The Effects of a Posture Compressive Shirt on Rotator Cuff Muscle Strength

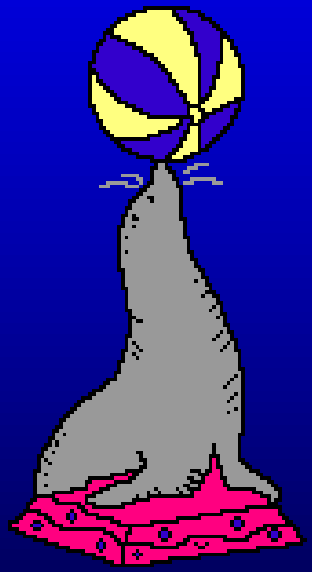
K. C. Owsley, M.D.
Brian Neri, M.D.
Karen Mohr, PT
Neal ElAttrache, M.D.

Shoulder Function

- The shoulder does not function in isolation
- Shoulder/Scapula is a link in a kinetic chain
- Any break in the chain affects the energy, force and velocity that is generated

Scapular Function

Static shoulder model

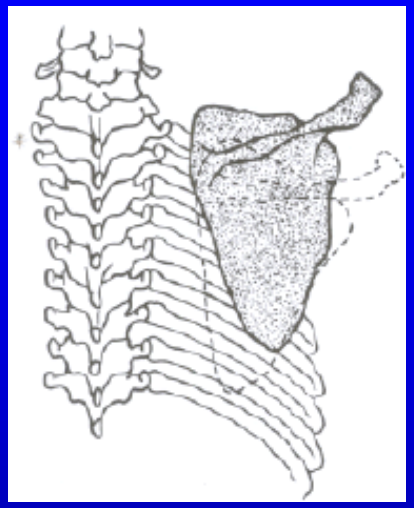


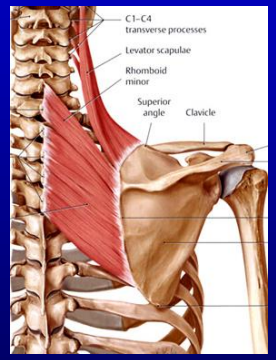
Dynamic shoulder model

Scapular Position

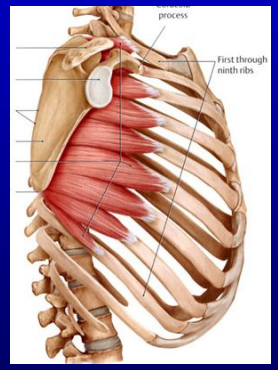
Scapular Protraction

Internal rotation
Anterior tilt
Superior translation





Serratus anterior
Pectoralis minor
Levator scapulae
Pectoralis major

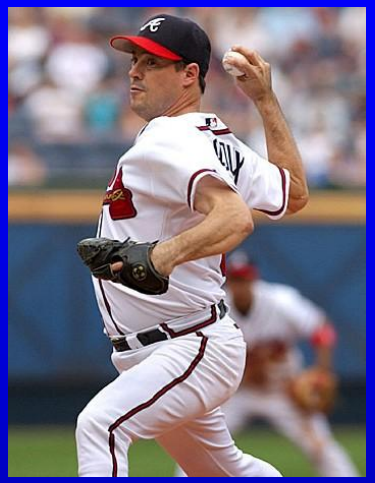


- Associated with multiple deleterious shoulder effects
- Related to an inability to properly achieve retraction

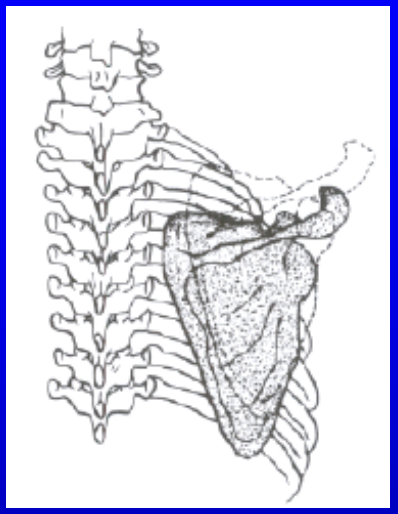
Scapular Protraction

- Narrow subacromial space w/ impingement
- Increased IGHL strain
- GH “hyperangulation” – internal RTC impingement
- Superior glenoid labrum injuries
- Decreased muscle strength

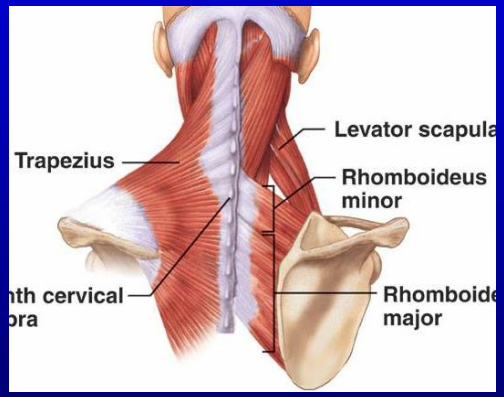
Scapular Retraction



External rotation
Posterior tilt
Inferior translation



Trapezius (middle/lower fibers)
Rhomboids
Latissimus dorsi



- Mechanically favored position for maximal shoulder function.

McClure, et al JSES 2001
Ludewig, et al JPOT 2000
Kibler, et al AJSM 2006

Scapular Positioning

- Scapular braces can effectively optimize scapular position at rest and with motion.
  - Uhl et al, *ASES* 2005
- A Scapular brace system has been shown to increase IR/ER strength in asymptomatic subjects
  - Smith et al , *KJOC-AOSSM* 2007

Is it scapular position or muscle compression?

Compression Garments

- Medical grade
  - Lymphedema, burn recovery, post surgical, DVT prophylaxis.
    - improve peripheral circulation and venous return
    - improve clearance of blood lactate and markers of muscle damage such as creatine kinase
    - reduce muscle oscillation

Compression Garments

Compression Garments

- Sp
  - –
  - –

- Enhances power based activities
- Improve circulation/ clearance of blood lactate /CK
- Reduce muscle oscillation
- Augmented proprioception
- Enhanced mechanics

Compression Garments

- Volleyball players and max height of jump… NO, but increased the ability to resist fatigue.
  - J Sport Con Res 1996
- Varsity track athletes loose vs compressive shorts. Inc jump height/ dec muscle oscillation w/ landing
  - Int J Sports Med 2006
- “Supersuits” of power lifters did increase strength but were poorly tolerated
  - Am J Physical Med 1987
- Commercial compression suits did not increase resistance/fatigue on effected muscles but did decrease injury potential

J Sport Con Res 1998
Sports Med 1997
Eur J Appl Physiol 1998
Br J Spts Med 2006
J Sports Rehab 2001
J Orthop Spts Phys Ther 2001

Hypothesis

Application of a form fitting, compressive scapular positioning shirt would result in improvements in demonstrated rotator cuff strength compared with a compression shirts or wearing no shirt.

Posture Shirt® back

Posture Shirt® front

Under Armour®

Methods

- Investigational Review Board (IRB) approval
- Recruitment through male clinic employees
- Only dominant, uninjured shoulder tested
- No prior shoulder, elbow, cervical spine surgery

Methods

- Biodex® System 3 isometric testing unit

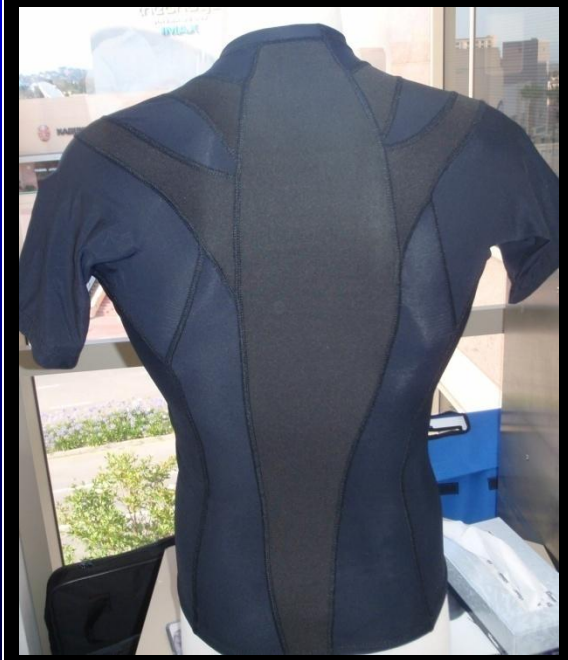
Methods

- Each subject endured three separate Biodex testing sessions done in randomized order
  - "No Shirt"
  - Compression shirt (Under Armour®)
  - Compressive Posture Shirt® (Alignmed®)

- Fatigue controlled by > 3 days of rest between testing sessions

Methods

- Scapular Posture Shirt, and Under Armour shirts fit snuggly (XS-XXL)



Methods

- PT certified in Biodex dynamometer recorded data in isokinetic resistance mode
- 2 testing speed: 180 deg/sec , 300 deg/sec
- All subject had a warm-up/stretch prior to testing
- Standardized testing position - standing position to avoid scapular stabilization from seat back

Methods

- Standard isokinetic outcome measures were recorded:

peak torque (ft-lbs) ER	max rep tot work IR
peak torque (ft-lbs) IR	work/body weight ER
peak torque/body weight ER	work/body weight IR
peak torque/body weight IR	total work ER
max rep tot work ER	total work IR

Methods

- Means and standard deviations calculated
- Statistical analyses were carried out by a statistician using a 3 x 2 repeated measures analysis of variance (ANOVA)
- Significance set at $p<.05$

Results

- 14 Male subjects
- Ages 24-44yo (32.5 mean)
- All RHD
- No statistical correlation between demonstrated strength and age, weight, or order of testing



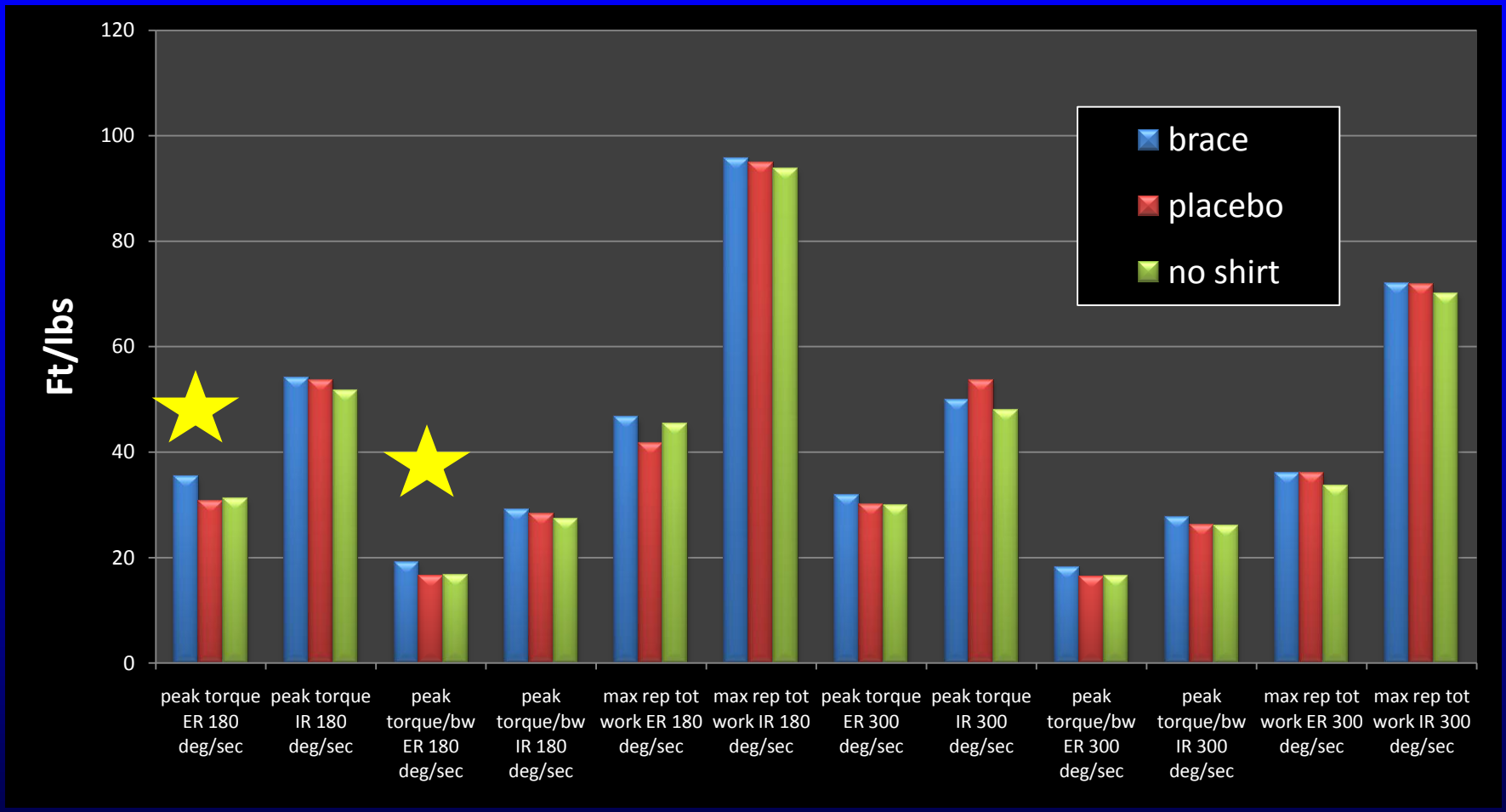




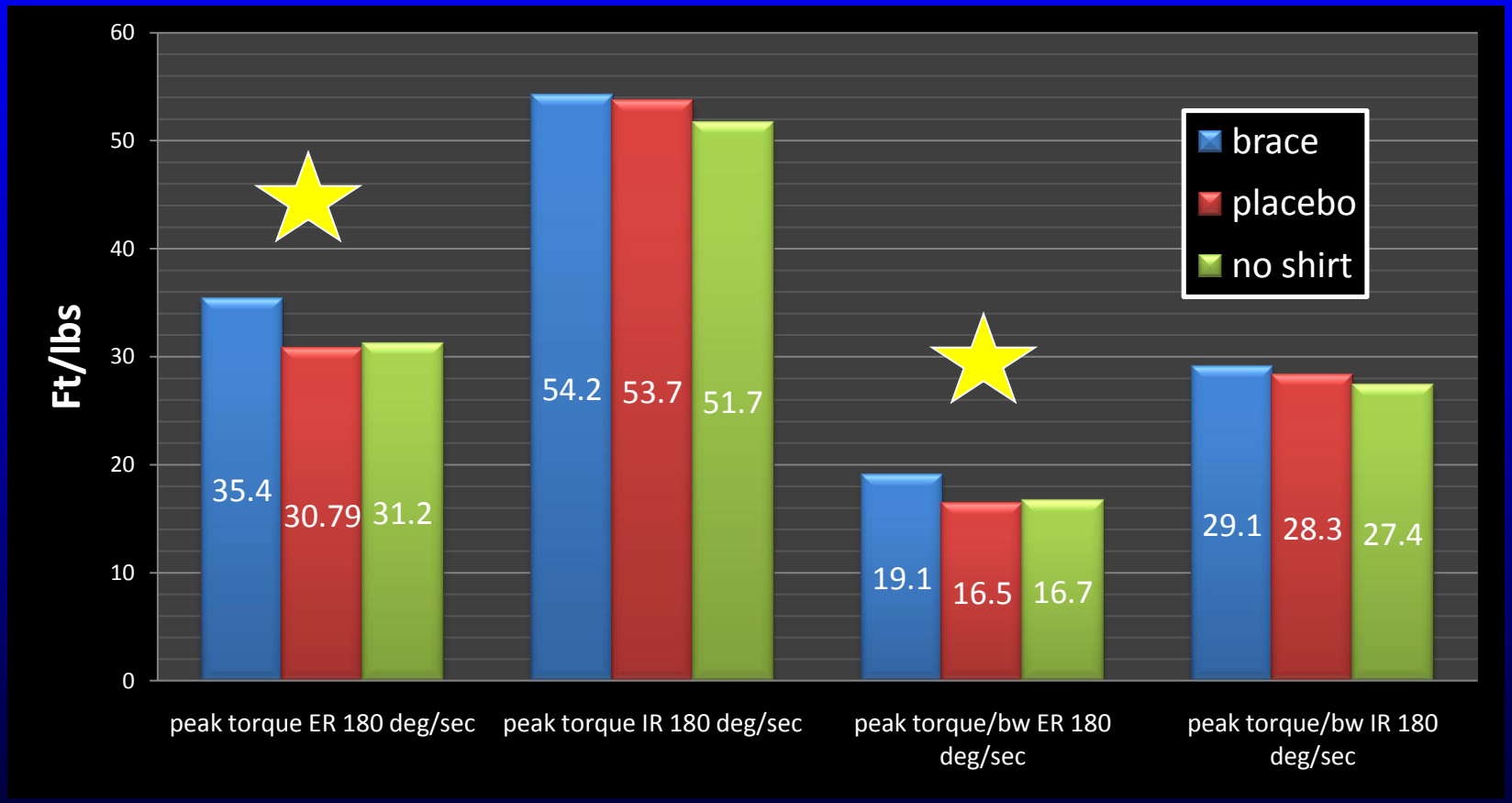

Results

- Peak torque in ER at slow speeds (180 deg/sec) was improved with the compressive Posture Shirt® vs controls
- No difference between the No Shirt and Under Armour® compression shirt alone
- Most testing parameters showed some difference between all three shirts

Results


Ft/lbs
120
100
80
60
40
20
0
brace
placebo
no shirt
peak torque ER 180 deg/sec
peak torque IR 180 deg/sec
peak torque/bw ER 180 deg/sec
peak torque/bw IR 180 deg/sec
max rep tot work ER 180 deg/sec
max rep tot work IR 180 deg/sec
peak torque ER 300 deg/sec
peak torque IR 300 deg/sec
peak torque/bw ER 300 deg/sec
peak torque/bw IR 300 deg/sec
max rep tot work ER 300 deg/sec
max rep tot work IR 300 deg/sec

Results


Ft/lbs
60
50
40
30
20
10
0
brace
placebo
no shirt
35.4
30.79
31.2
54.2
53.7
51.7
19.1
16.5
16.7
29.1
28.3
27.4
peak torque ER 180 deg/sec
peak torque IR 180 deg/sec
peak torque/bw ER 180 deg/sec
peak torque/bw IR 180 deg/sec

Results

	peak torque ER	peak torque/bw ER
Compression posture shirt	35.4	19.1
Compression only	30.79	16.5
no shirt	31.2	16.7

14% increase

15% increase

Limitations

- All male subjects
- Lack of concurrent evaluation of specific scapular position

Discussion

- A form fitting posture shirt with variable tensions may help increase Rotator Cuff RTC motor strength in certain positions (especially at peak torque ER)

- No difference between Compression Shirt and No Shirt, therefore, compressive component of sport garments do little to alter peak shoulder strength, whereas proper scapular positioning has a beneficial effect.

Discussion

- Future studies needed: with wear during sport, females, various body sizes, following the effects of fatigue or sports specific moves.

END