Is rotator cuff strengthening, scapular stabilization, or manual therapy the best way to reduce pain in patients with shoulder impingement?

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Background

- Reporting of shoulder pain
  - 30% of collegiate athletes (Laudner ’09)
  - 24-32% youth athletes (Bonza ’09, Lyman ’01)
  - 1% of all adults (Teys ’08)
- Overall health care cost high at shoulder
- Many classified as impingement
  - 44-65% (Sauers ’05, van der Wint ’95)

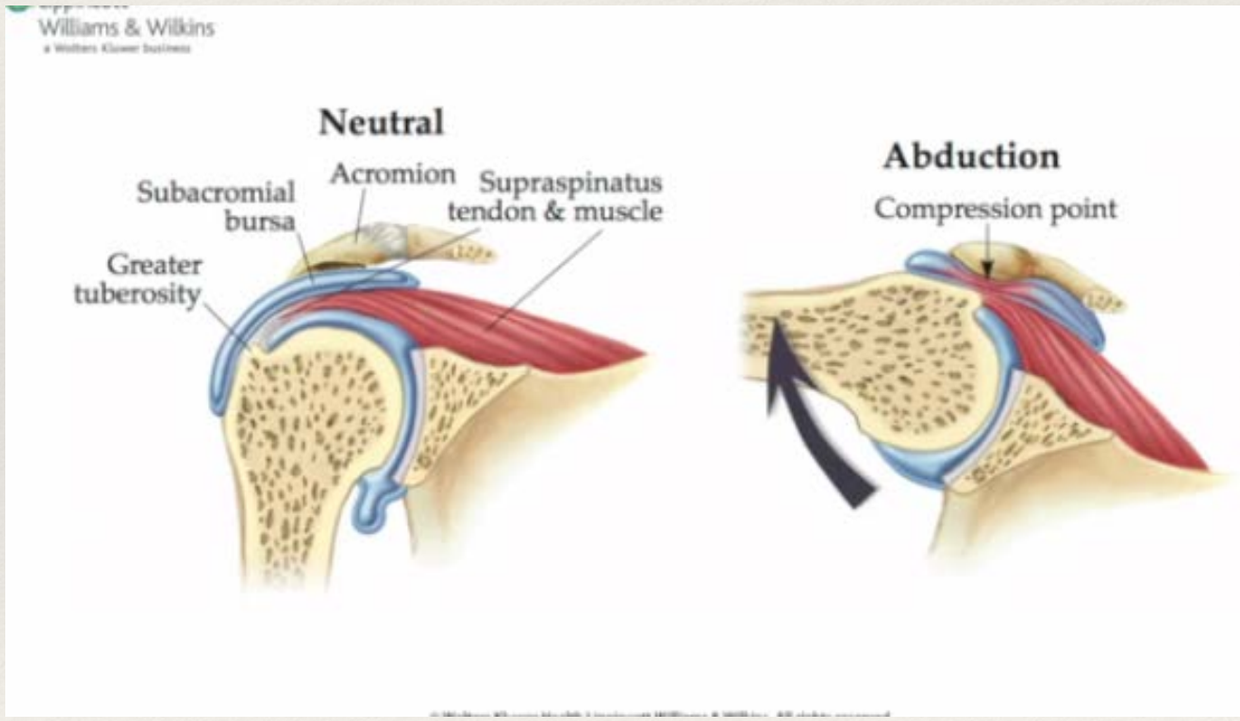
Types of Impingement

- Subacromial
  - External/primary
  - External surface of supraspinatus
- Internal
  - Secondary
  - Internal surface of infraspinatus/supraspinatus

Subacromial Impingement

- Compression of rotator cuff under coracoacromial arch
- Degeneration of tendon

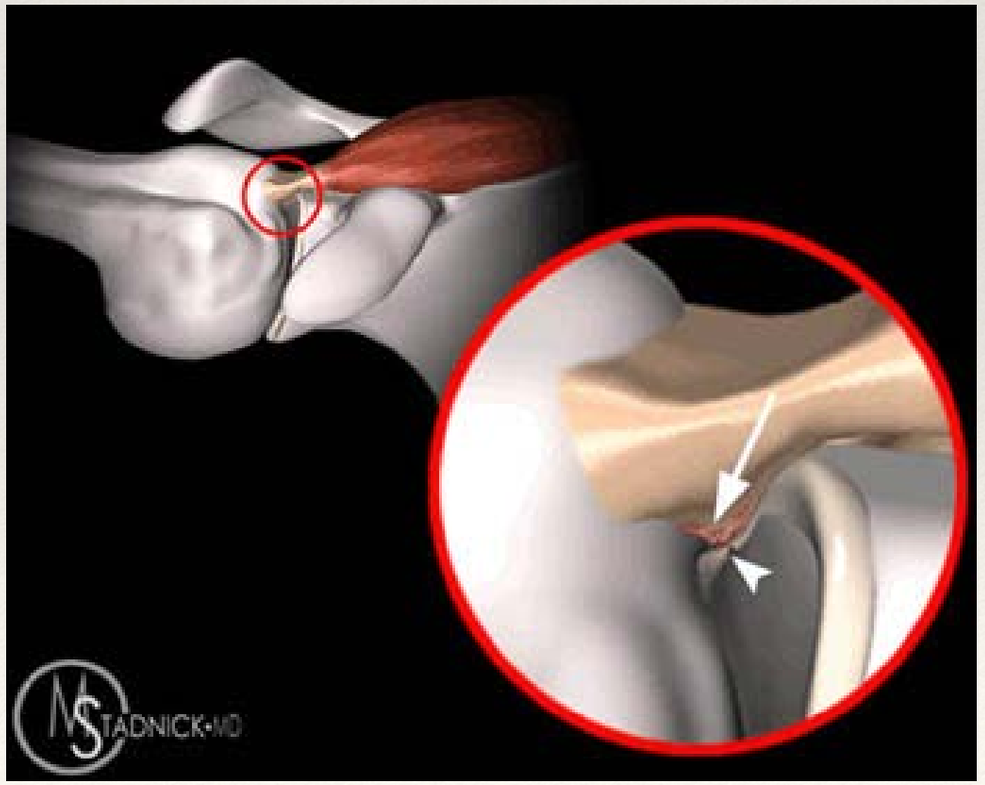
- Casuses?
  - Acromial morphology
  - Muscular weakness
    - Humerus congruency
    - Scapular kinematics



Internal Impingement

- Contact between infra/supraspinatus and glenoid
- Fraying of undersurface of rotator cuff

- Causes?
  - Anatomy/retroversion
  - Anterior laxity
  - Posterior capsule tightness



Rehab Works at Reducing Pain!

- Combined rehabilitation programs work (Holmgren ’12, Moezy ‘14)
  - Compared to modalities and ROM
- Flexibility
  - Pec, sleeper
- Scapular Strengthening
  - Serratus punches, T’s, Y’s, W’s, etc.
- Rotator cuff
  - ER, IR, PNF D2, etc.

How much? (Holmgren '12)

Exercise Group Changes

- VAS rest- 5/100
- VAS activity- 36/100
- VAS night- 31/100

Control Group Changes

- VAS rest- 0/100
- VAS activity- 25/100
- VAS night- 13/100

Problems with Global Approach

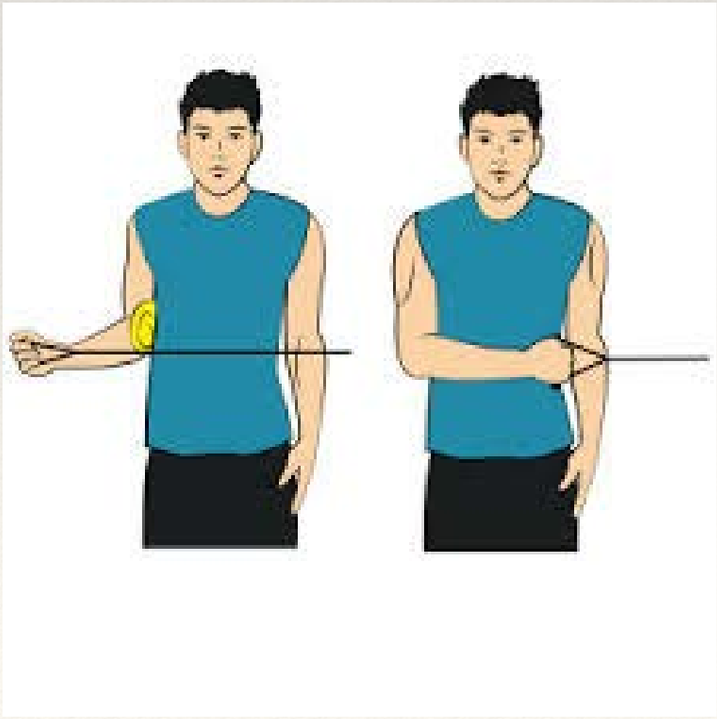
- Time consuming
  - In clinic- cost consuming
- Inclusion of exercises that don’t work
- Can’t confirm what is best for reducing pain

Oxford Evidence Rating Scale

- 1a- Systematic Reviews of randomized controlled trials
- 1b- Individual randomized controlled trials
- 2a- Systematic reviews of cohort studies
- 2b- Individual cohort studies
- 2c- Outcomes research
- 3a- Systematic review of case-control studies
- 3b- Individual case-control studies
- 4- Case-series
- 5- Expert opinion

Rotator Cuff Strengthening- Theory

- Impingement degrades tendon
- Strengthening should
  - Regenerate tendon
  - Limit superior humeral head glide
- Eccentric exercise should be best
- Works at other tendons
  - Achilles (Kingma ’07)
  - Patellar (Lorenzen ’10)



RC Strength vs. Nothing (Lombardi '08)

- RC group vs. people on wait list for treatment

- Very minimal treatment
  - 2x8 of ER, IR, FLEX, EXT

- Pain measured by VAS and DASH

DASH Question Examples

	NOT AT ALL	SLIGHTLY	MODERATELY	QUITE A BIT	EXTREMELY
22. During the past week, *to what extent* has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups? *(circle number)*	1	2	3	4	5

	NOT LIMITED AT ALL	SLIGHTLY LIMITED	MODERATELY LIMITED	VERY LIMITED	UNABLE
23. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem? *(circle number)*	1	2	3	4	5

Please rate the severity of the following symptoms in the last week. *(circle number)*

	NONE	MILD	MODERATE	SEVERE	EXTREME
24. Arm, shoulder or hand pain.	1	2	3	4	5
25. Arm, shoulder or hand pain when you performed any specific activity.	1	2	3	4	5
26. Tingling (pins and needles) in your arm, shoulder or hand.	1	2	3	4	5
27. Weakness in your arm, shoulder or hand.	1	2	3	4	5
28. Stiffness in your arm, shoulder or hand.	1	2	3	4	5

RC Strength vs. Nothing

	Control Group		Experimental Group	
	Baseline	Post-treatment	Baseline	Post-treatment
Pain at rest	3.9 ± 2.6	4.3 ± 3.2	4.2 ± 2.4	**2.4 ± 2.1**
Pain with movement	7.1 ± 1.5	7.1 ± 2.5	7.4 ± 1.0	**5.2 ± 2.0**
DASH	47.4 ± 24.7	44.2 ± 28.2	49.6 ± 23.5	**28.7 ± 24.8**

Eccentric vs. Concentric

- Blume ’15- therapist repositioning
- Maenhout ’13- focus on eccentric phase
- Groups in both studies completed same exercises
- 6-8 week programs

Eccentric vs. Concentric

- In both studies
  - Both groups got better
  - No difference between groups

- Blume ‘15 (DASH scores)
  - Control group improved by 11.9 points
  - Eccentric group improved by 12.9

- Maenhout (SPADI scores)
  - Control group improved by 29.2 points
  - Eccentric group improved by 27 points

Rotator Cuff Strength Conclusion

- Works better than nothing for decreasing pain
- Shoulder doesn’t act like lower extremity tendons
- Eccentric exercise may not be ideal treatment
- Other eccentric protocols are needed

Why Does Eccentric Training not Work?

- Natural recovery
- Not aimed at impacting clinical symptoms (Maenhout ‘13)
- Training intensity (Blume ‘15)
- Length of treatment

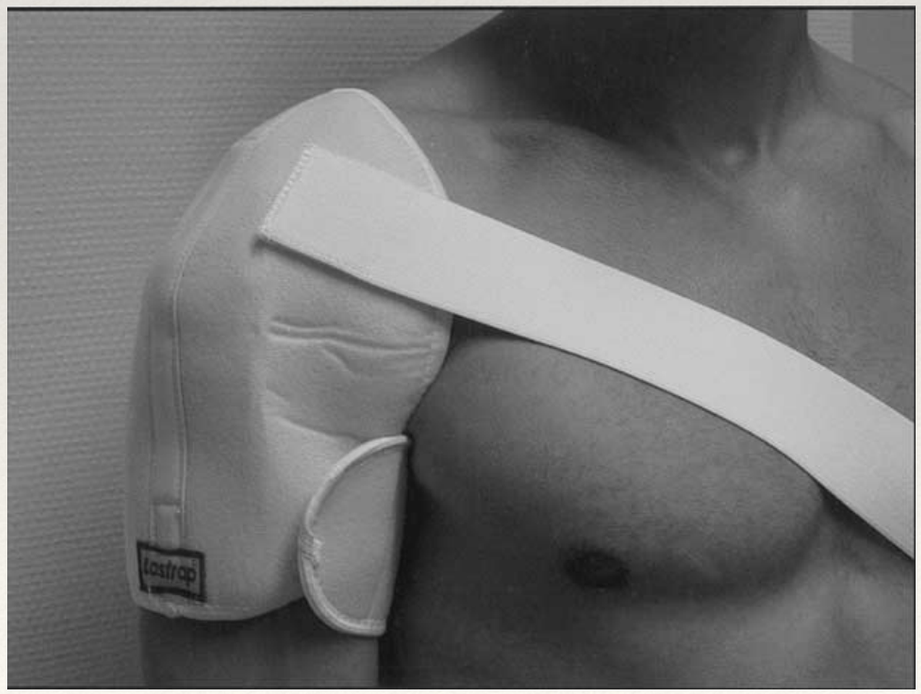
Scapular Strengthening- Theory

- Superior humeral head glide causes impingement

- Proper scapular kinematics should:
  - Help “clear” acromion
  - Reduce impingement
  - Reduce pain

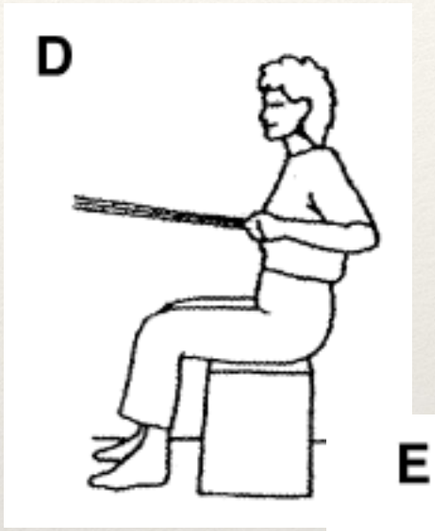
Scapular Strengthening vs. “Normal” PT

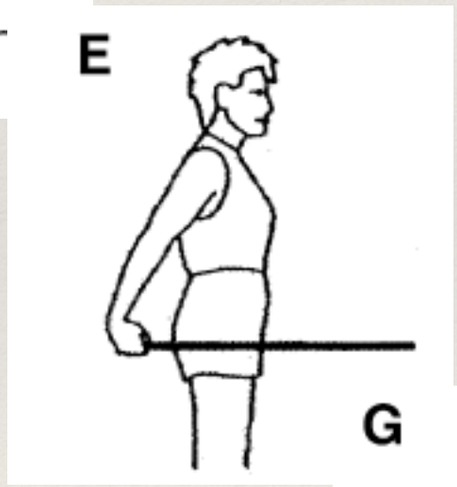
- “Normal” Physical Therapy
  - Modalities
  - Shoulder Brace



Scapular Strengthening vs. “Normal” PT

- Exercises with theraband
  - Retraction
  - Extension
  - Rows
- Exercises with dumbbell
  - Retraction
  - Protraction
  - Depression





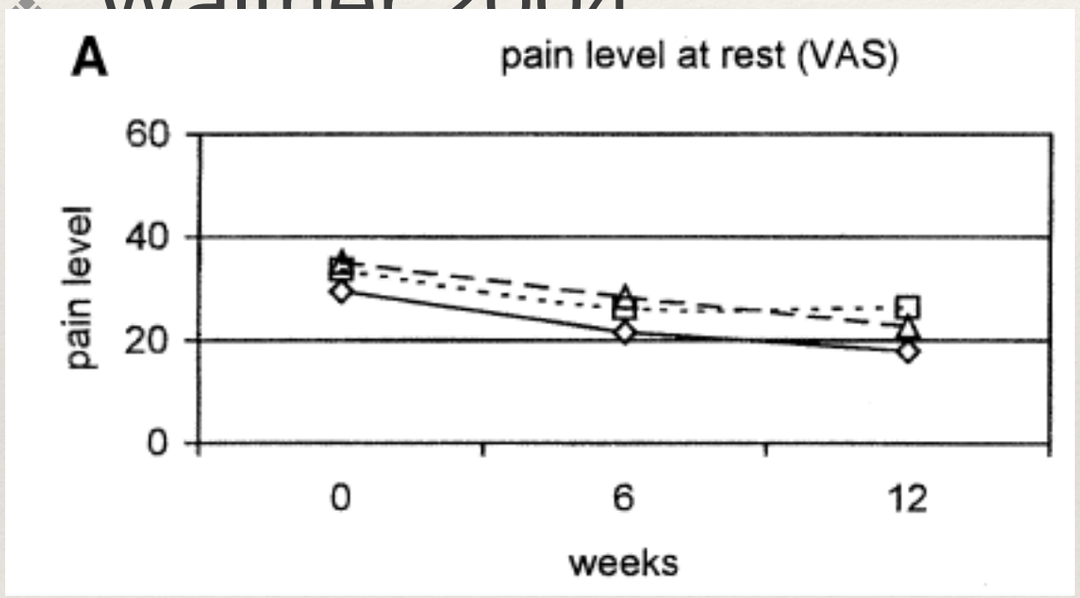
Scapular Strengthening vs. “Normal” PT

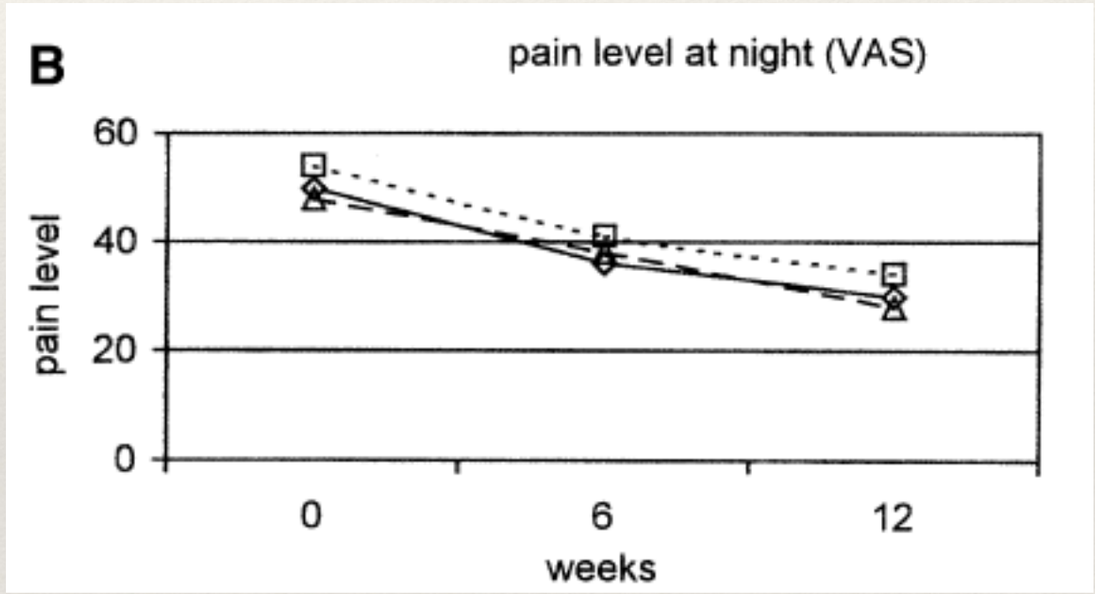
- Park 2013

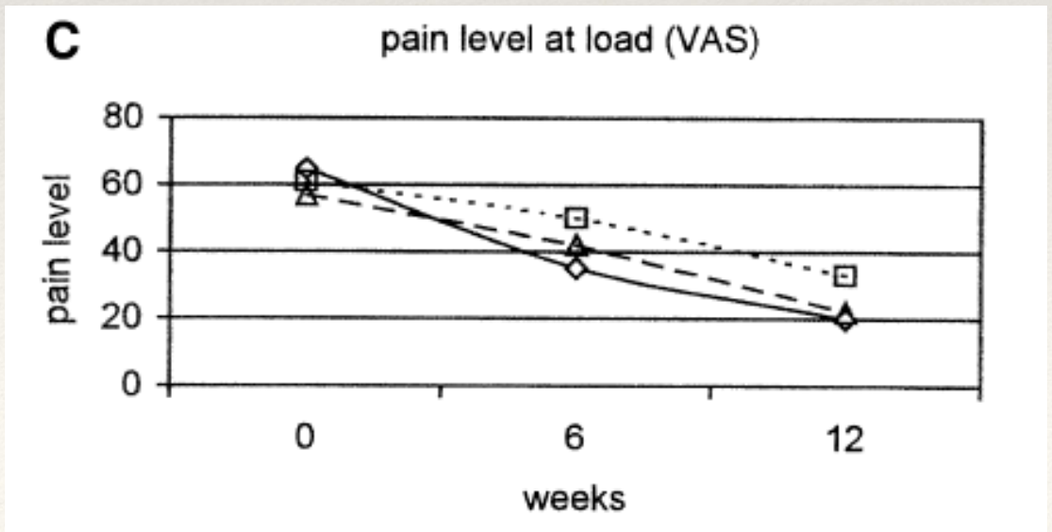
	Scapular Strength		“Normal” PT	
	Before	After	Before	After
VAS	56.7 ± 12.3	44.7 ± 14.1	63.7 ± 13.8	60.7 ± 16.0
Pain during SST	6.7 ± 2.4	9.3 ± 1.8	7.3 ± 3.7	8.3 ± 3.1

Scapular Strengthening vs. “Normal” PT

- Walther 2004

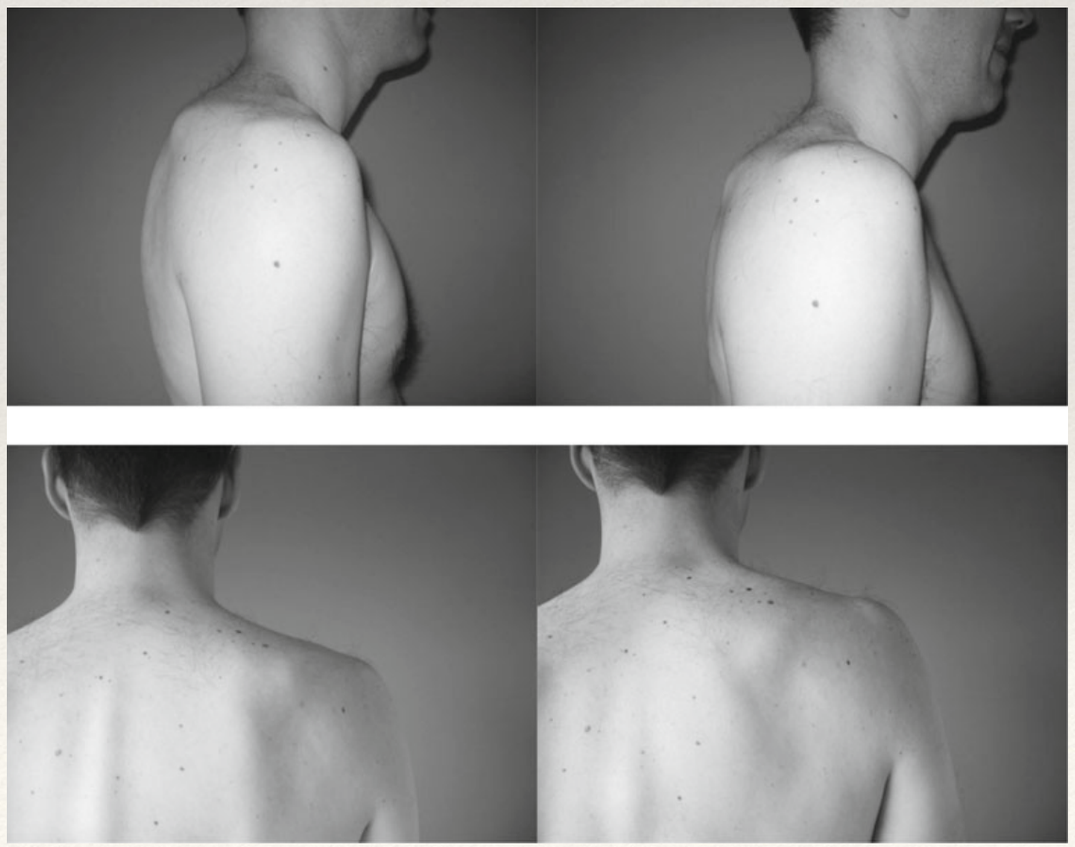






Scapular vs. RC Strengthening (Struyf '13)

- 9 session scapular program
  - Levator and pec minor stretching
  - Postural training
  - Motor control training
    - Lower trapezius
    - Middle trapezius
    - Serratus anterior



Scapular vs. RC Strengthening (Struyf '13)

- Pain decreased more in scapular
  - At rest
  - During movement
  - During special tests
- Shoulder disability decreased more in scapular group
  - Shoulder Disability Questionnaire
- Differences remained after 3 months

Scapular Strength Conclusion

- Seems to be promising treatment
- Probably better than RC strengthening
- Self-training seems feasible

Why does Scapular Strengthening Work?

- Not because of static scapular mechanics (Struyf ‘13)
- Potential improvements in motor control? (Struyf ‘13)

Manual Therapy Theory

- Capsular tightness creates GH kinematic problems

- Mobilization
  - Stretches capsule
  - “Resets” normal mechanics
  - Mechanoreceptor change

Manual Therapy vs. Exercise

- Throw everything at problem
  - GH (Camargo ‘15, Conroy ‘98, Kromer ‘13, Senbursa ‘07)
  - AC (Camargo ‘15, Kromer ‘13)
  - Scapula (Camargo ‘15, Senbursa ‘07)
  - Cervical (Camargo ‘15, Kromer ‘13)
  - Typical 15-20 min treatment time

Manual Therapy vs. Exercise

- Significant pain decrease
  - 23-37 points/100
- No difference between groups in 3/4 studies
- Large SD’s in study that found differences

Mobilization with Movement

- Joint mobilizations may not work, what next?

- Mobilization with movement
  - AKA- Mulligan technique
  - Accessory glide
  - Movement through entire range
  - Overpressure at end range

Shoulder Mobilization with Movement

Shoulder Mobilization with Movement

MWM vs. nothing (Delgado-Gil ’15)

- Vs. sham treatment
- Neither group provided with exercise
- 4 total treatments
  - 10 minutes per session

- Significant decrease in pain for MWM group
  - .8/10 in last 24 hours
  - 1.4/10 with movement

MWM vs. Other Treatments (Kachingwe '08)

- Added to exercise program
- Compared
  - Exercise only
  - Exercise and mobilization
  - Control
- Limited sample size (pilot study)

Mobilization with Movement

- % change from pre-post treatment

	Control	Exercise	Mobilization	MWM
VAS	14.4	20.8	42.2	**55.2**
VAS on Neer	46.4	44.0	57.6	**66.5**
VAS on Hawkins	11.2	39.5	52.1	**60.5**
SPADI	34.2	61.6	56.7	55.5

Manual Therapy Conclusion

- Joint mobilizations have limited effects
- MWM appears to have most effect
- Combined with other interventions = greater improvements?
- More research is needed on these techniques

Why MWM works

- Speculative
- Loosening of joint capsule (Delgado-Gil ‘15, Kachingwe ‘08)
  - Proprioceptive effect
- GH mechanics improvement (Delgado-Gil ‘15, Kachingwe ‘08)
  - normal humeral translation
- Analgesic effects of mobilization (Kachingwe ‘08)

Limitations

- Type of impingement
- Age of population
- Combination of therapies/inconsistent programs

Conclusion

- Exercise helps people with impingement
- Eccentric and concentric strengthening the same
- Scapular strengthening > RC strengthening
- Home Exercise Programs work!!!
- Mobilization with Movement may be best treatment

Questions?