

Shouldering the Burden

Wheelchair Athletes and Shoulder Injuries



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CMO, 2015 Parapan Games, Toronto

Faculty/Presenter Disclosure

Faculty: **Dr. Julia Alleyne** BHSc(PT) MD CCFP Dip Sport Med
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Relationships with commercial interests:

Employee of Toronto2015 Organizing Committee

Disclosure of Commercial Support:

None

Potential for conflict(s) of interest:

None

Objectives

1. To be able to describe the anatomy and physiology of the shoulder joint in motion
2. To be able to identify injury risk factors with common wheelchair sports
3. To be able to apply concepts of evidenced based rehabilitation into training



Fusion of Science and Sport

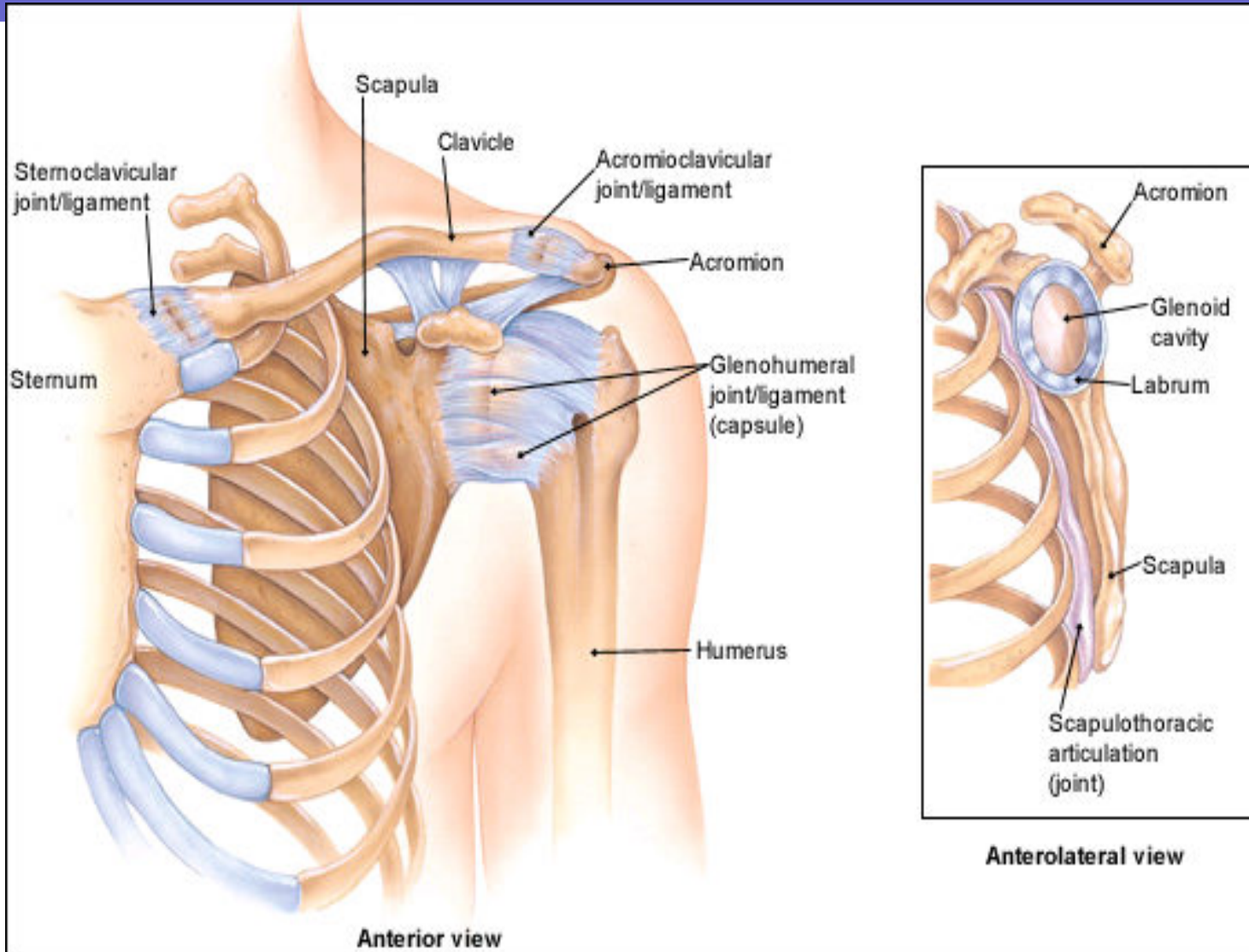
Functional Anatomy

Sport Mechanics

Athlete Risk Factors

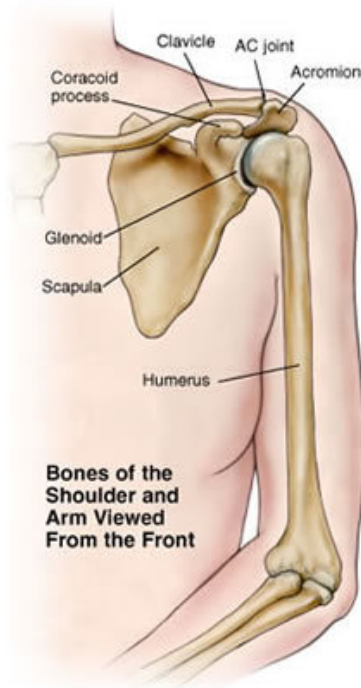
Rehabilitation and Recovery

Non-Contractile

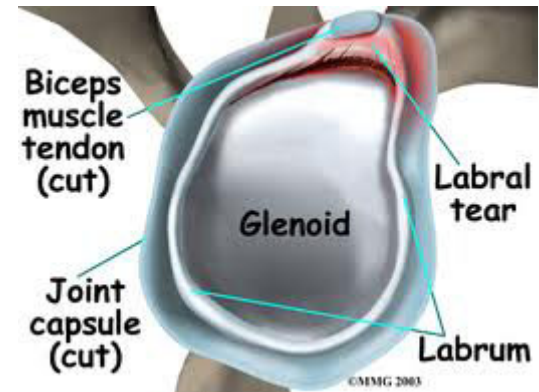
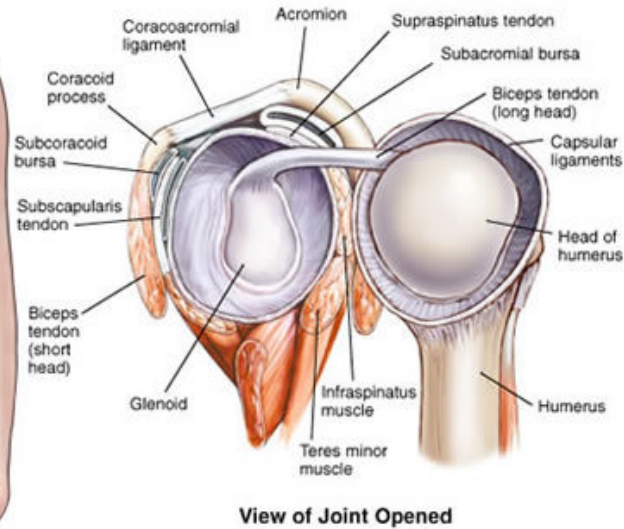


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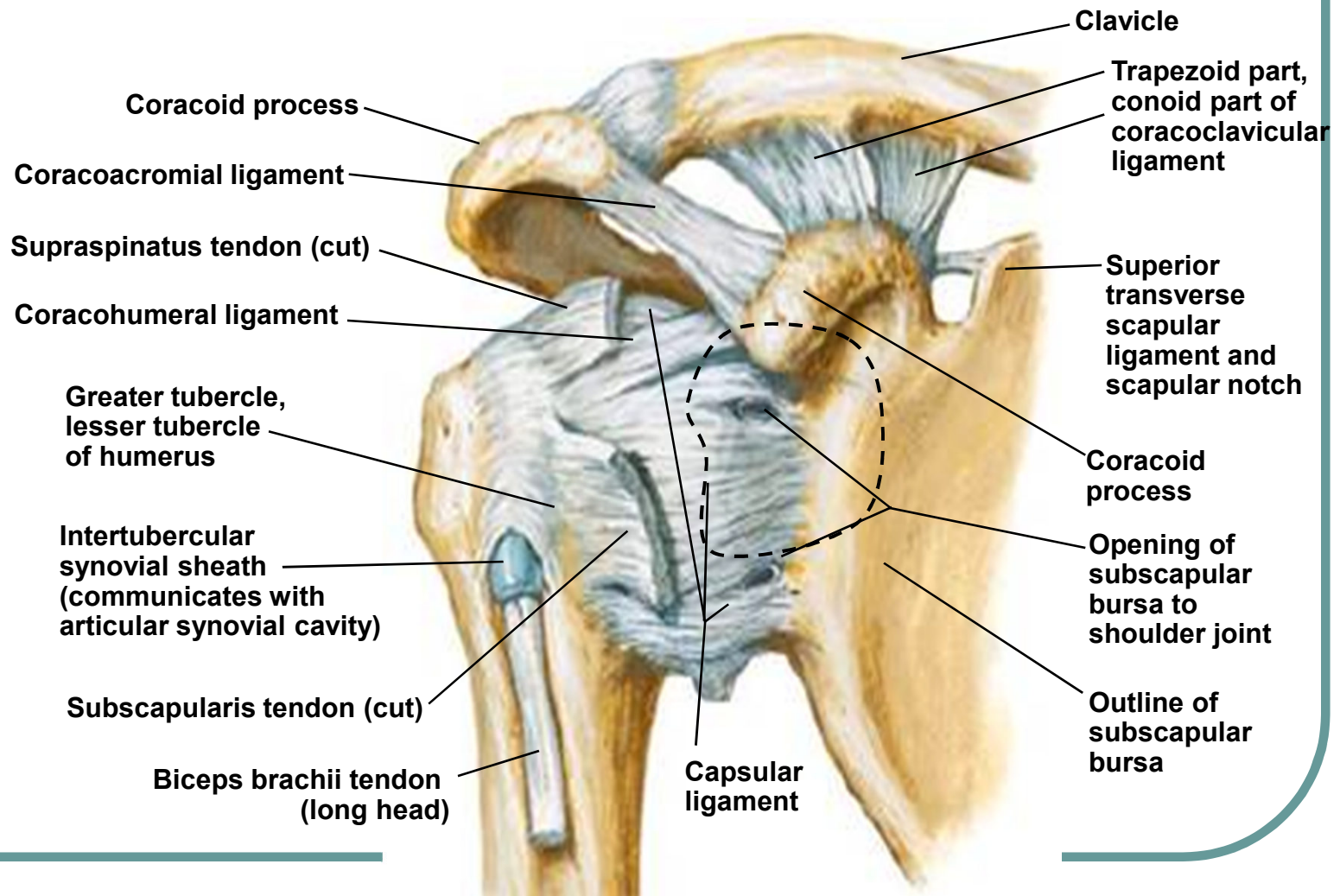
Labrum



Shoulder Anatomy



Anatomy. Anterior View



Stability with Mobility

Dynamics of Movement

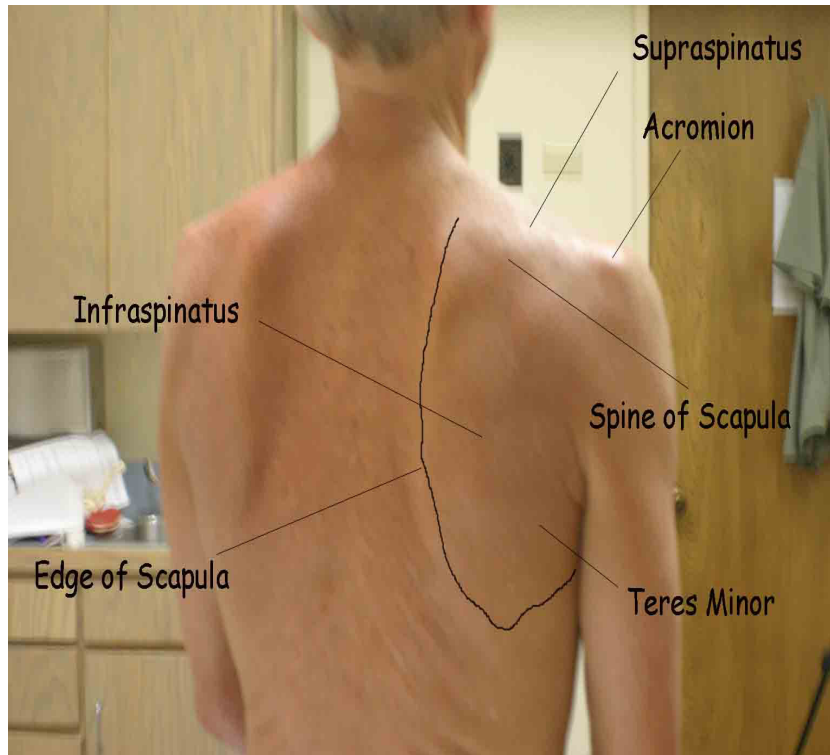
- Joint Shape and Position
- Producing Freedom of Range

Structures for Stability

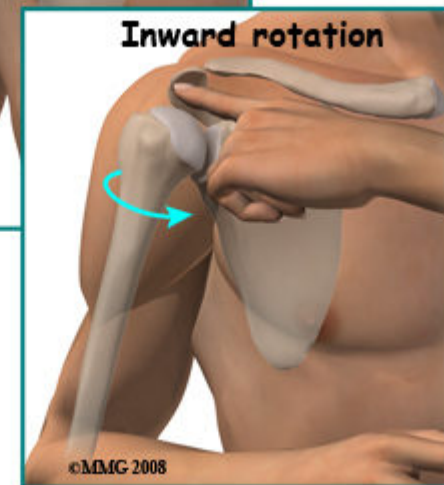
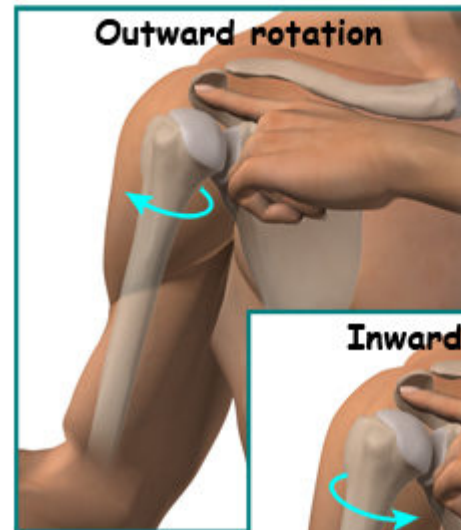
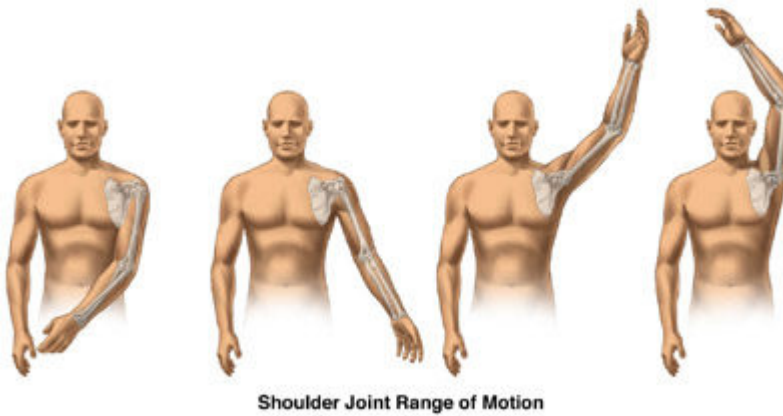
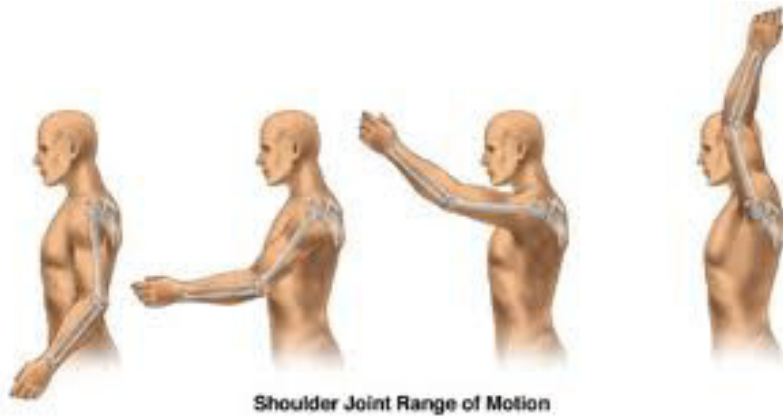
- Strength
- Shock Absorption



Shoulder Anatomy- Contractile



Dynamic Movement



Functional Anatomy

Contractile

- Rotator Cuff
 - Supraspinatus
 - Infraspinatus
 - Subscapularis
 - Teres Minor
- Biceps/ Triceps
- Deltoid
- Subscapular stabilizers

Non- Contractile

- Labrum
- Ligaments
- Capsule
- Bursa
- Nerves
- Bones

Dominant Symptoms

➔ Pain



Dominant Symptoms

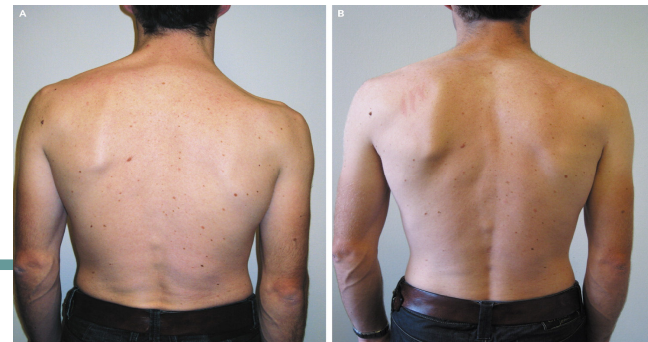
➔ Pain



➔ Stiffness



➔ Weakness



Dominant Symptoms

➤ Pain



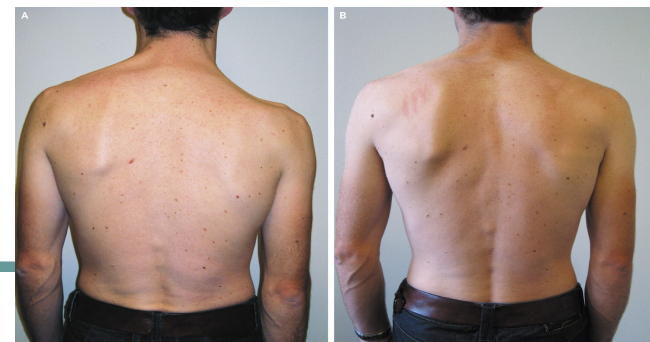
➤ Stiffness



➤ Instability



➤ Weakness



Shoulder Pathology

⇒ Impingement

“ Pinching sharpness ”

⇒ Inflammation

“ Hurts to move
through range ”

⇒ Instability

“ pops and shifts ”

⇒ Immobility

“ Can't move it ”

Shoulder Pathology

⇒ Impingement

- Tendon
 - Bursa
- “Pinching sharpness”

⇒ Instability

- Joint/ Labrum
 - Muscles
- “pops and shifts”

⇒ Inflammation

- Acute Strain
 - Tendonopathy
- “Hurts to move through range”

⇒ Immobility

- Frozen Shoulder
 - Arthritis
 - Fracture
- “Can't move it”

Fusion of Science and Sport

Functional Anatomy

Sport Mechanics

Athlete Risk Factors

Rehabilitation and Recovery

Sport Mechanics



Basketball
Rugby
Athletics
Tennis



Archery Dance Fencing Curling Shotput

Sport Mechanics

Pull

Propulsion
Repetitive

Reach/ Shoot

Stability and Rotation

Push

Propulsive
Repetitive

Grab/ Hold

Pivotal turns,

Key Mechanical Factors

- Propulsion
 - Repetition plus Force against Resistance
 - Athletics (Speed)
- Reach
 - Basketball (and Release)
 - Tennis (and Swing)
 - Rugby (and Throw)
- “Out of Reach”
 - Pivots, Manoeuvres, Awkward moments

How common are shoulder problems

Mobility – 40%, Push, F>M, Age

J.Rehabil Med., Shoulder pain in persons with thoracic spinal cord injury: prevalence and characteristics 2008 Apr;40(4):277-83

Prevalence and intensity of shoulder pain was significantly higher with patients with tetraplegia than paraplegia.

Arch Phys Med Rehabil., Shoulder pain in wheelchair users with tetraplegia and paraplegia 1999 Apr;80(4):453-7.

What is the incidence of Shoulder problems with Sport ?

Women > Men
52% at Study
90% per Lifetime

J Orthop Sport Phys Ther. **Shoulder pain in female wheelchair basketball players** 1999
Apr;29(4):225-31

Fusion of Science and Sport

Functional Anatomy

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Rehabilitation and Recovery



Are certain sports higher risk ?

Wheelchair Tennis

- Hyper-extension of shoulder
- Overhead smash
- Multi-directional
- Using arms to accelerate, manoeuvre and use racquet



High Risk Sport- WC Tennis

33 Elite WC Tennis Players, Random Health Questionnaire followed by Ultrasound

Dominant > Non-dominant Shoulder

- 21/33 (63%) Acromioclavicular pathology
- 14/33 (42%) Rotator Cuff Pathology

Negative Variables

- Age, Training time per day, Length of Career, Length of Time in Wheelchair

Positive Variable

- Wheelchair Tennis

Conclusion: **What is predictable is preventable**

Jeon et al; Ultrasonographic evaluation of the shoulder in elite wheelchair tennis players, J. Sport Rehab, 2010, 19, 2, 161-172,

Comparison of Able Bodied and Wheelchair Fencers

- Wheelchair fencers had higher overall injury incidence rate (3.9/1000 hours) than AFs (2.4/1000 hours).
- Wheelchair fencers with poor **trunk control** were more vulnerable to injuries (4.9/1000 hours) than those with good trunk control (3.0/1000 hours)

Chung et al; Clinical Journal of Sport Medicine; Musculoskeletal Injuries in Elite Able-Bodied and Wheelchair Foil Fencers—A Pilot Study Volume 22(3), May 2012, p 278–280

Risk Factors



Athlete Risk Factors

1. Pre-existing
 - Impairment
2. Precipitators
 - new injury/ new equipment
3. Perpetuating
 - Deconditioning
4. Protective
 - Fitness, Recovery, Access to Treatment

Which of the following are Risk Factors for Rotator Cuff Disease?

- Smoking
- Alcohol
- Gender
- Age
- Previous Trauma
- Increased Body Mass Index
- Deconditioning
- Psychological Stress

Which of the following are Risk Factors for Shoulder Injury?

- Smoking
- Alcohol
- Gender
- Age
- Previous Trauma
- Increased Body Mass Index
- Deconditioning
- Psychological Stress

Is Gender a Risk Factor ?

Prevalence and impact of musculoskeletal disorders of the upper limb in the general population.

Walker-Bone et al, United Kingdom Arthritis Rheum 2004 Aug 15:51(4):642-651

Methods:

- 9,696 subjects, M&F, Cross-sectional Survey, Random
- Screening Questionnaire then a Symptomatic Exam

Results:

- | | | | |
|----|-----------------------|-----|--------------|
| 1. | Shoulder Tendonopathy | M:F | 4.5% : 6.1% |
| 2. | Adhesive Capsulitis | M:F | 8.2% : 10.1% |

Concurrent Medical Problems

Conclusions:

A consistent association between **diabetes and shoulder** disorders, some associations for weight-related factors as well as a possible preventive effect from physical exercise and sports suggest a metabolic pathophysiological process in shoulder disorders.

Risk factors of atherosclerosis and shoulder pain - Is there an association? A systematic review

European Journal of Pain (May 2008), 12 (4), pg. 412-426

Risk Factors

Shoulder Anatomy

- Increased Glenohumeral Laxity
- Shallow or narrow Joint

Shoulder Physiology

- Smaller Muscle mass for conditioning
- Habitual Postures

Shoulder Function

- Above Shoulder Positioning & Repetition

Fusion of Science and Sport

Functional Anatomy

Sport Mechanics

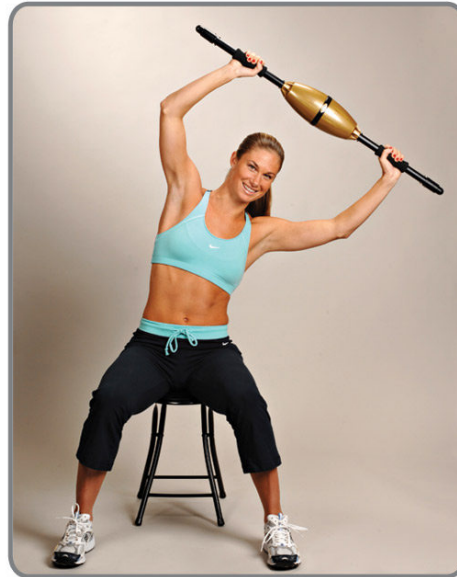
Athlete Risk Factors

Rehabilitation and Recovery

Rehabilitation and Recovery

1. Assess Trunk Control – Train CORE
2. Rotator Cuff Training – Predictable
3. Balance Mobility and Stability
4. Equipment
5. Lifestyle – Risk Factors
6. General Health Contribution

Key CORE Exercises



Rotator Cuff Conditioning

STUDIO FITNESS 2015
Studio Fitness: TRY THIS WORKOUT
Rotator Cuff
Greg Finch

Intensity
Level: **CHALLENGING** weight
Time: 30 minutes

1. Rotator Cuff Exercises
1. Stand with feet shoulder-width apart, holding a light dumbbell in your right hand. Perform 10 repetitions of the following exercises:
a. External rotation: Bend your right arm at the elbow, with your forearm parallel to the floor. Rotate your forearm away from your body.
b. Internal rotation: Bend your right arm at the elbow, with your forearm parallel to the floor. Rotate your forearm towards your body.
2. Repeat with the left hand.

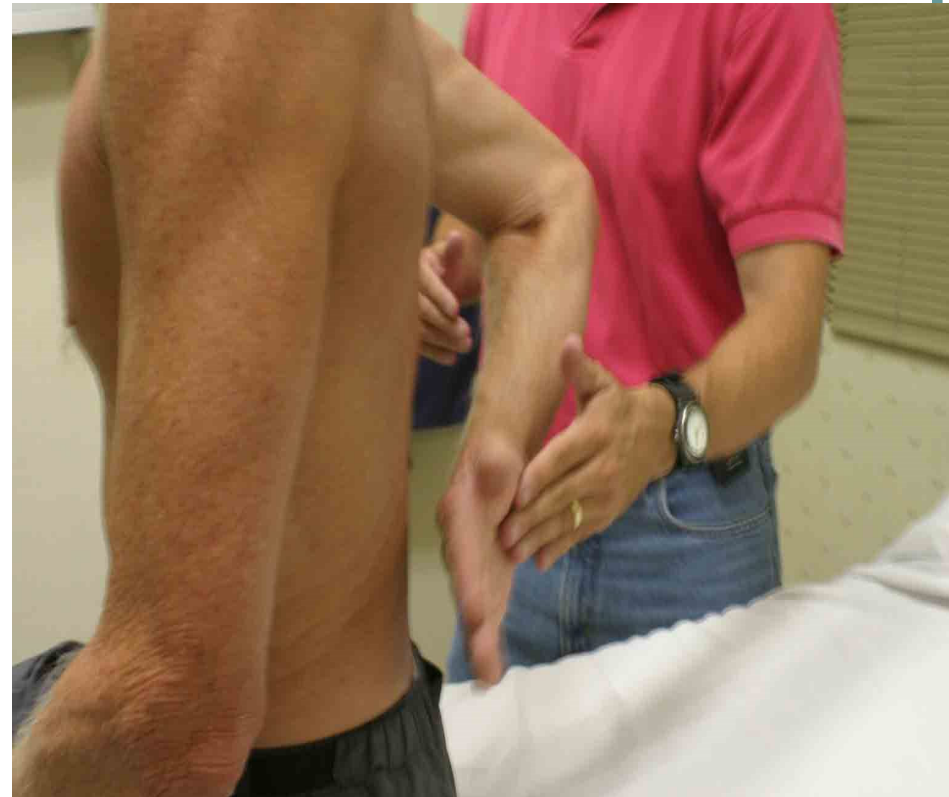
2. Rotator Cuff Exercises
1. Lie on your back with your knees bent and feet flat on the floor. Hold a light dumbbell in your right hand, with your arm extended straight out to the side. Perform 10 repetitions of the following exercise:
a. External rotation: Rotate your forearm away from your body.
2. Repeat with the left hand.

3. Rotator Cuff Exercises
1. Stand with feet shoulder-width apart, holding a light dumbbell in your right hand. Perform 10 repetitions of the following exercise:
a. External rotation: Bend your right arm at the elbow, with your forearm parallel to the floor. Rotate your forearm away from your body.
2. Repeat with the left hand.

4. Rotator Cuff Exercises
1. Stand with feet shoulder-width apart, holding a light dumbbell in your right hand. Perform 10 repetitions of the following exercise:
a. External rotation: Bend your right arm at the elbow, with your forearm parallel to the floor. Rotate your forearm away from your body.
2. Repeat with the left hand.

5. Rotator Cuff Exercises
1. Stand with feet shoulder-width apart, holding a light dumbbell in your right hand. Perform 10 repetitions of the following exercise:
a. External rotation: Bend your right arm at the elbow, with your forearm parallel to the floor. Rotate your forearm away from your body.
2. Repeat with the left hand.

6. Rotator Cuff Exercises
1. Stand with feet shoulder-width apart, holding a light dumbbell in your right hand. Perform 10 repetitions of the following exercise:
a. External rotation: Bend your right arm at the elbow, with your forearm parallel to the floor. Rotate your forearm away from your body.
2. Repeat with the left hand.



Stop Guessing and Start Assessing

1. Mobility

- Sport requirements and Athlete Ability
 - GAP: Dynamic Stretching, Passive Positioning
 - Rehab: Soft Tissue Manual Therapy

2. Stability

- Risk Factor analysis for instability
 - Gap: Strength – Rotator Cuff/ Subscapular/ Core
 - Rehab- Progressive, proprioceptive strengthening
 - Structure - Labral /Ligament/ Capsular Tear

Recovery

Mini recovery within sport activity

- positional, variable intensity, active rest

Optimal Recovery between activity

- Light training days, Off days
- Massage, Cool Tubs, Nutrition

Recovery within Periodization

- Extended Time off – 2-3 weeks for recovery

