: unknown
    - May be autoimmune disease
    - Antibodies attack the body's own tissues
  - No cure, and treatment is supportive

Diseases and abnormal conditions

- Muscle spasms and cramps
  - Sudden, painful, involuntary contractions of muscles
  - Usually occur in legs or feet
  - May result from overexertion, low electrolyte levels, or poor circulation
  - Use gentle pressure and stretching of muscle to relieve spasm

Diseases and abnormal conditions

- Strain
  - Overstretching or injury to muscles and/or tendons
  - Frequent sites include the back, arms, and legs
  - Prolonged or sudden muscle exertion is usually cause
  - Symptoms: myalgia or muscle pain, swelling, limited movement
  - Treatment
    - Rest and elevation of extremity
    - Muscle relaxants or pain medications
    - Alternating heat and cold applications



Muscles of the Head

- Orbicularis Muscles
  - They get their name from their shape
  - Orbicularis Oculi-encircles they eye
  - Orbicularis Oris-encircles the mouth
- Levator Palpebrae Superior
  - Lifter of the upper eye lid
  - An antagonist muscle
- Buccinator
  - The fleshy part of the cheek
  - Used in whistling, blowing, or eating

Muscles of the Head

- Mastication: "eating"
  - Four pairs of muscles, in which insert on the mandible and move it
    - Temporal: located above and near the ear
    - Masseter: At the angle of the jaw
  - The tongue has two groups of muscles
    - Intrinsic: located within the tongue
    - Extrinsic: located on the outer surface of the tongue
  - Two muscles of mastication: Masseter and Buccinator

Muscles of the Neck

- Sternocleidomastoid
  - Extend from the sternum upward, across either side of the neck
  - Together they bring the head forward on the chest. (Flexion)

Shoulder and Arm

- Trapezius
  - A triangular muscles that covers the back of the neck and extends across the back of the shoulder.
  - Enables one to raise the shoulders and pull them back
- Latissimus Dorsi
  - Originates from the vertebral spine in the middle and lower back and covers the lower half of the thoracic region
  - Extends the arm, bringing it down forcibly
- Pectoralis Major
  - Located on either side of the upper part of the chest at the front of the body
  - It flexes and adducts the arm, pulling it across the chest
- Serratus Anterior
  - On the side of the chest
  - Moves the scapula forward, aids in raising the arm above the horizontal level
- Deltoid
  - Covers the shoulder joint
  - Responsible for the roundness of the upper part of the arm
  - Abducts the arm

Forearm and Hand

- Biceps Brachii
  - Located on the arm
  - Serves to flex the forearm
- Triceps Brachii
  - Located on the back of the arm
  - Straightens the elbow
- Hand Movements
  - Flexor Carpi and Extensor Carpi Muscles
    - Responsible for many movements of the hand
  - Flexor Digitorum and the Exensor Digitorum Muscles
    - Produce finger movement

Muscles of the Trunk

- Diaphragm
  - The most important muscles in breathing
  - Dome shaped muscles that forms a partition between the thoracic cavity above and the abdominal cavity below
- Intercostal
  - Attached to and fill the spaces between the ribs

Muscles of the Abdomen and Pelvis

- The walls of the abdomen have three layers of muscle
  1. External Oblique: on the outside
  2. Internal Oblique: in the middle
  3. Transversus Abdominis: the innermost

  - Rectus Abdominus: the anterior abdominal wall is connected by tissue from these three muscles
  - Linea Alba: the midline meeting of the aponeurosis.It is important landmark of the abdomen. It extends from the tip of the sternum to the pubic joint

Deep Muscles of the Back and Lower Extremities

- Sacrospinalis
  - Helps maintain vertebral column in an erect posture
- Gluteus Maximus: forms much of the fleshy part of the buttock. Large because of support when a person is standing. It extends the thigh muscles
- Gluteus Medius: partially covered by the maximus. Serves to abduct the thigh
- Iliopsoas: arises from the ilium and the bodies of the lumbar vertebrae, crosses the front of the hip joint to insert on the femur. It's a powerful flexor of the thigh
- Adductor Muscles: located on medial thigh. Arises from pubis and inserts on the femur.
- Sartorius: a long, narrow muscle that begins at the iliac and winds downward and inward across the entire thigh

Deep Muscles of the Back and Lower Extremities

- Quadriceps Femoris: large muscle that has four head of origin
  - One of these muscles is from the ilium
  - Three are from the femur
- Hamstring Muscles: located in the posterior part of the thigh. Flex the leg
- Gastrocnemius: the chief muscle of the calf of the leg
- Achilles Tendon: attaches to the calcaneus and is the largest tendon in the body
- Tibialis Anterior: located on the front of the leg and is responsible for inversion of the foot
- Peroneus Longus: Muscle for eversion and is located on the lateral side of the leg

Locations and Functions of Major Muscles of the Body

Sternocleidomastoid	Side of neck	Turns and flexes head
Trapezius	Upper back and neck	Extends head, moves shoulder
Deltoid	Shoulder	Abducts arm, injection site
Biceps brachii	Upper arm	Flexes lower arm
Triceps brachii	Upper arm	Extends lower arm
Pectoralis Major	Upper chest	Adducts and flexes upper arm
Intercostals	Between ribs	Moves ribs for breathing

Locations and Functions of Major Muscles of the Body

Rectus abdominus	Ribs to pubis (pelvis)	Compresses abdomen
Latissimus dorsi	Spine around to chest	Extends and adducts upper arm
Gluteus maximus	Buttocks	Extends thigh, injection site
Sartorius	Front of thigh	Abducts thigh, flexes leg
Quadriceps femoris	Front of thigh	Extends leg
Tibialis anterior	Front of lower leg	Flexes and inverts foot
Gastrocnemius	Back of lower leg	Flexes sole of the foot