Dysfunctional Movement Patterns and Treatment Techniques

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What is a dysfunctional movement pattern?

An *inefficient* movement of a *system* resulting in a decrease in potential force production and the alteration of force accumulation in regional tissues.

Caused by:
- Response to injury
- Sport participation
- Age (growth spurts)
- Habituation to recurrent activity (texting)
- Adaptation to environment (posture)

Why is this important?
- Rehabilitation
- Performance
- Injury Prevention
Scapula

- **Major roles**
  - Provides synchronous rotation during humeral motion to maintain joint contact
  - Stable base for rotator cuff activation
  - Functional link in the kinetic chain
  - Keystone of Upper Extremity

- **Dyskinesis refers to:**
  - Collective term to describe dysfunction
  - Can be positional or dynamic in nature
Scapular Dysfunction

Scapular dyskinesis is defined as an alteration in position or motion of the scapula during normal scapulohumeral movements.

• Kibler Classifications:
  • Type 1 inferior dysfunction
  • Type 2 medical dysfunction
  • Type 3 superior dysfunction

• Sahrmann Classifications:
  • Downward rotation syndrome
  • Depression syndrome
  • Abduction syndrome
  • Scapular winging
  • Humeral anterior glide syndrome
  • Humeral superior glide syndrome
  • Medial rotation syndrome
Scapular Dysfunction

The scapula plays a crucial role for proper shoulder function, serving as a stable base for rotator cuff activation and as a link in the kinetic chain. Joint, ligament or muscular problems near the scapula can lead to malpositions or to an altered movement pattern. This abnormal situation is called "scapular dyskinesis", Kibler, Med Sport Science, 2012

Scapular dyskinesis is probably most aptly viewed as a potential impairment to optimum shoulder function and shoulder be evaluated and treated as part of the comprehensive treatment protocol. Kibler, Scapular Summit, 2013

‘The association between abnormal scapular positions and motions, and glenohumeral joint pathology has been well established in the literature.’ Cools, BJSM, 2014
Anatomy Reviewed

Diagram of Shoulder Anatomy:
- Trapezius muscle
- Coracoid
- Coracoid tendon
- Of coracohumerals and biceps
- Pectoralis minor muscle
- Scapular notch
- Omohyoid muscle
- Acromion
- Deltoid muscle
- Glenoid fossa
- Scapula neck
- Triceps (long head)
- Teres minor muscle
- Teres major muscle
- Serratus anterior muscle
- Subscapularis muscle
- Latissimus dorsi muscle
- Superior angle
- Levator scapulae muscle
- Supraspinatus muscle
- Rhomboid minor muscle
- Infraspinatus muscle
- Medial border
- Rhomboid major muscle
- Inferior angle
Isolated Scapular motions include:
• Depression/elevation,
• Protraction/retraction,
• Ant/post tilting,
• upward/downward rotation

In the purest form, all motions require movement at the:
• AC Joint,
• SC Joint
• Scapulothoracic region
Joint Centration

Roll of stabilizer muscles is to ensure appropriate contact between joint surfaces throughout all ranges. This is accomplished with a coordinated symphony of contractions. Restrictions in joint gliding reduce centration and compromise stability of the joint.
Arthrokinematics

Mobilization/Manipulation Vector
Assessment

A **qualitative** assessment of position and motion

- Static (standing, sitting, sports specific)
- Dynamic
  - Scaption, flexion, abduction
  - Load and unloaded
  - Sport specific
  - Alternate speeds
  - CKC OPC

Joint play assessment of:

- Glenohumeral joint (sphroidal)
- Acromioclavicular joint (planar)
- Sternoclavicular joint (sellar)
- Scapulothoracic (false)
- Costovertebral joints 1-7 (planar)
- Thoracic spine 1-12 (planar)
- Thoraco lumbar junctio (planar)
- SI/lumbo sacral sport dependant (planar)

**Myofascial Tone/Length**

- Scap movers: Pec Minor, Serratus anterior, traps (UT, LT, MT), lev scap, rhomboid, short head biceps
- Internal Rotators (pec major, lat dorsi, subscap, teres major)
- External rotators (infraspinatus, teres minor)
- Other: subclaius, bicep brachi (long head), triceps, supraspinatus, deltoid
Always Evaluate the Entire Kinetic Chain
Muscle Tone/Length

- Evaluate muscle for overall length and tone to determine hypertonicity or tension.
  - Active and passive ROM, palpation.
- Treatment matches dysfunction... pick the best treatment for the specific type of restriction.
  - Hypertonic muscles (trigger points) respond well to sustain pressure, needling, rolling or ball work.
  - Myofascial tension can be reduced with ART, Graston, assisted stretching, and movement based therapies
  - Address areas of hypertonicity first
Articular specific Treatments

Mobilization and manipulations (grade 1-5)
• Direct force to improve accessory joint motion and stretch joint capsule
  • Neurological and mechanical effects
  • Circulation of synovial fluid
  • Effect dependant on
    • Vector (generally in direction of glide),
    • speed,
    • Force,
  • can be combined with active or passive movement

Instrument Assisted Soft tissue therapy
• Applied to ligaments
• Circulation of synovial fluid
• Combined with active movement
  • Into restriction (neurologic effect)
  • Into stretch (mechanical effect)
Myofascial Therapy

- Goals (therapy must match goal):
  - Reduce Intramuscular tension (trigger points/knots)
  - Reduce myofacial tension
  - Increase intermuscular/fascial gliding
Critically Appraise Your Treatment!!!

Test

Treat

Re-test
• Better?
• Same?
• Worse?
Integration of Therapy and Rehab

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Why Broach This Subject?
Objectives

- Review rehabilitation principles of shoulder dysfunction
- Review actions of therapeutic intervention
- Discuss the concept of combining therapy to facilitate targeted rehabilitation.
- Discuss concept as it pertains to Scapular Dyskinesis
Rehabilitation

Restoring something to its original state... or better.
Rehabilitation Principles

- **Overload Principle**
  - Body will adapt to a stress that is greater than its tolerance
Rehabilitation Principles

Functional Centration Principle

The ideal balance of mobilizers and stabilizers to keep the maximum amount of contact between the joint surfaces.
Rehabilitation Principles

SAID Principle
Specific Adaptation to Imposed Demand
Goals of Therapy

1. Promote the best cellular environment for the body to heal.
2. Identify and improve any mechanical faults that may be seen to increase risk of future injury.
3. To facilitate the safe return of an athlete to play as soon as possible.

Accomplished by:

1. Application of some type of external stimulus to alter:
   1. myofascial and or ligamentous tension
   2. blood flow
   3. proprioception
Therapy

- **Types of Therapy**
  - Modality based
    - Cryotherapy
    - Ultrasound
    - Electro stim
    - Shockwave
    - Laser
    - Etc.
  - Manual (hands on)
    - Articular (mobs/manipulations)
    - Soft tissue (ART, PNF, MET, Massage, Trigger point release, IMS, Acupuncture, dry needling, cupping, Graston, Gua sha, etc.)
Proposed Effects of Therapy

- Decrease pain
- Reduce inflammation
- Increase inflammation
- Reduce swelling
- Increase blood flow
- Decrease blood flow
- Increase range of motion
- Reduce trigger points
- Restore joint biomechanics
- Lengthen myofascial components
- Release myofascial restrictions
- Circulate synovial fluid
- Reduce swelling
- Stimulate mechanoreceptor

- Improve overall function
- Promote fibroblast proliferation
- Increase endorphin release
- Breakdown scar tissue
- Promote normal alignment of connective tissue
- Increase mitochondrial activity
What does the Evidence SAY about therapy?

- ‘Mixed results’
- ‘Low to moderate quality of evidence’
- ‘Insufficient evidence from Randomized control trials’
- ‘Few conclusions can be drawn’
- ‘Immediate effects of therapy have been shown to decrease pain and increase ROM, but these appear to be short term.’
- ‘There is a level of B or fair evidence for manual manipulative therapy of the shoulder, shoulder girdle, and/or functional kinetic chain (FKC) combined with multimodal or exercise therapy for rotator cuff injuries or disorders.

So...
- why do we do it?
Evidence Informed Care

Critically evaluating the best available literature and **applying clinical expertise/experience** to develop the best possible treatment.
Athletes see an immediate benefit.
Here is something we do know.

Therapy has a profound effect on mechanoreceptors:

- These are general and specialized somatic receptors that respond to adequate stimulation of cutaneous receptors and the receptors in muscles, tendons, ligaments, joints and fascia.
- Respond to varying degrees of: position, movement, pressure, tension and load.
- Can be slow adapting, fast adapting or continuous.
- Excitation has been shown to last from 5 – 30 minutes.
↑ Input = ↑ Awareness = ↑ Control of Output (task performance) ??
Pre Rehab Treatment Model

- Assess for imbalances and or restrictions
  - Yes: manual treatment to improve mechanics
  - No: Teach athlete to stable scap position
    - Stim mech rec (GH, AC, SC, Scap, Post Cuff, LT)
    - Active control of scap position with multidirectional unpredictable load
      - Sport specific loading to engrain Neuromuscular pattern
Thank you
Stroeve S. Analysis of the role of proprioceptive information during arm movements using a model of the human arm. Motor Control, 1999 Apr; Vol. 3 (2), pp. 158-85


Dimitriou M. Enhanced Muscle Afferent Signals during motor leaning in humans. Journal of Current Biology 2016 Apr; 26(8); pp. 1062-8

Pickar JG, Sung PS, Kang YM, Ge W. Response of lumbar paraspinal muscle spindles is greater to spinal manipulative loading compared with slower loading under length control. Spine Journal 2007 Sep-Oct; 7(5):583-95


References

References

- MANIPULATIVE THERAPY FOR SHOULDER PAIN AND DISORDERS: EXPANSION OF A SYSTEMATIC REVIEW