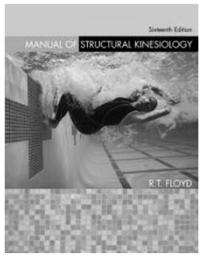


Chapter 5
The Shoulder Joint

Manual of Structural Kinesiology

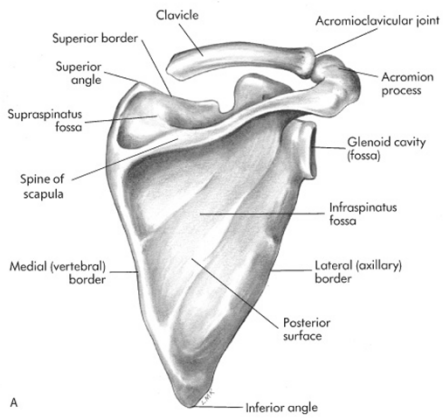
R.T. Floyd, EdD, ATC, CSCS

The Shoulder Joint

- Wide range of motion of the shoulder joint in many different planes requires a significant amount of laxity
- Common to have instability problems
  - Rotator cuff impingement
  - Subluxations & dislocations
- The price of mobility is reduced stability
- The more mobile a joint is, the less stable it is & the more stable it is, the less mobile

Bones

- Scapula, clavicle, & humerus serve as attachments for shoulder joint muscles
  - Scapular landmarks
    - supraspinatus fossa
    - infraspinatus fossa
    - subscapular fossa
    - spine of the scapula
    - glenoid cavity
    - coracoid process
    - acromion process
    - inferior angle

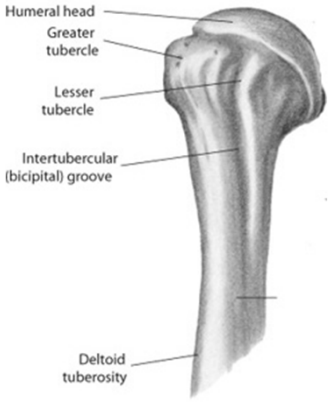


From Seeley RR, Stephens TD, Tate P: *Anatomy and physiology*, ed 7, New York, 2006, McGraw-Hill

5-3

Bones

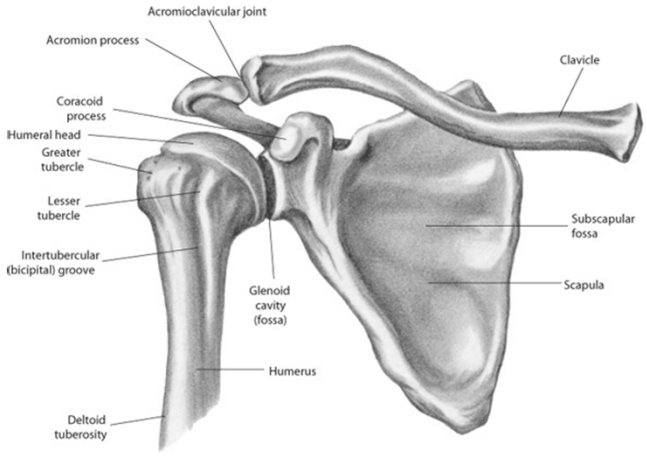
- Scapula, clavicle, & humerus serve as attachments for shoulder joint muscles
  - Humeral landmarks
    - Head
    - Greater tubercle
    - Lesser tubercle
    - Intertubercular groove
    - Deltoid tuberosity



5-4

Glenohumeral Joint

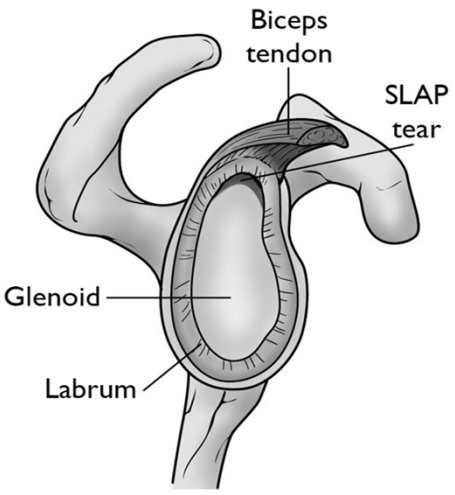
- multiaxial ball-&-socket
- enarthrodial



5-5

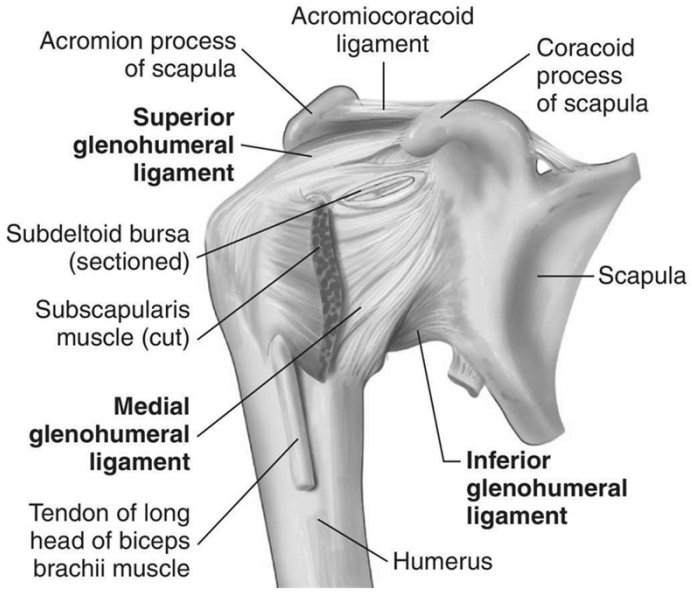
Glenohumeral Joint

– Glenoid labrum slightly enhances stability



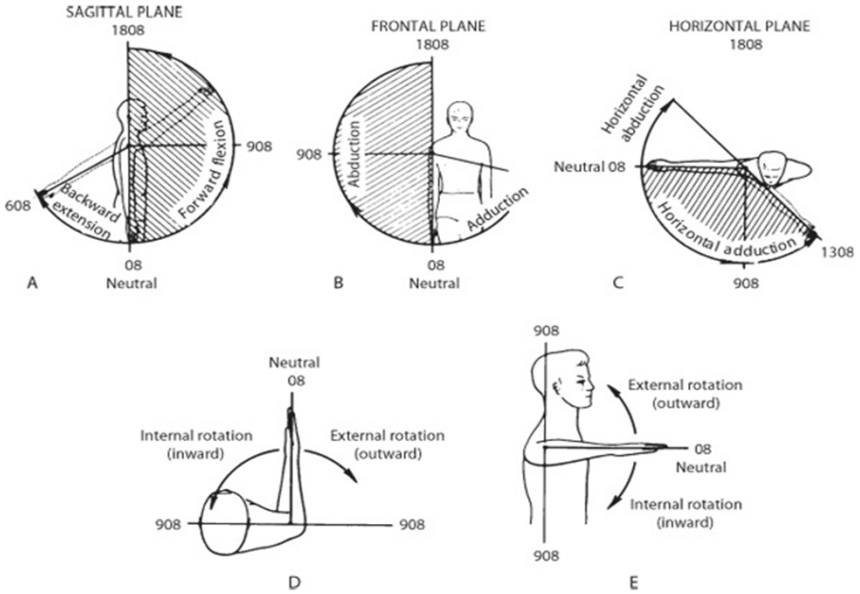
5-6

Glenohumeral ligaments



5-7

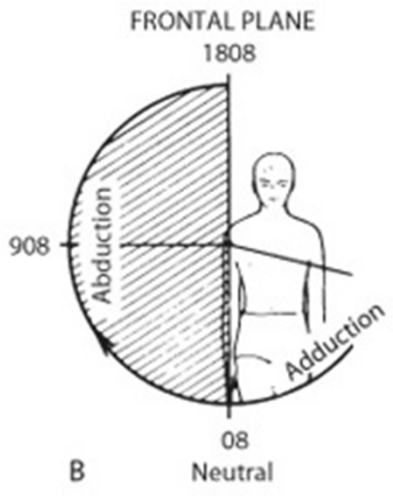
Glenohumeral Joint



5-8

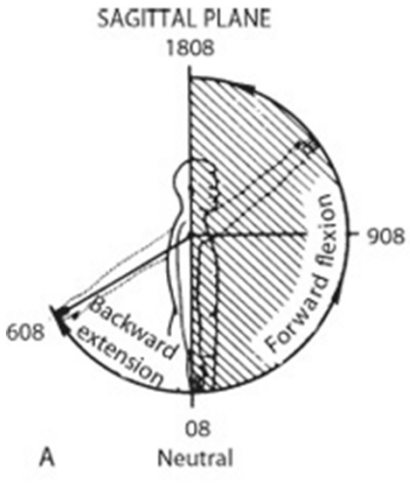
Glenohumeral Joint

- 90 to 95 degrees abduction
- 0 degrees adduction, 75 degrees anterior to trunk



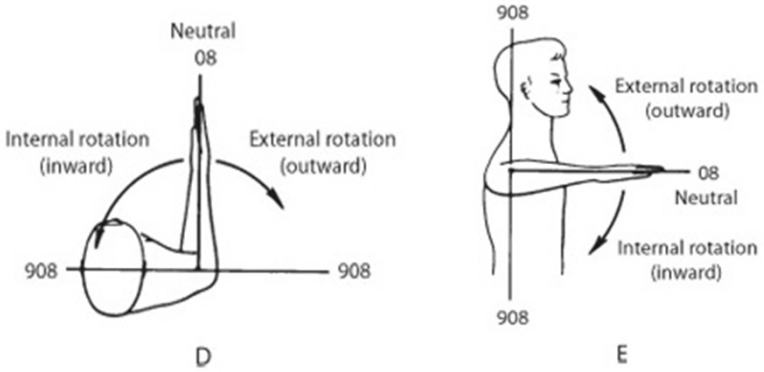
Glenohumeral Joint

- 40 to 60 degrees of extension
- 90 to 100 degrees of flexion



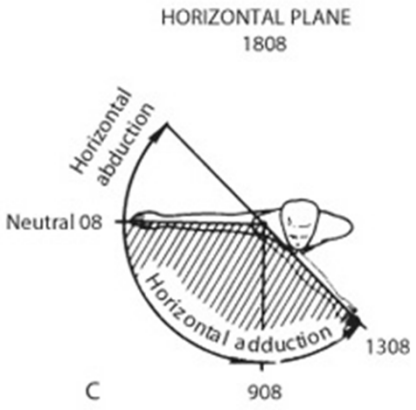
Glenohumeral Joint

– 70 to 90 degrees of internal & external rotation



Glenohumeral Joint

– 45 degrees of horizontal abduction
– 135 degrees of horizontal adduction



Glenohumeral Joint

- Frequently injured due to anatomical design
  - shallowness of glenoid fossa
  - laxity of ligamentous structures
  - lack of strength & endurance in muscles
  - anterior or anteroinferior glenohumeral subluxations & dislocations – common
  - posterior dislocations – rare
  - posterior instability problems somewhat common

Glenohumeral Joint

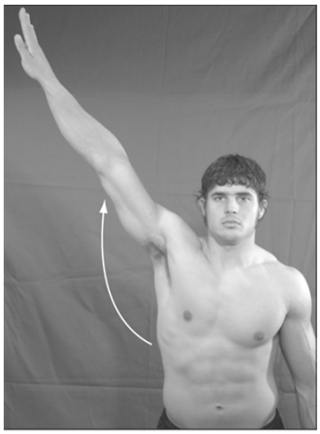
- Rotator cuff is frequently injured
  - Subscapularis, supraspinatus, infraspinatus, & teres minor muscles
  - attach to the front, top, & rear of humeral head
  - point of insertion enables humeral rotation
  - vital in maintaining humeral head in correct approximation within glenoid fossa while more powerful muscles move humerus through its wide range of motion

Pairing of shoulder girdle & shoulder joint movements

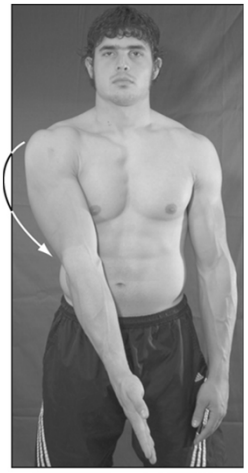
Shoulder joint	Shoulder girdle
Abduction	Upward rotation
Adduction	Downward rotation
Flexion	Elevation/upward rotation
Extension	Depression/downward rotation
Internal rotation	Abduction (protraction)
External rotation	Adduction (retraction)
Horizontal abduction	Adduction (retraction)
Horizontal adduction	Abduction (protraction)

Movements

- Abduction
- Adduction



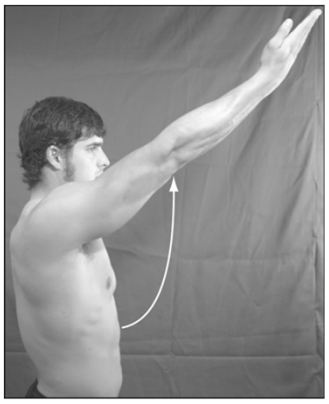
Abduction



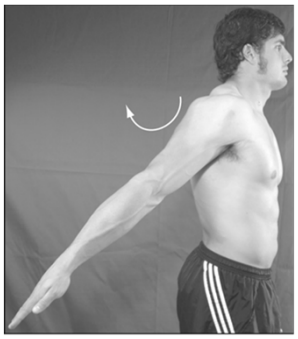
Adduction

Movements

- Flexion
- Extension



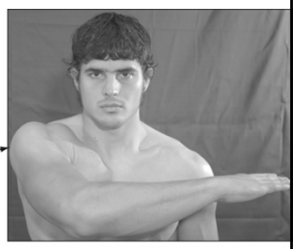
Flexion



Extension

Movements

- Horizontal adduction (transverse flexion)
- Horizontal abduction (transverse extension)

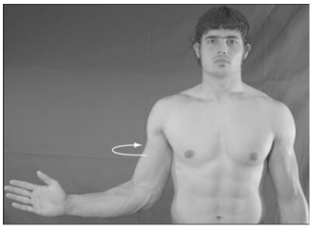


Horizontal adduction

Horizontal abduction

Movements

- External rotation
  - movement of humerus laterally around its long axis away from midline
- Internal rotation
  - movement of humerus medially around its long axis toward midline

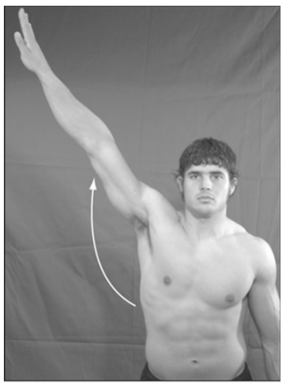


External rotation

Internal rotation

Movements

- Diagonal abduction
- Diagonal adduction



Abduction

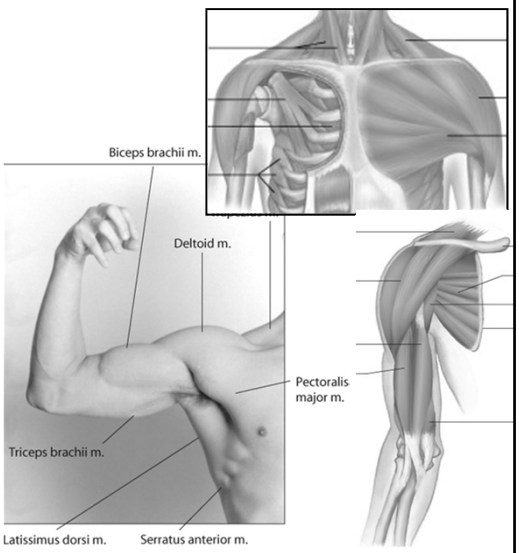
Diagonal adduction

Muscles

- Intrinsic glenohumeral muscles
  - Originate on scapula & clavicle
  - Deltoid, Coracobrachialis, Teres major
  - Rotator cuff group
    - subscapularis, supraspinatus, infraspinatus, & teres minor
- Extrinsic glenohumeral muscles
  - latissimus dorsi & pectoralis major

Muscles

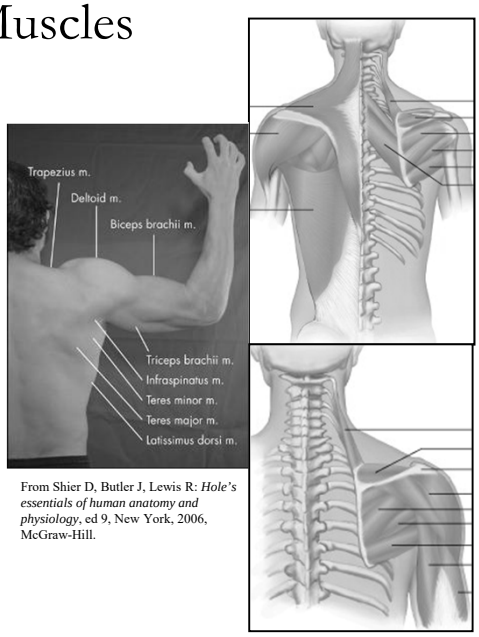
- Anterior
  - Pectoralis major
  - Coracobrachialis
  - Subscapularis
- Superior
  - Deltoid
  - Supraspinatus



From Shier D, Butler J, Lewis R: *Hole's essentials of human anatomy and physiology*, ed 9, New York, 2006, McGraw-Hill.

Muscles

- Superior
  - Deltoid
  - Supraspinatus
- Posterior
  - Latissimus dorsi
  - Teres major
  - Infraspinatus
  - Teres minor



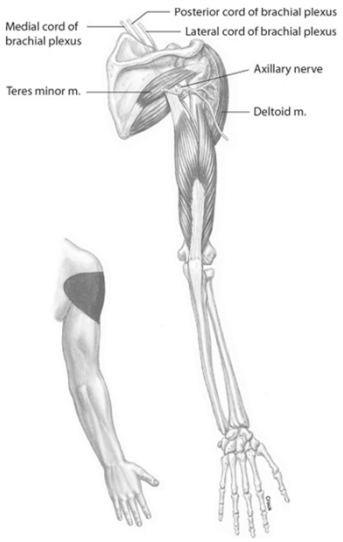
From Shier D, Butler J, Lewis R: *Hole's essentials of human anatomy and physiology*, ed 9, New York, 2006, McGraw-Hill.

Nerves

- All shoulder joint muscles are innervated from the brachial plexus
- Lateral pectoral nerve arising from C5, C6, & C7
  - Pectoralis major (clavicular head)
- Medial pectoral nerve arising from C8 & T1
  - Pectoralis major (sternal head)
- Thoracodorsal nerve arising from C6, C7, & C8
  - Latissimus dorsi

Nerves

- Axillary nerve branching from C5 & C6
  - Deltoid
  - Teres minor
  - Sensation to lateral patch of skin over deltoid region of arm
- Upper subscapular nerves arising from C5 & C6
  - Subscapularis



Nerves

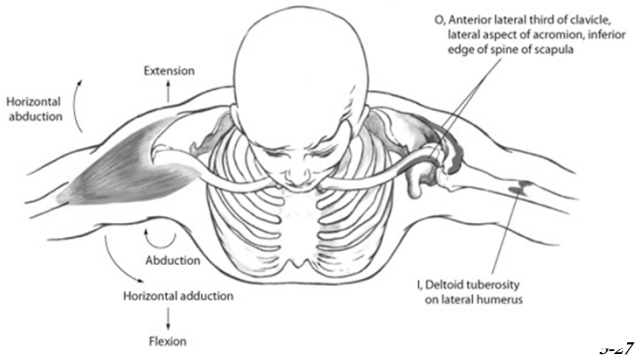
- Lower subscapular nerve arising from C5 & C6
  - Subscapularis
  - Teres major
- Suprascapula nerve originating from C5 & C6
  - Supraspinatus
  - Infraspinatus

Deltoid Muscle

Anterior fibers: abduction, flexion, horizontal adduction, & internal rotation

Posterior fibers: abduction, extension, horizontal abduction, & external rotation

Middle fibers: abduction

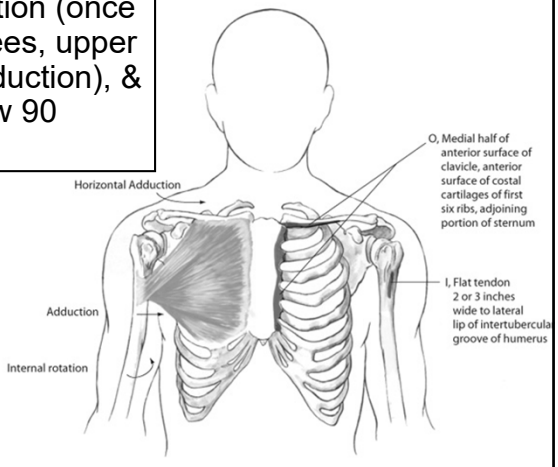


5-27

Pectoralis Major Muscle

Upper fibers (clavicular head): internal rotation, horizontal adduction, flexion, abduction (once arm is abducted 90 degrees, upper fibers assist in further abduction), & adduction (with arm below 90 degrees of abduction)

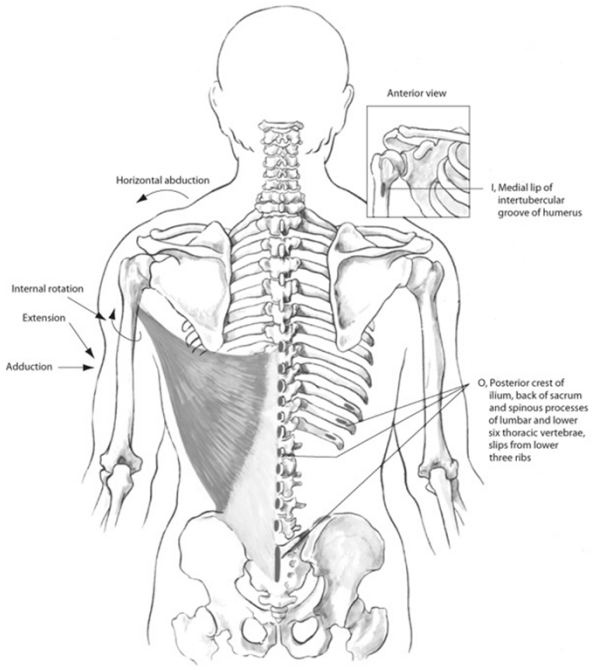
Lower fibers (sternal head): internal rotation, horizontal adduction, extension, & adduction



5-28

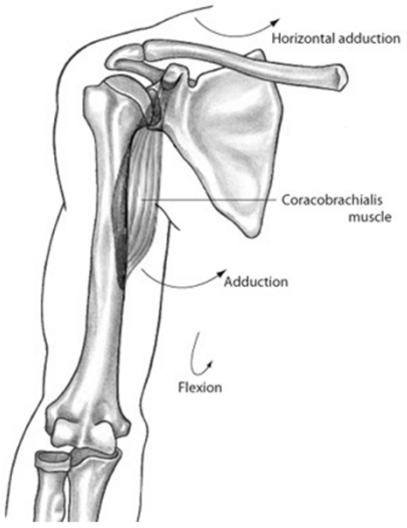
Latissimus Dorsi Muscle

- Adduction
- Extension
- Internal rotation
- Horizontal abduction



Coracobrachialis Muscle

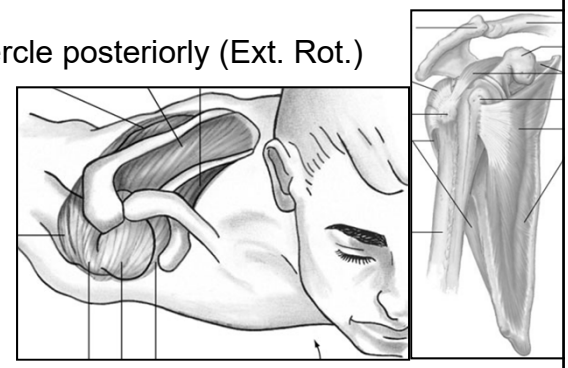
- Flexion
- Adduction
- Horizontal adduction



5-30

Rotator cuff muscles

- ***S***upraspinatus
  - attach to greater tubercle from above (Abduct)
- ***I***nfraspinatus
  - attach to greater tubercle posteriorly (Ext. Rot.)
- ***T***eres Minor
  - attach to greater tubercle posteriorly (Ext. Rot.)
- ***S***ubscapularis
  - attach to lesser tubercle anterior (Int. Rot.)

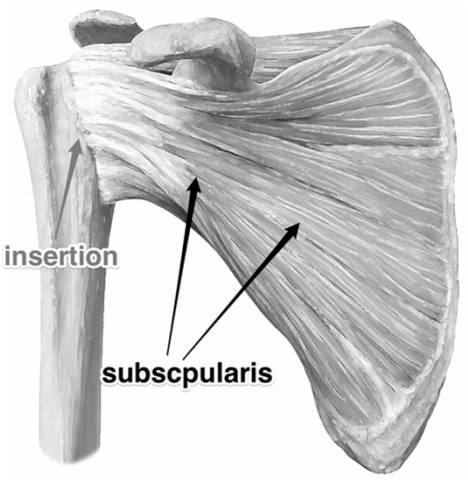


Rotator cuff muscles

- not very large
- must possess strength & muscular endurance
- conducting repetitious overhead activities (throwing, swimming, & pitching) with poor technique, muscle fatigue, or inadequate warm-up & conditioning leads to failure of rotator cuff muscle group in dynamically stabilizing humeral head in glenoid cavity
- leads to further rotator cuff problems such as tendinitis & rotator cuff impingement within subacromial space

Subscapularis Muscle

- Internal rotation
- Adduction
- Extension
- Stabilization of the humeral head in glenoid fossa



Supraspinatus Muscle

- Abduction
- Stabilization of the humeral head in glenoid fossa

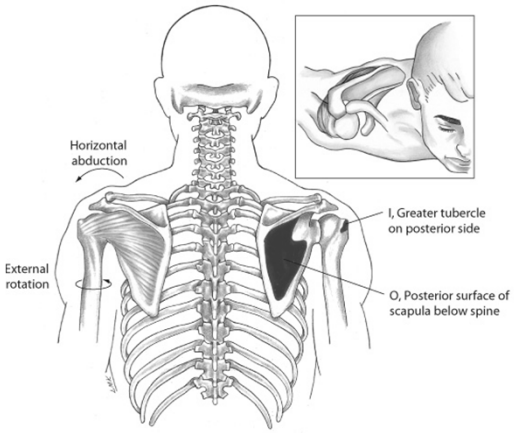
Infraspinatus Muscle

External rotation

Horizontal abduction

Extension

Stabilization of humeral head in the glenoid fossa



5-35

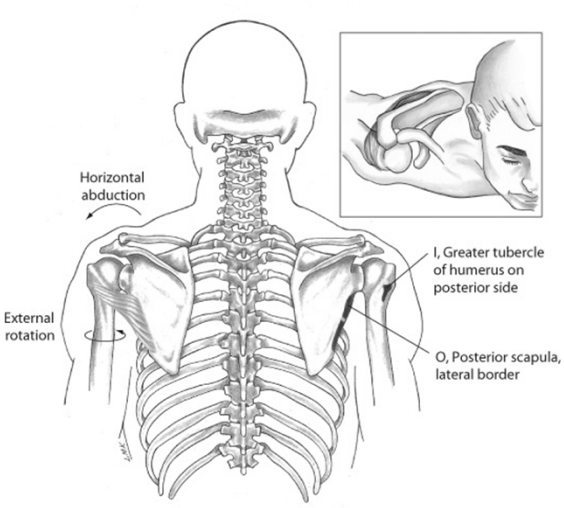
Teres Minor Muscle

External rotation

Horizontal abduction

Extension

Stabilization of humeral head in the glenoid fossa



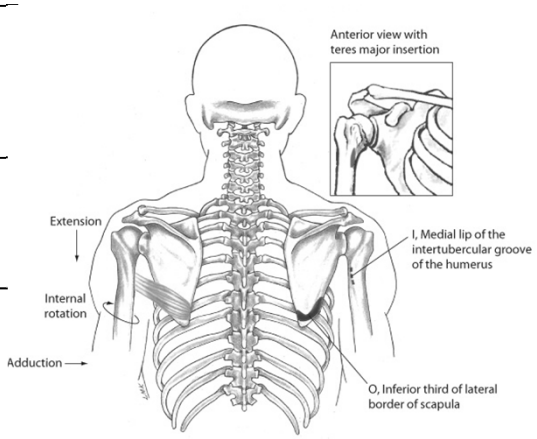
5-36

Teres Major Muscle

Extension, particularly from the flexed position to the posteriorly extended position

Internal rotation

Adduction, particularly from the abducted position down to the side & toward midline of body



5-37

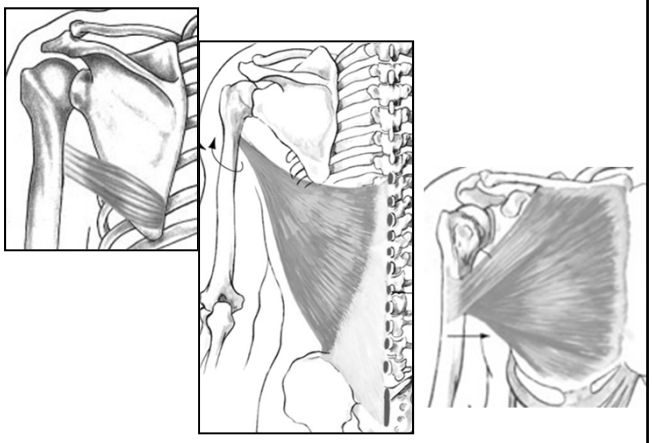
Glenohumeral Flexion

- Agonists
  - Anterior Deltoid
  - Upper Pectoralis Major

5-38

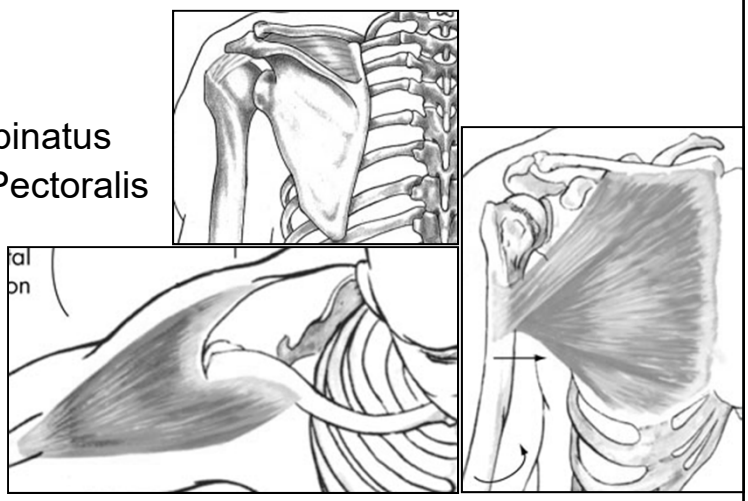
Glenohumeral Extension

- Agonists
  - Teres Major
  - Latissimus Dorsi
  - Lower Pectoralis Major



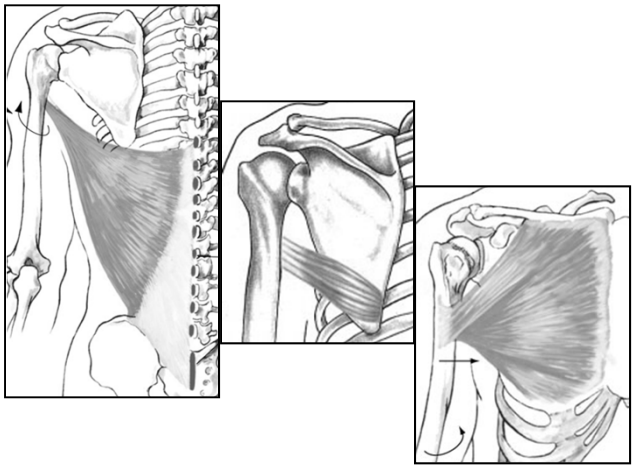
Glenohumeral Abduction

- Agonists
  - Deltoid
  - Supraspinatus
  - Upper Pectoralis Major



Glenohumeral Adduction

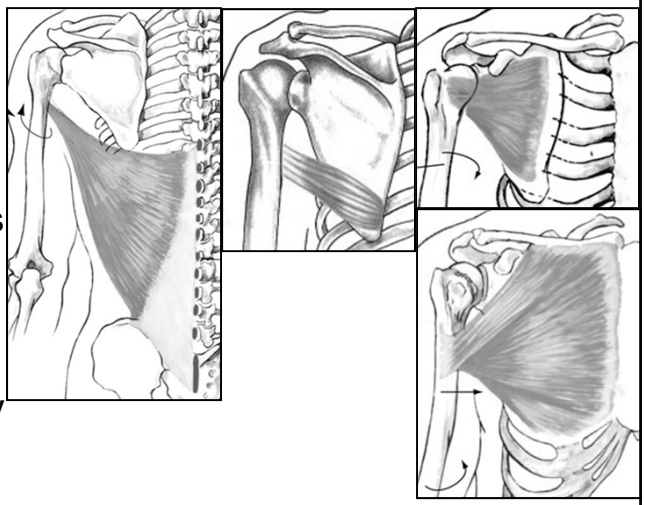
- EX. Lat. Pull - pull down weights
- Agonists
  - Latissimus Dorsi
  - Teres Major
  - Lower Pectoralis Major



5-41

Glenohumeral Internal Rotation

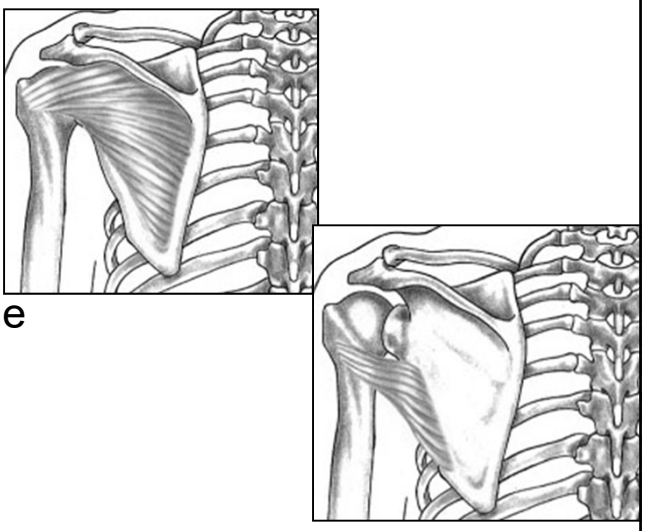
- Agonists
  - Latissimus Dorsi
  - Teres Major
  - Subscapularis
  - Pectoralis Major
- All attach anteromedially on humerus



5-42

Glenohumeral External Rotation

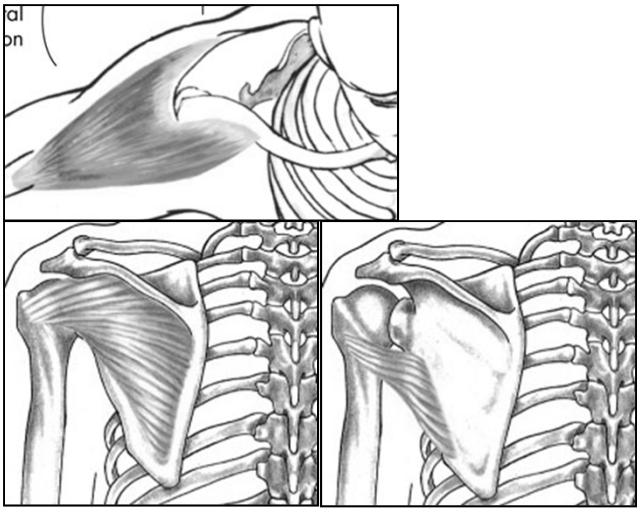
- Agonists
  - Infraspinatus
  - Teres Minor
- Both attach posteriorly on greater tubercle



5-43

Glenohumeral Horizontal Abduction

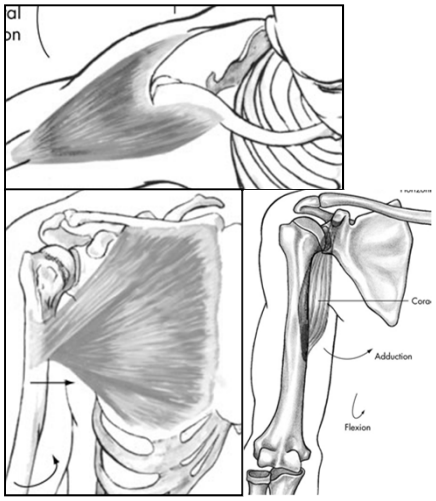
- Agonists
  - Posterior Deltoid
  - Middle Deltoid
  - Infraspinatus
  - Teres Minor



5-44

Glenohumeral Horizontal Adduction

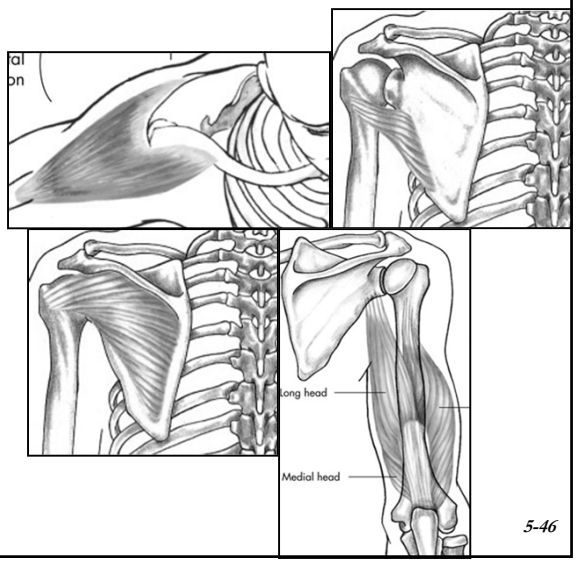
- Agonists
  - Anterior Deltoid
  - Pectoralis Major
  - Coracobrachialis



5-45

Glenohumeral Diagonal Abduction

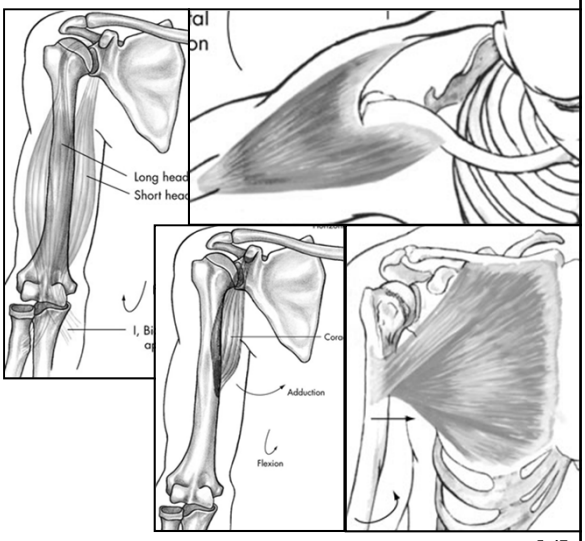
- Agonists
  - Posterior Deltoid
  - Infraspinatus
  - Teres Minor
  - Triceps Brachii (Long Head)



5-46

Glenohumeral Diagonal Adduction

- Agonists - both low & high
  - Anterior Deltoid
  - Coracobrachialis
  - Biceps Brachii (short head)
  - Pectoralis Major - Upper & Lower



Web Sites

Radiologic Anatomy Browser
http://radlinux1.usuf1.usuhs.mil/rad/iong/index.html
- This site has numerous radiological views of the musculoskeletal system.

University of Arkansas Medical School Gross Anatomy for Medical Students
http://anatomy.uams.edu/anatomyhtml/grossresources.html
- Dissections, anatomy tables, atlas images, links, etc.

Loyola University Medical Center: Structure of the Human Body
www.meddean.luc.edu/lumen/MedEd/GrossAnatomy/GA.html
- An excellent site with many slides, dissections, tutorials, etc., for the study of human anatomy

Wheeless' Textbook of Orthopaedics
www.wheelessonline.com/
- This site has an extensive index of links to the fractures, joints, muscles, nerves, trauma, medications, medical topics, lab tests, and links to orthopedic journals and other orthopedic and medical news.

Web Sites

Premiere Medical Search Engine
- http://www.medsite.com/Default.asp?bhcp=1
  - This site allows the reader to enter any medical condition and it will search the net to find relevant articles.

Arthroscopy.Com
- www.arthroscopy.com/sports.htm
  - Patient information on various musculoskeletal problems of the upper and lower extremity

Virtual Hospital
- www.vh.org
  - Numerous slides, patient information, etc.

Medical Multimedia Group
- www.healthpages.org/AHP/LIBRARY/HLTHTOP/CTD/
  - A Patient's Guide to Cumulative Trauma Disorder (CTD)

Baseball Almanac
- www.baseball-almanac.com/chapters/cap-ch8.shtml
  - Coaching Adult Pitchers

Web Sites

Lecture Topics in Kinesiology
- http://moon.ouhsc.edu/dthompso/namics/shoulder.htm
  - Shoulder articulations, movements, and muscles that are within the shoulder girdle

The Physician and Sportsmedicine
- www.physsportsmed.com/issues/2003/0703/depalma.htm
  - Detecting and Treating Shoulder Impingement Syndrome: The Role of Scapulothoracic Dyskinesis

Southern California Orthopedic Institute
- www.scoi.com/sholanat.htm
  - Anatomy of the Shoulder

FamilyDoctor.org
- http://familydoctor.org/268.xml
  - Shoulder Pain

Web Sites

MedlinePlus
- www.nlm.nih.gov/medlineplus/tutorials/shoulderarthroscopy/htm/index.htm
  - Shoulder arthroscopy interactive tutorial

MedlinePlus
- www.nlm.nih.gov/medlineplus/tutorials/rotatorcuffinjuries/htm/index.htm
  - Rotator cuff injuries interactive tutorial

American Physical Therapy Association
- www.apta.org/AM/Template.cfm?Section=Home&TEMPLATE=/CM/HTMLDisplay.cfm&CONTENTID=20448
  - Taking Care of Your Shoulder

American Academy of Orthopaedic Surgeons
- http://orthoinfo.aaos.org/category.cfm?topcategory=Shoulder
  - Patient Education Library on the Shoulder

Web Sites

Orthopaedic Research Institute
- http://www.ori.org.au/bonejoint/shoulder/contents.htm
  - Several web pages, text, and graphics on glenohumeral instability

American Sports Medicine Institute
- www.asmi.org/asmiweb/mpresentations/mmp.htm
  - Biomechanics of the Shoulder during Throwing

American Sports Medicine Institute
- http://www.asmi.org/SportsMed/throwing/thrower10.html
  - Throwers Ten Exercises

Washington Musculoskeletal Tumor Center
- www.sarcoma.org/main.php?page=shoulder
  - Shoulder girdle surgery