Session 2: The Upper Extremity: The Shoulder Region

COURSE: Introduction to Exercise Science Level I (Kinesiology)

Presentation Created by
Ken Baldwin, M.Ed
Objectives

1. Name, locate, & describe the structures of the shoulder joint and scapulaothoracic area
2. Analyze the fundamental movements with respect to joint & muscle actions
3. Describe common shoulder injuries
Joints of Shoulder Region

- Acromioclavicular joint - True joint (Anatomical Joint) - Plane Synovial Joint
- Sternoclavicular joint - True joint (Anatomical Joint) - Plane Synovial Joint
- The Shoulder or Gleno-Humeral Joint (Scapulohumeral) joint - True joint (Anatomical Joint) - Ball and Socket
- ScapuloThoracic Joint - Physiological Joint - Not A True Joint
JOINT AND MUSCULAR ANALYSIS OF
THE FUNDAMENTAL MOVEMENTS OF
THE ARM ON THE TRUNK

• Movements of the arm on the trunk involve the cooperative action of the shoulder girdle
  – Acromioclavicular joint
  – Sternoclavicular joint
  – Scapulothoracic joint
and the Glenohumeral joint
Acromioclavicular (AC) Joint

- Articulation of acromion & distal end of clavicle
- Plane synovial joint
- AC ligament
- Coracoclavicular ligament (Trapezoid & Conoid) Prevent superior dislocation
Acromioclavicular (AC) Joint

- Permits $3^\circ$ motion in 3 Planes
- Elevation/Depression of Upper Extremity
- Rotation of Scapula
- Protraction & retraction
Sternoclavicular (SC) Joint

- Sternal clavicle articulates with sternum and cartilage of 1st rib
- Articular Disc improves fit between bone articulations (shock absorber)
Sternoclavicular (SC) Joint

- Capsule thickened by anterior & posterior SC ligaments
- CostoClavicular Ligament-attaches between 1st rib and clavicle
- Interclavicular Ligament- attaches between 2 clavicles and manubrium
- Important-Moves in Rhythm or synchronization with other 3 joints
Sternoclavicular (SC) Joint

• Great importance because it is the only bony connection between the humerus and axial skeleton
• Permits limited 3° motion in 3 Planes
• Clavicle movements at the SC joint: elevation & depression, protraction & retraction, and forward & backward rotation
GLENOHUMERAL (GH) JOINT Structure

- Articulation of spherical head of humerus with small, shallow, somewhat pear-shaped glenoid fossa of scapula
- Ball & Socket
- Very unstable joint
- Exhibits Great Range of Motion (ROM) in all 3 planes
GLENOHUMERAL (GH) JOINT Structure

- Glenoid labrum deepens the fossa and cushions against impact of humeral head in forceful movements.
- Labrum is fibrocartilage.
- Problem: Glenoid is tiny—therefore, not much surface contact between humerus.
GLENOHUMERAL (GH) JOINT STRUCTURE - Shoulder Motion

- Stability comes from compression of humeral head on glenoid and muscular structures criss-crossing joint
- A combination of efficient motion between the spine, scapula, clavicle, and humerus
- This is a joint structure where the muscles create the stability while moving
GH Ligamentous Reinforcements

- Coracohumeral – Anterior (lesser) & Posterior (greater) Fibers
  Forms bicepital groove
- Glenohumeral Z-Band-Abduction-Middle Lower Bands become taunt
- Coracoacromial-Protects muscles, tendons, nerves, blood supply
GH Bursae

- Subdeltoid Bursae lies between Supraspintus & Deltoid & Acromion
- Allows for Gliding and cushioning
- Abduction may cause of pain
- Supraspinatus tendon frayed or ruptured (35%) after 70
GH Movements

- GH Joint is most freely moveable joint in the body, 3° motion in 3 Planes
- Flexion, Extension, Abduction, Adduction, Horizontal Abduction & adduction, Medial & Lateral Rotation
- Abduction- 90°, External rotation, Closed Pack, ligaments get taunt, Greater Tubercle hits acromion arch
GH Center of Rotation

- Center of Rotation occurs of Humeral Head in Glenoid Fossa
- 0° to 50°, Lower Portion of Humeral Head in Contact with Glenoid
- 50° to 90°, Upper Portion of Humeral Head in Contact with Glenoid
- What does this mean? Shear Force creates friction across surfaces. This Rolling reduces stresses on joint
Scapulothoracic Joint

- Formed by articulation of Scapula w/ Thorax (Rib Cage)
- NO BONY attachments to the thorax
- Not a True joint
- Muscular attachments provide stability
- Kinematic Chain with AC, SC, & GH Joints
- Any Movement at Scapula results in movement at another joint
- Position is critical for proper glenohumeral joint motion
- Must maintain stability
- KEY: Provides Mobility & Stability for orientation of Glenoid and Humeral Head for arm movements
Scapula/Clavicle Position

- Scapula does not lie in frontal plane (Scaption plane)
- Glenoid Fossae faces more forward than to the side
- Scapula runs Obliquely, 30° to the Frontal Plane
- Scapula is between 2nd & 7th Rib in Normal Position
- Clavicle runs obliquely, 60° to the Scapula
Scapulohumeral Rhythm

1. Large Range of Motion (ROM)
2. Maintains Glenoid Fossa in Optimal Position
3. Muscles maintain proper tension
4. Shoulder Complex moves in a coordinated fashion to provide the smoothest and greatest ROM possible
Scapulohumeral Rhythm

• 3 Phases of Abduction- 2° (GH) to 1° (ST)
1. 0° to 90° Deltoid & Supraspinatus (Force Couple)
2. 90° to 150° Scapula provides Upward Rotation, 30° from Scapulathoracic Joint + 30° from AC & SC Joints
3. 150° to 180° movement of Spinal Column becomes necessary
Force Couples

Force couples: when 2 muscles on opposite sides of joint work simultaneously to produce stability and or rotation

1. Axio-Scapular Force Couple: Upper trapezius, levator scapula, and lower trapezius
2. Scapulo-humeral force couple: Deltoids and rotator cuff
3. Scapular Depression: levator scapula, pectoralis minor
4. Scapular elevation: Upper trapezius, levator scapula, and serratus anterior
Movements

Elevation & Depression

Protraction (Abduction) Retraction (Adduction)
Movements

- Upward rotation
- Downward rotation
- Upward tilt
- Reduction of Upward Tilt
Movements

• Flexion / Extension
• Circumduction
• Abduction / Adduction
  – Horizontal
  – Diagonal
• Inward (Internal)/ outward (External) rotation
Elevation (Tipping of Scapula)

- Scapulae Superior border moves Anteriorly
- Inferior Border moves Posteriorly
Winging of Scapula

• With Abduction of the Scapulae, Winging keeps the Scapulae hugging against the Thorax or rib cage
• Anterior orientation of Glenoid Fossa
GH Position

- Glenoid Tilts Upward-Upward Rotation
- Glenoid Tilts Downward-Downward Rotation
- Glenoid Tilts Laterally- Retraction-Adduction
- Glenoid Tilts Anteriorly- Protraction-Abduction
MUSCLE OF THE SHOULDER GIRDLE

• Location:
  – Anterior
    • Pectoralis minor, Serratus anterior, Subclavius
  – Posterior
    • Levator scapulae, Rhomboids, Trapezius
Pectoralis Minor

Function:
- Movements of scapula: downward rotation, upward tilt, depression
- Lifting effect on ribs in force inspiration and posture
Serratus Anterior

Function:
- Protract (Abduct) scapula
- With trapezius upward rotation of scapula
- Active is reaching and pushing
Subclavius

Function:
• Protect and stabilize SC joint
• Depress scapula
Levator Scapulae

Function:
- Elevation and downward rotation of scapula
Rhomboids, Major and Minor

Function:
- Downward rotation, retraction, & elevation of scapula
- With trapezius for maintenance of good posture
Trapezius

Function:

I. Elevation
II. Elevation, upward rotation, retraction
III. Retraction
IV. Upward rotation, depression, retraction
MUSCLE OF THE SHOULDER JOINT

• Location:
  – **Anterior:** Pectoralis major, Subscapularis, Coracobrachialis, Biceps brachii (4)
  – **Posterior:** Infraspinatus, Teres minor (2)
  – **Superior:** Deltoid, Supraspinatus (2)
  – **Inferior:** Latissimus dorsi, Teres major, Long head of Triceps brachii (3)
Pectoralis Major

Function:
Adduction, horizontal adduction, and medial rotation of humerus
Clavicular portion – flexion of humerus
Sternocostal portion – Extension of humerus from flexed position
Subscapularis

Function:
- Medial rotation of humerus
- Contributes to stabilization of GH joint
- Integrity during lateral abducted movements.
Coracobrachialis

Function:
• Flexion & adduction of humerus
Biceps Brachii

Function:
- Flexion & Supination of elbow
- Horizontal adduction
- Short head assists flexion, adduction & medial rotation
Deltoid

Function:

• Powerful abductor of humerus
• Middle – Abduction
• Anterior – flexion, horizontal adduction & medial rotation of humerus
Deltoid

- Posterior extension, horizontal abduction, & lateral rotation of humerous
- Supraspinatus and Middle Deltoid force couple for abduction
- Plane of Scapula or Scaption Plane
Supraspinatus

Function:

• Act together with deltoid in abduction of the arm (20% power)
• Contributes to stabilization of GH joint
Infraspinatus and Teres Minor

Function:

- Lateral rotation & Extension of Humerus
- With subscapularis depress head of humerus
- Contributes to stabilization of GH joint, depresses GH downward
Rotator Cuff Muscles

- SITS MUSCLES = 4 Rotator Cuff Muscles
- (S) Supraspinatus
- (I) Infraspinatus
- (T) Teres Minor
- (S) Subscapularis
- Muscular, but acts like one strong ligamentous structure
- Rotator Cuff stabilization- SITS contract to hold humeral head in tightly
- Action depends on scapular stability
- Supraspinatus contracts during normal posture
Latissimus Dorsi

Function:
• Extension, medial rotation, & adduction of humerus
• Angle of Pull increased when arm raised 30 to 90 degrees
Teres Major

Function:
- Extension, Medial rotation & adduction of humerus
- Same movements as Latissimus dorsi
- Similar Angle of Pull
Triceps Brachii

Function:
- Extension of Elbow
- Long head extension of the humerus
COMMON INJURIES OF THE SHOULDER REGION

1. Structural Dysfunction of any of 4 Joints reduces Scapulahumeral rhythm
2. Acromioclavicular Sprain- AC joint, ligaments tear, Ex. Falling
3. Anterior inferior Dislocation-Forward most common, Blow to top of shoulder, Ex. Football
4. Supraspinatus muscle-most common of SITS muscles, Strain or tearing, Ex. Baseball, improper lifting technique
COMMON INJURIES OF THE SHOULDER REGION

- Impingement lesions - painful arc
- Bursitis - pain in movement
- Thoracic Outlet Syndrome - impingement of nerve by scalenes or pec. minor; neural problems; cause forward head/posture.