

## Scapula Dyskinesia: 5 Ways to Put it Back on Track

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**Instagram: Wilk\_kevin**





## The Finale METCALF/AANA 2017 ARTHROSCOPIC SURGERY SEMINAR

February 23-26, 2017  
Snowbird, Utah  
20 miles from Salt Lake City Airport


snowbird



## Evaluation & Treatment Scapula

### Goals of the Presentation

- ✓ Present new concepts in the treatment of scapula disorders
- ✓ **Scapular dyskinesia: what is it? What it isn't?**
- ✓ Evaluation of the scapula
- ✓ Describe exercises for strengthening scapular muscles
- ✓ Discuss scapular neuromuscular control exercises & drills




## Scapular Dyskinesia

### 5 Ways to Put It Back On Track

- **5 Key Treatment Concepts:**
  - ✓ Proper Recognition of the Lesion
  - ✓ Postural Correction Exercises
  - ✓ Synchronicity of Muscle Firing
    - ✓ Activation exercises
  - ✓ Re-establish force couple ratios
  - ✓ Strengthening & endurance exercises



## Scapular Dyskinesia

### 5 Ways to Put It Back On Track

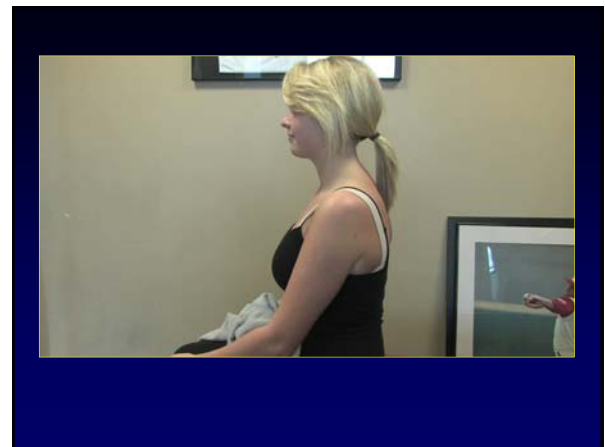
- 5 Key Treatment Concepts:
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  - ✓ Re-establish force couple ratios
  - ✓ Strengthening & Endurance exercises

## Scapulothoracic Joint

### Introduction

- *Scapular Dyskinesia:*
  - ✓ Alteration in scapular position or movement
  - ✓ Due to bony or soft tissue lesions
  - ✓ As well as weakness or inflexibility

*Kibler & Sciascia: Br J Spts Med '10*



## Scapular Dyskinesia Test (SDT)

McClure et al: J Athl Train '09

✓ 2 handheld weights based on body size:

- ✓ < 68.1kg = 3 lb. weights
- ✓ > 68.1 kg = 5 lb weights



- Perform 5 bilateral reps of shoulder flexion (scapular plane) & then shoulder abduction
- Speed of movement 3 sec ascend/descend
- Videotaped for analysis

✓ "If it looks abnormal – it's scapular dyskinesia"

## Scapular Evaluation

### Scapular Dysfunction

✓ Shoulder elevation scapular plane

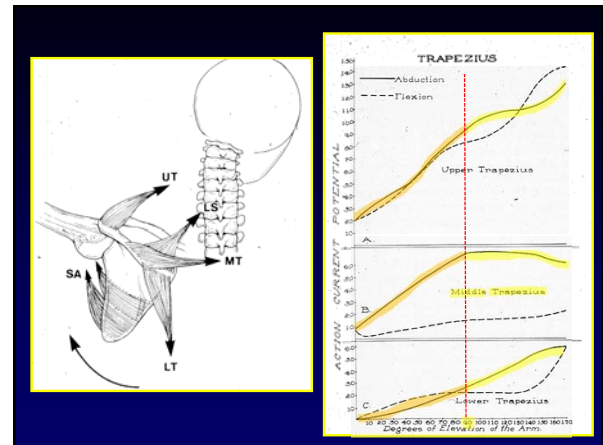
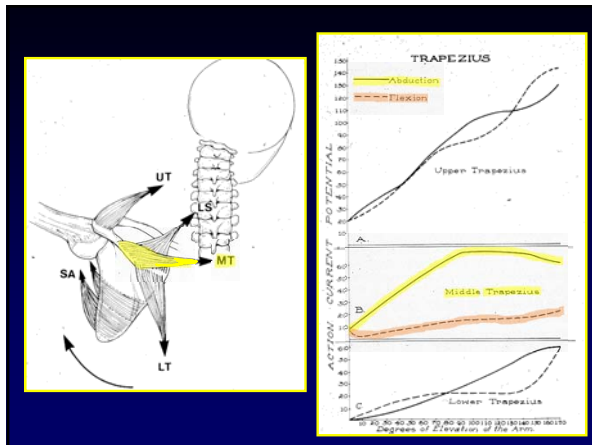
- ✓ Without resistance
- ✓ With resistance

✓ Shoulder abduction

- ✓ Without resistance
- ✓ With resistance



Which Motion is Better to Evaluate?



## Scapular Evaluation

### Scapular Dysfunction



## Scapular Evaluation

### Assessment - Recognition



## Scapular Dyskinesia Classification Overview

- Scapular dyskinesia is too vague – not specific enough for differential diagnosis & specific treatment

### ✓ Classification system

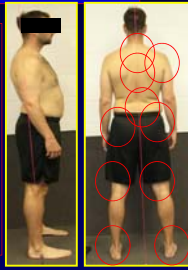
*Kibler et al: JSES '02*

- ✓ I: inferior border pattern
- ✓ II: medial border pattern
- ✓ III: superior border pattern
- ✓ IV: normal scapula



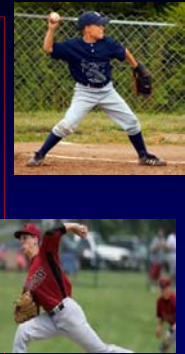
## Shoulder Examination in Athletes (especially Overhead Athletes is an Entire Body Screening/Examination

- *Rubin & Kibler: Arthroscopy '02*
- *Burkhart et al: Arthroscopy '03*
- *Kibler et al: JOSPT '09*
- *Savoie et al: Arthroscopy '09*
- *Kibler et al: Br J Sports Med '12*
- *Beckett et al: AJSM '14*



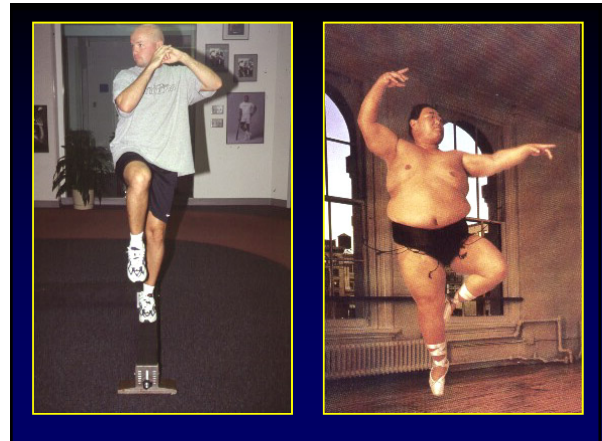
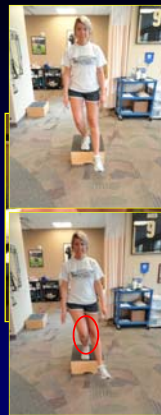
## *Beckett et al: AJSM '14*

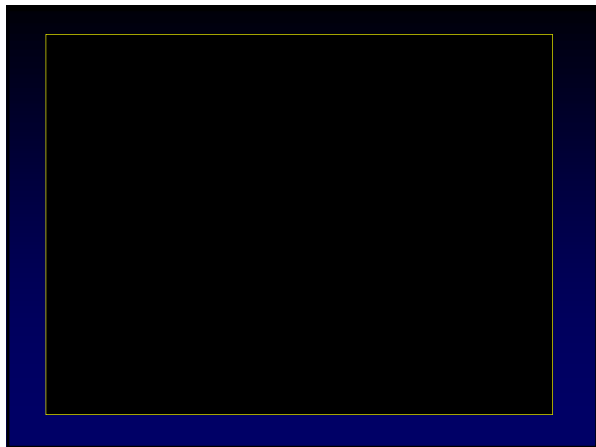
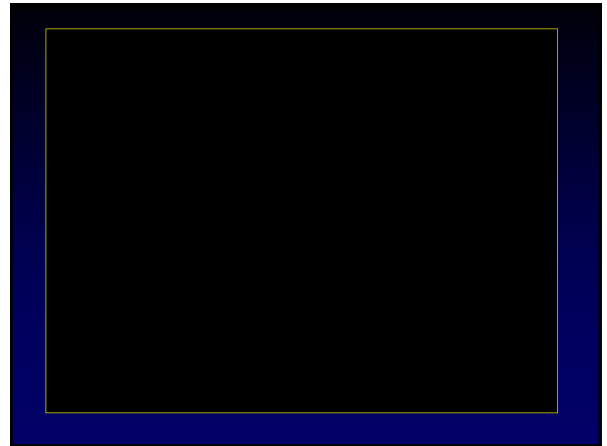
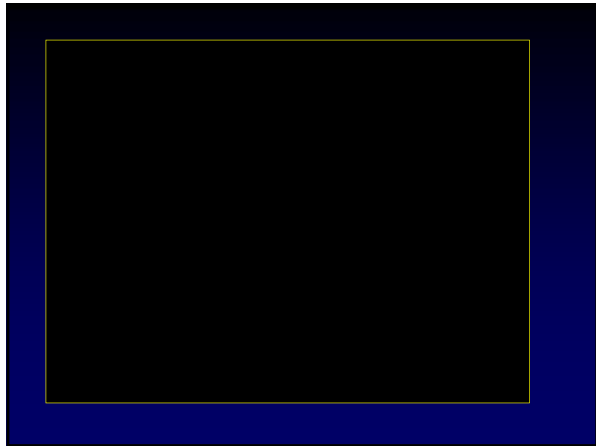
- Assessment of scapular & hip joint in preadolescent (7-12 yrs) & adolescent (13-18 yrs) in baseball players



## *Beckett et al: AJSM '14*

- Assessment of scapular & hip joint in preadolescent (7-12 yrs) & adolescent (13-18 yrs) in baseball players
- ✓ High rate of scapular dyskinesia in adolescent players compared to pre-adolescent
- ✓ Also poor single leg squat test
- ✓ Higher coracoid process distance – correlated dyskinesia





### Scapular Kinematics

- 3 Rotations
  - » Upward/ Downward
  - » Internal/External
  - » Anterior/Posterior
- 3 Translations
  - » Superior/Inferior
  - » Anterior/Posterior
  - » Medial/Lateral

*McClure JSES '01*

**“Translation”/Position:  
Superior**

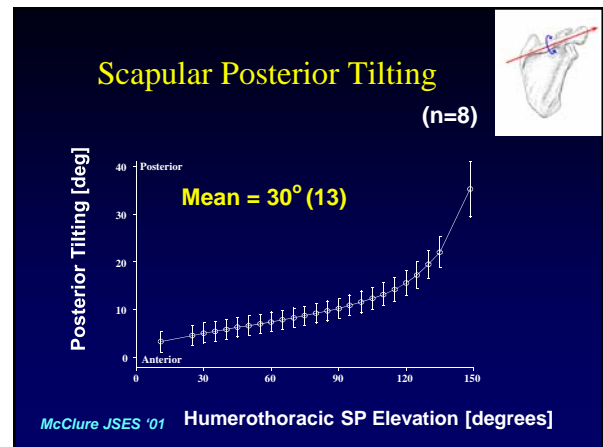
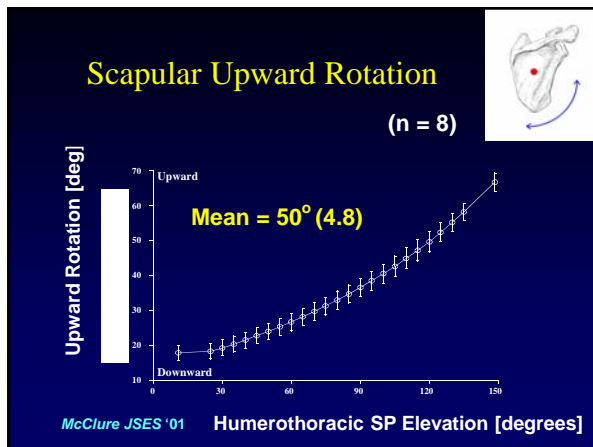
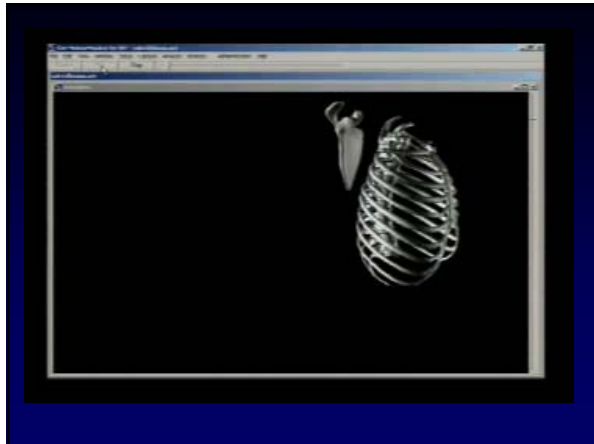
**Rotation:  
Upward**

Superior/Inferior Translation    Internal / External Rotation    Ant / Post Tilting

**Anterior / Posterior Translation**

**Up / Down Rotation**

### Scapular Motion



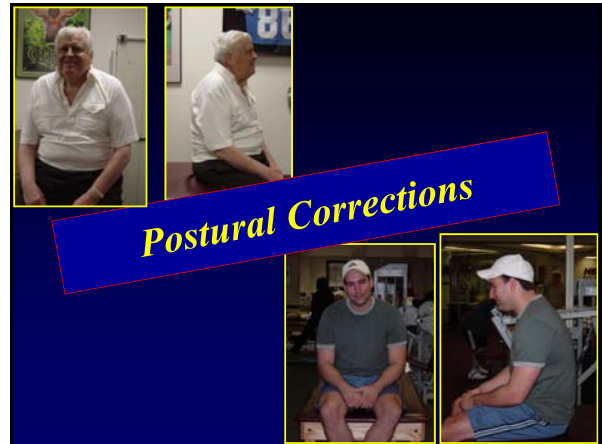
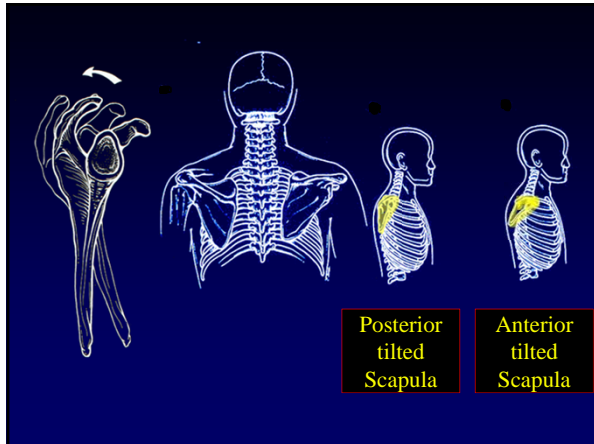
### Scapular Dyskinesia

*5 Ways to Put It Back On Track*

- 5 Key Treatment Concepts:
  - ✓ Proper Recognition of the Lesion
  - ✓ Postural Correction Exercises
  - ✓ Synchronicity of Muscle Firing – Activation
  - ✓ Re-establish force couple ratios
  - ✓ Endurance exercises & drills

*Lukasiewicz et al: JOSPT '99*

- Analyze scapular position and orientation in subject w/ impingement & normals
- 3D electromechanical devices in 3 planes
- During arm elevation: posterior tilting, upward rotation, retraction
- ✓ *Impingement subjects: greater scapula elevation & less posterior tilting*



### Rehabilitation of Shoulder Impingement


*Rehab Overview:*

- ✓ Specific rehab concepts:
  - ✓ pain reduction
  - ✓ restoration ROM& flexibility
  - ✓ **normalizing posture**
  - ✓ muscular strength (balance)
  - ✓ advanced phases
  - ✓ return to activity phase
    - ✓ sports
    - ✓ work activities



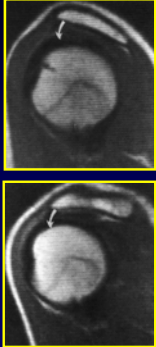

*Borich, Bright, Lorello, et al:  
JOSPT 36(12) 926-934, 2006*

- Scapular angular position assessment at end range internal rotation
- 3- dimensional scapular assessment
- 23 subjects were analyzed
- *IR ROM deficit group exhibited significantly greater scapular anterior tilt (9 deg) compared to control group*



*Solem - Bertoft: Clin Orthop '93*

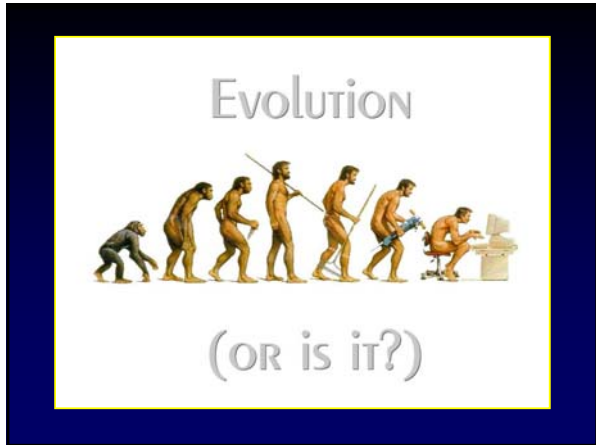
- Used MRI to determine effect of scapular retraction & protraction on acromial space
- Subjects supine & passively positional
- ✓ *Protraction position sign reduced acromial angle, or increased anterior tilting of scapula & decreased SA space*



## Slouched Thoracic Posture

- Shoulder abduction ROM
  - » Erect: 157.5° ( $\pm$  10.8)
  - » Slouched: 133.9° ( $\pm$  13.7)
- Abduction strength @ 90°
  - » Erect: 10.4kg ( $\pm$  4.5)
  - » Slouched: 8.7kg ( $\pm$  3.5)
- Scapular Kinematics
- Upward rotation:
  - » Erect: 43.1° ( $\pm$  7.5)
  - » Slouched: 37.9° ( $\pm$  6.5)
- Posterior tilt
  - » Erect: 44.7° ( $\pm$  6.8)
  - » Slouched: 40.6° ( $\pm$  6.9)

*Kebaetse et al. Arch Phy Med Rehab 1999*





### Bastan, Wilk, Reinold: APTA CSM '06

- Analyzed scapular position in 43 professional baseball pitchers
- Assessed 4 static positions
  - » Arm at side
  - » Full can
  - » 90 deg abd ER
  - » 90 deg abd IR
- Compared bilateral differences (T vs NT)



✓ **Results: most significant difference was with protraction in all positions, then anterior tilt & more depressed scapula**

### Macrina, Wilk: CSM '07

- Analyzed the *effects of fatigue* on scapular position in 39 professional baseball pitchers
- Assessed 4 static positions
  - » Arm at side
  - » Full can
  - » 90 deg abd ER
  - » 90 deg abd IR
- Compared bilateral differences (T vs NT)

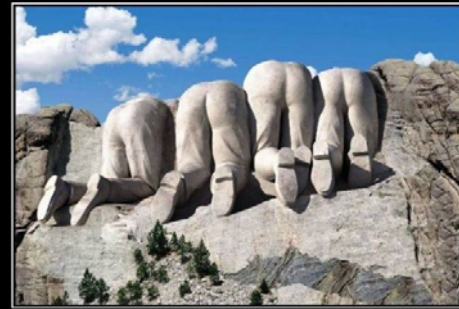


✓ **Results: most significant difference was with protraction in all positions then anterior tilt**

### Scapular Strength Ratios

Wilk, Reinold, Hooks... Unpublished data '07

	Pitchers		Non-throwers	
	D	ND	D	ND
Elev / Depress	400%	480%	520%	540%
Retract / Protract	88%	71%	78%	71%



**MT. RUSHMORE**  
The backside

### Best Stretch for Pectoralis Minor

**THE DISABLED THROWING SHOULDER**

Strengthening for of exercises to regain retraction, depression chain exercises with scapular control (Fig 21) **lateral and distal depresses or retracts**

Wrist cuff (Fig 25) **lateral depresses or retracts**

**FIGURE 21.** Pectoralis minor tightness is treated by placing a rolled towel between the shoulder blade of the upper arm and protracting proximally on the shoulder.

### Comparison of three stretches for the pectoralis minor muscle

J Shoulder Elb Surg '06

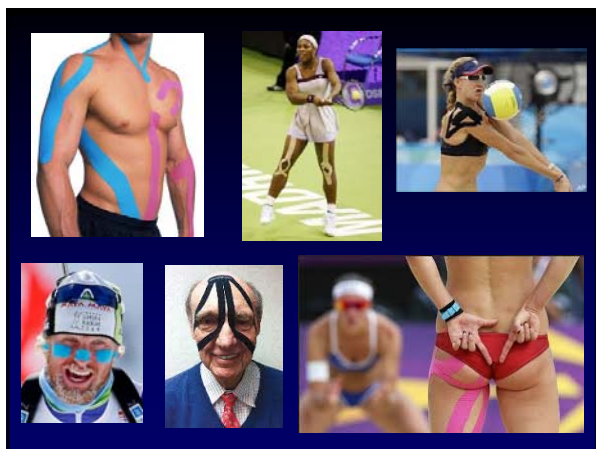
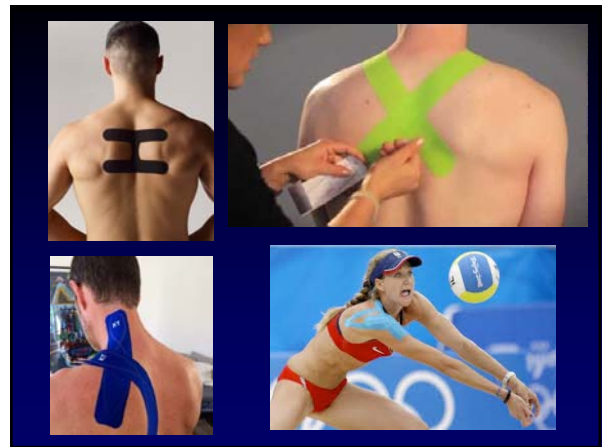
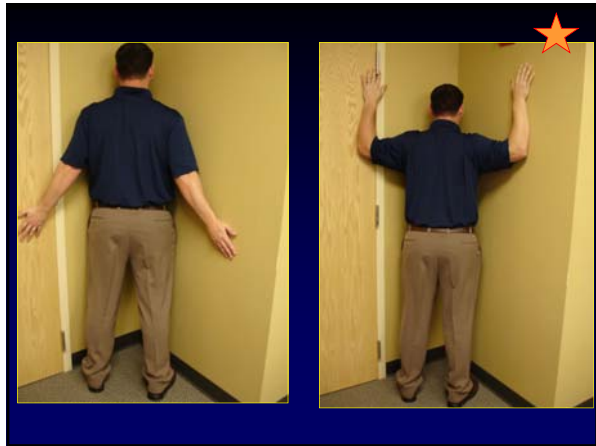
John D. Borstad, PhD, PT\* and Paolo M. Ludewig, PhD, PT\* Columbus, OH, and Minneapolis, MN

**Figure 2** Unilateral corner stretch. The subject's forearm is stabilized by a vertical plane before the trunk is rotated to the opposite direction.

**Figure 3** Supine manual stretch. The investigator holds the probe and stabilizes the trunk at 90° abduction and flexion at 90° before applying force to the angle through the coronal process with the ligamentum sternum. The subject is lying with a towel between the thoracic spine and the treatment table.

**Figure 4** Sitting manual stretch. The investigator's hip/forearm sequence is used to apply force to the scapula through the coronal process.

Stretch type	Mean (SE) (cm)
Corner	0.28 (0.10)
Sitting manual	0.77 (0.11)
Supine manual	1.70 (0.19)



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    - ✓ muscle re-education drills
  - ✓ Re-establish force couple ratios
  - ✓ Endurance exercises & drills

## Cools, Witvrouw, et al : AJSM '03

- Scapular muscle recruitment patterns (timing)
- Compared 39 overhead athletes with shoulder pain (impingement) to 30 painfree overhead athletes
- Performed sEMG to scapular & deltoid muscles – performed drop arm test
  - ✓ Significant slower muscle activation in MT,LT in painful group compared to control grp. (esp. LT)
  - ✓ Painful group slower recruitment from deltoid to trapezius



## Scapular Motor Control Re-Education

- ✓ Visual feedback
  - Mirror
    - Two mirrors positioned at side of patient to view posterior trunk
  - Video
    - Video posterior with the person watching the monitor
- Do not overly verbal correct  
*Uhl & Kibler: '15*



## Scapular Motor Control Re-education



Scapular & Back Across Wall –  
Feedback & Posture

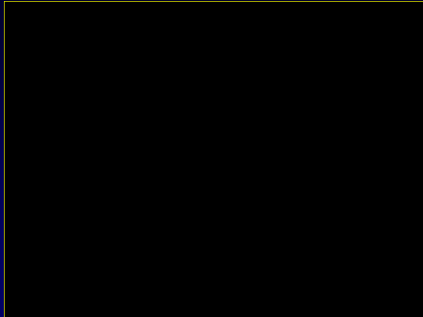
## Scapular Motor Control Re-education – mirror to mirror



## Scapular Muscle Training Muscle Firing Patterns

- Muscle stimulation:
  - ✓ lower trapezius
  - ✓ middle trapezius/rhomboids
- Biofeedback to specific muscles
  - ✓ lower trapezius
  - ✓ Middle trapezius/rhomboids

## Lower Trapezius Stimulation



## Scapular Dyskinesis

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  - ✓ **Re-establish force couple ratios**
  - ✓ Strengthening & endurance exercises

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  - ✓ **Strengthening & endurance exercises**

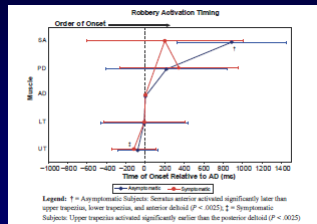
## Best Exercises for the Scapular Muscles



### Electromyographic Analysis of Specific Exercises for Scapular Control in Early Phases of Shoulder Rehabilitation

W. Ben Kibler,<sup>1</sup> MD, Aaron D. Sciascia,<sup>1\*</sup> MS, ATC, Timothy L. Uhl,<sup>2</sup> PhD, PT, ATC, Nathan Tambosy,<sup>3</sup> MD, and Thomas Cunningham,<sup>4</sup> MS  
 From the <sup>1</sup>Lexington Clinic Sports Medicine Center, Lexington, Kentucky, the <sup>2</sup>Division of Athletic Training, University of Kentucky, Lexington, Kentucky, and <sup>3</sup>Orthopaedic Associates of West Florida, Tampa, Florida

**AJSM '08**



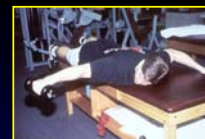
### Lower Trapezius Exercises

!!!



Not a Early Exercise

### Activation Exercises



Reinold, Escamillia, Wilk: JOSP '09



*Scapular Neuromuscular Exercise*



### Scapular Muscle Training *Train the Scapular Daily*

- ✓ *Isotonic table days*
  - » Heavier weights
  - » Isolated movements
  - » Hypertrophy
  - » Neuromuscular drills

- ✓ *Stability Ball days*
  - » Lighter weights
  - » Bilateral movts.
  - » Combined movts
  - » Trunk, core, ...



### Best Exercises for Scapular Muscles *Lower Trapezius*

- ✓ The Lower Trap exercise  
*Wilk '11*
- ✓ Robbery exercise  
*Kibler et al: AJSM '08*
- ✓ Prone horz abd at 105  
*Ekstrom' 93 Blackburn JAT*  
*"prone full can"*
- ✓ Table push down with depression & retraction  
*Wilk: NAJSPT '06*
- ✓ Inferior Glide *Kibler AJSM '08*

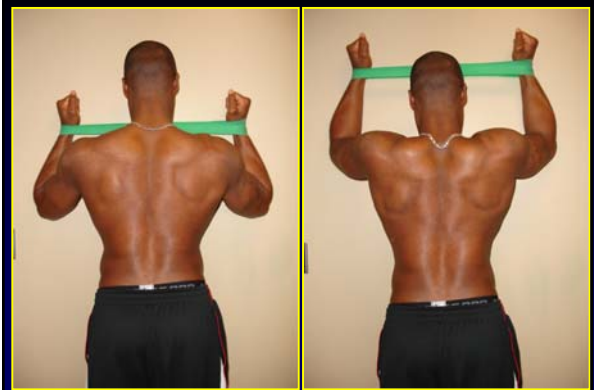


## Best Exercises for Scapular Muscles *Serratus Anterior*

- Push-up with a plus  
*Moseley: AJSM '92*
- Punches  
*Kendall: '79*
- Dynamic hug  
*Decker: AJSM '99*
- ✓ Wall slide  
*Hardwick: JOSPT '06*
- Bench press



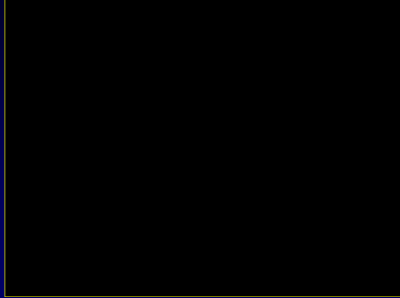
Wall Slide (high EMG 90° >)



## Advanced Thrower's Ten Program



## Endurance



## Scapulothoracic Joint

### Summary

- Key to shoulder joint function
  - Intimately involved in shoulder pathology
- Scapular muscle function
  - Synchronized action
  - Muscles working in concert
- Scapular motion (normal & pathology)
- Understanding abnormal & normal movts patterns assists in assessment
- Think Proximal Stability
- “Best exercises for scapular muscles”

