

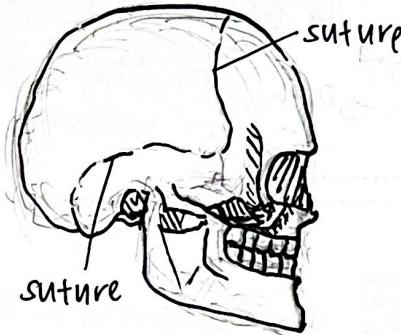
Skeletons

exo skeleton endoskeleton hydrostatic skeleton

Human

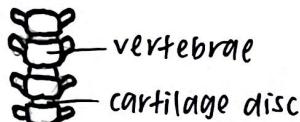
Joints

① Immovable

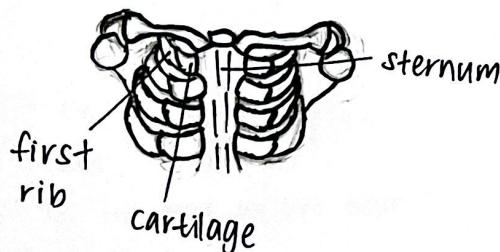


② Slightly movable

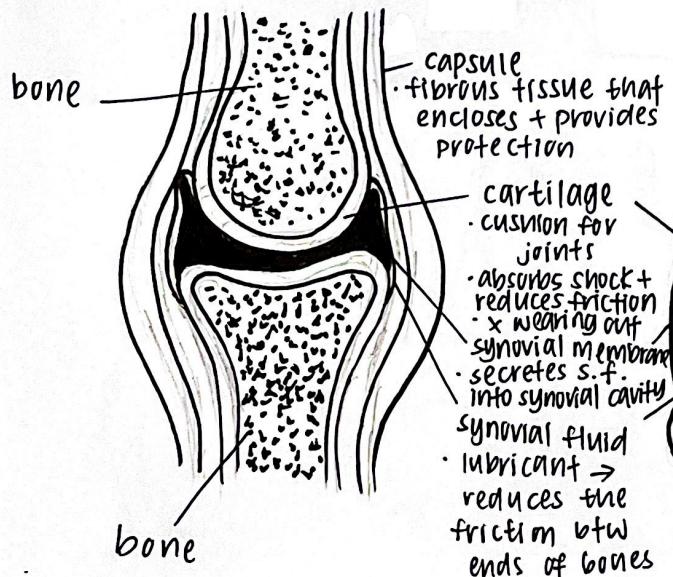
(a) cartilage disc btw vertebrae



(b) cartilage btw 1st rib + sternum

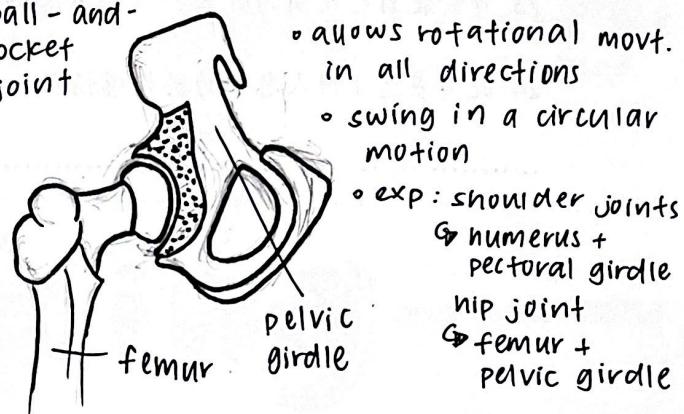


structure of freely movable joint

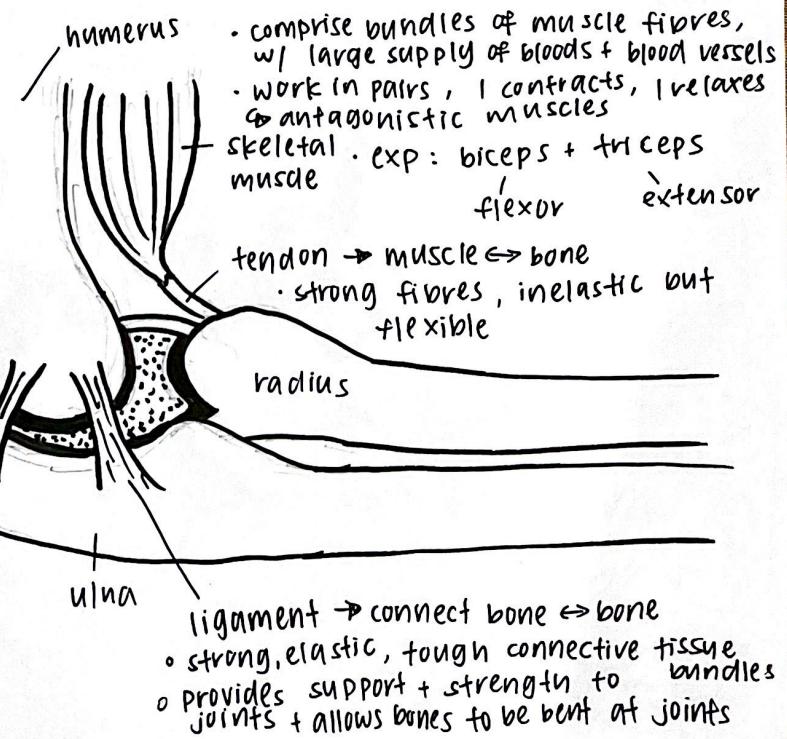
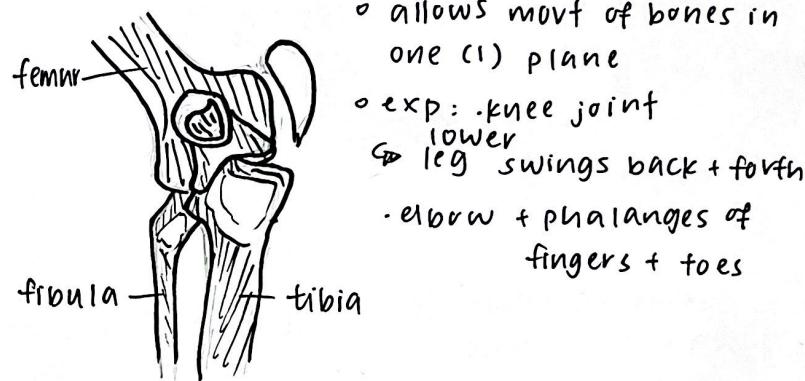


③ Freely moveable

(a) ball - and - socket joint

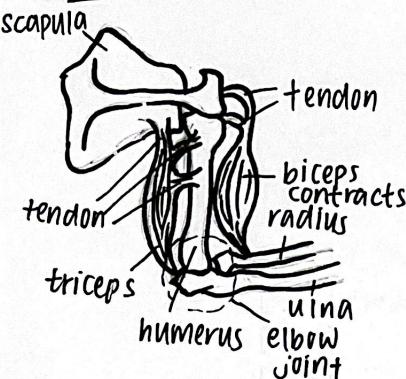


(b) hinge joint



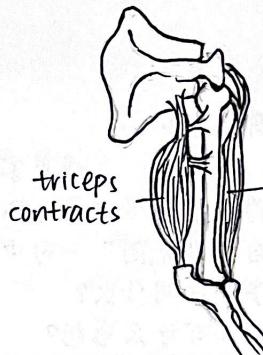
movement of forearm

Bending



- biceps contracts
- pull force transmitted to radius thru tendon
- triceps relaxes
- radius pulled ↑
- arm's bent

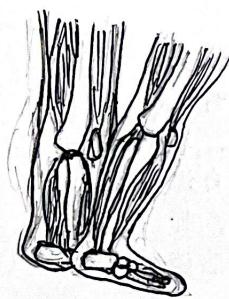
straightening



- triceps contracts
- pull force's transmitted to the ulna thru tendon
- biceps relaxes
- ulna's pulled ↓
- straightened

walking

①

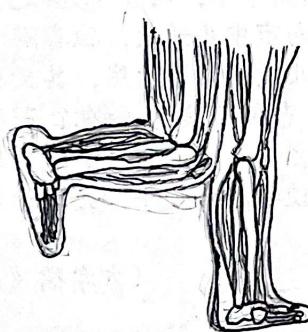


- ① right calf muscle contracts
- heels lifted
 - ball of the foot pushes against the ground

myotome
→ W-shaped muscle segment

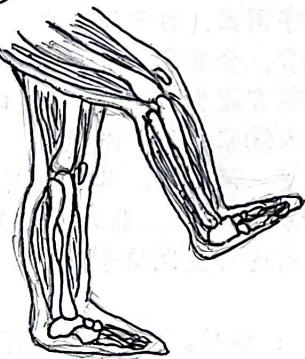
fish

②



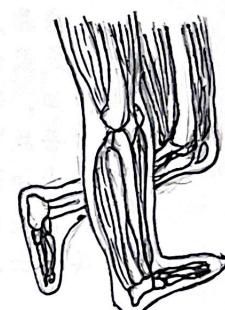
- ② biceps femoris contracts at the same time
- pulls femur ↑

③



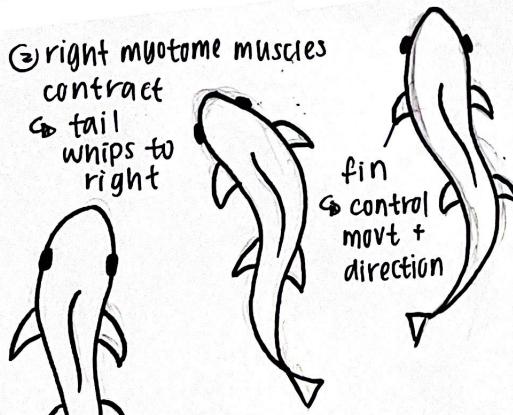
- ③ body weight is now supported by other leg on the ground
- quadriceps femoris contracts
 - leg straightened

④



- ④ tibialis contracts
- heels brought down
 - body weight shifts to the right leg
 - whole sequence is repeated w/ other leg

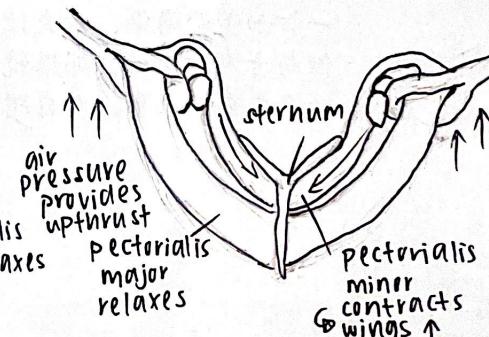
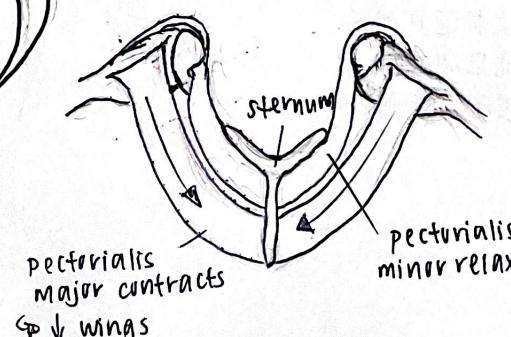
- ⑤ right myotome muscles contract
- tail whips to right



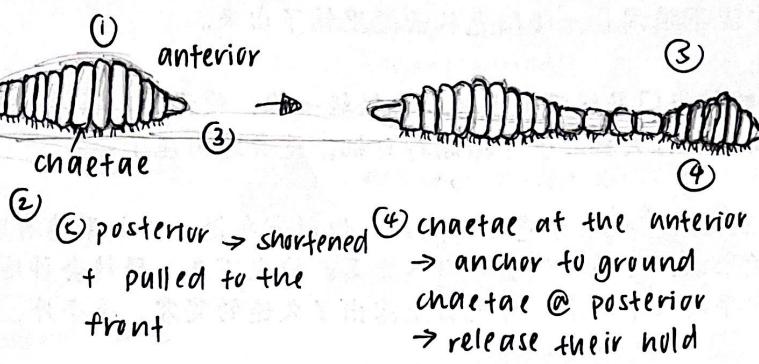
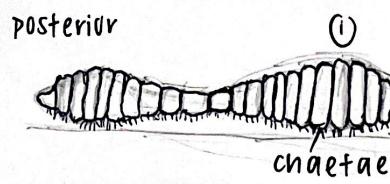
- ⑥ left myotome muscles contract
- tail whips to left



bird

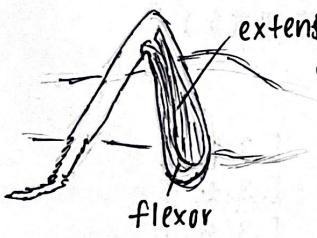


worm

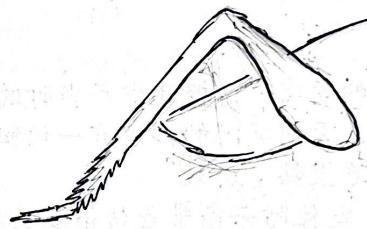


- (1) posterior longitudinal muscle contracts, circular muscle relaxes
→ earthworm shorter + thicker
- (2) chaetae at anterior → release hold off ground
chaetae at posterior → anchor to ground
- (3) circular muscle @ anterior contracts + longitudinal muscle relaxes
→ longer + thinner
- (4) anterior extends forward

grasshopper



- (1) flexor on hind legs contract
→ legs pulled towards the body
→ hind legs are folded into Z-shape
→ ready to jump / leap



- (2) the extensor contracts
→ hind legs are straightened backwards



- (3) the catapult-like ejection of hind legs projects the grasshopper forward + up into the air

① osteoporosis

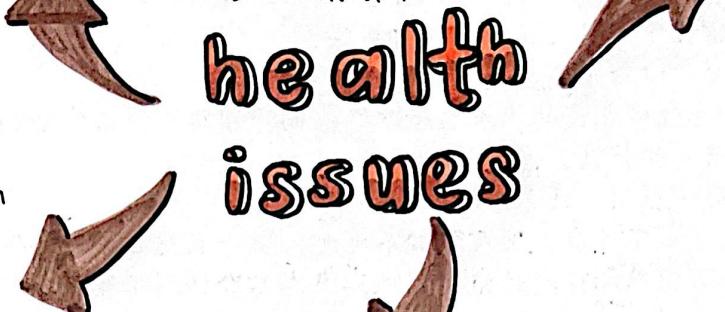
- weak, brittle, more porous,
bone → break easily
- low bone mass / density
- causes:
 - the rate of calcium loss ↑ due to ageing
 - lack of exercise
 - low intake of calcium, phosphorus, vit. D
- common among women who reach menopause → ↓ oestrogen
⇒ oestrogen → calcium metabolism
↓ level → helps body absorbs reduces bone density → reduces Ca loss

② osteomalacia

- soft bone condition
- causes: lack of Ca, phosphorus + Vit D.
- common among adults, esp. pregnant woman
- child = rickets
→ causes softening + weakening of bones → bone defects

③ Arthritis

- common type: osteoarthritis
- caused by:
 - decreased synovial fluid
 - wear + tear of the cartilage in certain joints
 - cartilage → thinner
 - ligament → shorten + less elastic
 - joints → swollen, painful + less flexible
- effects: restrict daily activities e.g. walking



④ scoliosis

- backbone bent to the side
→ forming 'S' / 'C' shape when viewed from the back
- causes:
 - genetic factor
 - abnormal growth of backbone during puberty

① good body posture

- ✗ slouch when standing / sitting
⇒ exerts pressure on the vertebral column
⇒ misalignment
⇒ prevent circulation of blood
⇒ suppressing nerves + vital organ

- prevent osteoporosis

③ Exercise

- strengthen joint structure + increases flexibility of muscles + ligaments
- increase bone strength + bone mineral deposition among adults

practices

② Proper attire

- wear proper, comfortable, loose clothing
- avoid restriction of blood circulation
⇒ + affect the musculoskeletal syst.
 - suitable pair of shoes
→ low heels + cushion
 - provides support + prevents injury to vertebral column

④ Balanced diet

- food rich in calcium → milk
- minerals e.g. phosphate → meats + proteins
- vit. C → citrus → increases bone mass
- vit D → oily fish, red meat, sunlight
⇒ aids in calcium absorption