Biomechanics

Mechanics – branch of physics, study effect of forces on inanimate bodies and resulting in motion

- Biomechanics – science which investigates effect of internal and external forces on living bodies in movement and at rest
- Kinesiology – study of movement
- Dynamics – branch of mechanics dealing with accelerated motion; study of bodies in motion when forces acting on a body are unbalanced or unequal – net forces cause change in state of motion (acceleration or deceleration)

- Statics – branch of mechanics which focuses on equilibrium conditions (acceleration=zero), when all forces acting on a body are balanced; either body is stationary or in constant state of motion
- Kinematics – time-geometry of motion without reference to force(s) which cause it (ie; how far, how fast, etc)
- Kinetics – study of forces influencing motion of body; concerned with forces that produce motion (gravity, lift, buoyancy, friction, drag), explain motion

- Look Supplement
- Planes
  - Sagittal – separates body into right/left halves
  - Frontal – separates body into front/back halves
  - Transverse – separates body into superior/inferior halves

- Center Of Gravity – where all 3 planes intersect, your weight center of the body
- AXES:
  - Transverse – runs from side-to-side (x axis)
  - Anterior-Posterior – runs from front-to-back (z axis)
  - Long – runs from top-to-bottom (y axis)
  - Motion Occurs in a plane (parallel) and around an axis (axis at right angles)

- MOVEMENTS...
Basic Joint Movements

- **Forward/Backward Movements:**
  - Flexion – bringing bones together, decreasing joint angle
  - Extension – moving bones apart, increasing joint angle
  - Hyperextension – extension beyond starting point
  - Plantar/Dorsi Flexion –
    - foot increase distance from lower leg, plant/toe down
    - foot decrease distance to lower leg, toe toward shin

- **Side-to-Side movement:**
  - Abduction – sideward movement away from midline or frontal plane
  - Adduction – return from abduction, movement toward midline
  - Lateral Flexion – sideways bending of head or trunk
  - Rotation - spine

- **Rotational Movement:**
  - Inward Rotation – medial, internal – shoulder, hip
  - Outward Rotation – lateral, external – shoulder, hip
  - Pronation/Supination – radial/ulnar joint

USE the Principles of Biomechanics

- In Healthy State analyze Movement to Examine HOW Musculoskeletal changes that occur from:
  - Injury
  - Training
  - Growth and Maturation
  - Aging
  Affect Motor Performance

- **Interest:**
  - If interested in learning HOW HIGH can one jump? *Use High-speed video to track positions of markers on body and calculate trajectory of the center of mass during a jump and can use Force plates (used in video)

**Why can some people jump higher than others? Or Run faster? Or Throw farther?**

- Why do children and older adults walk differently from healthy young adults?
- How does rupture of the ACL alter function of the remaining knee ligaments during activity?
- How does a total hip replacement alter mechanics of gait?
WHY does M. Jordan jump higher than most people his size?
Must look at architectural, physiological and mechanical properties of M.J.’s leg muscles must be correlated with records of the forces developed with ground contact