Evidence-based design of therapeutic exercise programs for the shoulder complex.

Shoulder Rehabilitation Exercises are Similar for all Injuries, Pathologies and Surgeries

- Acuteness
- Pain
- ROM Limitations
- Soft Tissue Healing
- Etc.

Respect:

Kinematic Chain (Link System)

Shoulder Rehabilitation Exercises are Similar for all Injuries, Pathologies and Surgeries

- Acuteness
- Pain
- ROM Limitations
- Soft Tissue Healing
- Etc.

Respect:

- Acuteness
- Pain
- ROM Limitations
- Soft Tissue Healing
- Etc.

Young, JL, et.al. The influence of the spine on the shoulder in the throwing athlete. J Back & Musculoskeletal Rehab. 7:5-17, 1996

Inflexibility of the hip musculature and weakness of the muscles which attach to the thoraco-lumbar fascia have profound effects upon spine function which secondarily places greater stress upon the GH joint and RTC.

Shoulder rehabilitation and injury prevention programs should include evaluation of and exercise regimens for the lumbar, thoracic and cervical spine.
Evidence-based design of therapeutic exercise programs for the shoulder complex

My Philosophy to designing a rehabilitation program - so how & why to select the top 10 exercises?
1) Basic science research
2) Lab research outcomes
3) Outcomes research with patients published in an Index Medicus journal

Which Exercises?

- "There is no consensus on an ideal exercise program to treat patients with RTC disease."
- (TREATMENT VARIATION)

Which Exercises?
- Systematic Review: Level I or level II studies
- Initial search: 12,428 articles
- Limited to: 80 manuscripts
- Met inclusion criteria: 11 articles
- ("Even these 11 RCTs were not without methodological flaws")

Which Exercises?
- Exercise as a treatment for RTC impingement:
  - Strongly suggests exercise improves symptoms in these patients
  - Exercise produced stat. sign. reductions in pain

Which Exercises?
- Exercise as a treatment for RTC impingement:
  - Function had stat. sign. improvements

Which Exercises?
- "These results support the NEED FOR development of a gold standard rehabilitation protocol.
  - The need for and utility of a standardized, accepted, evidence-based rehabilitation protocol for treating RTC impingement is apparent."

Which Exercises?
- "1) MDs and PTs will know that their patients are receiving the best available rehab program that has the greatest likelihood of improving the patient's condition and avoiding surgery"
- "2) An accepted gold standard rehabilitation protocol would reduce confounding variables and performance bias in research studies. This will allow comparison of results between studies."

Which Exercises?
- Recommendations:
  1. Supervised PT
  2. 2-3 times per week
  3. Manual therapy as indicated for PRIMARY IMPINGEMENTS with selective hypomobility
  4. When no longer need manual therapy and developed proficiency in rehab protocol, progress to HEP
  5. ROM and flexibility exercises performed daily
  6. Strengthening should be performed 3 times per week
Rehabilitation - Primary RTC Impingement
- Treat the cause of the problem
- Treat hypomobility (TERT, mobs, etc.)
- Then... "TOP TEN EXERCISES" &
- Therapeutic exercises
- Neuromuscular dynamic stability
- Functional exercises

Effectiveness of Exercises
- Brox, et.al., 1993
- Brox, et.al., 1999
- Bang & Doyle, JOSPT, 2000
- Ludewig & Borstad, 2003
- Michener, et.al., 2004
- Wallace, et.al., 2004
- Haefer, et.al., 2005
- Lombardi, et.al., 2008
- Kube, 2008
- Kelly & Wrightson, 2010
- Engbertsdum, et.al., 2011
- Callis, et.al., 2011
- Davies, et.al., 2013
- Birke, et.al., 2011

Therapeutic Exercise and Shoulder Pain
- Marinko, et.al. The effectiveness of therapeutic exercise for painful shoulder conditions: a meta-analysis. JSES, Sept. 1, 2011 (E-print)
- Shoulder pain is 3rd leading musculoskeletal complaint seen by GP-MDs.
- 19 articles from 1997-2011 (MedLine, CINAHL, Cochrane)
- Significant heterogeneity in studies prevented quantitative assessment
- PEDRO - 17 of 19 - 6 or better
- Therapeutic exercise has a positive effect on pain and function above all other interventions, however subsequent research is necessary for translation into clinical practice

Which Exercises?
- It’s pretty obvious that exercise is the "KEY" intervention to treating most patients with shoulder problems,
- BUT...
- What are the GOLD STANDARD exercises we should be using?
- That is the focus and direction of our research agendas...

We have literally 1000’s of exercises to choose from; however which are probably the most effective?

Foundation (CORE) Exercises for all Shoulder Complex Rehab

Total Arm Strength
How do you measure ST musculature?

- In order to treat the patient and the scapulo-thoracic joint, one must evaluate it first and determine muscle function.

Scapulo-thoracic Pathomechanics

- Alterations in shoulder kinematics and associated muscle activity in people with symptoms of shoulder impingement.

How do you measure ST musculature?

- Most of the focus in the literature is on scapular position or scapular kinematics; however, particularly with functional movement and scapular kinematics, what makes it happen?

Establishing normative data on scapulothoracic musculature using handheld dynamometry.
- Turner, N.,...Davies, GJ. JSR. 18:502-518, 2009
- N=344 scapulo-thoracic tests
Upper Trapezius -
Strongest Muscle:
All groups &
all ages

Middle Trapezius

Lower Trapezius -
Weakest Muscle:
All groups &
all ages

R H O M B O I D S

How do you measure ST
musculature?
• Rank order: UT, SA, MT, R, LT
• Unilateral Ratios:
• Elevation/ depression (UT/ LT): 2.62
• Protraction/ retraction (SA/ R): 1.45
• UR/ DR (SA/ MT): 1.23

Scapulo-Thoracic
Strengthening Exercises
Moseley, Jobe, et al. AJ SM, 1992

• 1) Inferior glide exercise: SA-23%
• 2) Low row exercise: SA-28%; PD-42%
• 3) Lawnmower exercise: LT-31%; SA-
26%; UT-21%
• 4) Robbery exercise: SA-21%; LT-27%;
UT-32%
• MVC: 20-40% moderate MVC
• Muscle activation timing
Activation of Scapulo-Thoracic Musculature
- Utilization of EMG to determine particular exercises to activate specific muscles
- Scapular exercises (optimal activation)
  -- Moseley, et al., AJSM, 1992
  -- Ekstrom, et al., JOSPT, 2003

**Concept:** what is the single best exercise to recruit the most EMG activity of the most muscles???
- Top of ST physiological joint
- Bottom - ST
- Front - ST
- Back - ST

**“TOP” Scaption**
- Patient goes through ROM appropriate for them
- Use alternating arm motions

**“Bottom” Press Downs/Ups**
- Lower Traps,
  - Lats,
  - Teres Major
  - Pect Minor

**Alternative exercise for LT if patient is too weak to do press up/down**
- Thumbs

**“SUPER-SET” Scaption/Press Ups**
- Top of Shoulder Blade
- Bottom of Shoulder Blade

**“Back” Rower (Retraction)**
- Middle Traps, Rhomboids
If the patient has excessive vertebral border (Kibler II dykinesis), then place patient supine to let BW stabilize scapula to provide a stable base of support and mechanical advantage for the Serratus anterior.

**Serape Effect**

Key to the Scapula!


**Serape Effect**

Body's core musculature creates a crisscross design. This diagonal orientation resembles a serape, a colorful scarf-like blanket worn by natives of Mexico and South American countries.

**Serape Effect**

This diagonal pre-stretch has been referred to as the “serape effect”. Watch hand position !!! Start with each link in the kinematic chain, and then integrate back into Functional Movement Patterns.

**Taping**
Kinesiotaping, Where’s the Research?

Research

- Thelen, MD, et.al.
  - The clinical efficacy of Kinesio Tape for shoulder pain: a randomized, double-blinded, clinical trial

- Utilization of KT for decreasing pain intensity or disability for young patients with suspected shoulder tendonitis/impingement is not supported

Shoulder Rehabilitation

Utilization of Taping and External Rotation to Scapulo-Thoracic Strengthening Experiments

2006

Scapulo-Thoracic Force Couple

Gleno-humeral Strengthening Exercises

Townsend, Jobe, et.al.
AJSM, 1991
Concept: what is the single best exercise to recruit the most EMG activity of the most muscles???

- Top of GH joint
- Bottom - GH
- Front - GH
- Back - GH

GH Rehab

- Top and bottom exercises of the GH joint are the same exercises that were the optimum exercises for the top and bottom of the scapulo-thoracic joint
- scaption - top
- press-ups - bottom
- No need to duplicate these exercises

“Bottom” Press Downs

- Lower Fibers - Infraspinatus, Teres minor, Lower Fibers - subscapularis

“Top” Scaption

- Patient goes Through ROM Appropriate for them
- Use Alternating Arm motions
- Supraspinatus, Ant. Deltoid, Middle Deltoid

Empty-can vs full-can position

Empty-can position

- Jobe, FW, et.al.
- Delineation of diagnostic criteria and a rehabilitation program for rotator cuff injuries.
- AJ SM, 10:336-9, 1982

Empty-can vs full-can position:

Which should you use?

1) EMG activity
2) Subjective comments regarding comfort of the exercise position
3) MRI results
4) Position of scapula to decrease subacromial space
5) Full can position recruits the supraspinatus mm better
6) Functional position
SUMMARY

- 4 Moseley exercises
- +
- 2 Townsend exercises (because 2 are redundant: scaption, press up)
- =
- 6 core exercises for ST + GH rehabilitation program

Exercises for the top & bottom of the ST & GH are the same

Summary: Davies’ TOP 10 Exercises for Shoulder Complex Rehab

- TAS Exercises - 2
- Scapulo-thoracic exercises - 4
- GH Exercises - 2 (2 overlap)
- *****RTC Exercises - 2
- (with progressions)