

28/2/2013

SSEH1103

Physical Fitness & Health – Lecture 1: Musculo-Skeletal System

The skeletal system

- 216 bones in the human skeleton = approx. 20% of body mass
- Determines basic shape of the body
- Provides vital structure
- Forms a system of jointed levers that permit movement. These rigid links enable transmission of force and body weight
- Contains bone marrow for production of red blood cells
- Main storage for calcium & phosphorus

Joints

- Fibrous: lacks joint cavity, limited to no movement (e.g. bones in skull)
- Cartilaginous: lacks joint cavity, limited movement (e.g. symphysis pubis (pelvis))
- Synovial (ligaments): has joint cavity, movement limited by structure of bone, strength & tautness of the ligament, tendons and capsules. Also by the size and arrangement of the muscles around the bone

Types of Synovial Joints

- Plane (gliding): e.g. vertebral discs
- Hinge: e.g. elbow, knee
- Ball & Socket: e.g. shoulder, hip
- Saddle: e.g. in the thumb
- Pivot: e.g. forearm
- Ellipsoid: e.g. joint between neck and skull

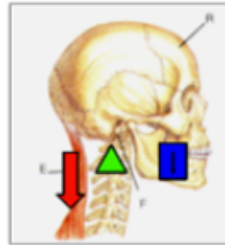
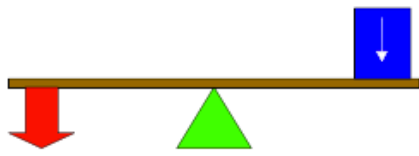
Body Movement

- Flexion: bending, decreasing the angle between two bones (at the joint)
- Extension: straightening, increasing the angle between two bones (at the joint)
- Abduction: moving the bone away from the midline of the body
- Adduction: moving the bone towards the midline of the body
- Circumduction: moving the bone so that the end describes a circle
- Inversion: moving the sole of the foot inwards at the ankle
- Eversion: moving the sole of the foot outwards at the ankle
- Protraction: anterior movement of a body part forward
- Retraction: posterior movement of a body part backwards
- Elevation: movement of a body part in an upward (vertically) direction
- Depression: movement of a body part in a downward (vertically) direction
- Rotation: moving a bone around its own longitudinal axis

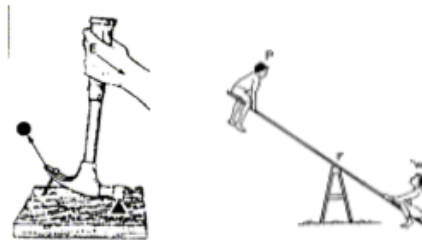
Mechanisms of Movement

Mechanics of Movement

- First Class Lever

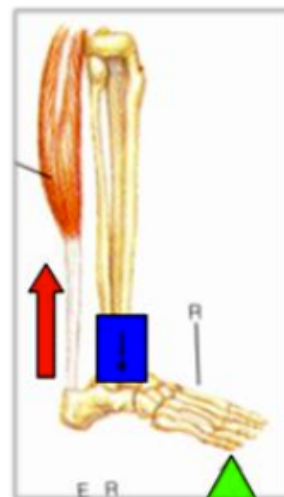
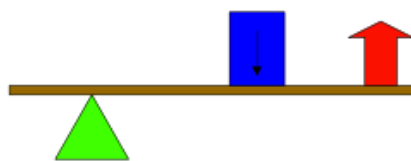


- = Muscle force
- ▲ = Fulcrum
- = External force



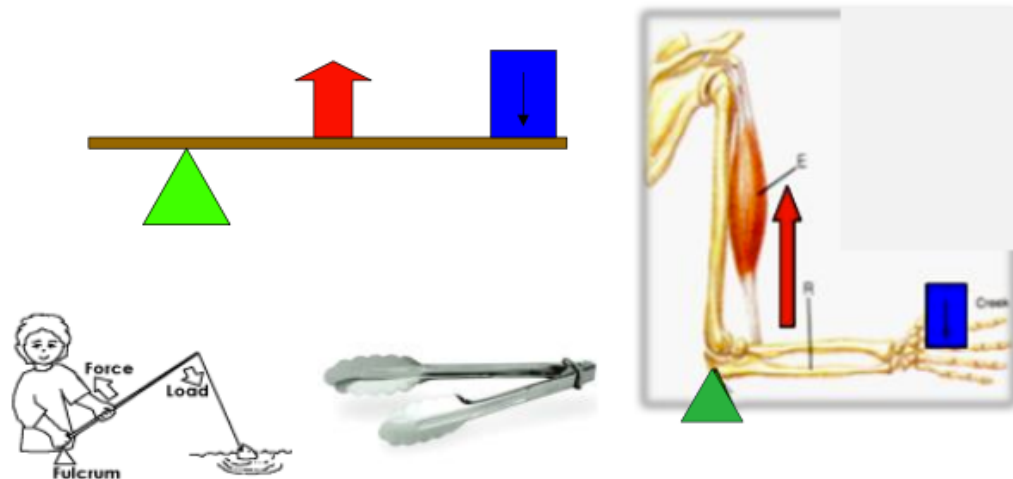
Mechanics of Movement

- Second Class Lever



Mechanics of Movement

- Third Class Lever



Skeletal Muscles

- 600+ muscles in the human body, comprising of approx. 43% of mass in males & approx. 36% in females
- Properties: excitable, contractible, extensible, flexible

Tension vs. Load

- Tension: force developed when muscle is contracted
- Load: force exerted on the muscle

Types of Contraction

- Concentric: the muscle shortens its length as it generates tension e.g. bicep curl
- Isometric: the muscle develops tension without changing length e.g. holding weight with straight arm
- Eccentric: the muscle lengthens as it generates tension e.g. releasing a bicep curl

Group Action

- Agonist (prime mover): the muscle that is principally involved in producing a movement
- Antagonist: the muscle with the opposite action to that of the agonist
- Stabiliser/Fixator: the muscles that hold other joints in place in order to allow controlled movement at a particular joint to occur
- Synergist: helps preform the same motion as the agonist, they cancel out extra motion produced by the agonist, to ensure smooth motion