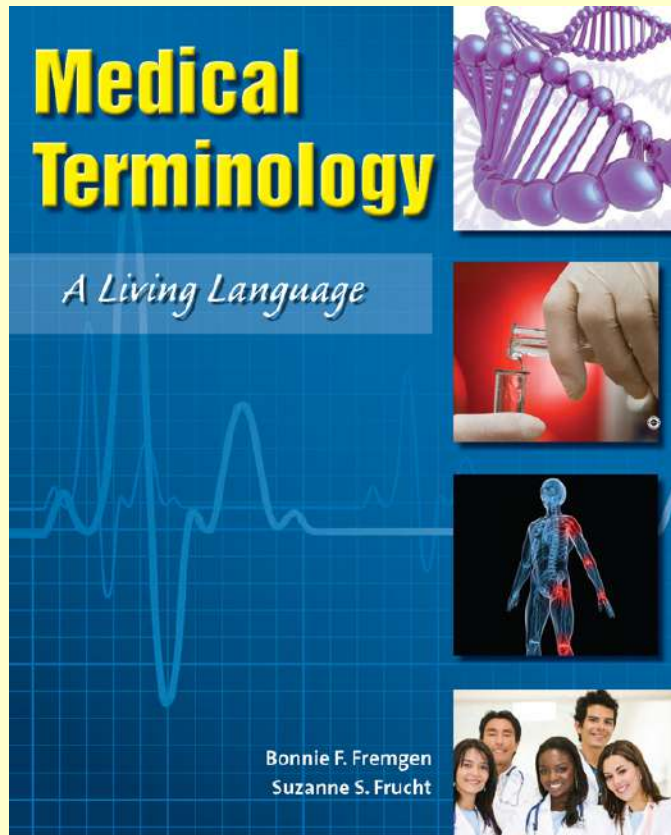


# Medical Terminology

## A Living Language



## Chapter 4

### *Musculoskeletal System*

# Multimedia Directory

Slide 30 Bone Structure Exercise

Slide 61 Skeletal Bones Exercise

Slide 78 Chiropractic Medicine Video

Slide 91 Osteoporosis Video

Slide 98 Arthritis Video

Slide 103 Arthroscopy Video

Slide 124 Muscles Animation

Slide 138 Joint Movement Animation

Slide 141 Humerus Adduction/Abduction Animation

Slide 143 Elbow Flexion/Extension Animation

Slide 145 Ankle Dorsiflexion and Plantar Flexion Animation

Slide 148 Ankle Inversion and Eversion Animation

Slide 150 Elbow Pronation and Supination Animation

# Multimedia Directory Continued

Slide 152Humerus Circumduction Animation

Slide 153Hand Opposition Animation

Slide 154Humerus Rotation Animation

Slide 162Muscle Atrophy Video

Slide 165Muscular Dystrophy Video

Slide 167Carpal Tunnel Video

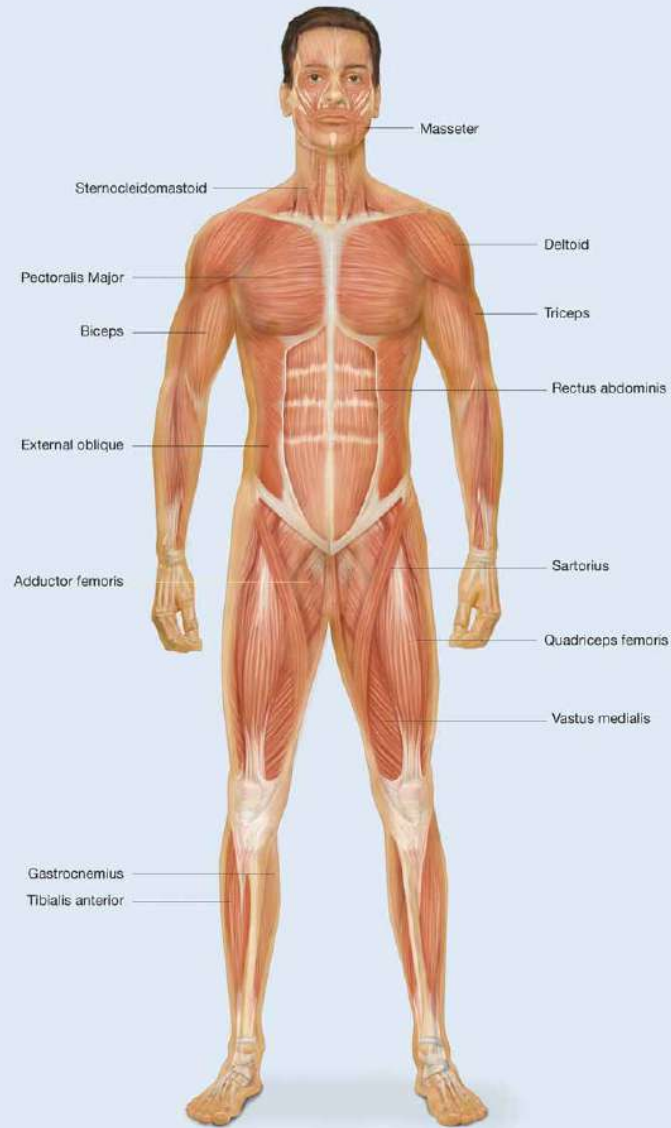
# Skeletal System at a Glance

- Functions of Skeletal System
  - Internal framework of body
  - Supports body
  - Protects internal organs
  - Point of attachment for muscles
  - Produces blood cells
  - Stores minerals

# Skeletal System at a Glance

- Organs of Skeletal System
  - Bones of the skeleton
  - Joints

## Muscular System Illustrated



# Skeletal System Combining Forms

- ankyl/ostiff joint
- arthr/ojoint
- articul/ojoint
- burs/osac
- carp/owrist
- cervic/oneck

# Skeletal System Combining Forms

- chondr/o cartilage
- clavicul/o clavicle
- coccyg/o coccyx
- cortic/o outer portion
- cost/o rib
- crani/o skull



# Skeletal System Combining Forms

- femor/ofemur
- fibul/ofibula
- humer/ohumerus
- ili/oilium
- ischi/oischium
- kyph/ohump

# Skeletal System Combining Forms

- lamin/olamina, part of vertebra
- lord/obent backwards
- lumb/oloin
- mandibul/omandible
- maxill/omaxilla
- medull/oinner portion

# Skeletal System Combining Forms

- metacarp/ometacarpals
- metatars/ometatarsals
- myel/obone marrow
- orth/ostraight
- oste/obone
- patell/opatella

# Skeletal System Combining Forms

- ped/ofoot
- pelv/opelvis
- phalang/ophalanges
- pod/ofoot
- pub/opubis
- radi/oradius

# Skeletal System Combining Forms

- **sacr/osacrum**
- **scapul/oscapula**
- **scoli/ocrooked, bent**
- **spondyl/overtebrae**
- **stern/osternum**
- **synovi/osynovial membrane**

# Skeletal System Combining Forms

- synov/osynovial membrane
- tars/oankle
- thorac/ochest
- tibi/otibia
- uln/oulna
- vertebr/overtebra

# Skeletal System Suffixes

- –blastimmature, embryonic
- –clasiato break surgically
- –desisstabilize, fuse
- –listhesis slipping
- –porosisporous

# Anatomy and Physiology

- Bones are body organs with blood supply, nerves, and lymphatic vessels
- Bones are connected to each other to form **skeleton**
  - Framework for the body
  - 206 bones



# Anatomy and Physiology

- **Red bone marrow** within bones produces blood cells
- Bones also:
  - Protect vital organs
  - Store minerals

# Anatomy and Physiology

## ● Joint

- Place where two bones meet
- Held together by **ligaments**
- Gives flexibility to skeleton

# Bones

- Also called **osseous tissue**
- One of hardest materials in body
- Formed from gradual process before birth called **ossification**
- Fetal skeleton is formed from a cartilage model

# Bones

- Flexible tissue is gradually replaced by **osteoblasts** (immature bone cells)
- In adult bones osteoblasts mature into **osteocytes**
- Formation of strong bones dependant on adequate supply of minerals

# Four Shapes of Bones

<b>Long bones</b>	<b>Short bones</b>	<b>Flat bones</b>	<b>Irregular bones</b>
Longer than wide  <b><u>Example:</u></b> <ul style="list-style-type: none"><li>● femur</li><li>● humerus</li></ul>	Roughly as long as wide  <b><u>Example:</u></b> <ul style="list-style-type: none"><li>● carpals</li><li>● tarsals</li></ul>	Plate-shaped  <b><u>Example:</u></b> <ul style="list-style-type: none"><li>● sternum</li><li>● scapula</li><li>● pelvis</li></ul>	Shape very irregular  <b><u>Example:</u></b> <ul style="list-style-type: none"><li>● vertebrae</li></ul>

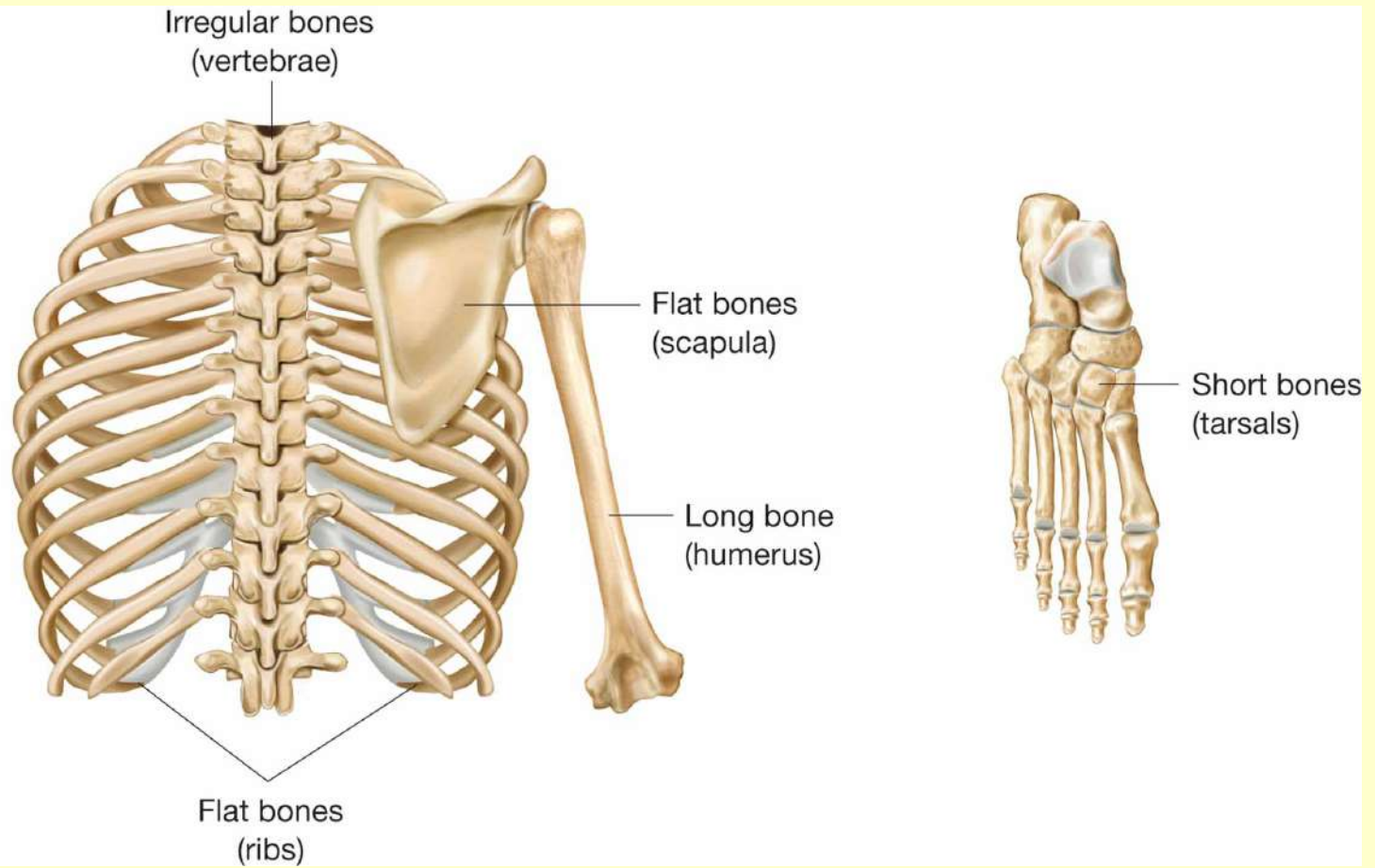


Figure 4.1 – Classification of bones by shape.

# Long Bones

- Majority of bones in body
- Divided into:
  - **Diaphysis**
  - **Epiphysis**



# Diaphysis

- Central shaft
- **Medullary cavity**
  - Open canal within diaphysis
  - Contains **yellow bone marrow**
    - Mostly fat





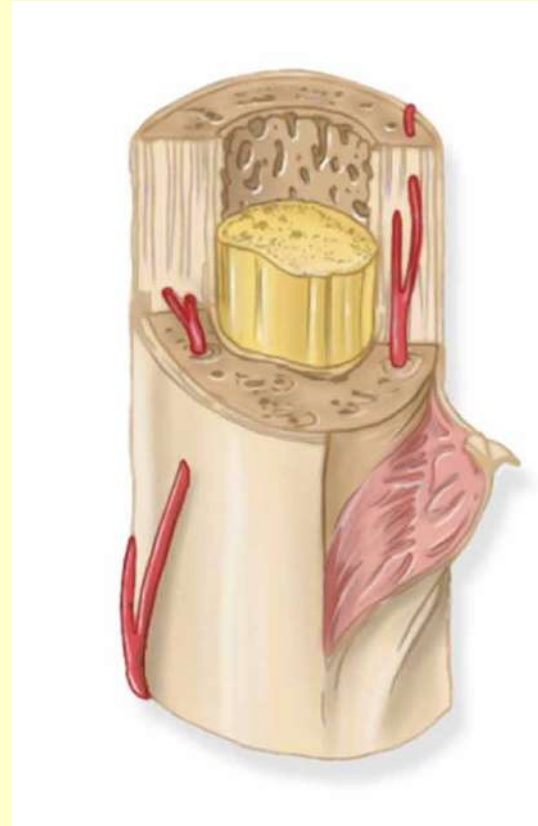
# Epiphysis

- Wide ends of long bone
  - **Distal epiphysis**
  - **Proximal epiphysis**
- **Articular cartilage**
  - Covers epiphysis
  - Prevents bone rubbing on bone



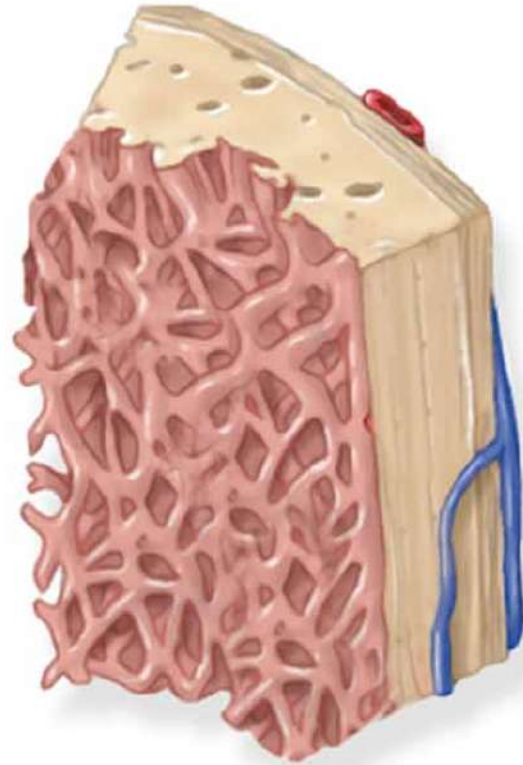
# Periosteum

- Covers surface of bone not covered by articular cartilage
- Thin connective tissue membrane
- Contains numerous nerve and lymphatic vessels



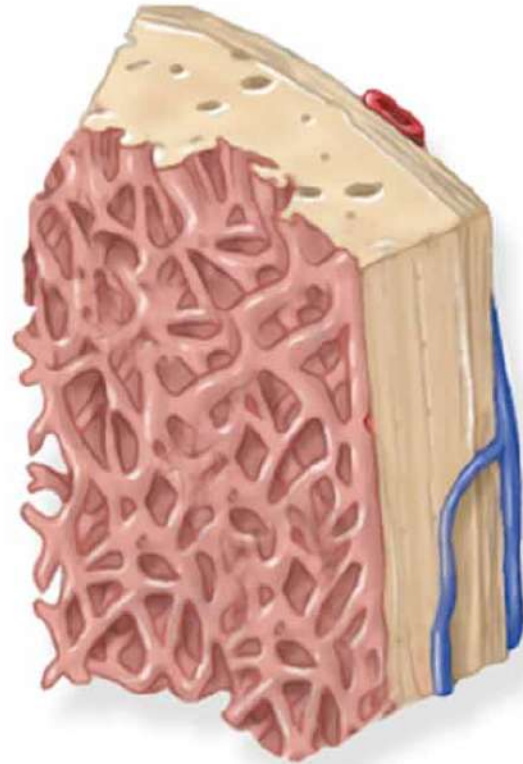
# Compact Bone

- Also called **cortical bone**
- Very dense and hard
- Outer layer of bone
- Found in both epiphysis and diaphysis



# Cancellous Bone

- Also called **spongy bone**
- Found inside bone
- Has spaces containing **red bone marrow**
  - Manufactures blood cells



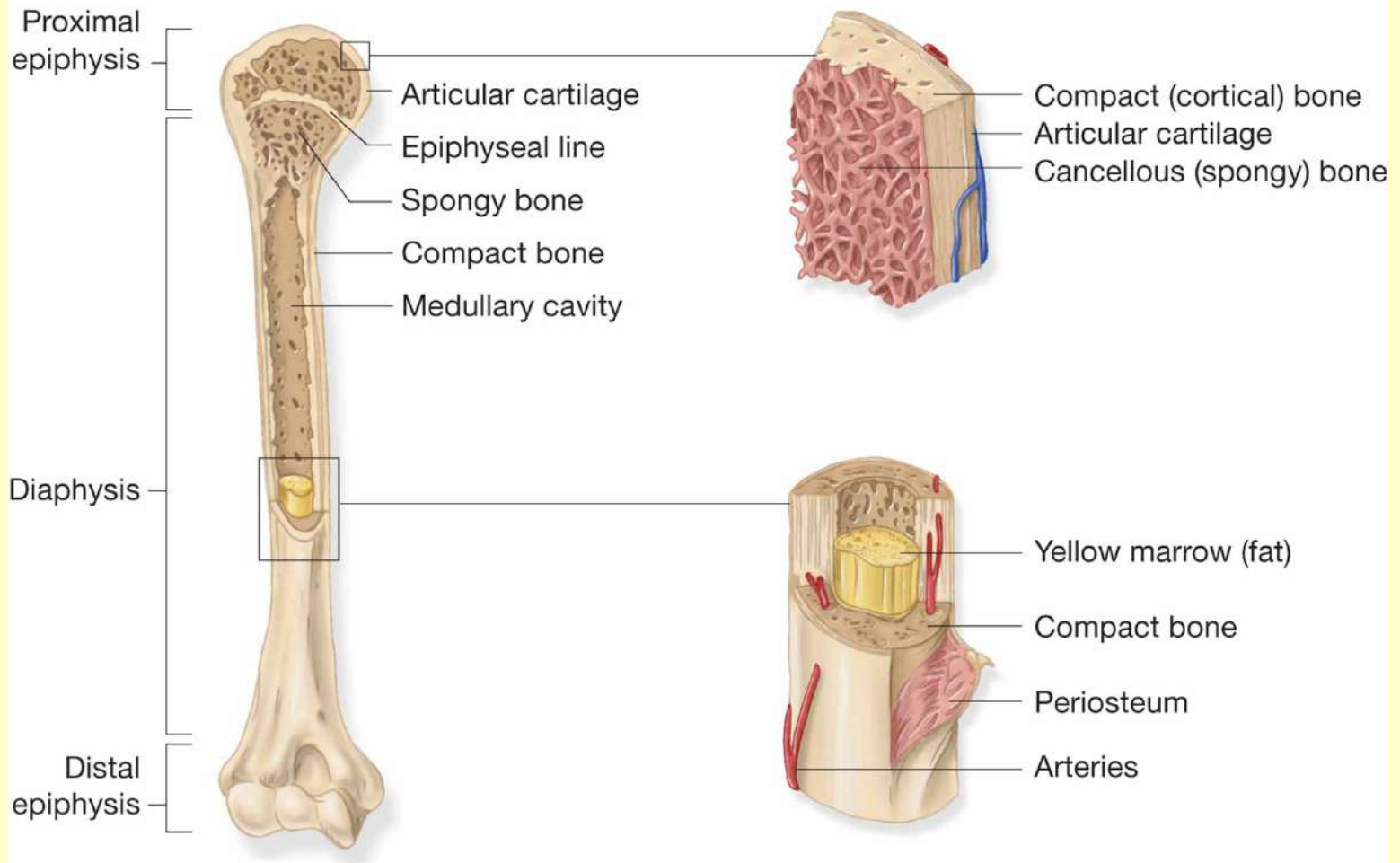


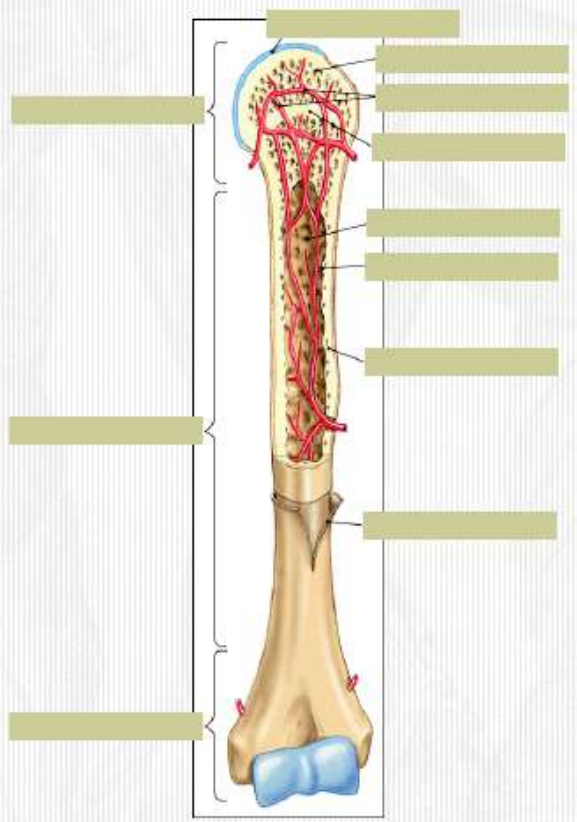
Figure 4.2 – Components of a long bone.

# Bone Structure Exercise

**Labeling 1**  
Click and drag each term to the appropriate feature of the long bone.

- Spongy bone
- Marrow cavity
- Periosteum
- Proximal epiphysis
- Blood vessels
- Compact bone
- Epiphyseal line
- Distal epiphysis
- Articular cartilage
- Endosteum
- Diaphysis

Score  
Items Attempted 0  
Correct on first try  
Percent



The diagram shows a long bone in a longitudinal section. At the top is the proximal epiphysis, which is wider and contains spongy bone and a marrow cavity. The middle section is the diaphysis, which is the shaft of the bone, composed of compact bone. At the bottom is the distal epiphysis, which is wider and contains spongy bone. A joint is visible at the very bottom. There are 11 empty label boxes: one on the left for the proximal epiphysis, one on the right for the proximal epiphysis, one on the right for the diaphysis, one on the right for the distal epiphysis, and one on the left for the distal epiphysis. Brackets on the left side group the proximal epiphysis, the diaphysis, and the distal epiphysis.

[Instructions](#) [reset](#)

Click here to review long bone structure with a labeling activity.

# Bony Processes

- Projection from the surface of a bone
- Rough processes provide place for muscle attachment
- Smooth rounded processes articulate with another bone in a joint
- Named for shape and location

# Common Bony Processes

<b>Head</b>	Large smooth ball-shaped end of a long bone
<b>Condyle</b>	Smooth rounded portion at end of bone
<b>Epicondyle</b>	Projection above or on a condyle
<b>Trochanter</b>	Large rough process
<b>Tubercle</b>	Small rough process
<b>Tuberosity</b>	Large rough process





Figure 4.3 – Bony processes found on the femur.

# Bony Depressions

- **Sinus**

- Hollow cavity within bone

- **Foramen**

- Smooth opening for nerves and blood vessels

- **Fossa**

- Shallow cavity or depression within a bone

- **Fissure**

- Deep groove or slit-like opening

# The Skeleton

- Skeleton has two divisions
  - **Axial skeleton**
  - **Appendicular skeleton**

# Axial Skeleton

- Includes bones in:
  - Head
  - Neck
  - Spine
  - Chest
  - Trunk



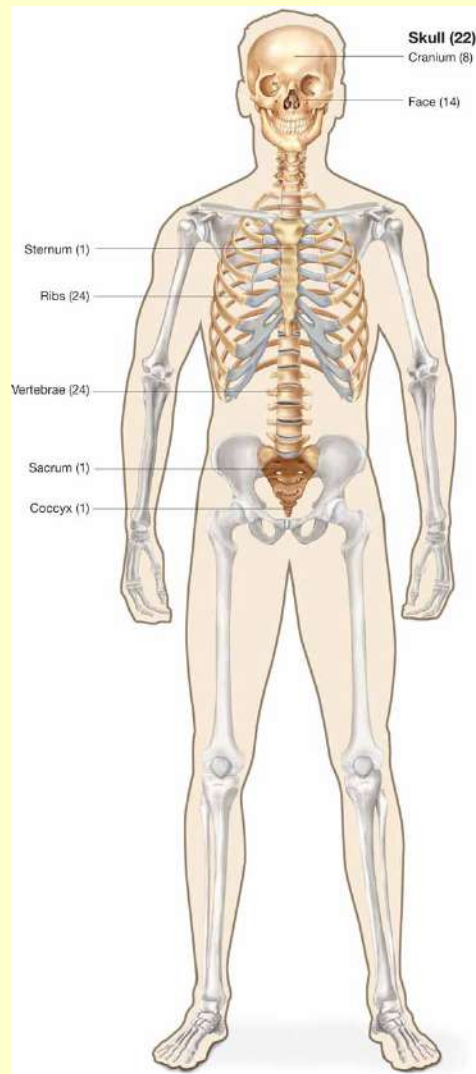


Figure 4.4 – Bones of the axial skeleton.

# The Skull

- Is divided into two parts
  - **Cranium**
  - **Facial bones**
- Protects brain, eyes, ears, nasal cavity, and oral cavity
- Attachment for muscles of chewing and turning the head

# Cranium

- **Frontal** – 1
  - Forehead
- **Parietal** – 2
  - Upper sides and roof of skull
- **Temporal** – 2
  - Sides & base of skull



# Cranium

- **Ethmoid** – 1
  - Part of eye orbit, nose, & floor of skull
- **Sphenoid** – 1
  - Part of floor of skull
- **Occipital** – 1
  - Back & base of skull





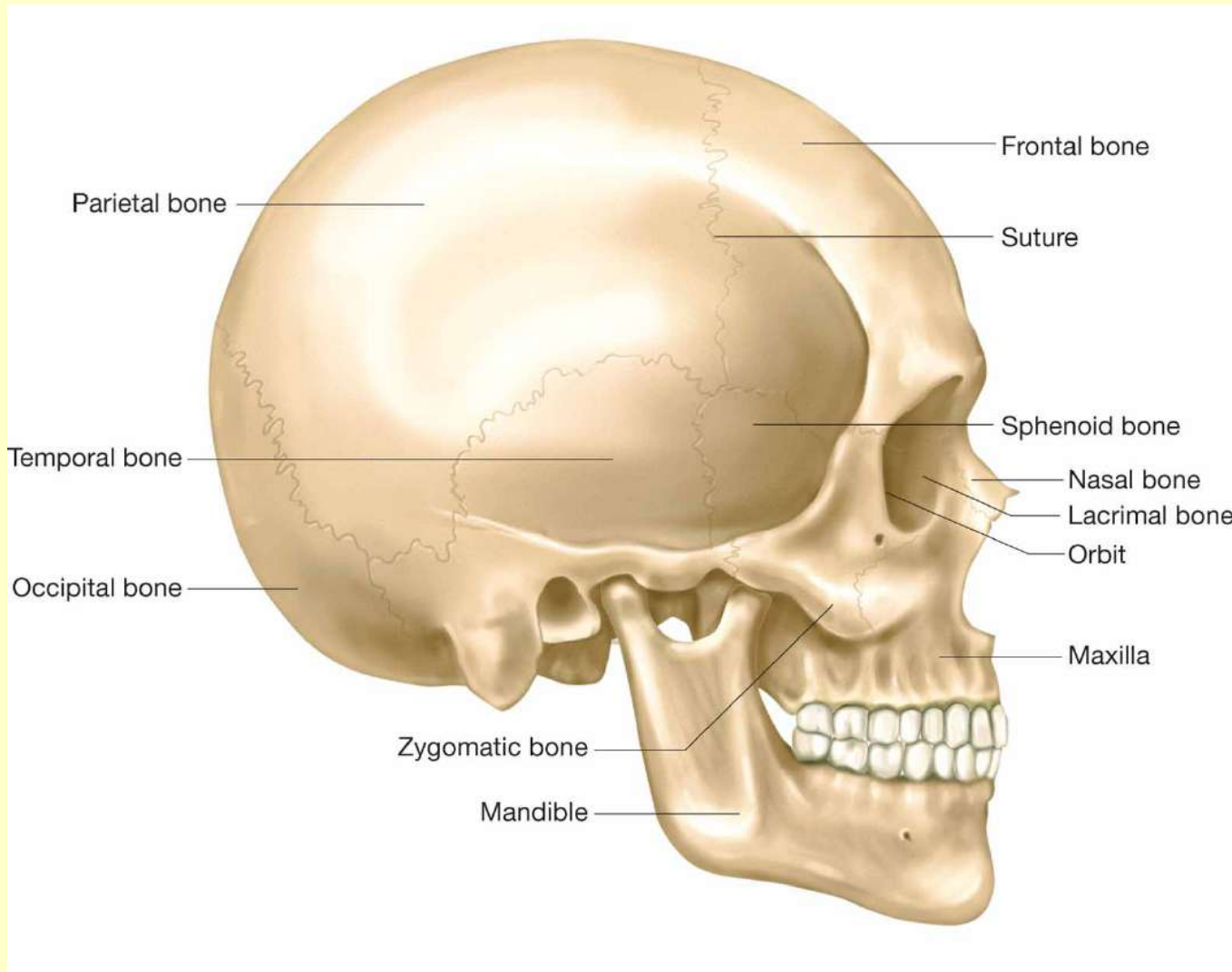


Figure 4.5 – Bones of the skull.

# Facial Bones

- **Mandible** – 1
  - Lower jawbone
- **Maxilla** – 1
  - Upper jawbone
- **Zygomatic** – 2
  - Cheek bones
- **Vomer** – 1
  - Part of nasal septum



# Facial Bones

- **Palatine** – 1
  - Hard palate and floor of nose
- **Nasal** – 2
  - Part of nasal septum and bridge of nose
- **Lacrimal** – 2
  - Inner corner of eye



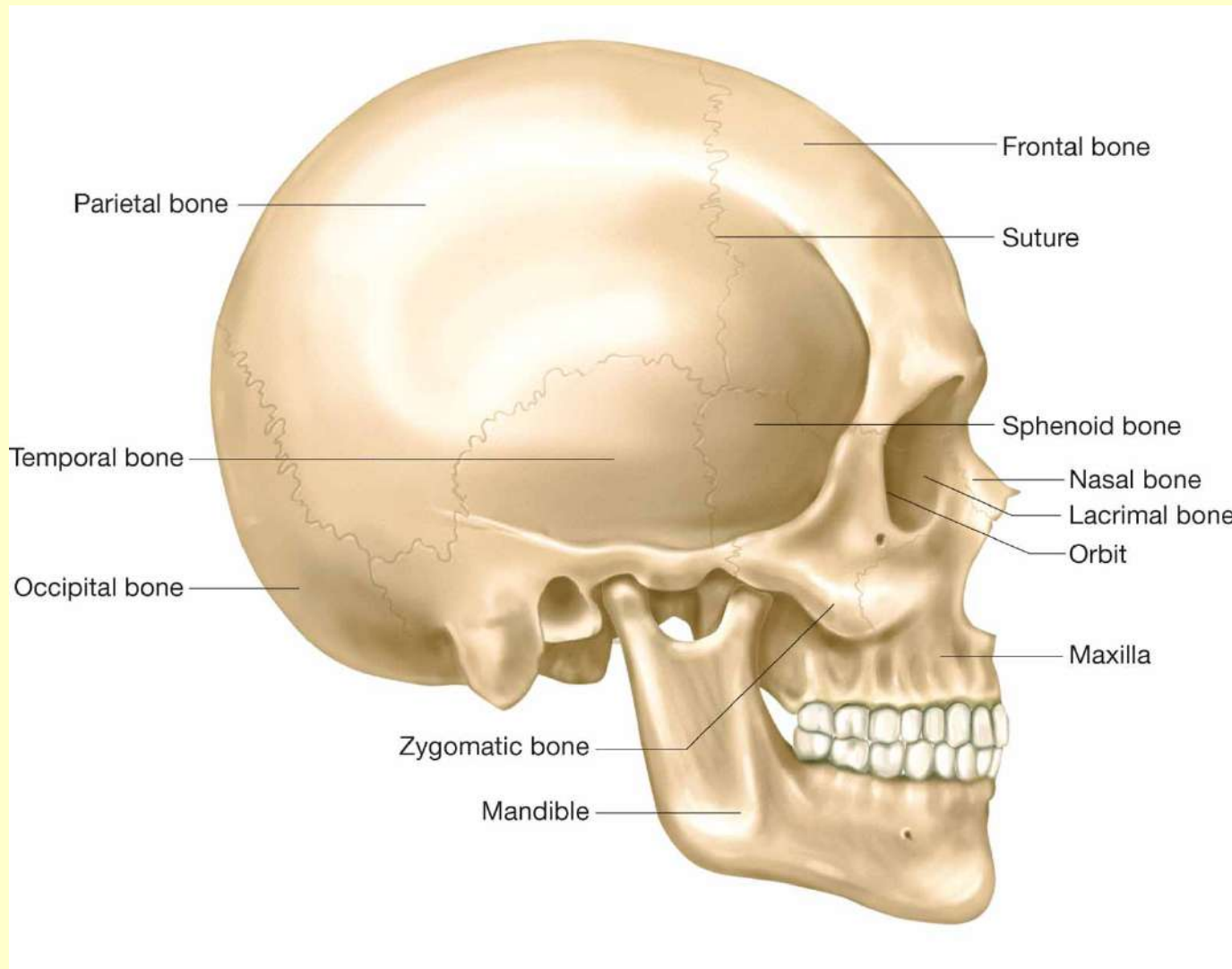


Figure 4.5 – Bones of the skull.

# Hyoid Bone

- Single U-shaped bone
- In neck between mandible and larynx
- Attachment point for swallowing and speech muscles

# The Trunk

- **Vertebral column**
- **Sternum**
- **Rib cage**



# The Vertebral Column

- Divided into five sections
  - **Cervical**
  - **Thoracic**
  - **Lumbar**
  - **Sacrum**
  - **Coccyx**



# The Vertebral Column

- Cervical
  - 7 vertebrae of neck
- Thoracic
  - 12 vertebrae of chest
- Lumbar
  - 5 vertebrae of low back
- Sacrum
  - 5 fused vertebrae at base of spine
- Coccyx
  - 3–5 small vertebrae attached to sacrum



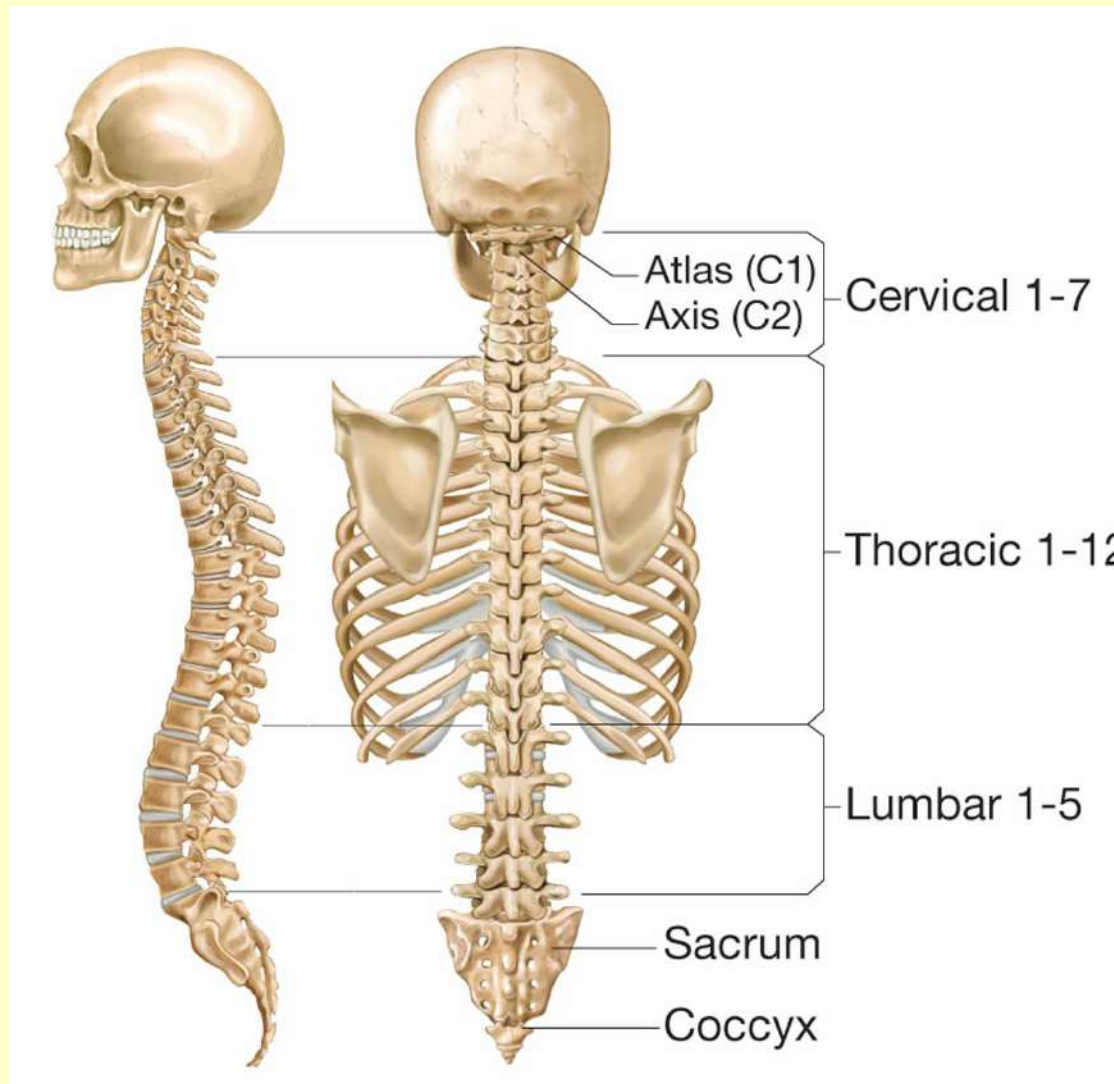
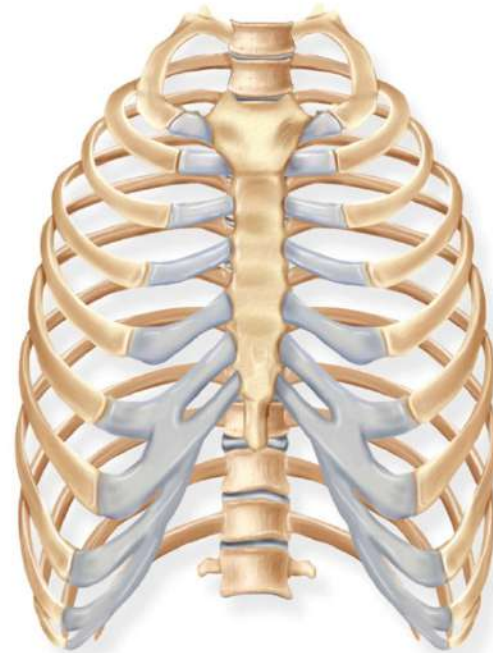


Figure 4.6 – Divisions of the vertebral column.

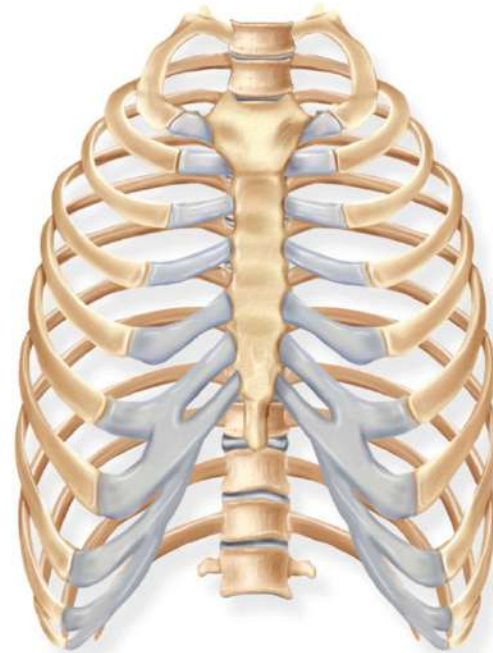
# The Rib Cage

- 12 pairs of ribs
- Attached to vertebral column at back
- Provides support for organs, such as heart and lungs



# The Rib Cage

- **True ribs**
  - 10 pairs attached to sternum in front
- **Floating ribs**
  - Inferior 2 pairs
  - No attachment in front



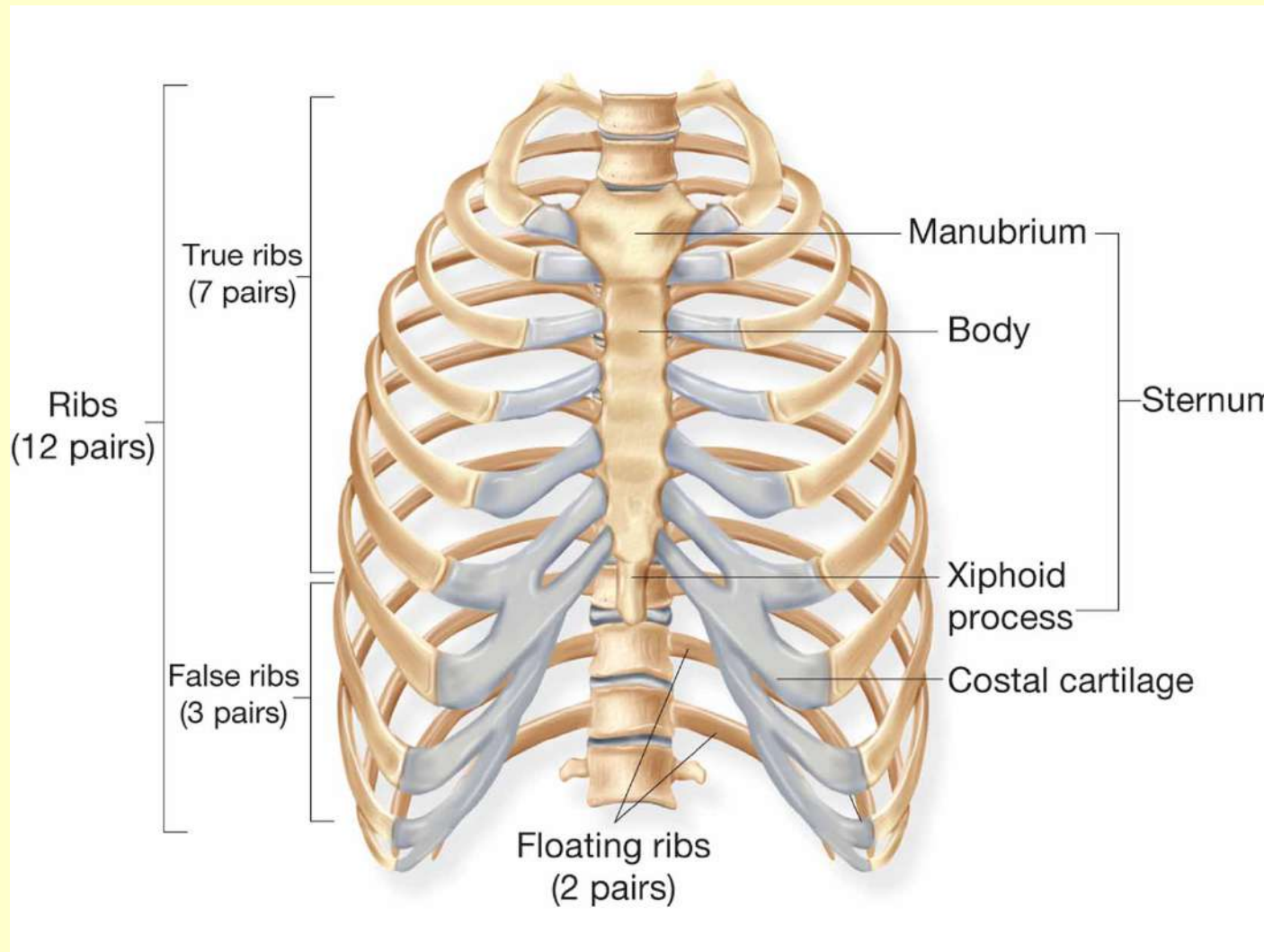
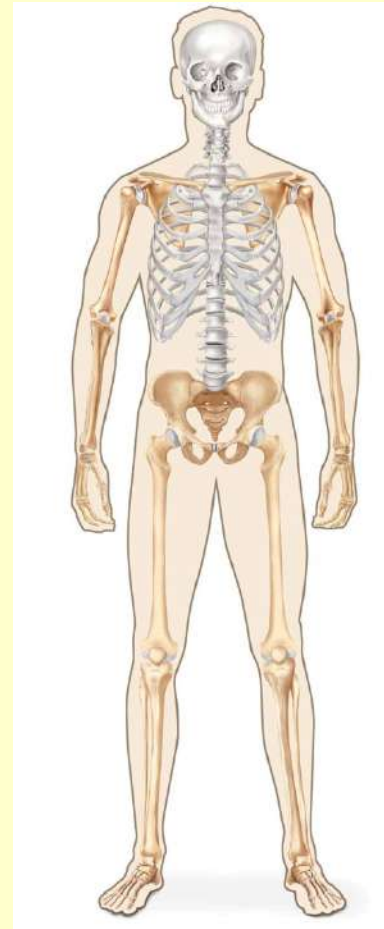


Figure 4.7 – The structure of the rib cage.

# Appendicular Skeleton

- Includes bones of:
  - **Pectoral girdle**
  - **Upper extremity**
  - **Pelvic girdle**
  - **Lower extremity**



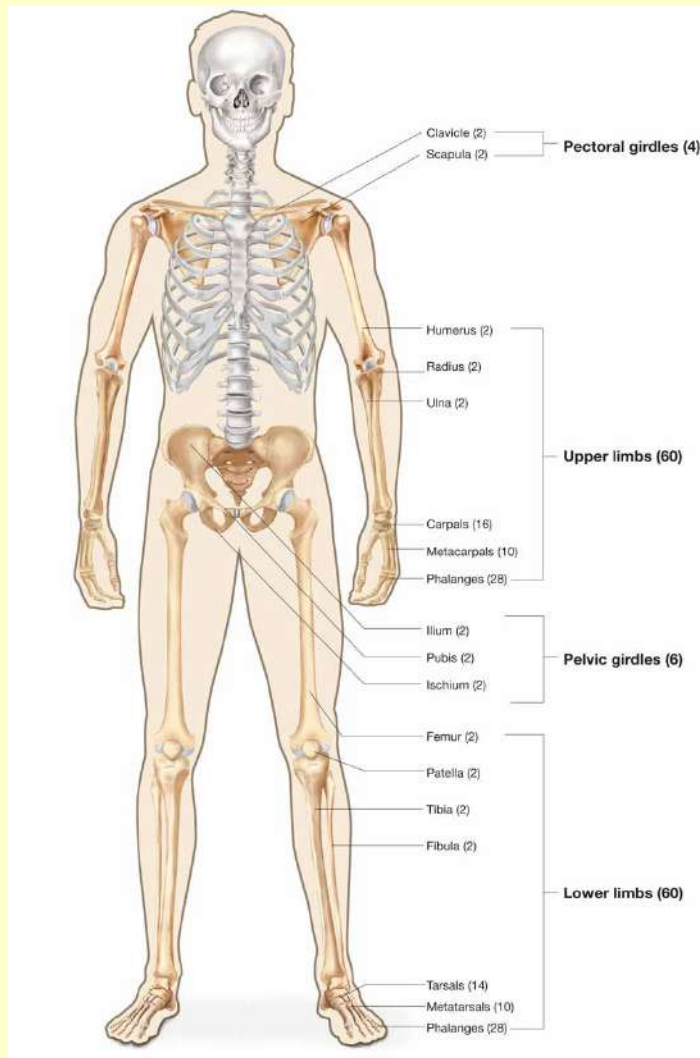


Figure 4.8 – Bones of the appendicular skeleton.

# Pectoral Girdle

- Attaches upper extremity to axial skeleton
- Articulates with:
  - Sternum anteriorly
  - Vertebral column posteriorly
- Consists of:
  - **Clavicle** – collar bone
  - **Scapula** – shoulder blade



# Upper Extremity

- Arm
- Consists of:
  - **Humerus** – upper arm
  - **Ulna** – part of forearm
  - **Radius** – part of forearm
  - **Carpals** – wrist bones
  - **Metacarpals** – hand bones
  - **Phalanges** – finger bones



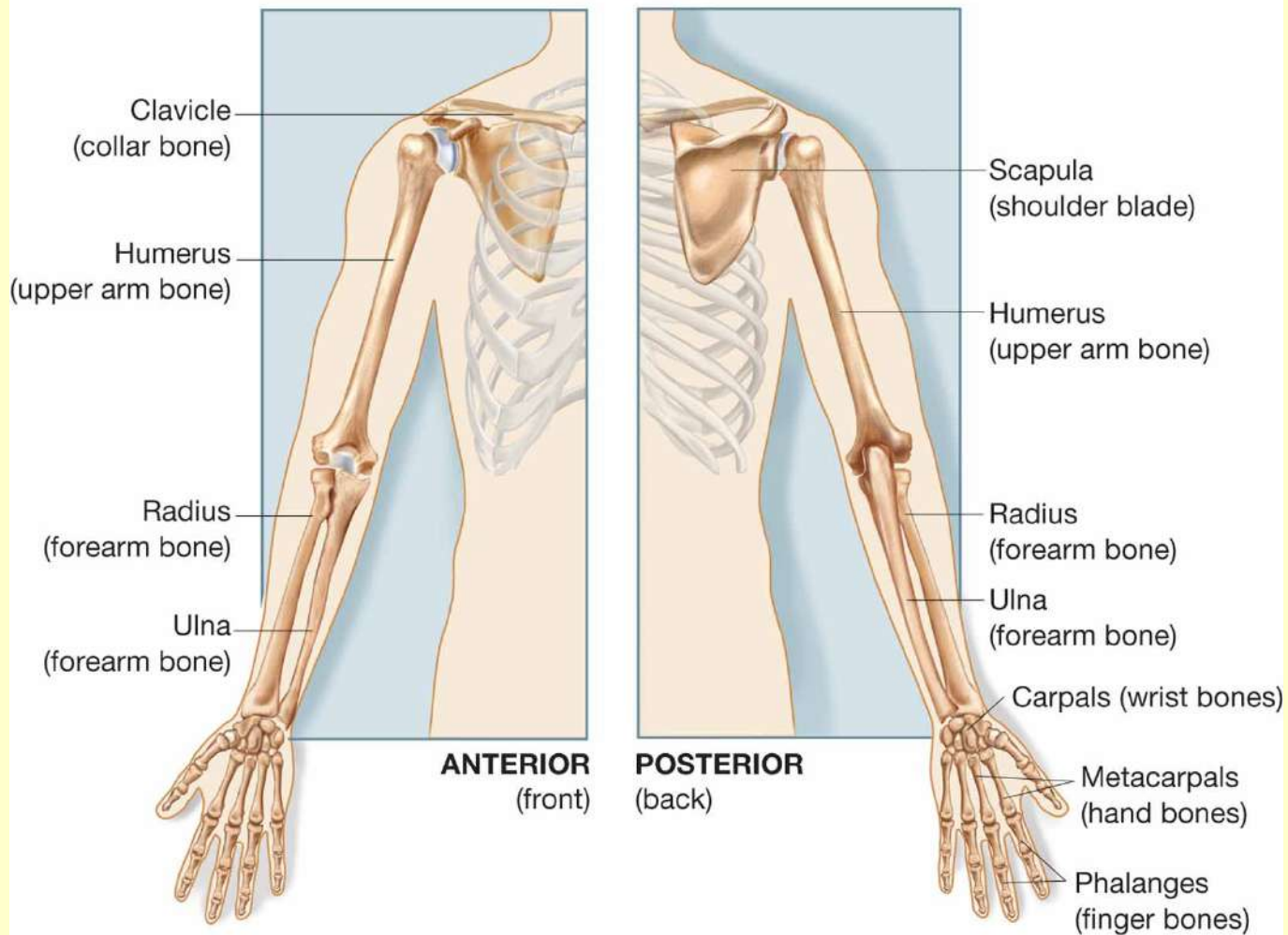


Figure 4.9 – Anatomical and common names for the pectoral girdle and upper extremity.

# Pelvic Girdle

- Also called **os coxae**, **innominate bone**, or **hipbone**
- Attaches lower extremity to axial skeleton
- Articulates with sacrum posteriorly
- Consists of:
  - **Ilium**
  - **Ischium**
  - **Pubis**

# Lower Extremity

- Leg
- Consists of:
  - **Femur** – thigh bone
  - **Patella** – knee cap
  - **Tibia** – shin bone
  - **Fibula** – lower leg bone
  - **Tarsals** – ankle bones
  - **Metatarsals** – foot bones
  - **Phalanges** – toe bones

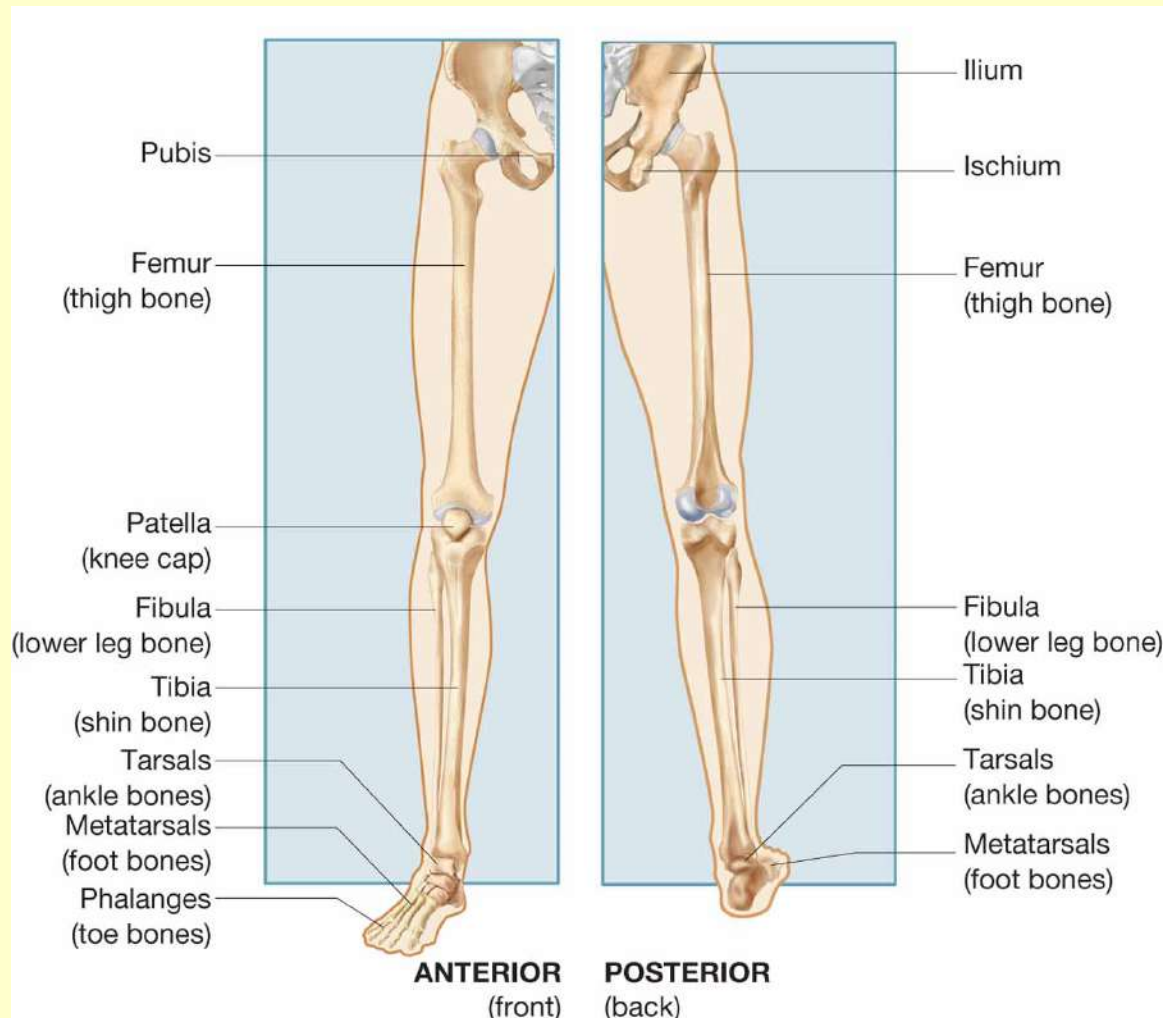
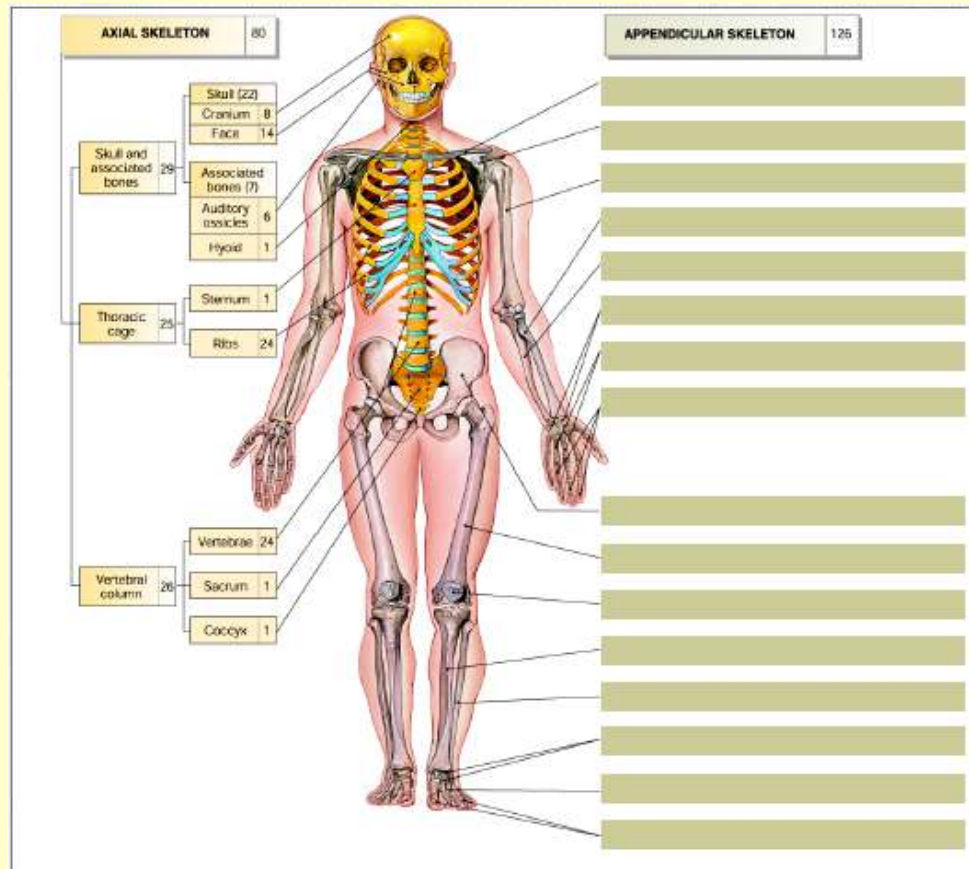


Figure 4.10 – Anatomical and common names for the pelvic girdle and lower extremity.

# Skeletal Bones Exercise



Click [here](#) to review the bones of the skeleton with a labeling activity.

# Joints

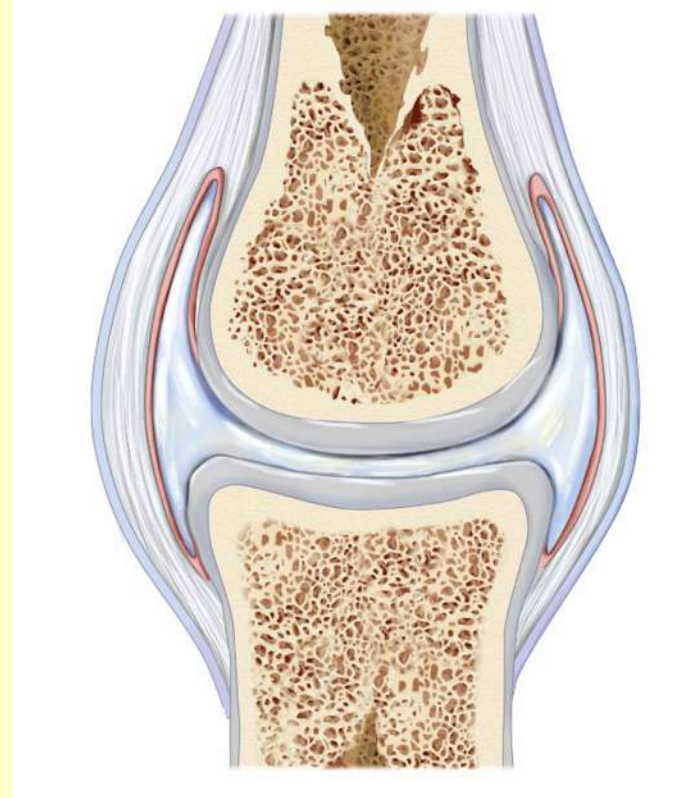
- Formed where two bones meet
- Also called an **articulation**
- Three types based on movement allowed between the 2 bones:
  - **Synovial**
  - **Cartilaginous**
  - **Fibrous**

# Synovial Joints

- Freely moving joints
- Most common type of joint
- Example is ball-and-socket joint
- Bones held together by **ligaments**
  - Strong bands of connective tissue
- Some contain a **bursa**
  - Sac-like structure lined with synovial membrane

# Synovial Joints

- Enclosed in an elastic **joint capsule**
- Contains **synovial fluid**
  - Lubricant secreted by **synovial membrane**
- Ends of bones are covered with **articular cartilage**





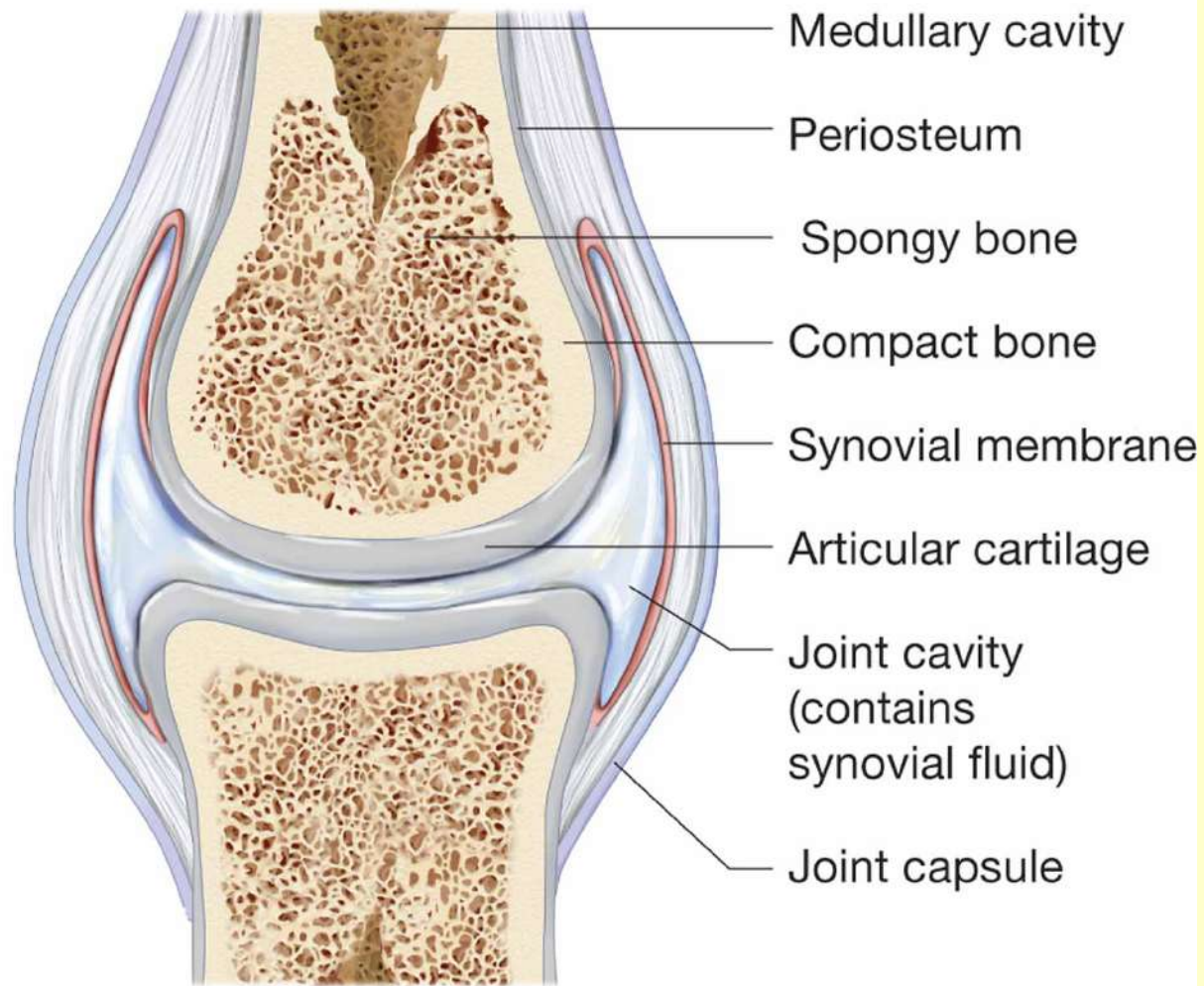


Figure 4.12 – Structure of a synovial joint.

# Cartilaginous Joints

- Allow slight movement
- Hold bones firmly in place by solid piece of cartilage
- Example
  - Pubic symphysis



# Fibrous Joints

- Allow almost no movement
- Joined by thick fibrous tissue
- Example
  - Sutures of the skull



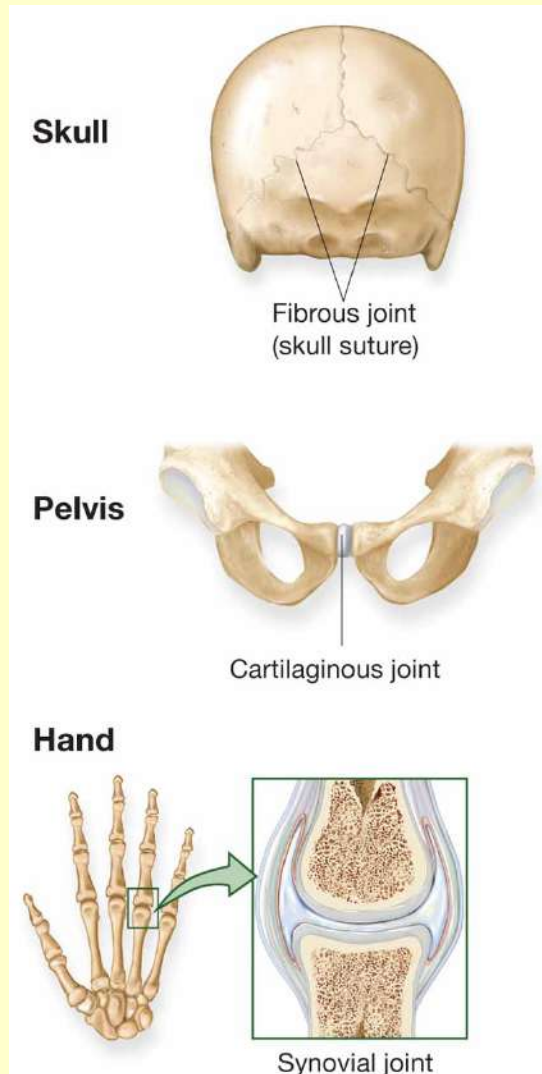


Figure 4.11 – Examples of three types of joints found in the body.

# Word Building with arthr/o

–algia	arthralgia	joint pain
–centesis	arthrocentesis	puncture to withdraw fluid from joint
–clasia	arthroclasia	surgically break a joint
–desis	arthrodesis	fusion of a joint
–gram	arthrogram	record of a joint
–itis	arthritis	joint inflammation
–otomy	arthrotomy	incision into a joint
–scope	arthroscope	instrument to view joint

# Word Building with burs/o & chondr/o

-ectomy	bursectomy	surgical removal of bursa
-itis	bursitis	inflammation of bursa

-ectomy	chondrectomy	surgical removal of cartilage
-malacia	chondromalacia	softening of cartilage
-oma	chondroma	cartilage tumor
-plasty	chondroplasty	surgical repair of cartilage

# Word Building with cortic/o and crani/o

-al	cortical	pertaining to the outer portion
intra- -al	intracranial	pertaining to inside the skull
-otomy	craniotomy	incision into the skull

# Word Building with medull/o & myel/o

-ary

medullary

pertaining to the inner portion

-oma

myeloma

red bone marrow tumor



# Word Building with oste/o

-algia	ostealgia	bone pain
chondr/o -oma	osteochondroma	bone and cartilage tumor
-clasia	osteoclasia	surgically break a bone
myel/o -itis	osteomyelitis	bone and bone marrow inflammation
-otomy	osteotomy	incision into bone
-pathy	osteopathy	bone disease
-tome	osteotome	instrument to cut bone

# Word Building with synov/o & vertebr/o

-itis	synovitis	inflammation of synovial membrane
-ectomy	synovectomy	surgical removal of synovial membrane
inter- -al	intervertebral	pertaining to between vertebrae

# Adjective Forms of Bone Names

iliac	ilium
carpal	carpus
cervical	neck
costal	rib
cranial	cranium
femoral	femur
humeral	humerus

ischial	ischium
metacarpal	metacarpus
metatarsal	metatarsus
radial	radius
sacral	sacrum
sternal	sternum
tarsal	tarsus

# Adjective Forms of Bone Names

tibial	tibia
clavicular	clavicle
fibular	fibula
lumbar	low back
mandibular	mandible
patellar	patella
scapular	scapula

ulnar	ulna
maxillary	maxilla
coccygeal	coccyx
phalangeal	phalanges
pelvic	pelvis
pubic	pubis
thoracic	thorax

# Skeletal System Vocabulary

callus	mass of bone tissue that forms at fracture site during healing
cast	solid material to immobilize a fracture; may be made of plaster of Paris or fiberglass
chiropractic	practice of treating patients using manipulations of vertebral column; practitioner is a chiropractor
crepitation	noise produced by bones or cartilage rubbing together
exostosis	bone spur

# Chiropractic Medicine Video



Click [here](#) to view a video on chiropractic medicine.

# Skeletal System Vocabulary

kyphosis	abnormal increase in curve of thoracic spine; humpback
lordosis	abnormal increase in forward curvature of lumbar spine; swayback
orthopedics	branch of medicine specializing in diagnosis and treatment of musculoskeletal system; physician is an orthopedist
orthotic	brace or splint used to prevent or correct deformities; specialist in making is an orthotist

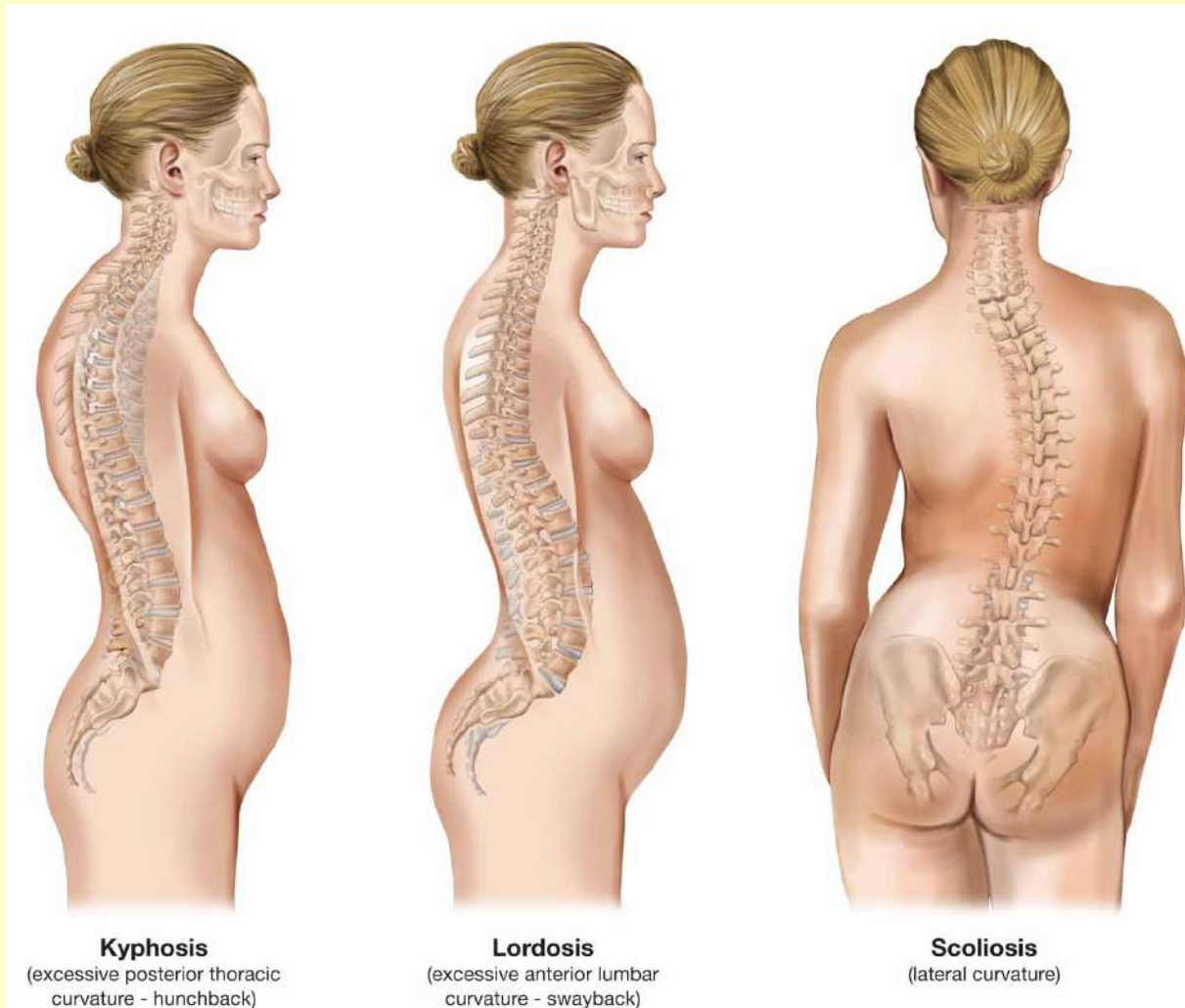


Figure 4.13 – Abnormal spinal curvatures: kyphosis, lordosis, and scoliosis.



# Skeletal System Vocabulary

podiatry	profession specializing in diagnosis and treatment of disorders of feet and lower leg; practitioner is a podiatrist
prosthesis	artificial device to substitute for a missing or damaged body part
prosthetics	profession specializing in making prostheses; specialist in making is a prosthetist

# Fractures

closed fracture	fracture with no open skin wound; also called simple fracture
Colles' fracture	common wrist fracture
comminuted fracture	fracture where bone is shattered, splintered, or crushed
compound fracture	fracture with an open skin wound; also called open fracture
compression fracture	fracture with loss of height in vertebral body; often from osteoporosis

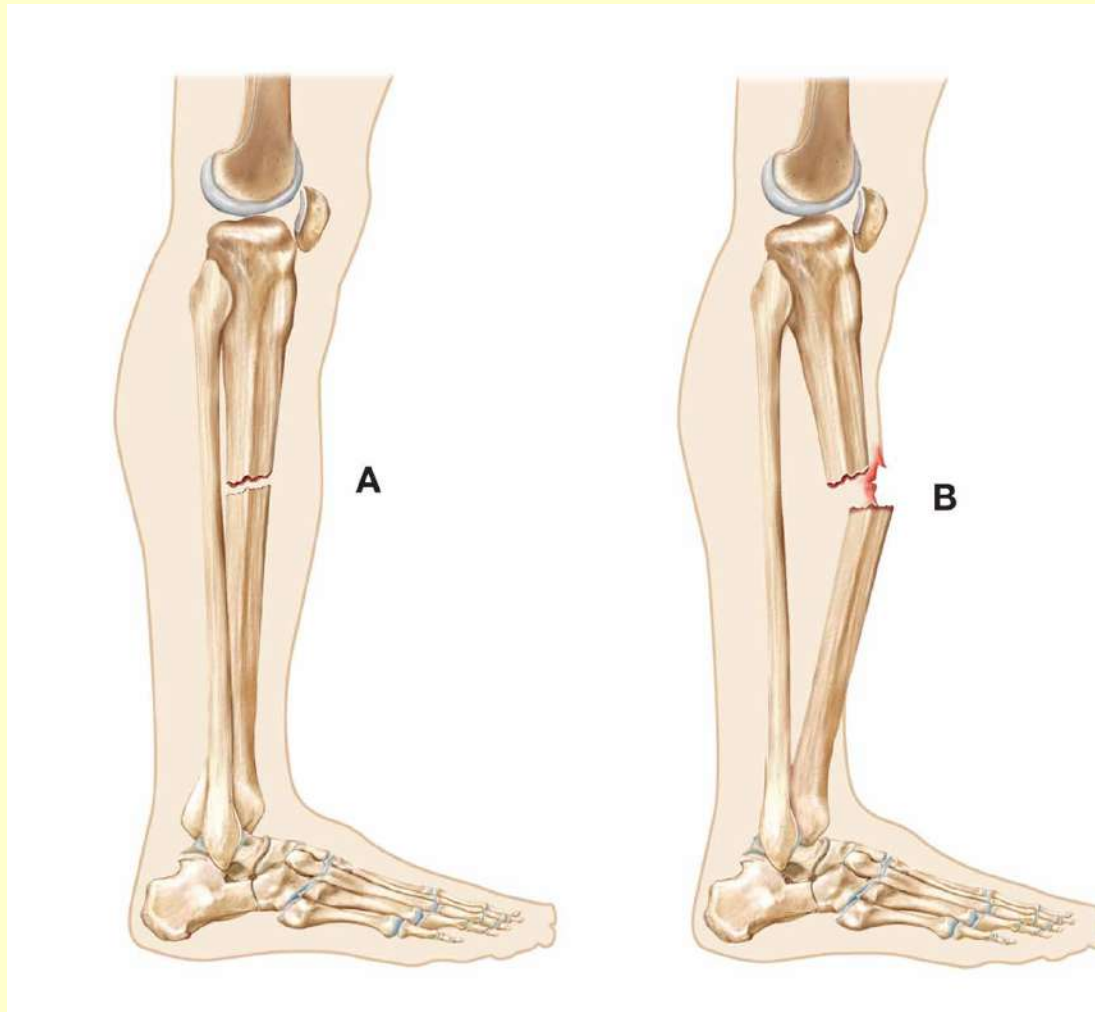


Figure 4.14 – A) Open (or compound) and B) closed (or simple) fractures.



**Figure 4.15 – Colles' fracture.**  
(Charles Stewart and Associates)

# Fractures

fracture (FX, Fx)	broken bone
greenstick fracture	incomplete break; one side of bone is broken, the other is bent; common in children
impacted fracture	bone fragments are pushed into each other
oblique fracture	fracture at an angle to bone



Figure 4.16 – X-ray showing oblique fracture of the humerus.  
(Charles Stewart and Associates)

# Fractures

pathologic fracture	fracture caused by diseased or weakened bone
spiral fracture	fracture line spiral around shaft of bone; often slower to heal
stress fracture	slight fracture caused by repetitive low-impact forces like running
transverse fracture	fracture is straight across bone



Figure 4.17 – X-ray showing transverse fracture of radius.

(James Stevenson/Science Photo Library/Photo Researchers, Inc.)



# Bone Pathologies

Ewing's sarcoma	cancerous tumor of shaft of long bones; spreads through periosteum; amputation is necessary to prevent metastasis
osteogenic sarcoma	most common type of bone cancer; begins in osteocytes
osteomalacia	softening of bones caused by calcium deficiency; caused in children with insufficient sunlight and vitamin D

# Bone Pathologies

osteoporosis	decrease in bone mass; results in thinning and weakening of bones; porous bone easily fractures
Paget's disease	metabolic disease of bone; unknown cause; results in bone destruction and deformity
rickets	caused by calcium and vitamin D deficiency; results in bone deformities like bowed legs

# Osteoporosis Video



Click [here](#) to view a video on osteoporosis.

# Spinal Column Pathologies

ankylosing spondylitis	inflammatory condition resembles rheumatoid arthritis; gradual stiffening and fusion of vertebrae
herniated nucleus pulposus (HNP)	protrusion of an intervertebral disk; also called ruptured disk
scoliosis	lateral curve of spine
spina bifida	congenital anomaly; vertebra fails to fully form around spinal cord

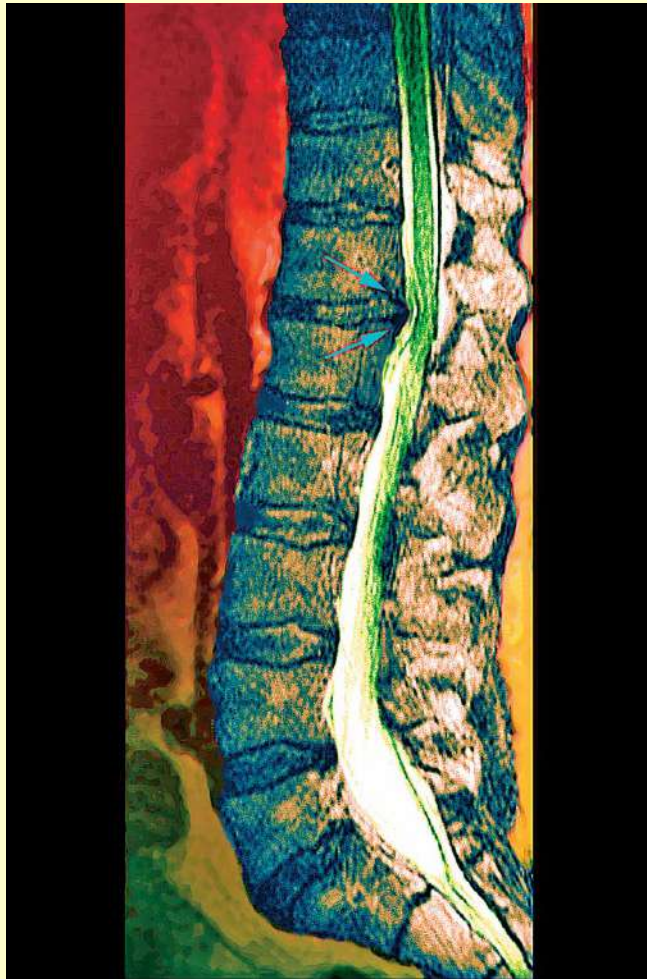


Figure 4.18 – Color enhanced magnetic resonance imaging (MRI) image demonstrating a herniated nucleus pulposus putting pressure on the spinal cord (see arrows).

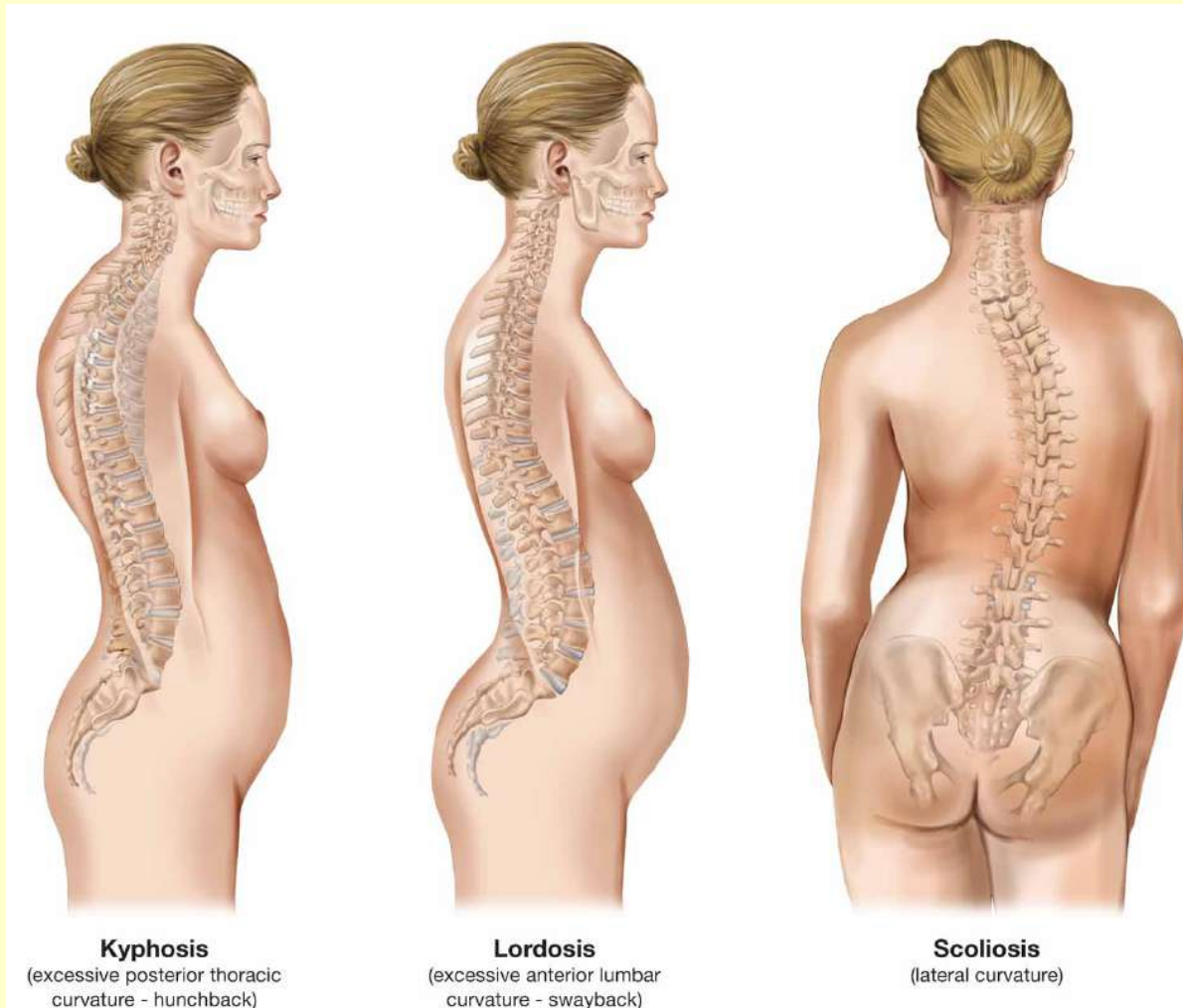


Figure 4.13 – Abnormal spinal curvatures: kyphosis, lordosis, and scoliosis.

# Spinal Column Pathology

spinal stenosis	narrowing of spinal canal; causes pressure on spinal cord and nerves
spondylolisthesis	forward sliding of lumbar vertebra over vertebra below it



# Joint Pathology

bunion	inflammation of bursa at base of great toe
dislocation	bones in joint are displaced from normal alignment
osteoarthritis (OA)	results in degeneration of bone and joints; bone rubs against bone
rheumatoid arthritis (RA)	autoimmune inflammation of joints with swelling, stiffness, pain; results in joint deformities





Figure 4.19 – Patient with typical rheumatoid arthritis contractures.  
(Science Photo Library/Photo Researchers, Inc.)

# Arthritis Video



Click [here](#) to view a video on arthritis.

# Skeletal System Pathology

sprain	damage to ligaments around joint due to overstretching; no dislocation or fracture
subluxation	incomplete dislocation; joint alignment is disrupted, but ends of bones remain in contact
systemic lupus erythematosus (SLE)	autoimmune disease of connective tissue affecting many systems including joints; looks like rheumatoid arthritis
talipes	congenital deformity of ankle misalignment; clubfoot

# Diagnostic Imaging

arthrography	visualizing joint by X-ray after injecting contrast medium into joint
bone scan	nuclear medicine procedure; radioactive dye is used to visualize bones; useful for identifying stress fractures and metastases
dual-energy absorptiometry (DXA)	measures bone density using low dose X-ray; detects osteoporosis

# Diagnostic Imaging

myelography	Study of spinal column after injecting opaque contrast medium; useful for identifying herniated nucleus pulposus
radiography	uses X-rays to study internal structure of body; especially useful for visualizing bones and joints

# Endoscopic Procedures

arthroscopy

Examining interior of joint with an arthroscope, a fiberoptic camera; view of joint interior appears on monitor during procedure

# Arthroscopy Video



Click [here](#) to view a video on arthroscopy.

# Surgical Procedures

amputation	removal of a limb for reasons like tumors, gangrene, or crushing injury
arthroscopic surgery	performing surgery while using an arthroscope to view inside joint
bone graft	bone from another source used to replace boney defect in another location



# Surgical Procedures

bunionectomy	removal of bursa at base of great toe
laminectomy	removal of posterior arch of vertebra to remove compression of a spinal nerve
percutaneous diskectomy	tube is inserted into intervertebral disk to suck out ruptured disk; may also be done with a laser

# Surgical Procedures

spinal fusion	surgical immobilization of adjacent vertebrae
total hip arthroplasty (THA)	implanting a prosthetic hip joint
total knee arthroplasty (TKA)	implanting a prosthetic knee joint

# Fracture Care

fixation	stabilizes fracture while it heals; external fixation includes casts and splints; internal fixation includes pins, plates, and screws
reduction	realigning bone fragments of fracture; closed reduction is manipulation without surgery; open reduction requires surgery
traction	applying a pulling force on fracture or dislocation to restore alignment



Figure 4.20 – Prosthetic hip joint.

(Lawrence Livermore National Library/Science Photo Library/Photo Researchers, Inc.)

# Skeletal System Pharmacology

bone reabsorption inhibitors	reduce the reabsorption of bone; treats osteoporosis and Paget's disease	Fosamax, Boniva
calcium supplements & Vitamin D supplements	supplements that maintain bone density; treats osteomalacia, osteoporosis, & rickets	Oystercal, Cal-Citrate

# Skeletal System Pharmacology

corticosteroids	have strong anti-inflammatory properties; treat rheumatoid arthritis	prednisone, Medrol, Decadron
nonsteroidal anti-inflammatory drugs (NSAIDs)	provide mild pain relief and anti-inflammatory benefits; treat arthritis	Advil, Motrin, Aleve, Aspirin

# Skeletal System Abbreviations

AE	above elbow
AK	above knee
BDT	bone density testing
BE	below elbow
BK	below knee
BMD	bone mineral density
C1, C2, etc.	first cervical vertebra, etc.

# Skeletal System Abbreviations

Ca	calcium
DJD	degenerative joint disease
DXA	dual-energy absorptiometry
FX, Fx	fracture
HNP	herniated nucleus pulposus
JRA	juvenile rheumatoid arthritis



# Skeletal System Abbreviations

L1, L2, etc.	first lumbar vertebra, etc.
LE	lower extremity
LLE	left lower extremity
LUE	left upper extremity
NSAID	nonsteroidal anti-inflammatory drug
OA	osteoarthritis
ORIF	open reduction – internal fixation

# Skeletal System Abbreviations

Orth, ortho	orthopedics
RA	rheumatoid arthritis
RLE	right lower extremity
RUE	right upper extremity
SLE	systemic lupus erythematosus
T1, T2, etc.	first thoracic vertebra, etc.
THA	total hip arthroplasty

# Skeletal System Abbreviations

THR	total hip replacement
TKA	total knee arthroplasty
TKR	total knee replacement
UE	upper extremity

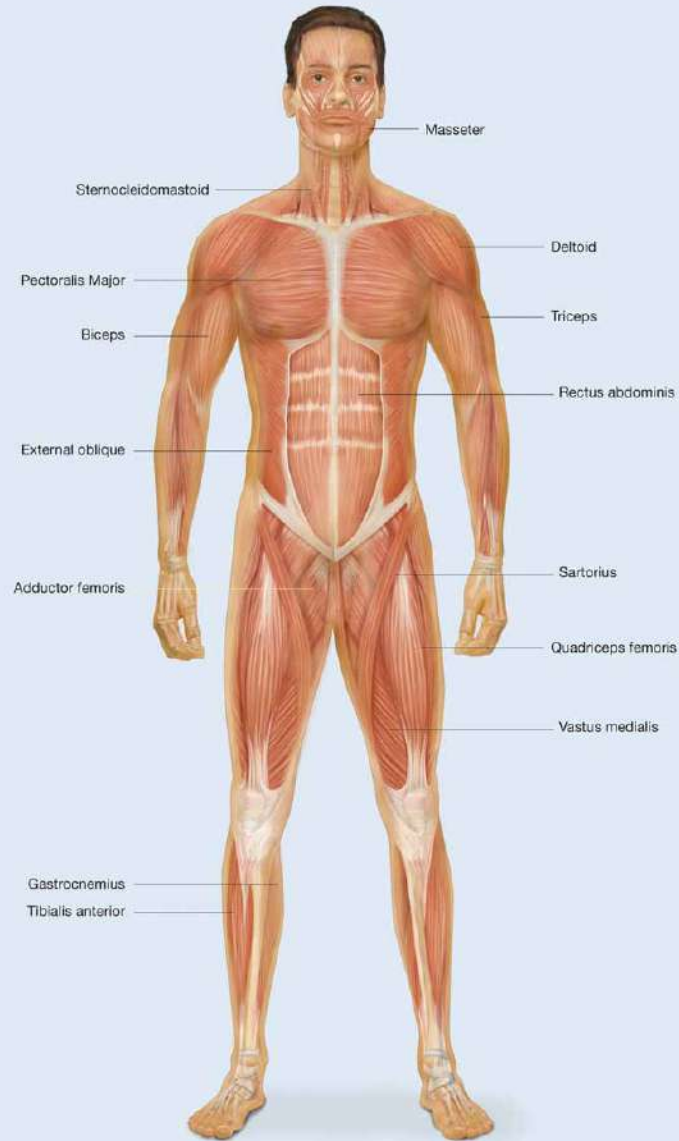
# Muscular System at a Glance

- Function of Muscular System
  - Individual cells are able to contract or shorten in length
  - Shortening produces movement

# Muscular System at a Glance

- Organs of Muscular System
  - Muscles

# Muscular System Illustrated



# Muscular System Combining Forms

- fasci/ofibrous band
- fibr/ofibers
- kinesi/omovement
- muscul/omuscle
- my/omuscle

# Muscular System Combining Forms

- myocardi/oheart muscle
- myos/omuscle
- plant/osole of foot
- ten/otendon
- tend/otendon
- tendin/otendon



# Muscular System Suffixes

- –asthenia weakness
- –kinesia movement
- –tonia tone

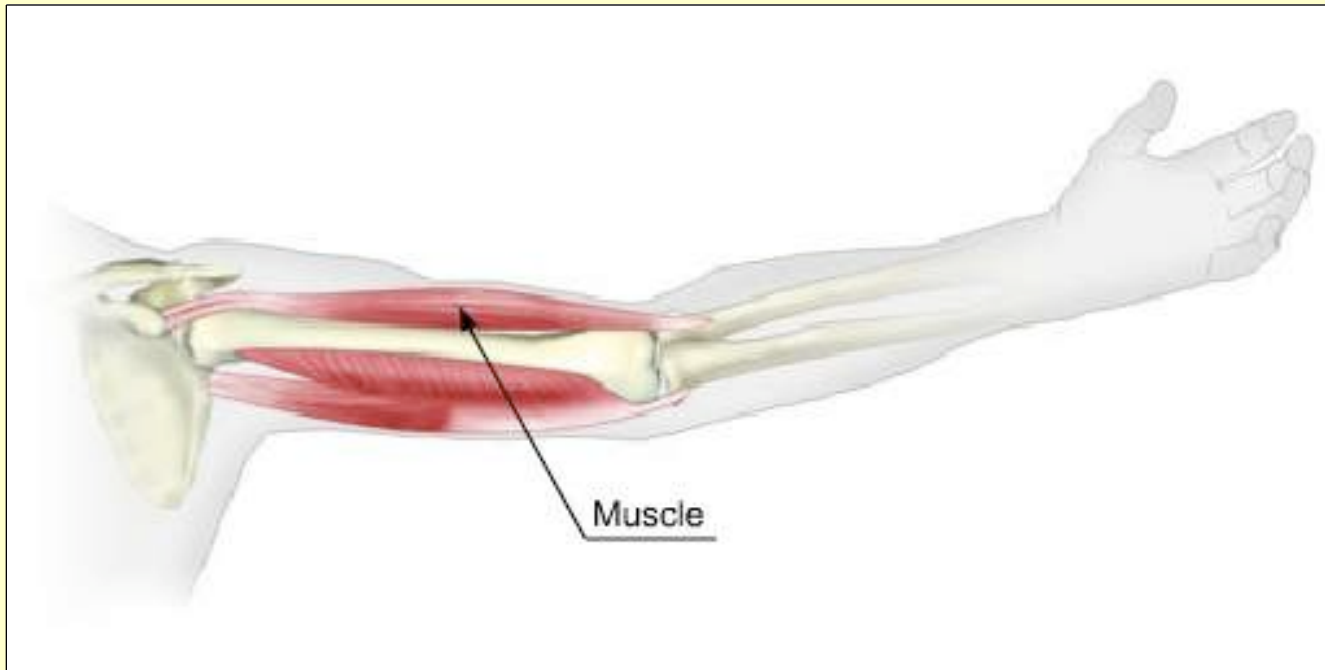
# Muscular System Prefixes

- ab– away from
- ad– towards
- circum– around

# Anatomy and Physiology

- Bundles of parallel **muscle tissue fibers**
- Fibers contract
  - Shorten in length
  - Produce movement
  - Move bones closer together
  - Push food through digestive system
  - Pump blood through blood vessels

# Muscles Animation



Click [here](#) to view an animation on muscles.

# Types of Muscles

- **Skeletal muscle**
- **Smooth muscle**
- **Cardiac muscle**
- **Voluntary muscles**
  - Consciously choose to contract the muscle
  - Skeletal muscles
- **Involuntary muscles**
  - Under control of subconscious brain
  - Smooth muscles and cardiac muscle

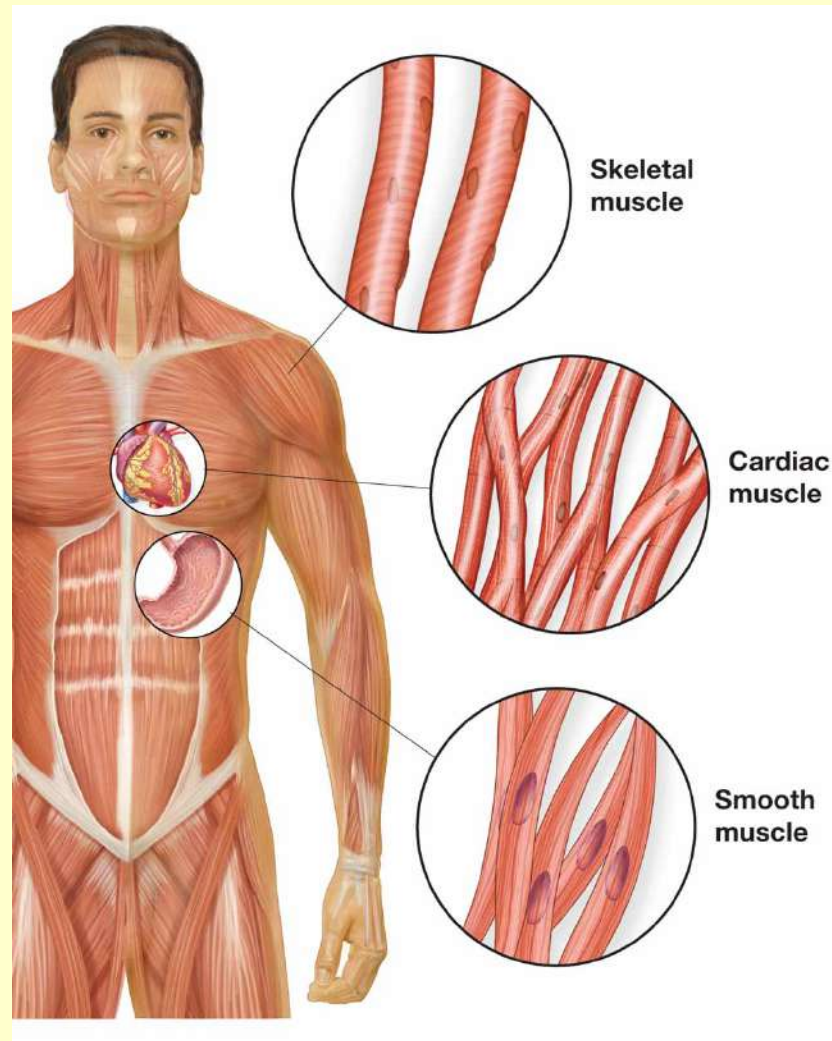


Figure 4.21 – The three types of muscles: skeletal, smooth, and cardiac.

# Skeletal Muscles

- Attached to bones
- Produce voluntary movement of skeleton
- Also referred to as **striated muscle**
  - Looks striped under microscope

# Skeletal Muscles

- Muscle is wrapped in layers of connective tissue
  - Called **fascia**
  - Tapers at the end to form **tendon**
  - Inserts into periosteum to attach muscle to bone
- Are stimulated by **motor neurons**
  - Point of contact with muscle fiber is called **myoneural junction**



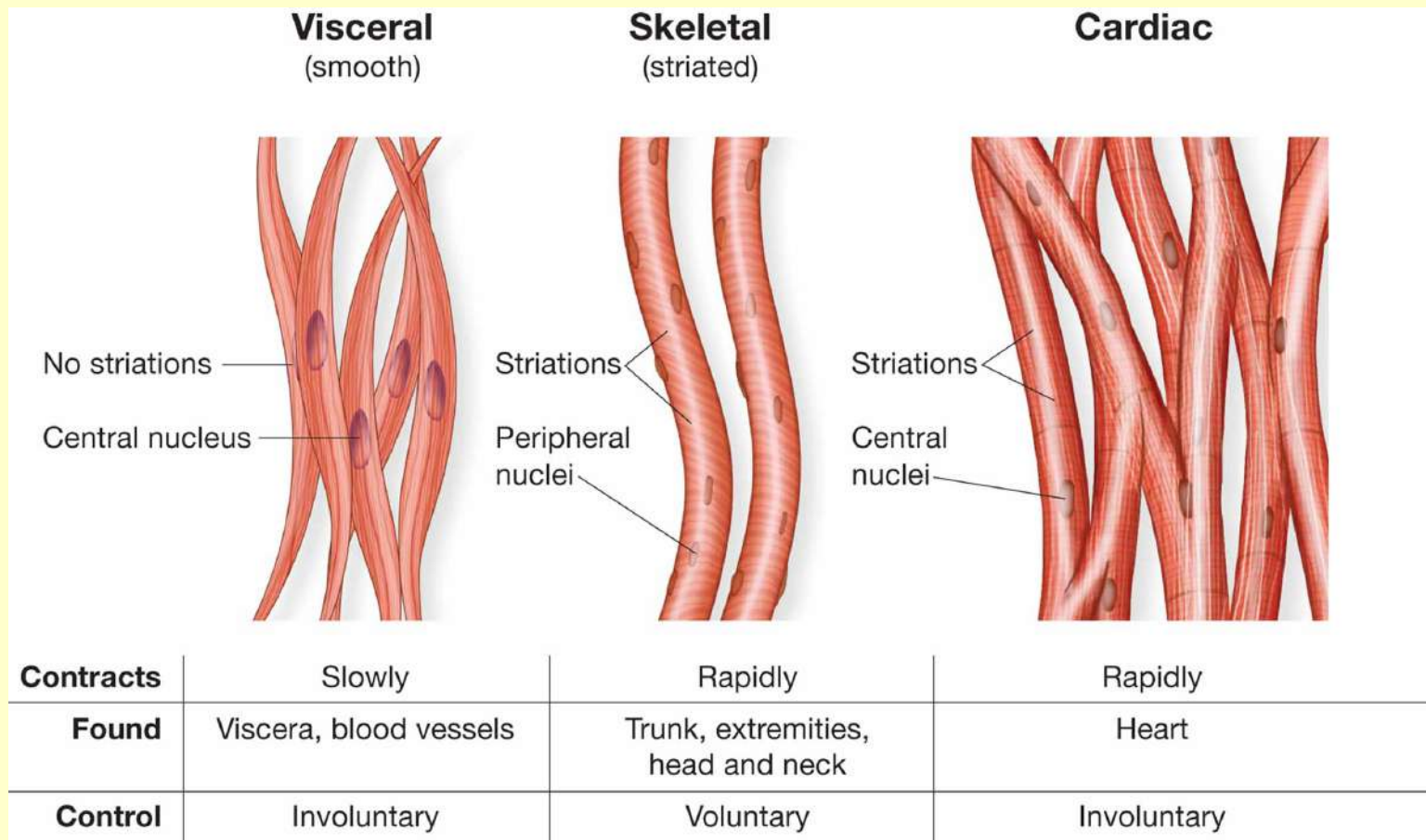


Figure 4.22 – Characteristics of the three types of muscles.

# Smooth Muscles

- Associated with internal organs
  - Also called **visceral muscle**
  - Stomach
  - Respiratory airways
  - Blood vessels
- Called smooth because has no microscopic stripes
- Produces involuntary movement of these organs

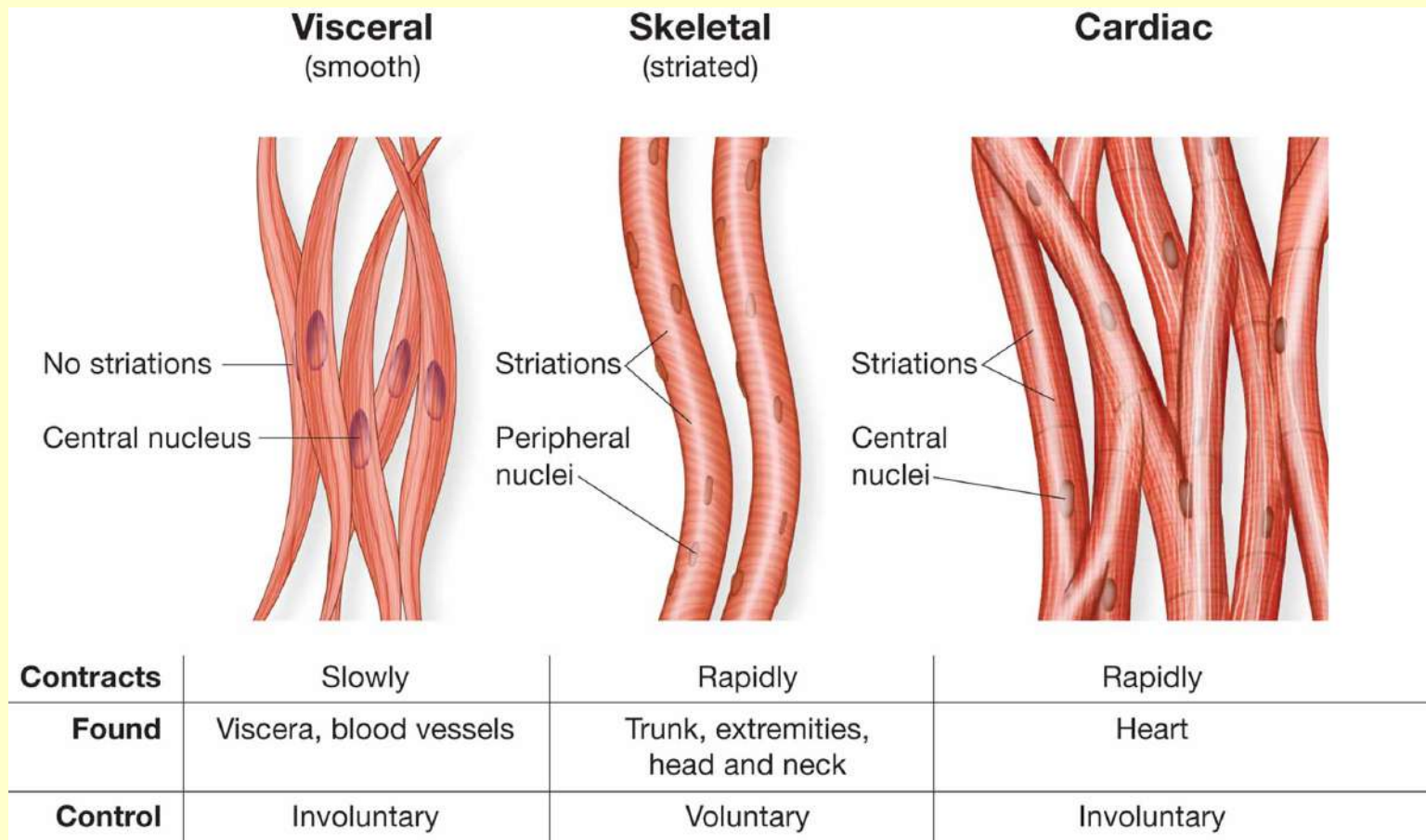


Figure 4.22 – Characteristics of the three types of muscles.

# Cardiac Muscle

- Also called **myocardium**
- Makes up walls of heart
- Involuntary contraction of heart to pump blood

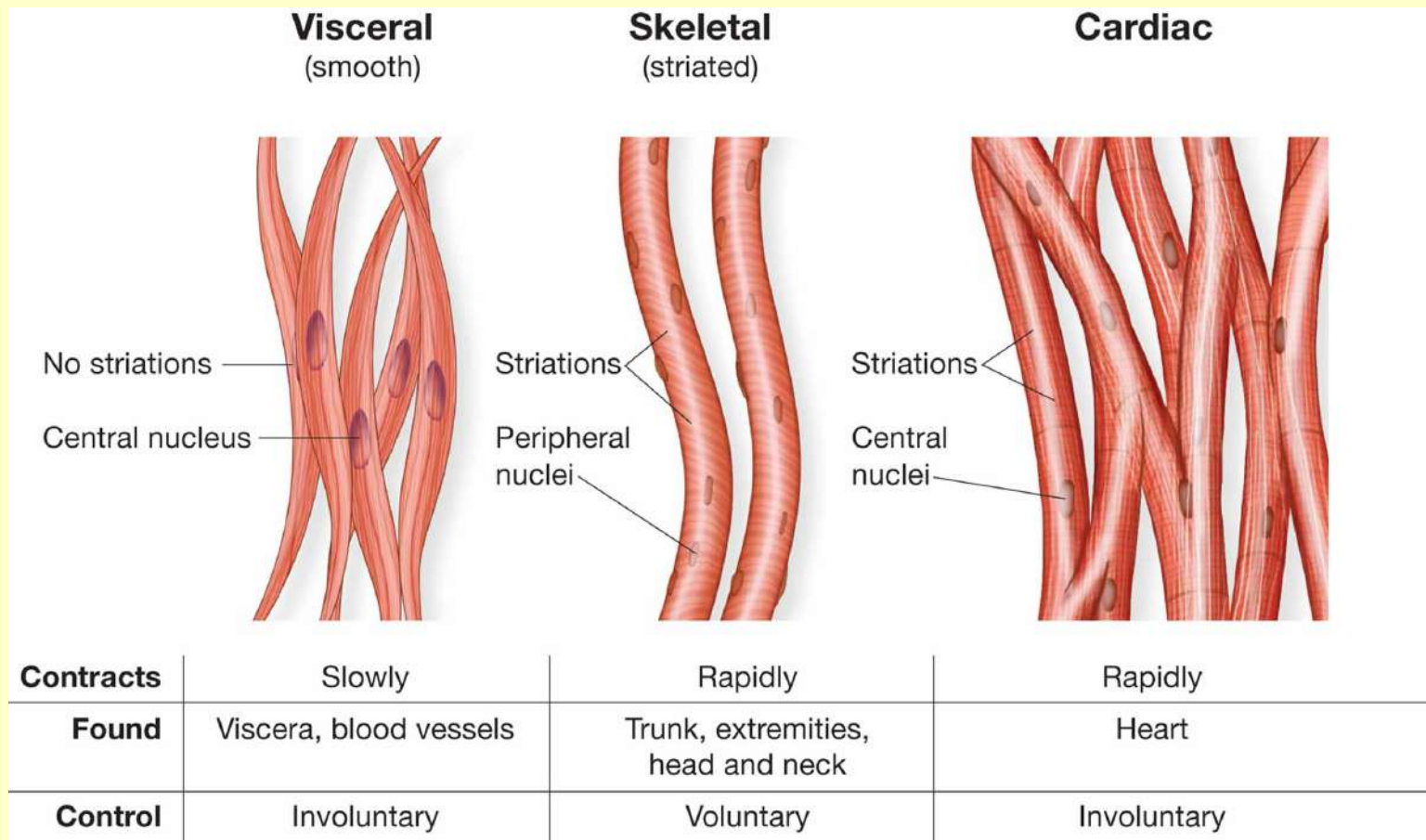


Figure 4.22 – Characteristics of the three types of muscles.

# Muscle Names

<b>Location</b>	rectus abdominis	straight abdominal muscle
<b>Origin and insertion</b>	sternocleidomastoid	named for its two origins: sternum and clavicle
<b>Size</b>	gluteus maximus	large buttock muscle

# Muscle Names

<b>Action</b>	flexor carpi	muscle that bends the wrist
<b>Fiber direction</b>	external oblique	abdominal with fibers running on an angle
<b>Number of attachment points</b>	biceps	muscle with two heads

# Skeletal Muscle Actions

- Skeletal muscles attach to two different bones and overlap a joint
- When muscle contracts both bones move, but not equally
  - **Origin:** less moveable of 2 bones
  - **Insertion:** more moveable of 2 bones



# Skeletal Muscle Actions

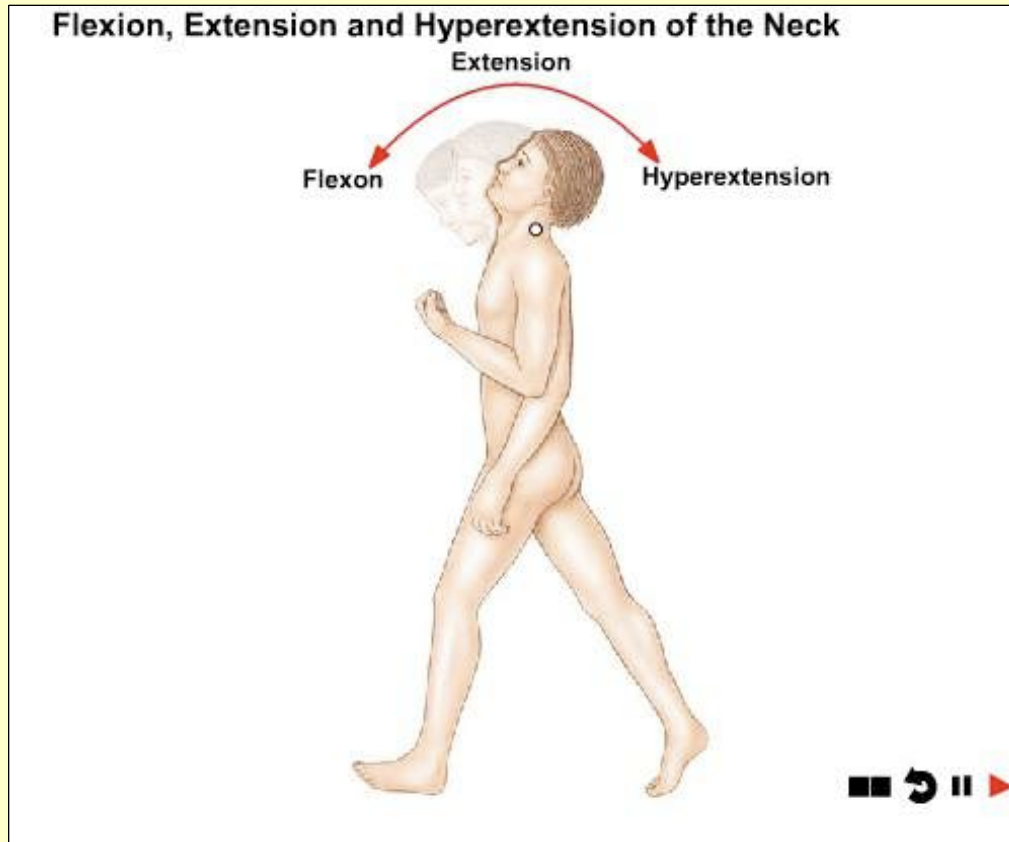
- **Action**

- Type of movement produced by the muscle

- **Antagonistic pairs**

- Pair of muscles arranged around a joint
- Produce opposite actions

# Joint Movement Animation



Click [here](#) to view an animation on the movement of joints.

# Movement Terminology

abduction	movement away from midline of body
adduction	movement toward midline of body

flexion	act of bending or being bent
extension	brings limb into a straight condition

dorsiflexion	backward bending of foot
plantar flexion	bending sole of foot; pointing toes



Figure 4.23 – Abduction and adduction.

# Humerus Adduction/Abduction Animation



Click [here](#) to view an animation on humerus adduction and abduction.

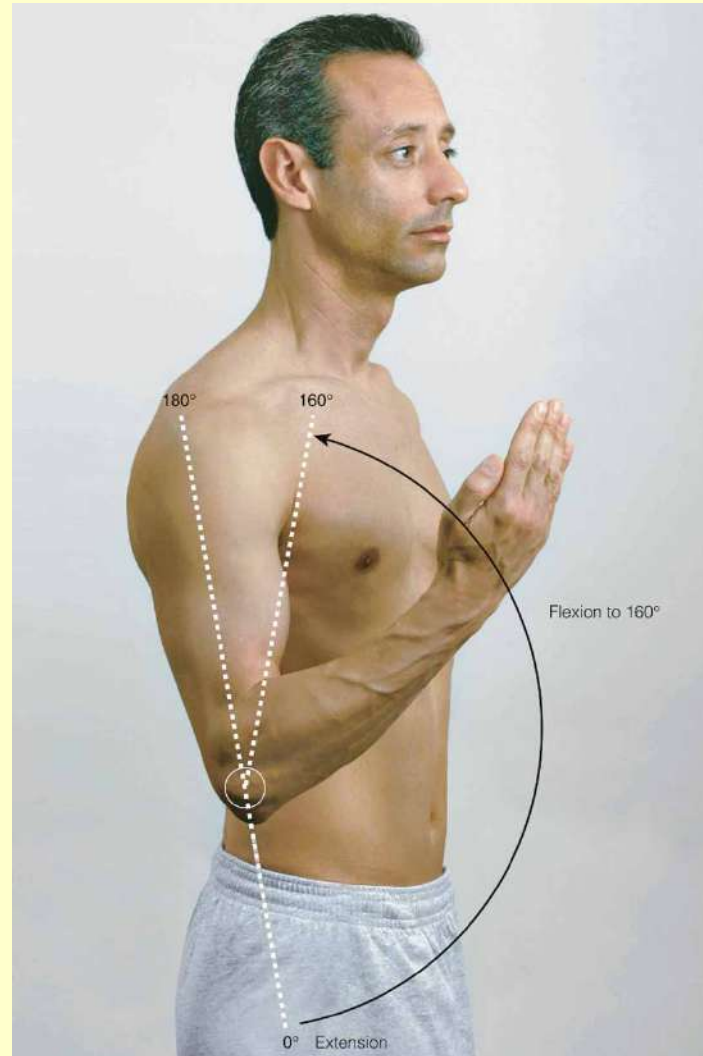
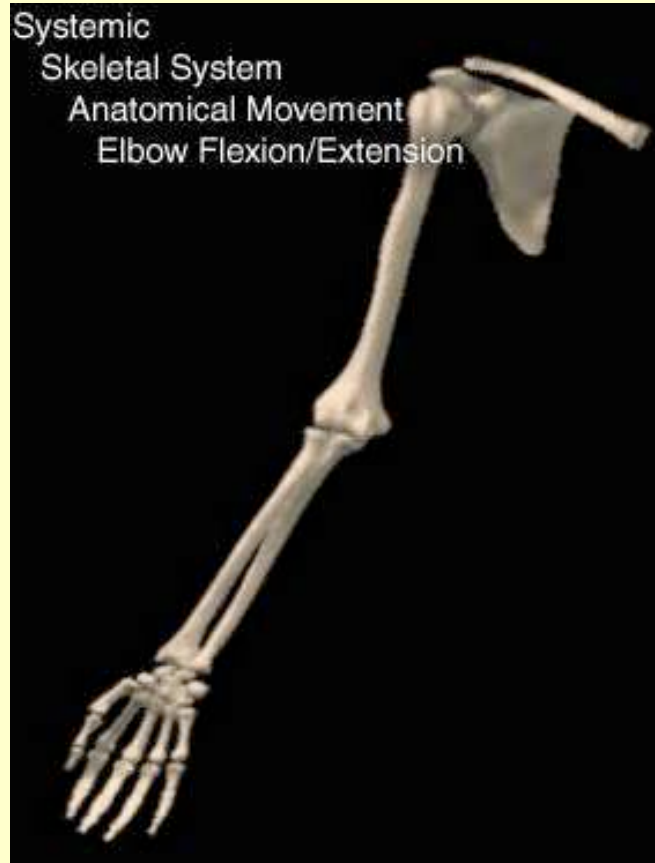


Figure 4.24 – Flexion and extension.

# Elbow Flexion/Extension Animation



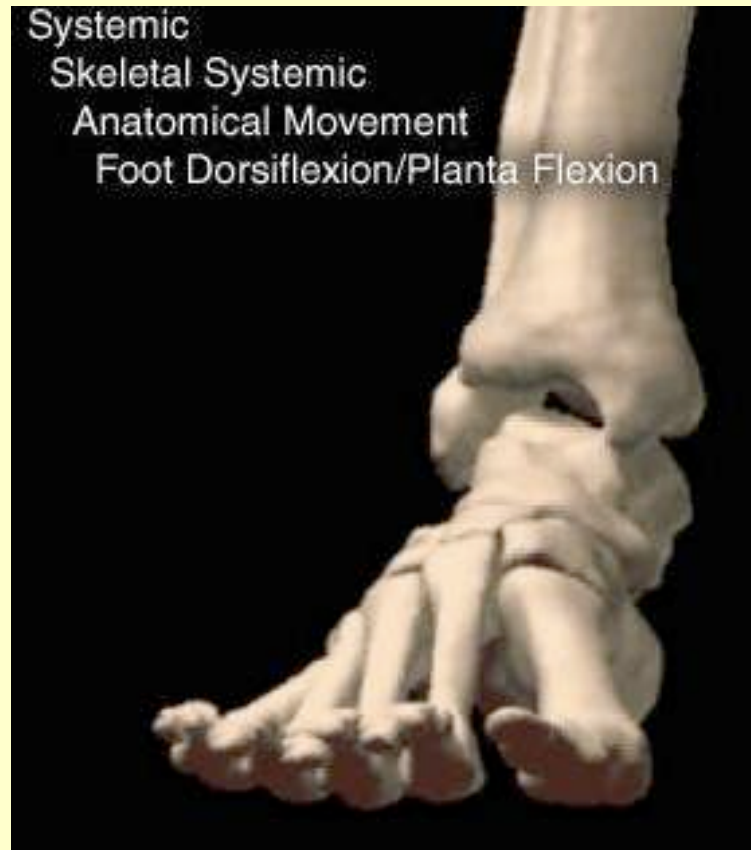
Click [here](#) to view an animation on elbow flexion and extension.



Figure 4.25 – Dorsiflexion and plantar flexion.



# Ankle Dorsiflexion and Plantar Flexion Animation



Click [here](#) to view an animation on ankle dorsiflexion and plantar flexion.

# Movement Terminology

eversion	turning outward
inversion	turning inward

pronation	turning palm downward
supination	turning palm upward

elevation	to raise
depression	to drop down

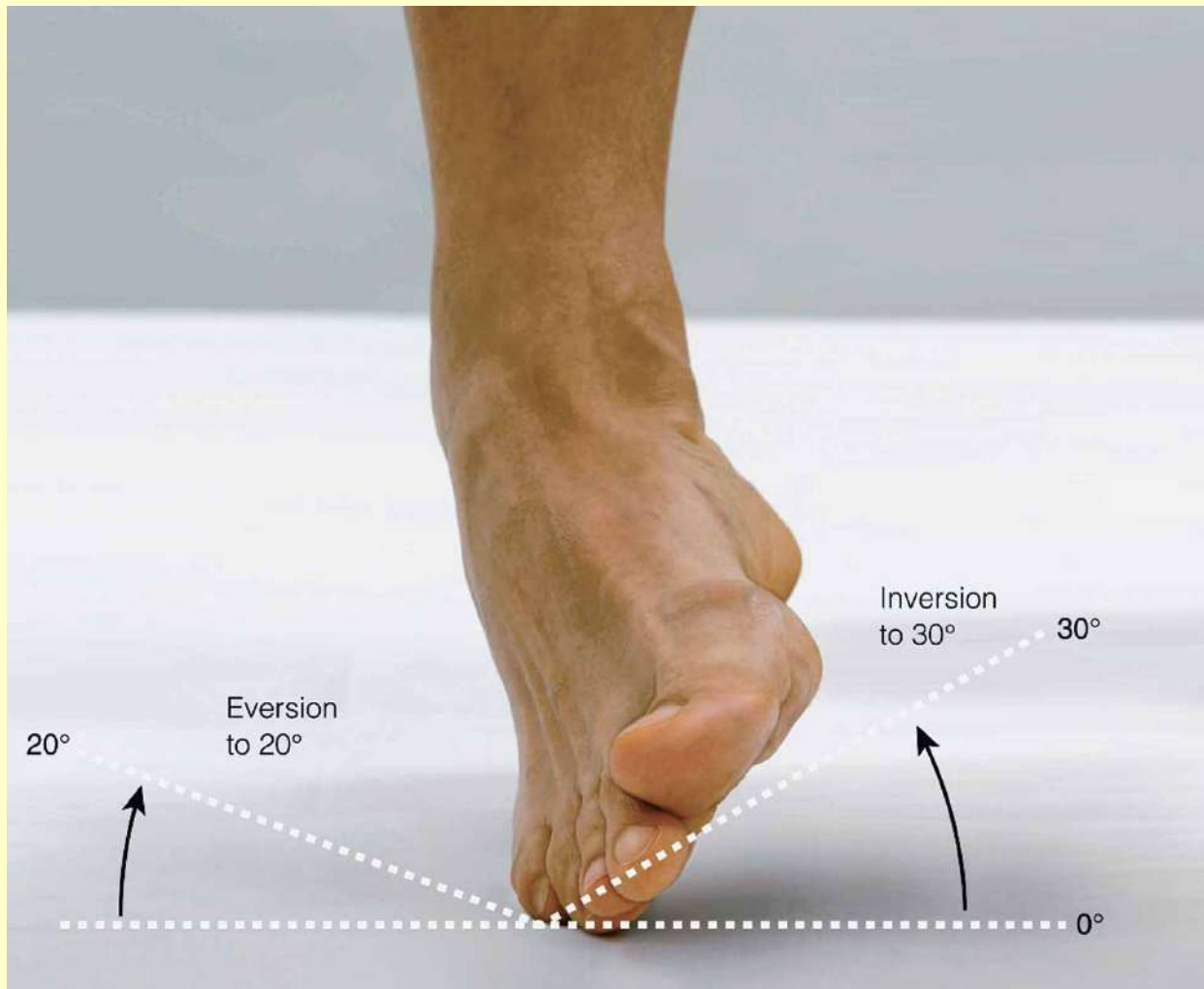
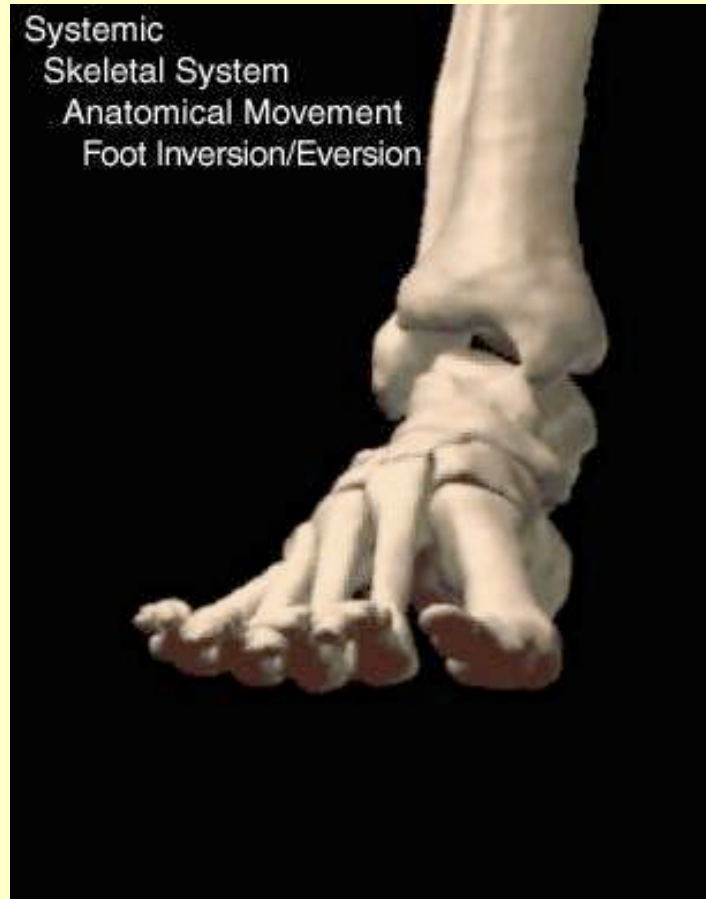


Figure 4.26 – Eversion and inversion.

# Ankle Inversion and Eversion Animation



Click [here](#) to view an animation of ankle inversion and eversion.

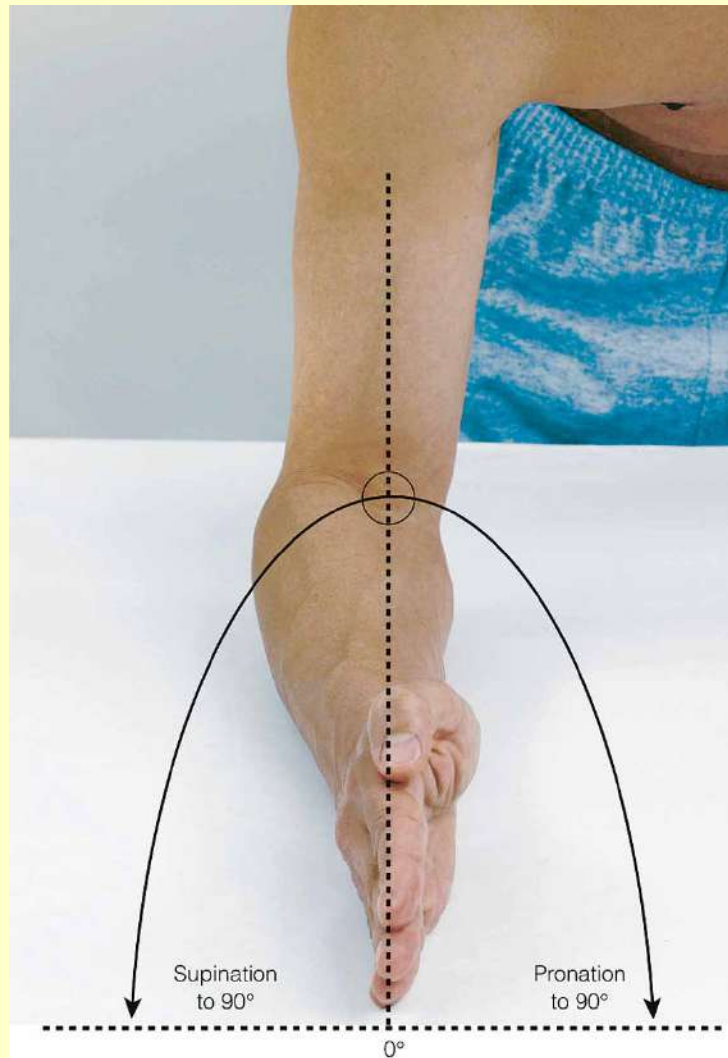
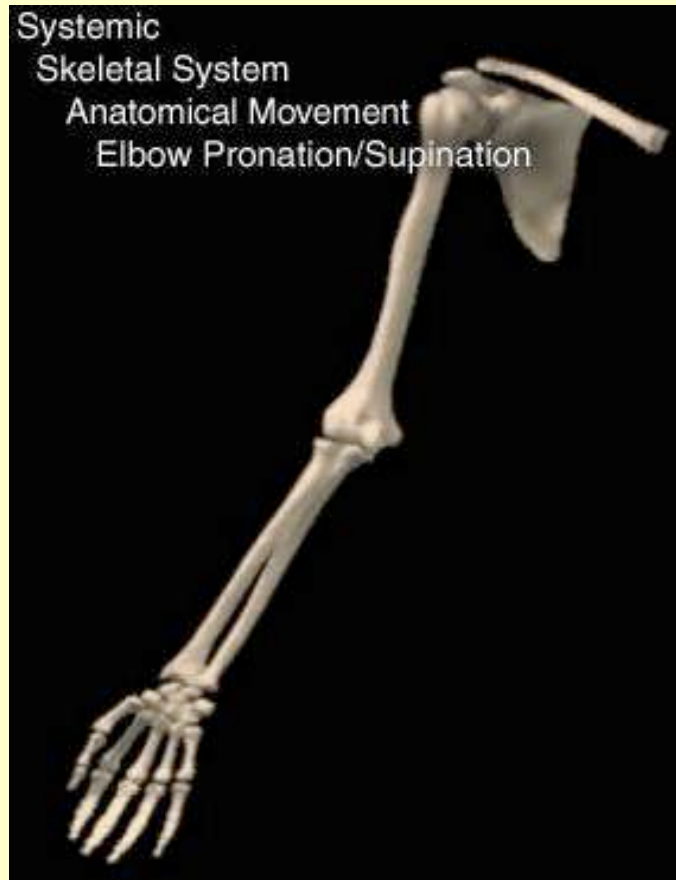


Figure 4.27 – Pronation and supination.

# Elbow Pronation and Supination Animation



Click [here](#) to view an animation of forearm pronation and supination.

# Different Circular Movements

- **Circumduction**

- Movement in circular direction from a central point

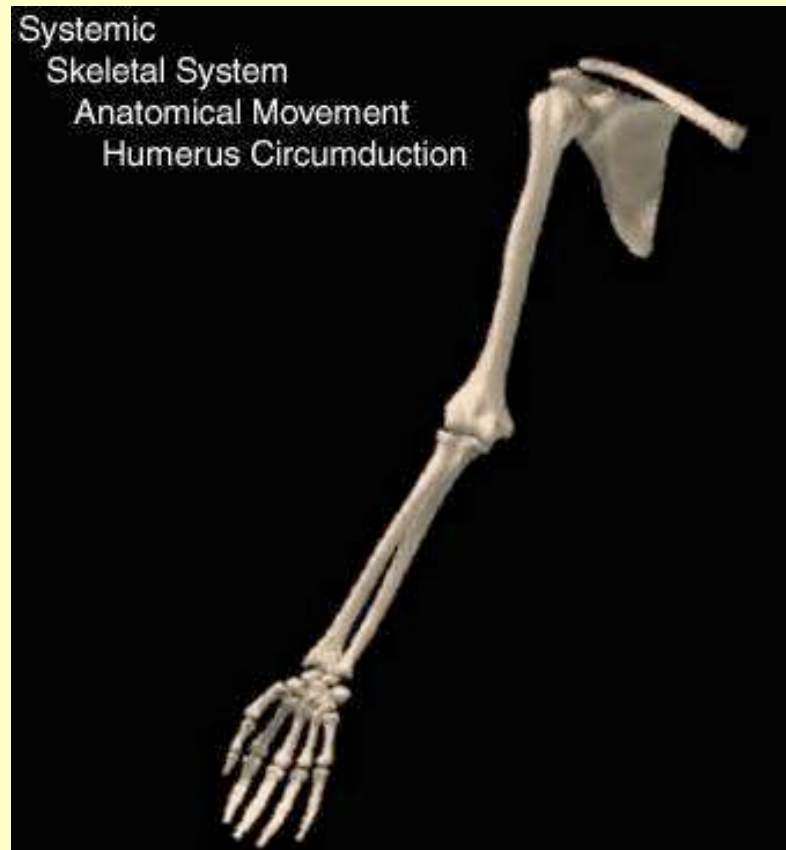
- **Opposition**

- Moving thumb away from palm to contact tip of other fingers

- **Rotation**

- Moving around a central axis

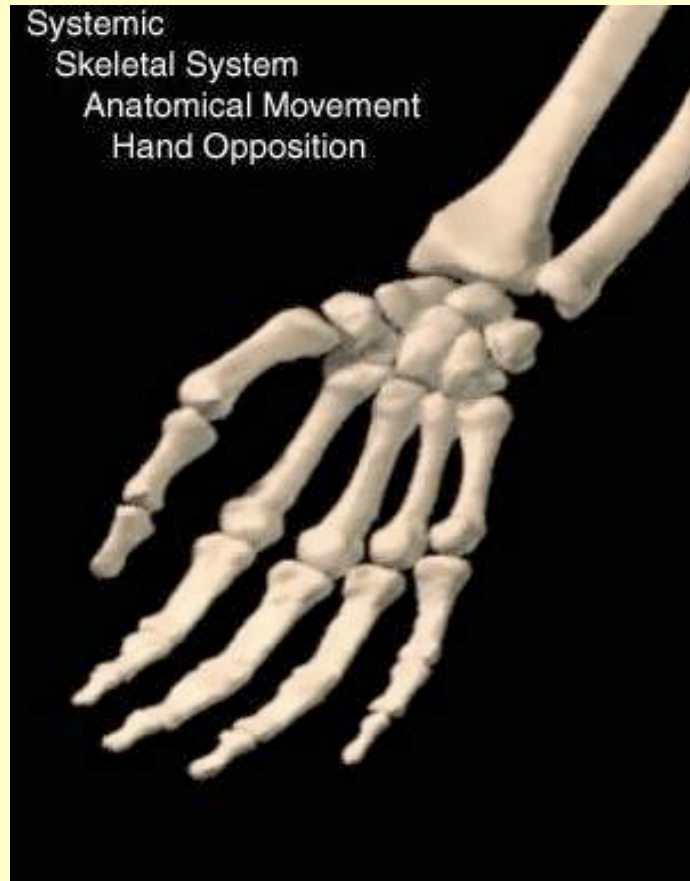
# Humerus Circumduction Animation



Click [here](#) to view an animation of humerus circumduction.

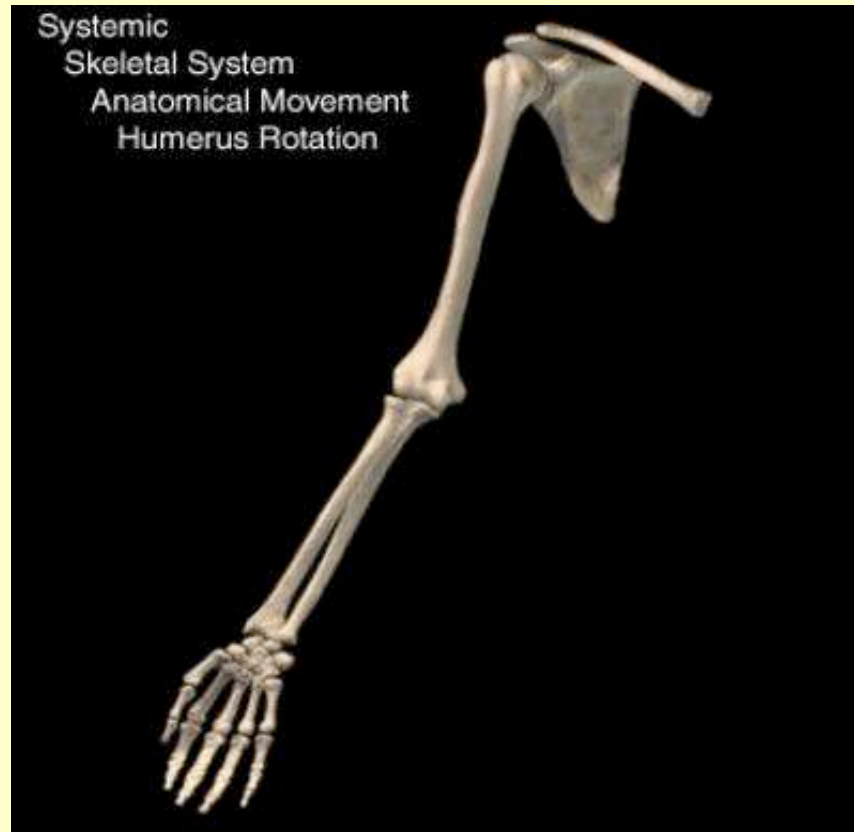


# Hand Opposition Animation



Click [here](#) to view an animation of thumb and finger opposition.

# Humerus Rotation Animation



Click [here](#) to view an animation of humerus rotation.

# Word Building with fasci/o and kinesi/o

-al	fascial	pertaining to fascia
-itis	fasciitis	inflammation of fascia
-otomy	fasciotomy	incision into fascia

-logy	kinesiology	study of movement
-------	-------------	-------------------

# Word Building with muscul/o & myos/o

-ar	muscular	pertaining to muscles
-----	----------	-----------------------

poly- -itis	polymyositis	inflammation of many muscles
-------------	--------------	------------------------------

# Word Building with my/o

–algia	myalgia	muscle pain
–asthenia	myasthenia	muscle weakness
electr/o –gram	electromyogram	record of muscle electricity
cardi/o –al	myocardial	pertaining to heart muscle
–pathy	myopathy	muscle disease
–plasty	myoplasty	surgical repair of muscle
–rrhaphy	myorrhaphy	suture a muscle
–rrhexis	myorrhexis	muscle rupture

# Word Building with ten/o, tend/o, and tendin/o

-dynia	tenodynia	tendon pain
-plasty	tenoplasty	surgical repair of tendon
-rrhaphy	tenorrhaphy	suture a tendon

-plasty	tendoplasty	surgical repair of tendon
-otomy	tendotomy	incision into a tendon

-itis	tendinitis	tendon inflammation
-ous	tendinous	pertaining to a tendon

# Word Building with –kinesia

brady–	bradykinesia	slow movement
dys–	dyskinesia	difficult movement
hyper–	hyperkinesia	excessive movement
hypo–	hypokinesia	insufficient movement

# Word Building with –tonia

a–	atonia	lack of tone
dys–	dystonia	abnormal tone
hyper–	hypertonia	excessive tone
hypo–	hypotonia	insufficient tone
my/o	myotonia	muscle tone



# Muscular System Vocabulary

adhesion	scar tissue in fascia; makes muscle movement difficult
atrophy	poor muscle development; result of muscle disease or lack of use; muscle wasting
contracture	abnormal shortening of muscle fibers, tendons, or fascia
hypertrophy	increase in muscle bulk from using it

# Muscle Atrophy Video



Click [here](#) to view a video on muscle atrophy.

# Muscular System Vocabulary

intermittent claudication	attacks of severe pain and lameness caused by muscle ischemia; usually in calf muscles
spasm	sudden, involuntary, strong muscle contraction
torticollis	severe neck spasms pulling head to one side; wryneck or crick in the neck

# Muscle Pathology

fibromyalgia	widespread aching and pain in muscles and soft tissue
lateral epicondylitis	inflammation of elbow muscles; caused by strong gripping; tennis elbow
muscular dystrophy (MD)	inherited disease with progressive muscle atrophy
pseudohypertrophic muscular dystrophy	one type of inherited muscular dystrophy; also called Duchenne's muscular dystrophy

# Muscular Dystrophy Video



Click [here](#) to view a video on muscular dystrophy.

# Pathology of Tendons, Muscles, and/or Ligaments

carpal tunnel syndrome (CTS)	repetitive motion disorder; compression of finger tendons and median nerve as they pass through carpal tunnel of the wrist
ganglion cyst	cyst on tendon sheath; usually on hand, wrist, or ankle
repetitive motion disorder	chronic disorders involving tendon, muscles, joints, and nerve damage; tissue is subjected to pressure, vibration, or repetitive movements

# Carpal Tunnel Video



Click [here](#) to view a video on carpal tunnel.

# Pathology of Tendons, Muscles, and/or Ligaments

rotator cuff injury	joint capsule of shoulder joint is reinforced by tendons; high degree of flexibility puts rotator cuff at risk for strain and tearing
strain	damage to muscle, tendons, or ligaments due to overuse or overstretching



# Clinical Laboratory Tests

creatine  
phosphokinase  
(CPK)

muscle enzyme found in skeletal and cardiac muscle; elevated blood levels indicate muscle damage; seen in muscular dystrophy and heart attack

# Muscular System Diagnostic Procedures

deep tendon reflexes (DTR)	muscle contraction in response to stretch; used to determine if muscles are responding properly
electromyography (EMG)	study of strength and quality of muscle contraction in response to electrical stimulation
muscle biopsy	removal of muscle tissue for examination

# Surgical Procedures

carpal tunnel release	cutting of ligament in wrist to relieve pressure caused by carpal tunnel syndrome
tenodesis	surgical stabilization of a joint by anchoring down tendons of muscles that move the joint

# Muscular System Pharmacology

skeletal muscle relaxants	relax skeletal muscle spasms	Flexeril, Soma
---------------------------	------------------------------	----------------

# Muscular System Abbreviations

CTS	carpal tunnel syndrome
CPK	creatine phosphokinase
DTR	deep tendon reflexes
EMG	electromyogram
IM	intramuscular
MD	muscular dystrophy