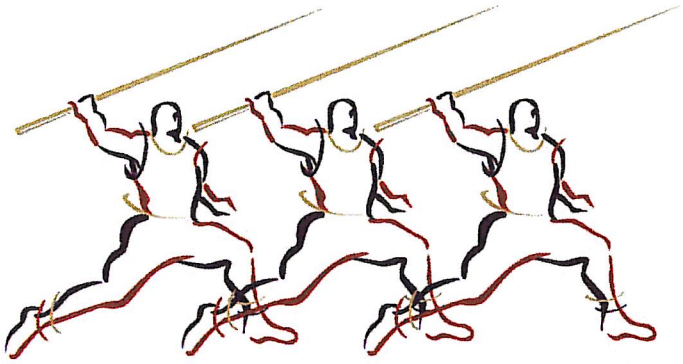


WORLD JAVELIN CONFERENCE

KUORTANE • FINLAND

09-11 OCTOBER 2009

SHOULDER REHABILITATION

MARK FLETCHER, MD

EUROPEAN ATHLETICS

COACHING SUMMIT SERIES

Shoulder Rehabilitation

No proper rehabilitation program exists on its own. For any program to give benefit to the athlete it must be incorporated into the overall training plan. "Adding on" to an existing program will only give an over- used shoulder more to do, making the problem worse. If the athlete is hurt then alterations must be made in the program with respect to volume, intensity, and rest/recovery, to allow the athlete to heal .

The coach and the physiotherapist must work together to create an overall plan. This communication is essential so that rehabilitative exercises and training can work together with respect to the general strength, specific strength, speed/explosive training, and the technical training that make up the training program.

Special attention must be given to the overall volume and intensity that the throwing shoulder endures. Volume is critically important to developing , and succeeding, as a javelin thrower. A common fault among coaches and athletes alike is having too much throwing volume at too high of an intensity. Most volume should come at lower intensities which will decrease the load on the shoulder but also allow maximum technical development. Higher intensity throwing should be planned for with periodization in the training program so that the athlete is recovered appropriately before and after and is in physical shape to perform at a high level. (Periodization is the cornerstone of successful training programs - but it is very difficult to convince most throwers that they should periodize their throwing..... 80% of 70m is 'only' 56m!!!)

Another critical point to prevention of injuries is awareness of the rest of the body. Injuries are common in javelin throwing. Any injury to any part of the body WILL result in lower velocity in the throwing arm if all things remain equal. This fact must be accounted for in training sessions. Athletes will try and keep their "normal" distances on throws by throwing - "over-throwing" - with the shoulder and elbow. Over time, this WILL lead to injuries to the upper extremity. It is the coaches responsibility to be aware of any injuries, and direct the athlete to decrease the intensity and throwing distance to accommodate the injury.

The following pictures that show common exercises for the main muscles of concern as well as some examples of more complex exercises. I have included a chart from the Journal of Orthopaedic and Sports Physical Therapy that gives good explanation of what each common exercises does in terms of muscle involvement and clinical implications.

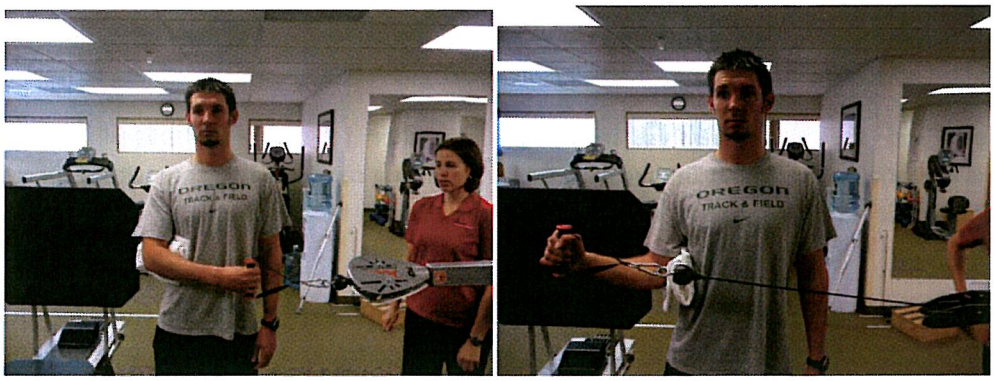
Generally.....these exercises should be done at volumes to emphasize strength (2-3 sets of 12-15 reps). Proper form and controlled movement, emphasizing the eccentric phase of the exercise, should be the main focus of the movements. Each session should have no more than 5-6 exercises per session. Ideally a comprehensive program should be created with the physiotherapist.

Daily stretching is one of the few things trainers and throwers can do to reverse the progression of pathologic changes in the shoulder. Please refer to the Stretching program described by Lintner et al from the American Journal of Sports Medicine.

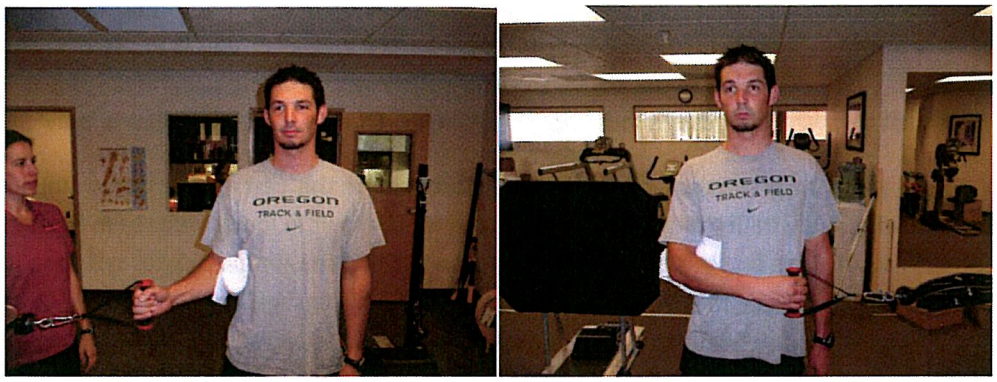
Mark Fletcher, MD

Basic Exercises-

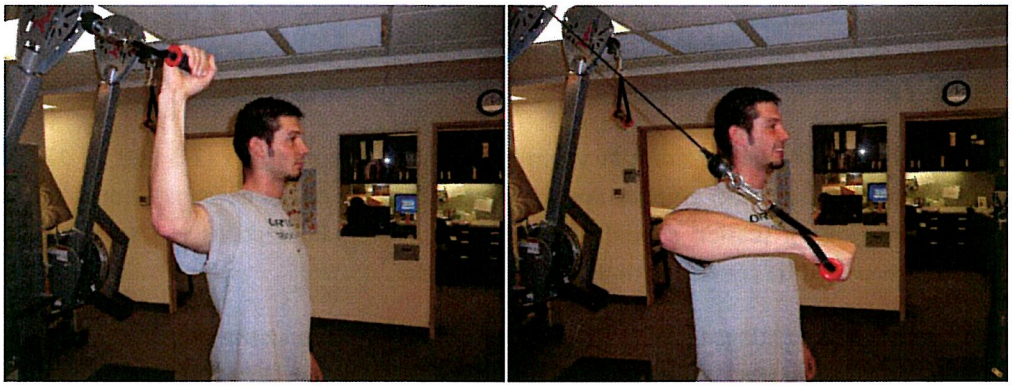
External Rotation with towel roll:



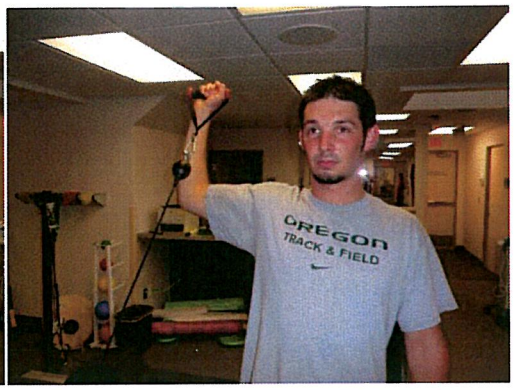
Internal Rotation at 0° abduction with towel roll:



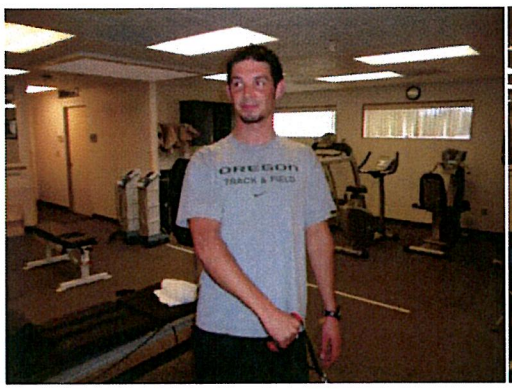
Internal Rotation at 90° abduction:

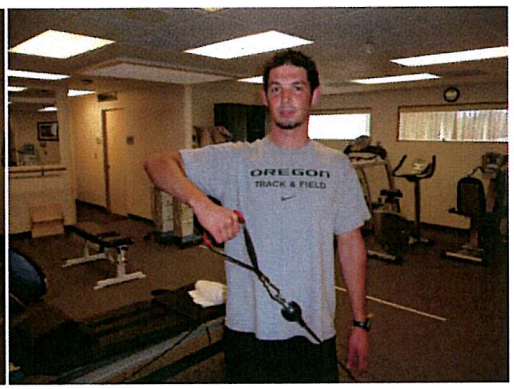


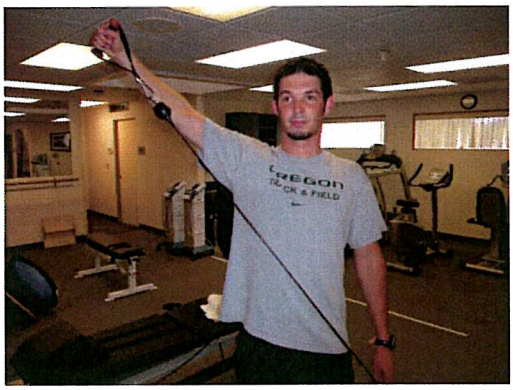
External Rotation at 90° abduction



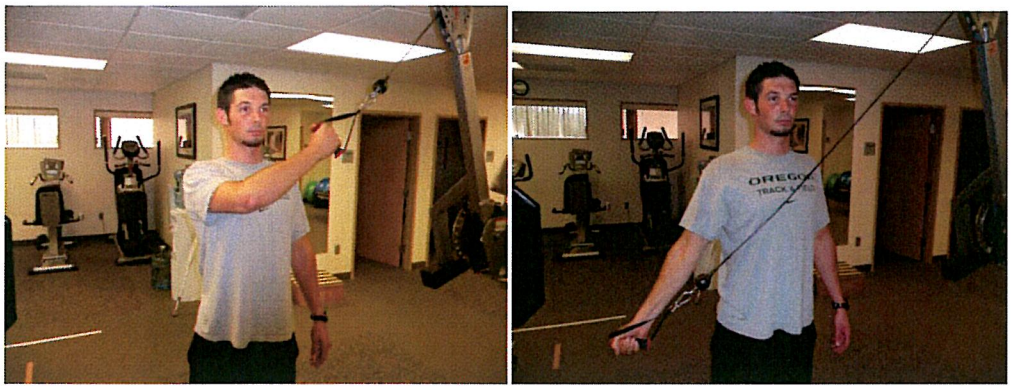
Diagonal abduction and external rotation(combined flexion/ER)



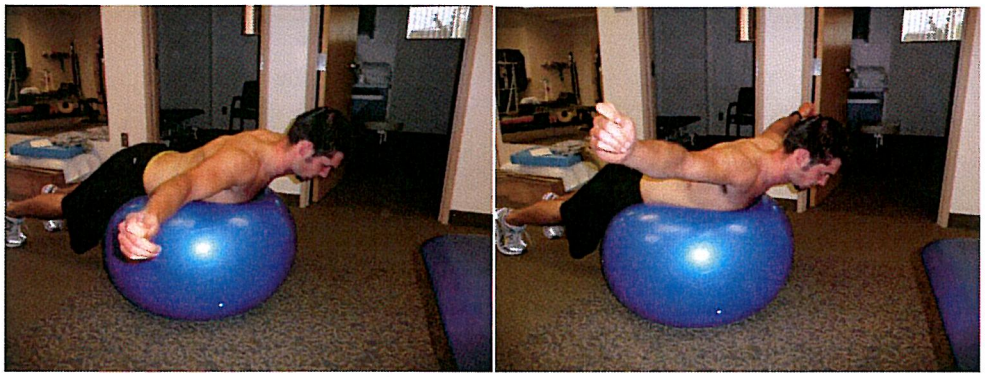




Diagonal external rotation and extension



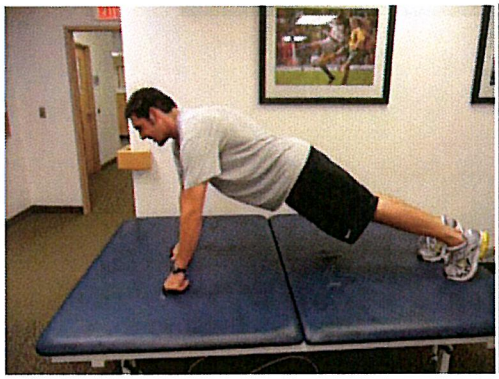
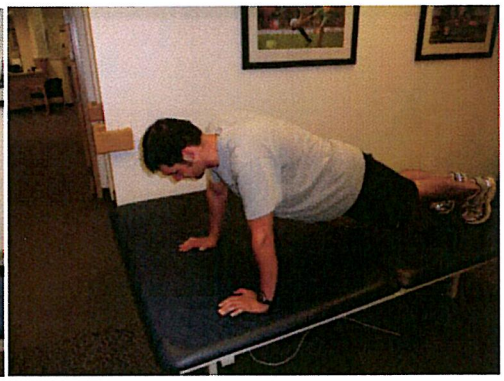
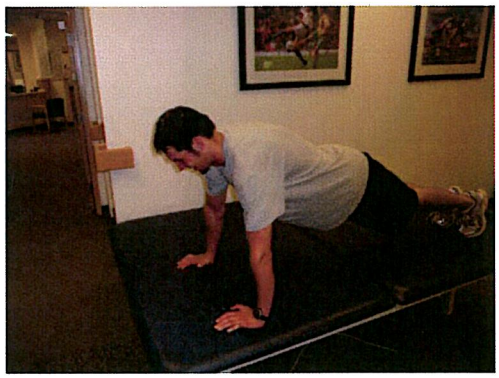
Rhomboids and Middle Trapezius - Prone Horizontal abduction at 90° abduction with ER ("Prone T")



Lower Trapezius : Prone Full Can ("Prone Y")

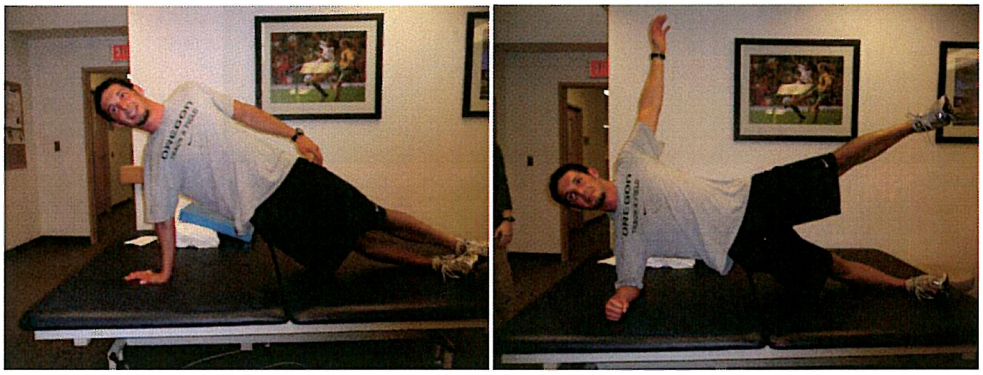
Lower Trapezius "flutter" (alternating arms up and down)


Serratus Anterior - Push up Plus: "Plank" position with body, head - torso - hips in one line. Push arms forward and shoulders forward keeping arms straight

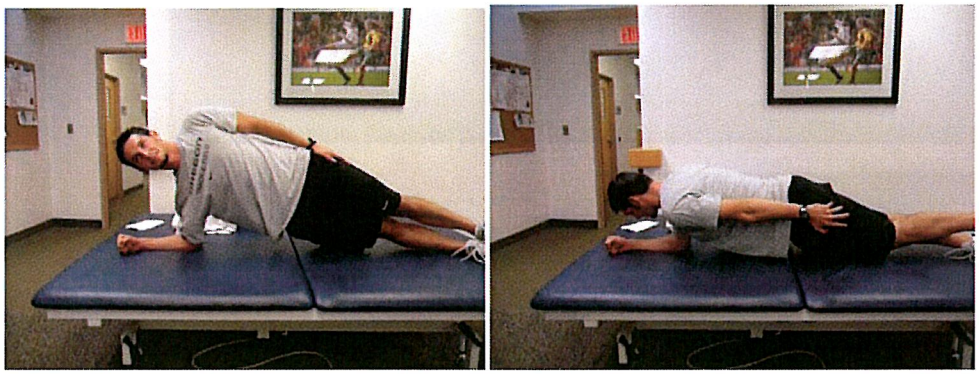




Complex movements:

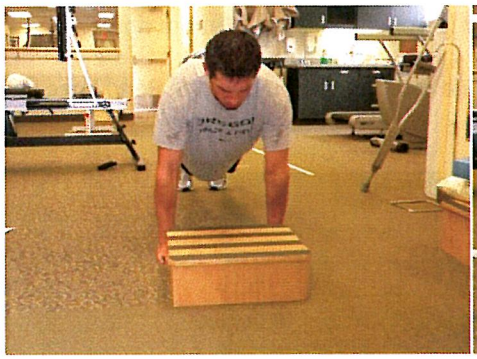
Side plank with arm/leg abduction:

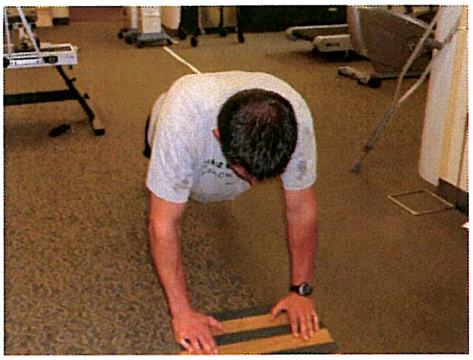


Side plank rotations:

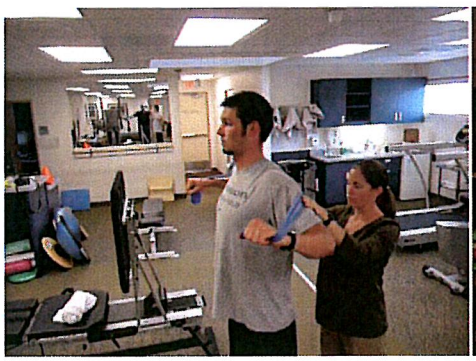


Push up plus with movement:





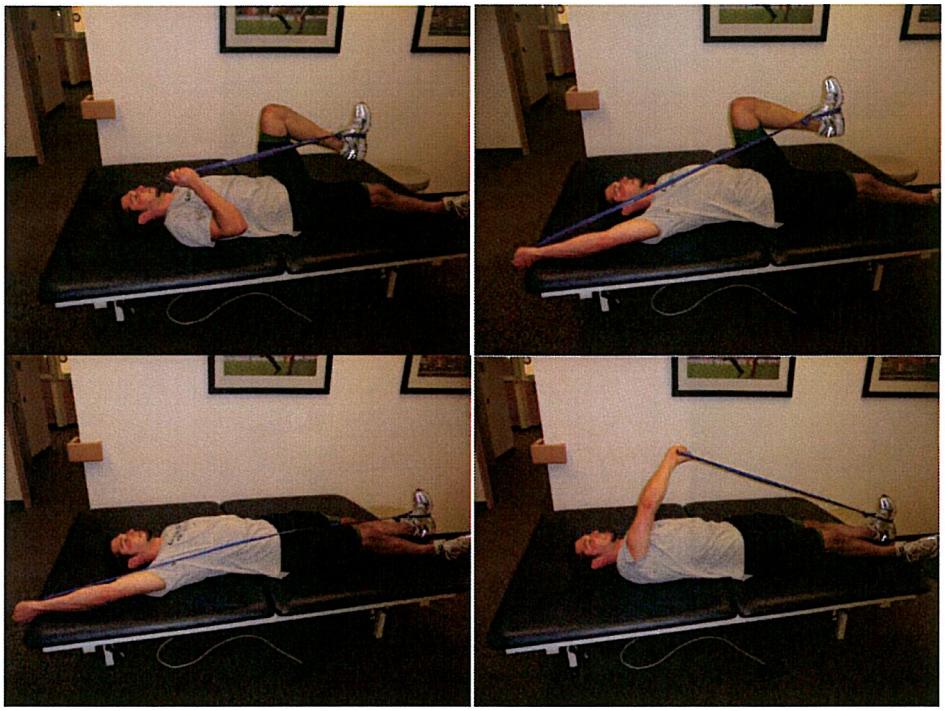
Serratus Anterior "Hugs":




Nolan Ryan's: (light concentric, heavy eccentric D2 movement)

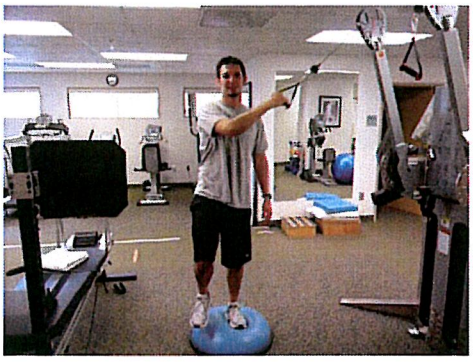
1)Knee up, hand in front of chest 2)Elevate hand over shoulder (throwing position) Thumb down

3) Straighten leg 4) lower arm slowly towards opposite leg while rotating thumb down 5) Bend knee and repeat

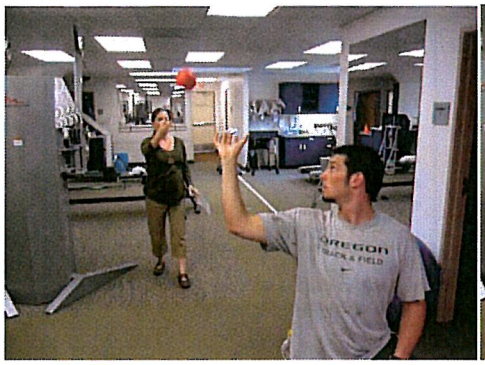
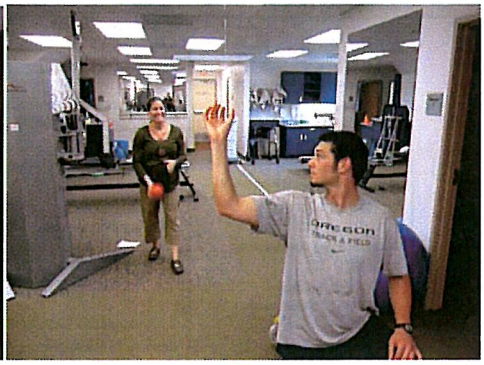


Added complexity:

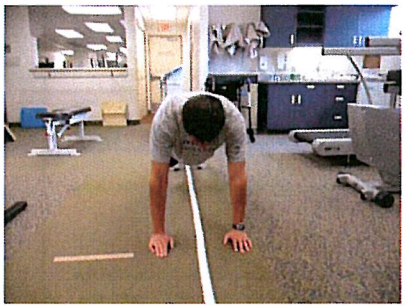
Do any exercise on unstable surface to activate postural and core muscles.



Reverse Throwing

Plyometric side to side push up plus: (note winging of Right shoulder blade)



Special Thanks to:

Carrie Lamb, PT

Kara Weigel, DPT

Alex Wolff

Recommended Exercises for Glenohumeral and Scapulothoracic Muscles Based on Anatomical, Biomechanical, and Clinical Implications.

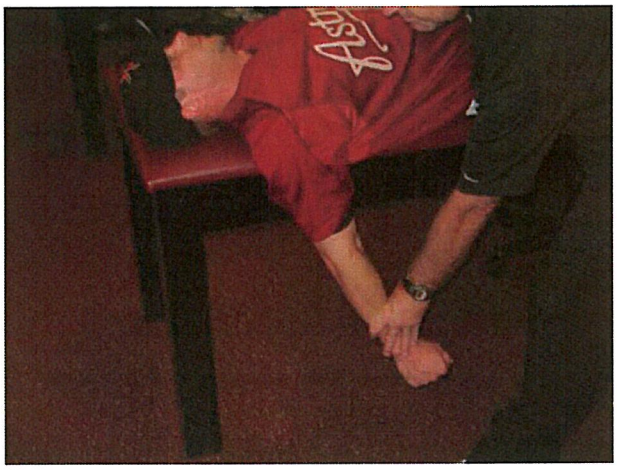
Reinhold, MM, "Current Concepts in the Scientific and Clinical Rationale Behind Exercises for Glenohumeral and Scapulothoracic Musculature"
Journal of Orthopaedic & Sports Physical Therapy, 39(2): 105-117, February 2009

Muscle	Exercise	Anatomical Considerations	Biomechanical Implications	Clinical Implications
Supraspinatus	1. Full can	1. Enhances scapular position and subacromial space	1. Decreased deltoid involvement compared to empty can	1. Minimizes chance of superior humeral head migration by deltoid overpowering supraspinatus
	2. Prone full can	2. Enhances scapular position and subacromial space	2. High posterior deltoid activity with similar supraspinatus activity	2. High supraspinatus activity and also good exercise for lower trapezius
Infraspinatus and teres minor	1. Side-lying ER	1. Position of shoulder stability minimal capsular strain	1. Increased moment arm of muscle at 0° abduction Greatest EMG activity	1. Most effective exercise in recruiting infraspinatus activity. Good when cautious with static stability
	2. Prone ER at 90° abduction	2. Challenging position for stability, higher capsular strain	2. High EMG activity	2. Strengthens in a challenging position for shoulder stability. Also good exercise for lower trapezius
	3. ER with towel roll	3. Allows for proper form without compensation	3. Increased EMG activity with addition of towel, also incorporates adductors	3. Enhances muscle recruitment and synergy with adductors
Subscapularis	1. IR at 0° abduction	1. Position of shoulder stability	1. Similar subscapularis activity between 0° and 90° abduction	1. Effective exercise, good when cautious with static stability
	2. IR at 90° abduction	1. Position of shoulder instability	2. Enhances scapular position and subacromial space, less pectoralis activity	2. Strengthens in a challenging position for shoulder stability
	3. IR diagonal exercise	3. Replicates functional activity	3. High EMG activity	3. Effective strengthening in a functional movement pattern
Serratus anterior	1. Push up with plus	1. Easy position to produce resistance against protraction	1. High EMG activity	1. Effective exercise to provide resistance against protraction also good exercise for subscapularis
	2. Dynamic hug	2. Performed below 90° abduction	2. High EMG activity	2. Easily perform in patients with difficulty elevating arms or
	3. Serratus punch 120°	3. Combines protraction with upward rotation	3. High EMG activity	3. Good dynamic activity to combine upward rotation and protraction function
Lower Trapezius	1. Prone full can	1. Can properly align exercise with muscle fibers	1. High EMG activity	1. Effective exercise, also good exercise for supraspinatus
	2. Prone ER at 90° abduction	2. Prone exercise below 90° abduction	2. High EMG activity	2. Effective exercise, also good exercise for infraspinatus and teres minor
	3. Prone horizontal abduction at 90° abduction with ER	3. Prone exercise below 90° abduction	3. Good ratio of lower to upper trapezius activity	3. Effective exercise, also good exercise for middle trapezius
	4. Bilateral ER	4. Scapular control without arm elevation	4. Good ratio of lower to upper trapezius activity	4. Effective exercise, also good for infraspinatus and teres minor
Middle Trapezius	1. Prone row	1. Prone exercise below 90° abduction	1. High EMG activity	1. Effective exercise, good ratios of upper, middle, and lower trapezius activity
	2. Prone horizontal abduction at 90° abduction with ER	2. Prone exercise below 90° abduction	2. High EMG Activity	2. Effective exercise, also good exercise for lower trapezius
Upper Trapezius	1. Shrug	1. Scapular control without arm elevation	1. High EMG activity	1. Effective exercise
	2. Prone Row	2. Prone exercise below 90° abduction	2. High EMG activity	2. Good ratios of upper, middle, and lower trapezius activity
	3. Prone horizontal abduction at 90° abduction with ER	3. Prone exercise below 90° abduction	3. High EMG activity	3. Effective exercise, also good exercise for lower trapezius
Rhomboids and levator scapulae	1. Prone row	1. Prone exercise below 90° abduction	1. High EMG activity	1. Effective exercise, good ratios of upper, middle, and lower trapezius activity
	2. Prone horizontal abduction at 90° abduction with ER	2. Prone exercise below 90° abduction	2. High EMG Activity	2. Effective exercise, also good for lower and middle trapezius
	3. Prone extension with ER	3. Prone exercises below 90° abduction	3. High EMG activity	3. Effective exercise, unique movement to enhance scapular control

APPENDIX:
The Houston Astros Stretching Program

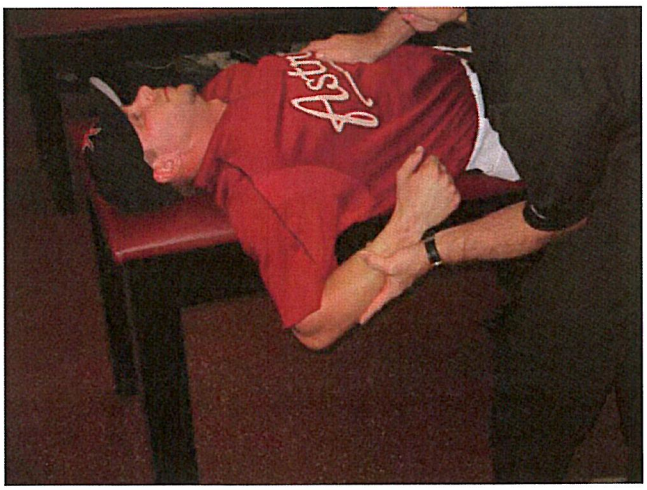
Our Flexibility program consists of 5 positions. Four of the 5 have 2 variations of each position. We use contract-relax at every position with all of the motions. Each position has 3 repetitions and about a 3 sec hold.

Position 1A. Supine, stretch the arm (with elbow extended) into shoulder extension



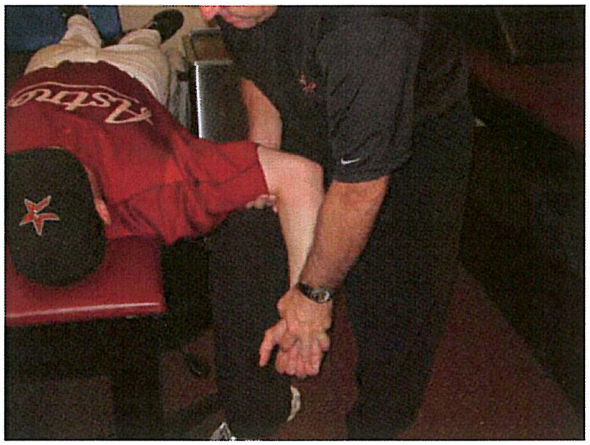
Position 1A stretches the biceps along both heads but primarily the long head, including its origin at the superior labrum.

Position 1B. Supine, stretch the arm (with elbow flexed) into shoulder extension



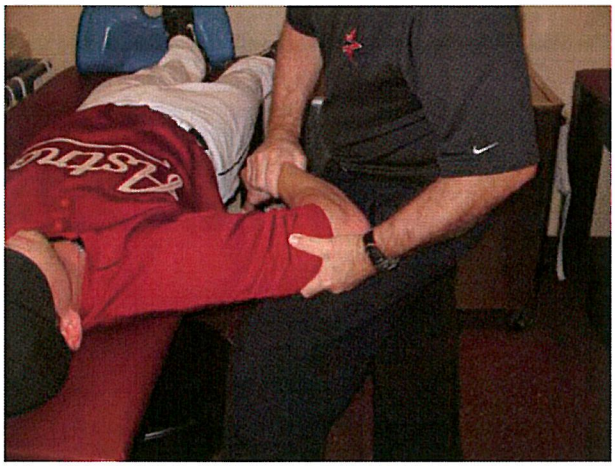
Position 1B should stretch the anterior capsule.

Position 2. Supine, shoulder abducted to 90 deg and elbow flexed to 90 deg (90/90 position). Distal arm rests on athletic trainer's thigh for support parallel to floor. The scapula is not manually constrained to avoid stretch of the anterior capsule and to include peri-scapular musculature. Stretch into external rotation. Most throwers will reach at least 120 deg of external rotation. We do not exceed 180 deg of rotation.



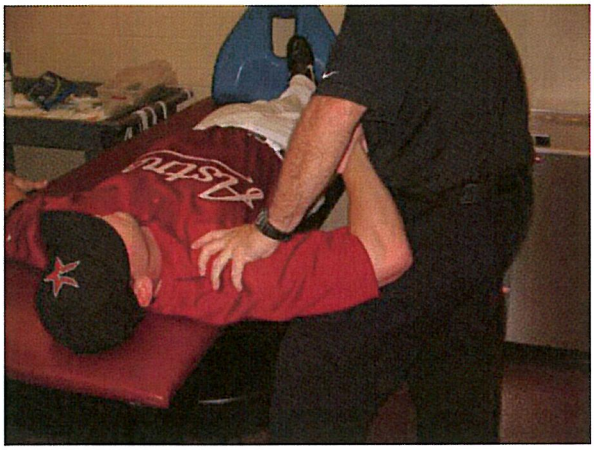
Position 2 should stretch the internal rotators.

Position 3A . Supine, shoulder abducted to 90 deg and elbow flexed to 90 deg (90/90 position). Elbow rests on athletic trainer's thigh parallel to floor. The scapula is not constrained to include the peri-scapular musculature. Stretch into internal rotation. In this position we allow the gleno-humeral joint to rotate forward. Try to prevent shoulder shrugging. Player actively returns arm to starting position against gentle resistance.



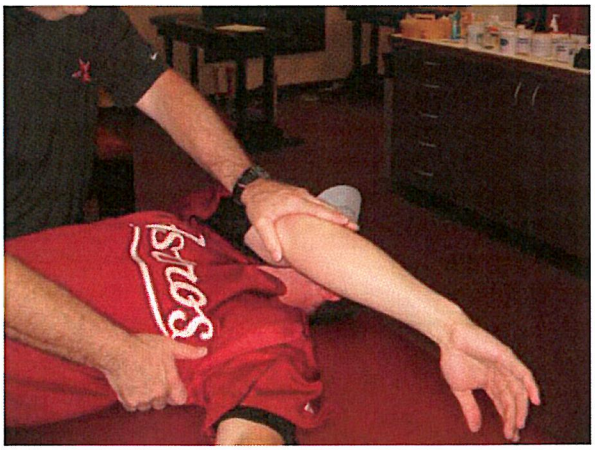
Position 3A stretches the scapulo-thoracic musculature into shoulder internal rotation.

Position 3B. Supine, shoulder abducted to 90 deg and elbow flexed to 90 deg (90/90 position). Elbow rests on athletic trainer's thigh parallel to floor. Scapula held against table to focus stretch on posterior capsule and posterior rotator cuff. Stretch into internal rotation while blocking scapula rotation with your hand against the anterior gleno-humeral joint. In this position we do not allow the gleno-humeral joint to rotate forward. Try to prevent shoulder shrugging.



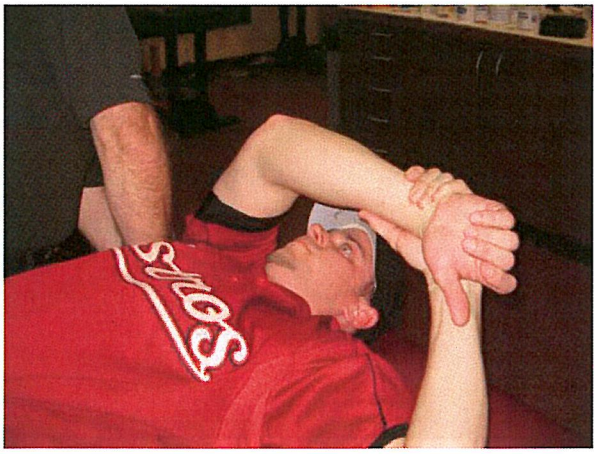
Position 3B stretches the posterior gleno-humeral soft tissues into shoulder internal rotation.

Position 4A. Supine, shoulder abducted to 90 deg and elbow extended. Stretch into horizontal adduction. Player actively returns to starting position against light resistance. Try to prevent shoulder shrugging.



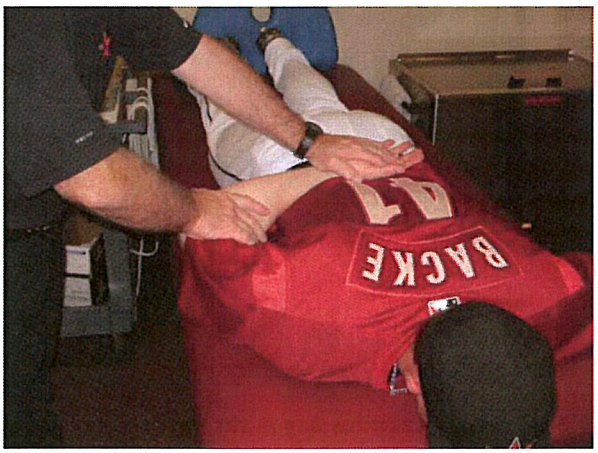
Position 4A stretches the posterior scapulo-thoracic musculature.

Position 4B. Supine, shoulder abducted to 90 deg and elbow extended. Stretch into horizontal adduction while blocking the lateral border of the scapula with the heel of your hand. The patient pulls his arm across his chest with his opposite hand. Try to prevent shoulder shrugging.



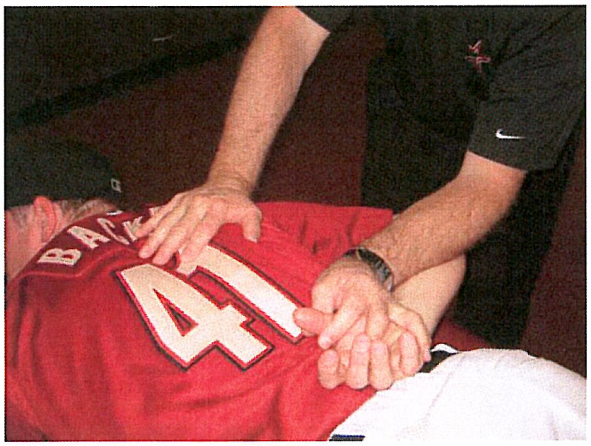
Position 4B stretches the posterior gleno-humeral musculature and capsule.

Position 5A. Prone, shoulder internally rotated so that the back of the hand is resting on the lumbar region. **GENTLY** push the elbow toward the floor while securing the hand in the small of the back. Allow scapula winging! Player pushes elbow back to starting position against gentle resistance.



Position 5A stretches the posterior scapulo-thoracic musculature into shoulder internal rotation.

Position 5B. Prone, shoulder internally rotated so that the back of the hand is resting on the lumbar area of the back, while securing the body of the scapula to prevent winging **GENTLY** push the elbow toward the floor while securing the hand in the small of the back. Do not allow scapula winging! Player actively returns to starting position against light resistance.



Position 5B stretches the posterior gleno-humeral soft tissues into shoulder internal rotation.

With an experienced trainer and player, this program takes a minimum amount of time (2 ½ minutes) and addresses all the areas that we feel are important with particular emphasis on internal rotation.

External rotation ROM is achieved with the action of throwing and typically needs less work. Today's athlete has often been stretching since Little League with emphasis on external rotation and little work in internal rotation. This has reduced the need to work into external rotation.

This program is done daily (except for the day after a game for a starter) and is typically done shortly before the pitcher goes out to throw. Note that the movements are fairly rapid. This is intentional to more closely mimic the forces the muscles see during throwing.

Note that this is a stretching program for uninjured shoulders, and SHOULD NOT be used for injured shoulders.