A LOOK AT THE MECHANICS OF THE SHOULDER GIRDLE

• GLENO-HUMERAL Joint: Axes of motion:
  – A to P: Adduction/Abduction
  – S to I: Medial/Lateral (Internal/External) Rotation
  – M to L: Flexion/Extension

• STERNO-CLAVICULAR Joint: Axes of motion:
  – A to P: Elevation/Depression (upward/downward rotation)
  – S to I: Protraction/Retraction
  – M to L: Rotation

• ACROMIO-CLAVICULAR Joint: Axes of motion:
  – A to P: Elevation/Depression (upward/downward rotation)
  – S to I: Protraction/Retraction (Winging)
  – M to L: (Longitudinal) Anterior/Posterior tipping

GLENO-HUMERAL JOINT
• Very unstable joint
• Exhibits great ranges of motion in all 3 planes
• Glenoid: tiny
• Humerus contact: like a ball on a seals nose
• Depends on compression of humerus in the glenoid

SHOULDER MOTION
• Stability comes from compression of humeral head on glenoid
• Combination of efficient motion between the spine, scapula, clavicle and humerus
• Muscles create the stability from proximal to distal
• The Structural Components of Shoulder Joint Motion

ROLE OF THE SCAPULA MAXIMUM HUMERAL FLEXION OR ABDUCTION
• Scapulo-humeral rhythm: 1:2 ratio: upward rotation
• 60 degrees scapular -vs- 120 degrees humeral=180 degrees of motion
• Inferior angle: should not protrude more than 1/2 inch from thorax
• Scapula should not wing
SCAPULAR MOTION AND ELEVATION
- From 0-90 degrees of elevation there is a 2:1 ratio of humeral elevation to scapular rotation. (30 degrees of scapular)
- The axis of motion occurs at the superior spine of scapula.
- Inferior angle moves outward and AC moves upward

SCAPULAR MOTION AND ELEVATION
- From 90-180 degrees of elevation there is a 2:1 ratio of humeral elevation to scapular rotation. (30 degrees of scapular)
- The axis of motion occurs at the acromial end of the scapula.
- Tension on clavicular ligaments fixes AC-joint causing axis to change

THE ROTATOR CUFF
- Holds head of humerus in glenoid
- Depends on scapular stability
- Pulls head of humerus down in abduction

FORCE COUPLES
Upward Rotation: Axio-Scapular
- Serratus Anterior: Pulls scapula outward
- Upper Trapezius: Pulls upward toward occiput
- Lower Trapezius: Pulls downward toward the lumbar spine
- Levator Scapula: Works to stabilize the superior angle as the axis in the 1st 90 degrees of abduction
- The function of each of these is dependent on the location of the axis of rotation

FORCE COUPLES
Humeral Elevation
- Deltoid: Rotates humerus into elevation and pulls it up into the glenoid
- Rotator Cuff: Rotates humerus in elevation while pulling the humeral head downward to neutralize the upward pull of the deltoid

JOINT STABILITY -VS- JOINT MOBILITY

BODY’S PROTECTIVE MECHANISM
- If a muscle is weak: body recognizes joint instability in that position
- Body protects to not allow joint to get into that position
- Antagonist muscle tightens
- It’s these protective mechanisms that lead to pain
- Goal: mo-stability
THE LAW OF RECIPROCAL INHIBITION

**Inhibition -vs- Weakness**
- Altered communication to the muscle
- Not weak, just hesitant
- Timing is off: Function is about timing
- Least amount of proprioceptive input in shortened position
- ROM is limited in shortened position

**ISOLATED WEAKNESS IN EXTREMES**
- Neurological advantage: Lengthened position (spindle feedback)
- Biomechanical advantage: 90 degree force angle
- Biomechanical and neurological disadvantage: Shortened position

**PAIN AND WEAKNESS CONVERGE AT EXTREMES**
- Neurological inhibition in shortened position
- Represents joint instability
- Body protects itself from this position
- May reinforce the imbalance through exercise

**ASSESSMENT: EXTREMEs OF MOTION**
- Shoulder Flexion
- 90/90 Humeral External Rotation
- 90/90 Humeral Internal Rotation
- Horizontal Adduction: Internal Rotation
- 120°Abduction With Internal Rotation
- Extension, Abduction and Internal Rotation

**ACTIVATION THROUGH ISOMETRICS**
- Must activate “Positions of Weakness”
- 15 degree carry over
- Must be “Jump-Started” prior to prescribing isolated strengthening exercises
- Concentrics alone cause decreased facilitation from the stretch reflex as the muscle moves into a shortened position
- GOAL: increase neural input through the full ROM

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