Musculoskeletal System

Muscles

Musculoskeletal System

The **ability to move** is an essential activity of the human body

- And to move we need **muscles**!

Did you know?

Our body has over **600 individual muscles**

Muscles make up about **½ our body weight**

Musculoskeletal System

Muscles have 4 main functions:

Movement

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Maintaining Posture

your muscles are working to keep you standing up, even if you are not moving

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Stabilizing Joints

some joints are held in place by muscles

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Heat Release

75% of energy expended during muscle movement becomes heat

Muskuloskeletal System

Body movements are determined by three types of muscles

Skeletal (Voluntary) – can be controlled by **will.**

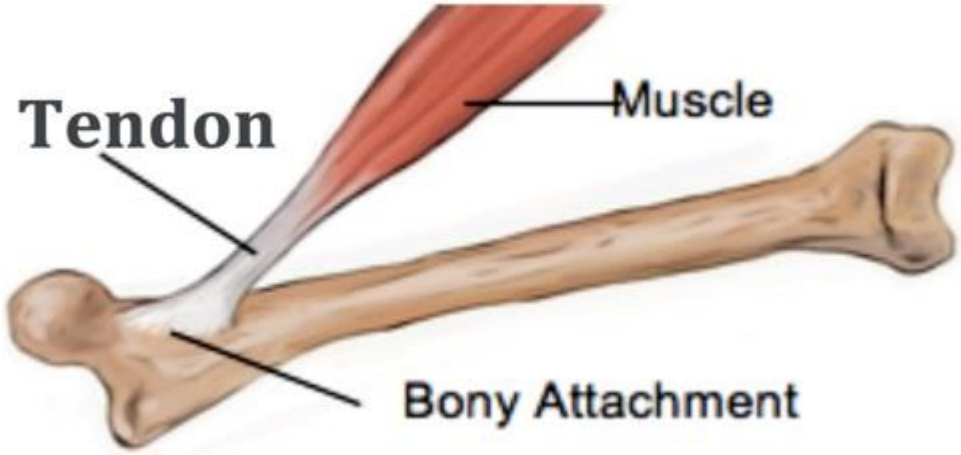
Smooth (involuntary) – cannot be controlled by will.

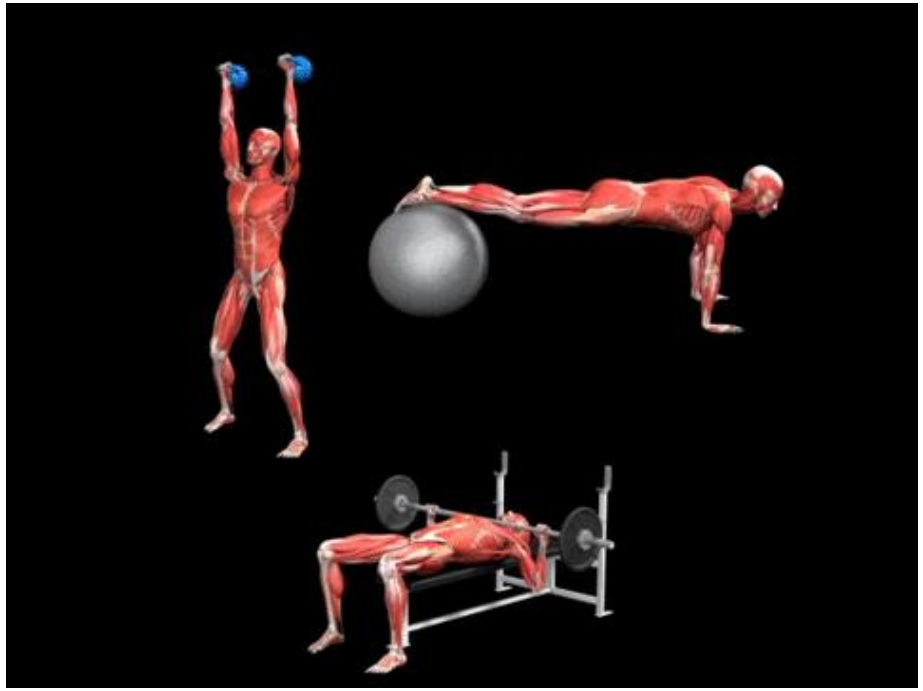
Cardiac – control the contractions of the **heart**.

Skeletal Muscle

Attach to bones to provide voluntary movement

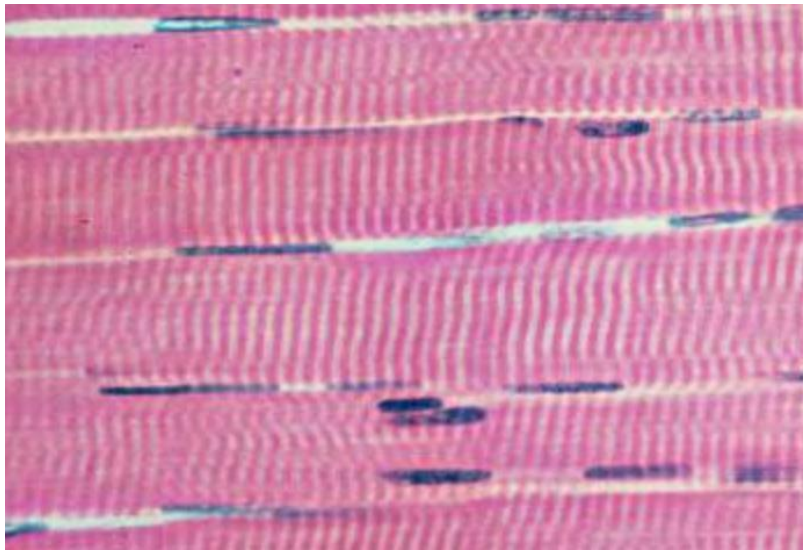
- **Tendons:** strong, tough connective cords **between muscles and bones**
- **Fascia:** tough, sheet-like membrane





Skeletal Muscle

Help **maintain posture**
Protect internal organs
Called **striated (striped)** because they have striations of alternating light and dark bands



Skeletal Muscles

Fleshy body parts are made of skeletal muscles

Provide movement to the limbs, but **contract quickly**, **fatigue easily** and **lack** the ability to **maintain contraction** for **long periods**

- Ex: Blinking eyes, talking, breathing, eating, dancing and writing all produced by these muscles

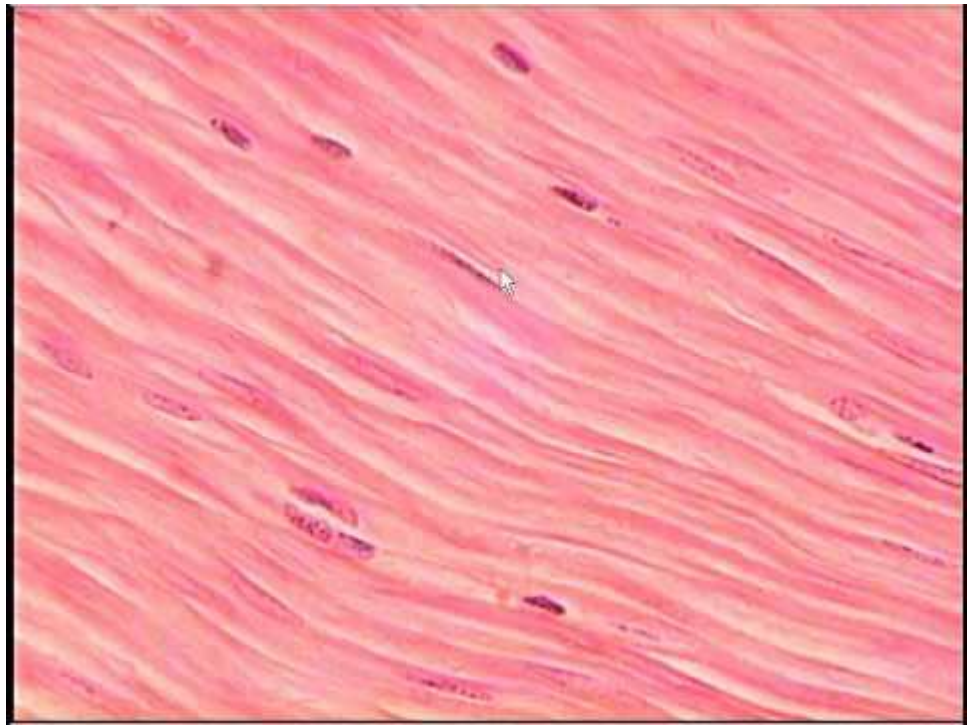
Smooth Muscles

Called smooth muscle because they are unmarked by striations

Not attached to bones, **act slowly**, **do not tire easily** and can **remain contracted** for a long time

Not under conscious control so they are also called **involuntary muscles**

Found in walls of **internal organs** (intestines, bladder, stomach, uterus, blood vessels)



Cardiac Muscles

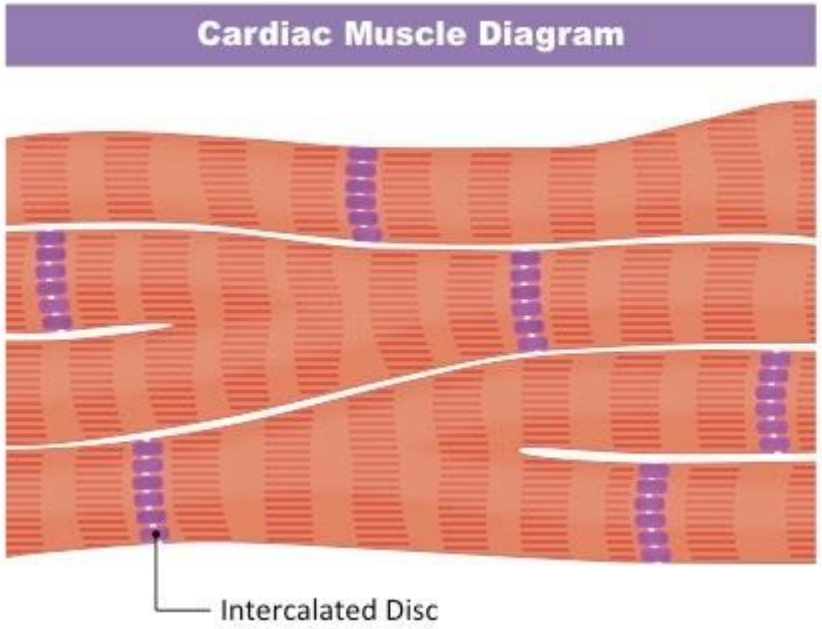
Found only in the **heart**

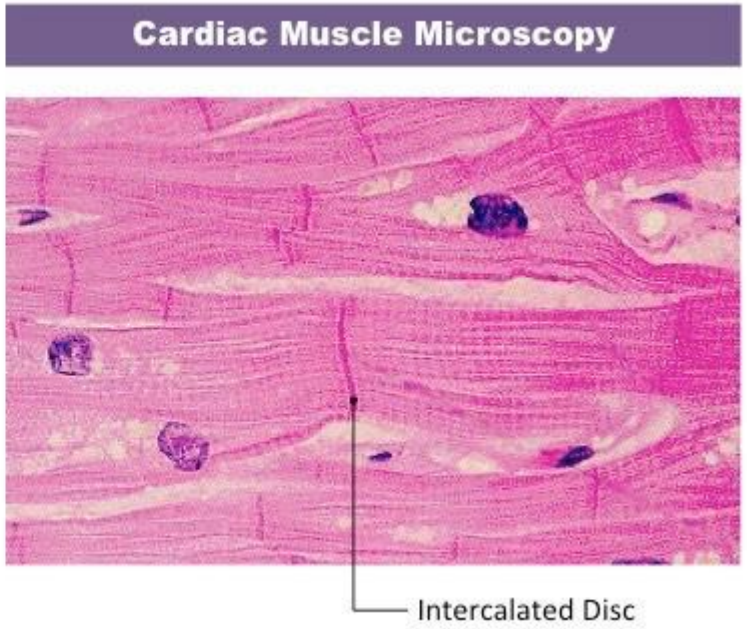
Involuntary muscle

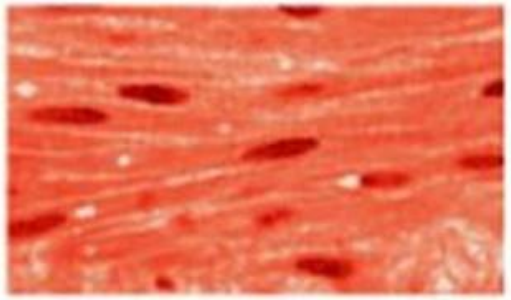
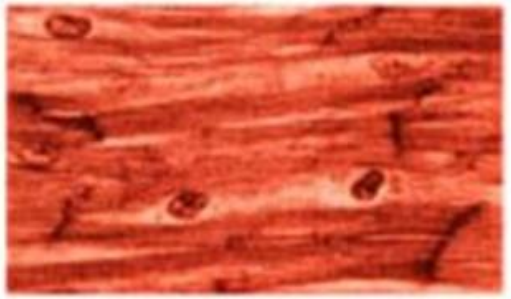
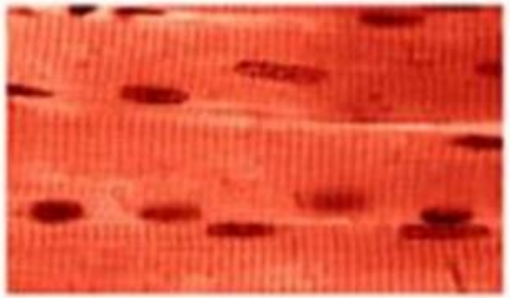
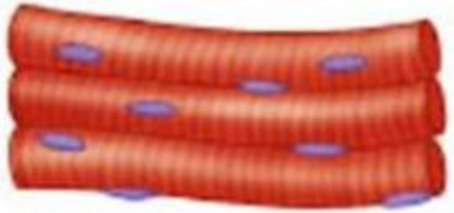
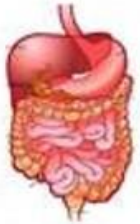
Requires a continuous supply of oxygen to function

Cardiac muscle cells begin to **die after 30 seconds of oxygen cut-off**

Striated and branched





Smooth muscle	Cardiac muscle	Skeletal muscle
		
		
		
Internal organs	Heart	Leg
involuntary		voluntary

Special Muscles

Sphincter (dilator) muscles are openings between:

- The esophagus and stomach
- The stomach and small intestines
- Walls of the anus, urethra and mouth

Open and close to **control passage of substances**

Characteristics of Muscles

All muscles have 4 common characteristics

Excitability – ability to respond to a stimulus (ie: nerve impulse)
Contractibility – muscle fibers that are stimulated by nerves contract (become shorter) and causes movement
Extensibility – ability to be stretched
Elasticity – allows the muscle to return to its original shape after it has been stretched

Characteristics of Muscles

Muscle fatigue

- Buildup of lactic acid caused by vigorous exercise where blood is unable to be transported

Muscle tone

- State of partial contraction is called muscle tone

Characteristics of Muscles

Contractures

- Permanent shortening of a muscle or joint from remaining tight for too long

Atrophy

- Loss of muscle tone occurs when muscles are not used for a long period of time.
  - This is why astronauts must spend a lot of time working out so that their muscles don't atrophy!

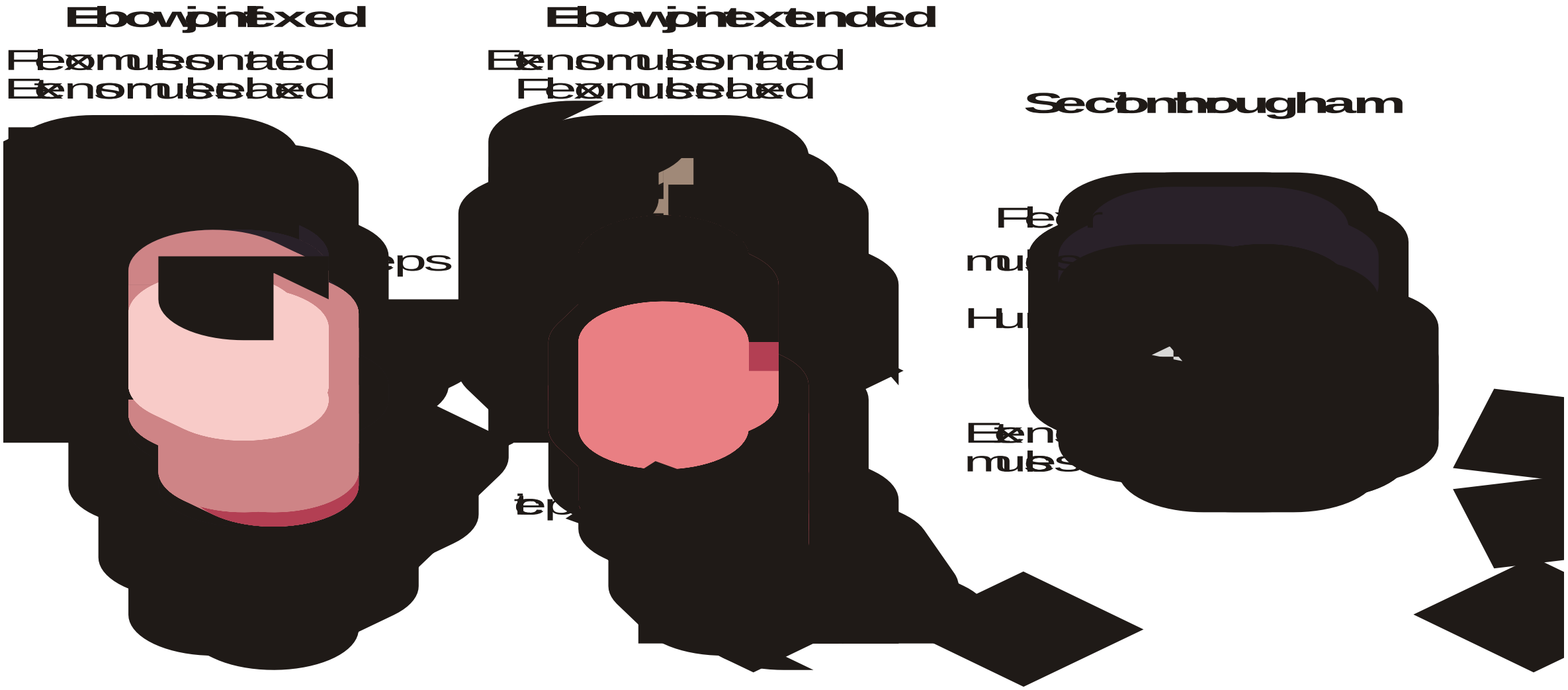
Characteristics of Muscles

Muscles can only **pull**. They can never push.

- Because of this, muscles will **work together in pairs**. One muscle will **contract (get shorter)**, while its partner will **extend (get longer)**.
- This type of relationship is called an **antagonistic relationship**.

What is the best example of this?

Biceps and Triceps


Elbow joint fixed
Flexor muscle contracted
Extensor muscle relaxed
Elbow joint extended
Extensor muscle contracted
Flexor muscle relaxed
Sec bnh bugham

Muscles and Heat

When muscles work, they **produce heat** that our body needs to function properly

- Major source of this heat is from the **production of ATP**
- Recall that ATP is the result of **cellular respiration**
  - Therefore muscle cells need enough **oxygen, glucose** and other materials circulated by the blood in order to function properly
  - When the **muscle is stimulated**, **ATP** is released, thus producing **heat**

Types of Movement

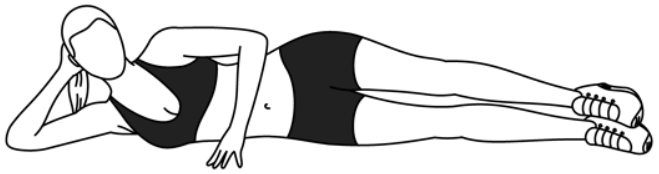
Adduction:

Moving a body part toward the midline

Types of Movement

Abduction:

Moving a body part away from the midline



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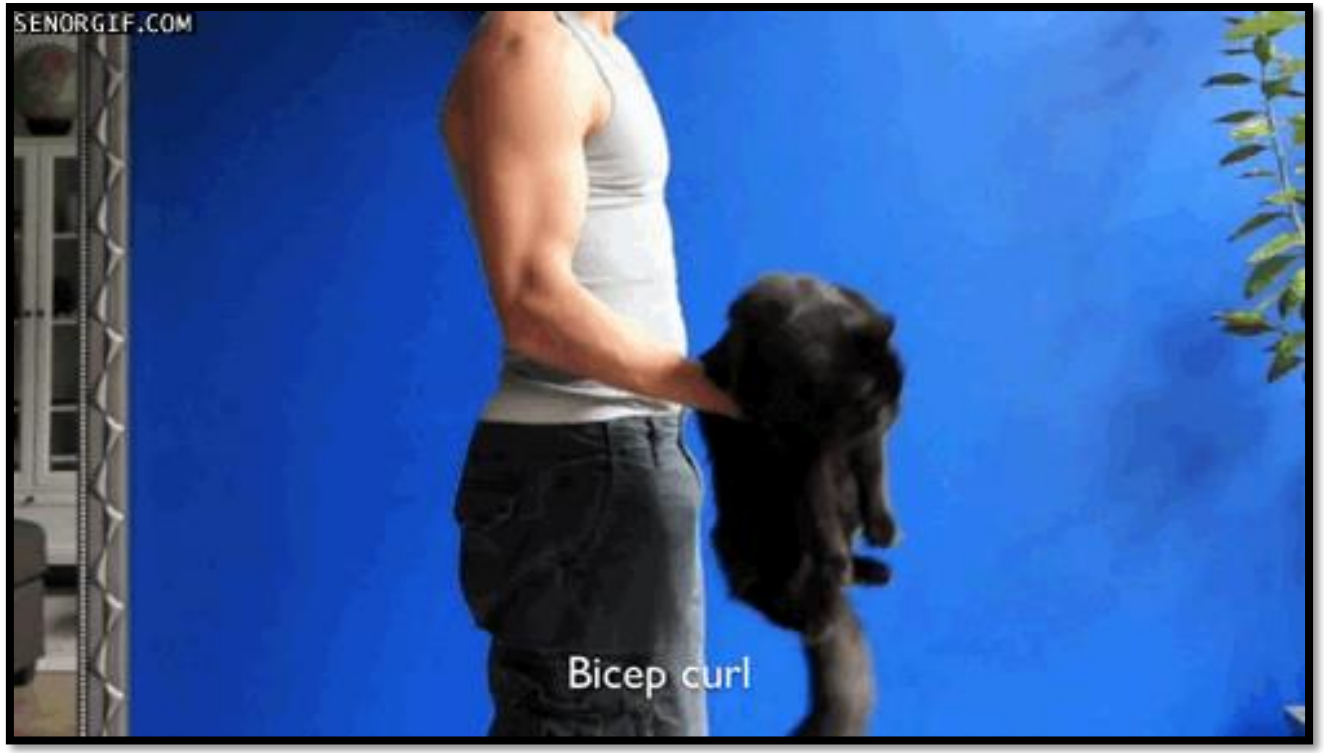
Types of Movement

Flexion:

Decreasing the angle between two bones or bending body parts



Types of Movement

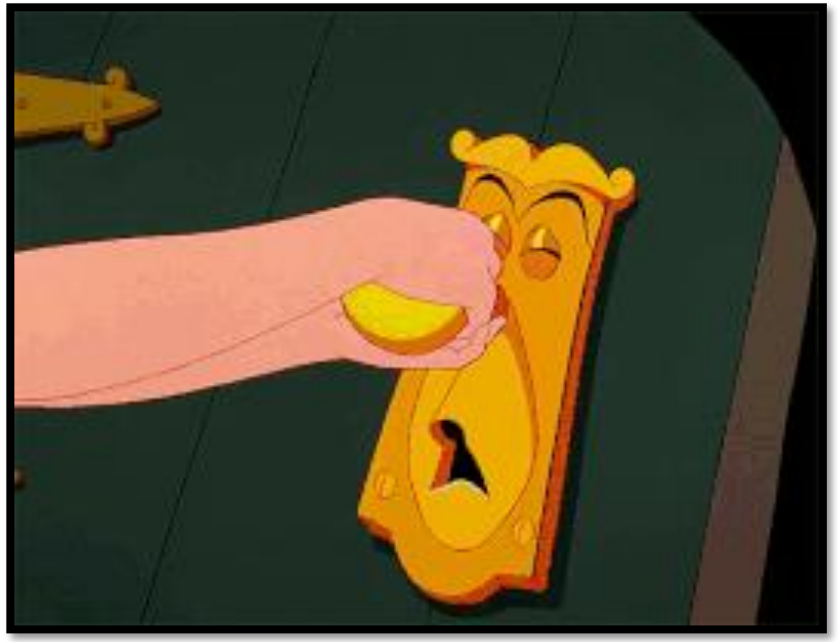
Extension:

Increasing the angle between two bones or straightening the body part

Types of Movement

Rotation:

Turning a body part around its own axis



Types of Movement

Circumduction:

Moving in a circle at a joint

Summary: Types of Motion

Abduction – moving away from midline

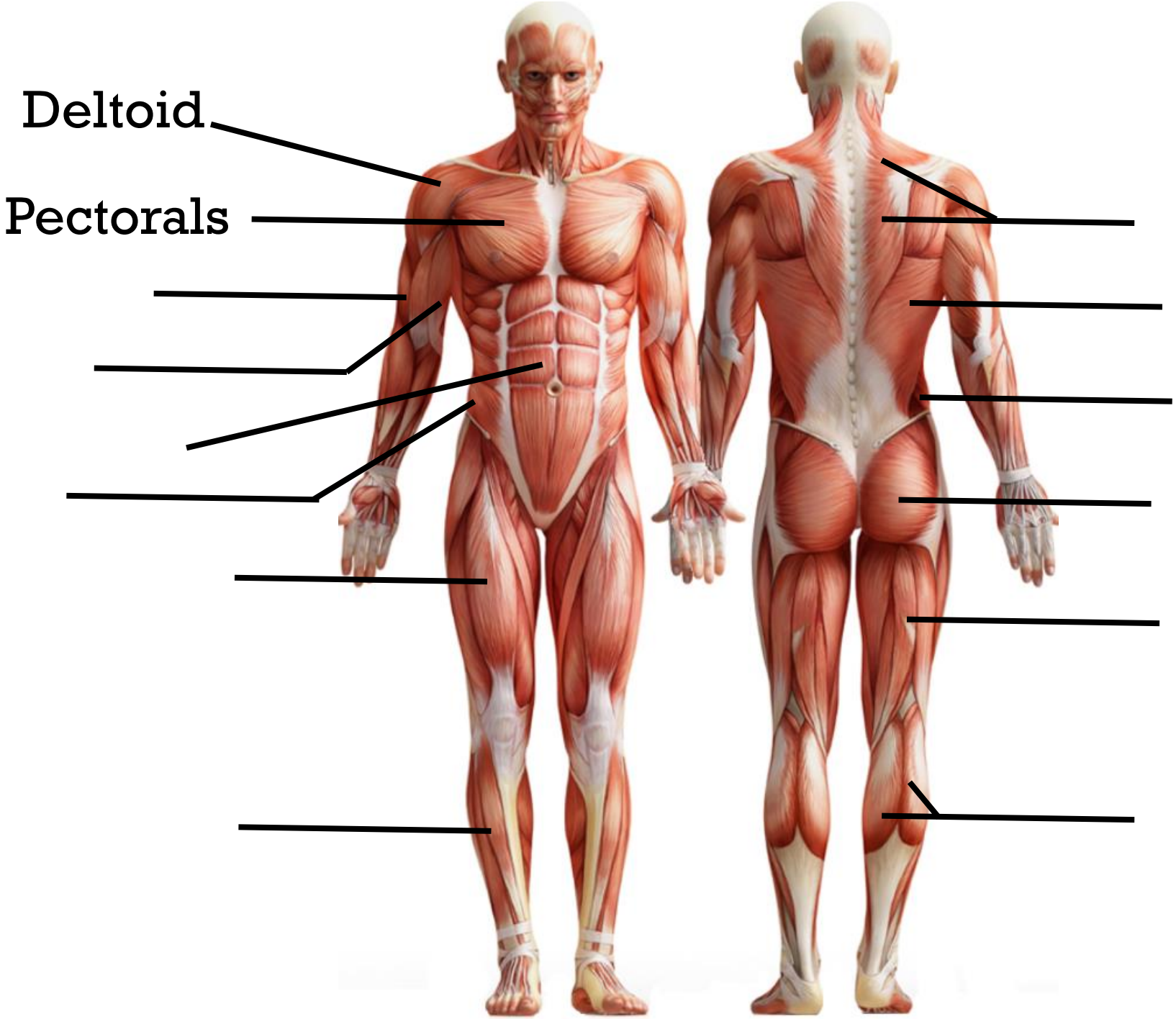
Adduction – moving toward midline

Flexion – bending of body part

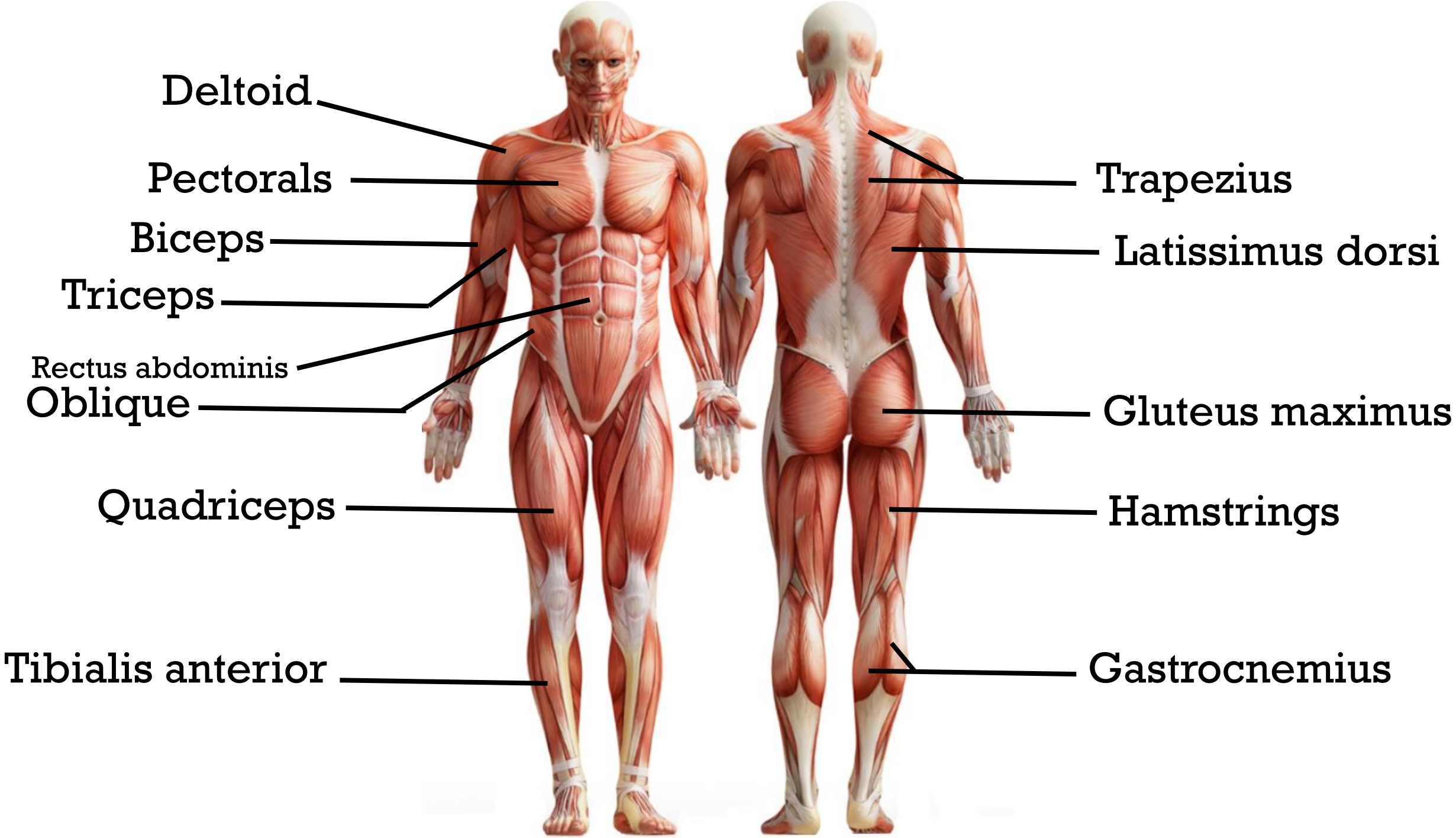
Extension – straightening of body part

Rotation – moving around its own axis

Circumduction – moving in a circle at a joint


Deltoid
Pectorals


So did they give you a name along with all those rippling pectorals?


Deltoid
Pectorals
Biceps
Triceps
Rectus abdominis
Oblique
Quadriceps
Tibialis anterior
Trapezius
Latissimus dorsi
Gluteus maximus
Hamstrings
Gastrocnemius

Muscles and their Functions

Biceps – flexes lower arm

Deltoid – abducts arm; injection site

Gastrocnemius – flexes sole of feet

Latissimus dorsi – extends & adducts upper arm

Pectoralis major – adducts and flexes upper arm

Intercostals – moves ribs for breathing

Muscles and their Functions

Trapezius – extends head, moves shoulder

Triceps – extends lower arm

Gluteus maximus – extends thigh; injection site

Rectus abdominus – compresses the abdomen

Rectus femoris – flexes thigh & extends lower leg

Tibialis anterior – flexes and inverts foot

Muscular Disorders

FIBROMYALGIA

Description: Chronic, widespread pain in specific muscle site; numbness and tingling in arms or legs;
Often accompanied by fatigue as well as sleep, memory and mood issues

Cause: unknown

Treatment: Treat symptoms – pain relief; stress reduction and muscle relaxers

Muscular Disorders, etc

MUSCULAR DYSTROPHY

Description and cause: Group of inherited diseases that cause chronic, progressive muscle atrophy resulting in total disability and early death

Treatment: No cure
Treatment used to slow progression of disease

Muscular Disorders, etc

MYASTENIA GRAVIS

Description: Chronic condition where nerve impulses are not transmitted correctly leading to progressive muscular weakness and paralysis; affects respiratory muscles and can be fatal

Cause: could be antibodies attacking the receptors for acetylcholine; could also be antibodies blocking the function of certain proteins

Treatment: Medications to relieve symptoms

Muscular Disorders, etc

MUSCLE SPASMS/CRAMPS

Description: Sudden, painful involuntary muscle contractions

Causes: Caused from overexertion, low electrolytes or poor circulation

Treatment: Treat by applying gentle pressure and stretching of the affected muscle

Muscular Disorders, etc

STRAIN

Description: Overstretching of a muscle or tendon frequently in legs, back or arms

Cause: Caused by sudden muscle exertion

Treatment: Treated by resting, muscle relaxants, or pain medications, elevation of extremity and applying hot/cold compresses

Problems from Lack of Movement

Contractures

Tightening and shortening of a muscle resulting in a permanent flexing of a joint

Muscle atrophy

Muscles become weak and joints become stiff

Circulatory impairment

Blood clots and pressure ulcers can develop

Problems from Lack of Movement

Mineral loss

Especially calcium from the bones making bones brittle and easily to be fractured

Other problems

Poor appetite; constipation; urinary infections; respiratory problems; and pneumonia

Good Body Mechanics

- Maintain broad base of support (8-10 in.)
- Bend from hips and knees to get close to object
- Use strongest muscles: shoulders, arms, hips, thighs
- Use weight of body to help push/pull
- Carry heavy objects close
- Avoid twisting body; turn whole body when changing direction
- Avoid bending for long periods
- Get help if object is too heavy