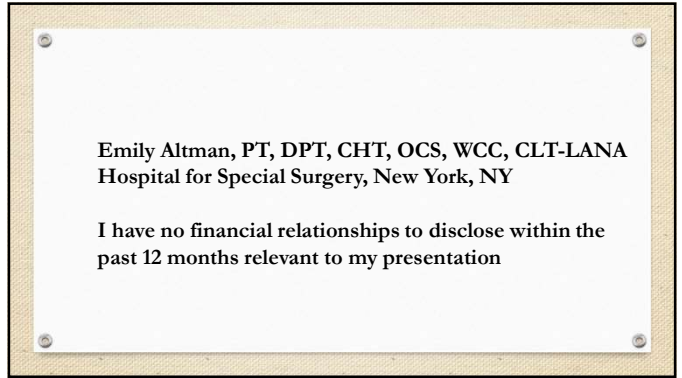
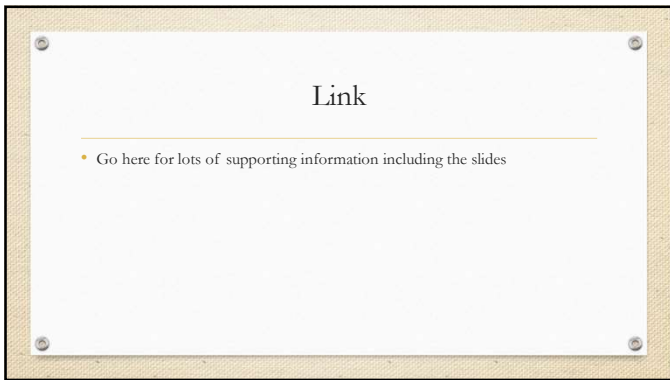


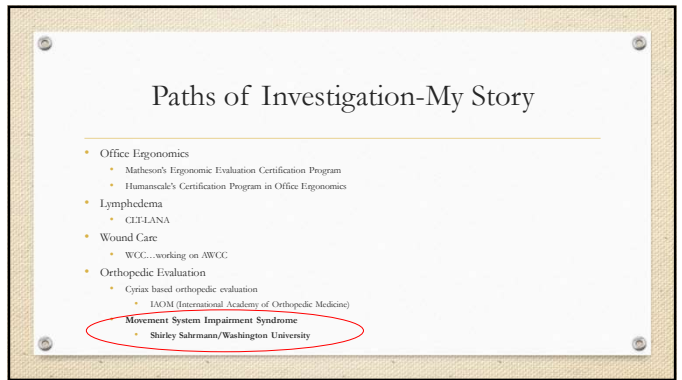
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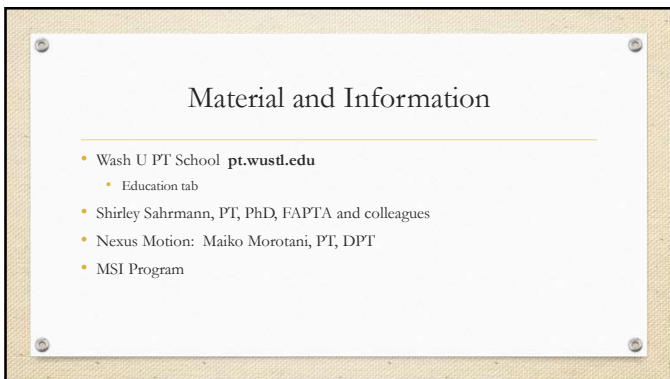
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6

Found During Preparation

- Rene Cailliet, MD: Pain Series
- ABEBOOKS.COM



7

This Talk

- An introduction...whet your appetite
- Focus will be on an **introduction** to the concept of adding a comprehensive musculoskeletal evaluation to a traditional ergonomic evaluation
 - Detailed patient intake form or pre-assessment survey (patient)
 - Pictures and video (patient)
 - Handouts (therapist)
 - Equipment recommendations (therapist)
 - Patient education (therapist)

8

Combine

- Inanimate components of the workspace
 - Work demands (hours, writing, phone, reading)
 - Geometry of the space (work area)
 - Geometry of the furniture (desk, chair, tray)
 - Geometry of the tools (phone, keyboard, monitor, mouse, lighting)
- Physics of the musculoskeletal system
 - As therapists we are rigorously trained in movement analysis and assessment

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Specialists

- Cardiologist
- Podiatrist
- Orthopedic Surgeon
- Neurologist
- Endocrinologist

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Our Identity

- No longer technicians
- We are capable of thorough evaluation of the movement system and
- Identification of a musculoskeletal diagnosis
 - What is wrong with the movement machine
- Different from the execution of a battery of eponymized "Special Tests"

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"Office Work"

- An Olympic Event
- Yet...no training regimen to be found

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What Is MSI?

- Movement Systems Impairment Syndromes: Shirley Sahrmann, PT, PhD, FAPTA
- Structured, detailed musculoskeletal evaluation
- It is an evaluation and treatment philosophy based on kinesiology, anatomy and physics
- Results of the evaluation lead to treatment interventions
- Focus is on
 - Assessment of movement: patterns, quality, deficits, excesses
 - Assessment of alignment
 - Assessment of muscle performance, strength, length, "stiffness", neuromuscular control
 - Identify inducers of faulty movement patterns
 - Repeated movements in daily activities
 - Sustained alignments

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What is MSI?

- Pain
 - The site and the cause of pain are often **not** in the same location
 - Pain most often arises from tissues that are stressed by subtle impairments in movement or alignment
 - Majority of musculoskeletal pain syndromes are the result of cumulative microtrauma from stress of repeated movements or sustained alignments (daily activities)
 - Hypermobility of a link in the system is often the pain generator/pain site
- Faulty alignments and movement patterns can be tolerated for some time before they induce pain

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What is MSI?

- An MSI evaluation can be done even in the setting of no complaints
- It gives you information about how the machine is working
 - Elucidate areas of potential concern
- Their research has resulted in the defining of Movement System Impairment Syndromes for each area of the body
 - Collections of kinesiological impairments named for the principal impairment
 - Examples: Scapular downward rotation syndrome, scapular depression syndrome

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MOVEMENT SYSTEM IMPAIRMENT SYNDROMES
of the Extremities, Cervical and Thoracic Spines
Shirley Sahrmann and Associates



Diagnosis and Treatment of Movement Impairment Syndromes of the Extremities
Shirley Sahrmann

<https://pt.wustl.edu/education/movement-system-impairment-syndromes-courses/>

16

Key Concepts

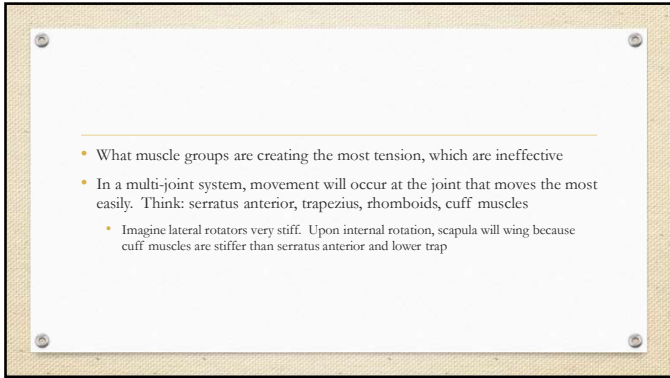
- Path of Least Resistance
 - Relative flexibility
 - Relative stiffness
 - Joint hypomobility
 - What moves is what hurts, usually
- The way everyday activities are performed is critical (repetition/alignment)

17

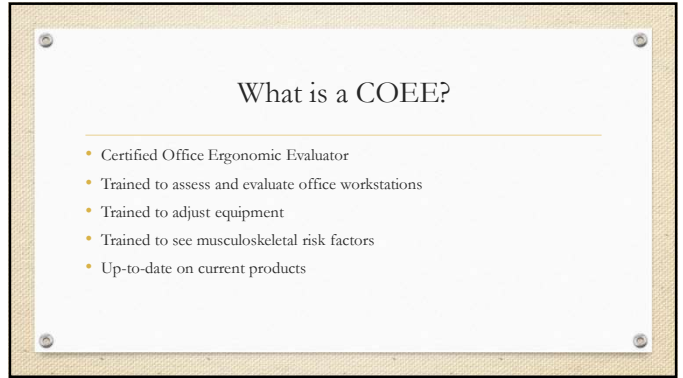
Key Concepts

- You get what you train
- Presence of a muscle does not mean it is being used properly
- It is not "the exercise" but, rather, achieving the desired movement
- Cause and Source
 - Impaired scapular upward rotation; supraspinatus tendinopathy

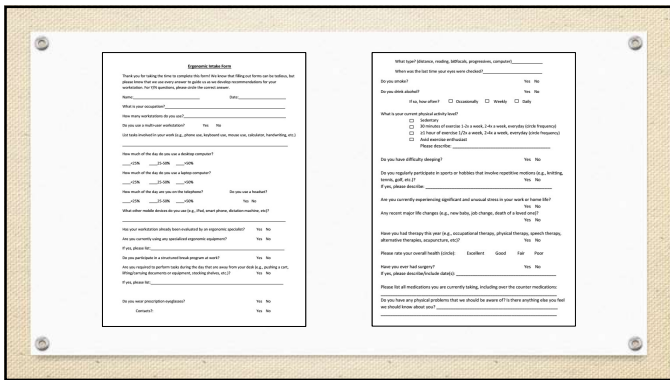
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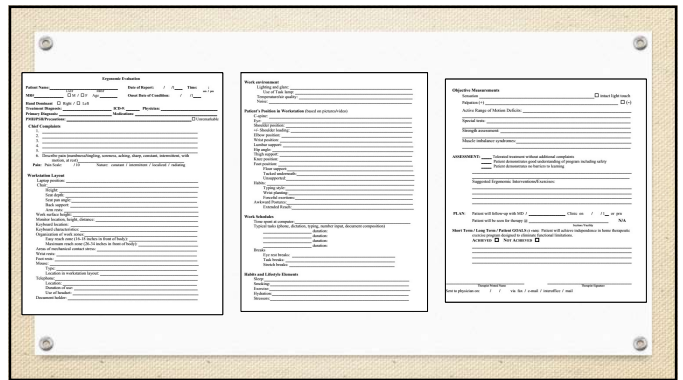
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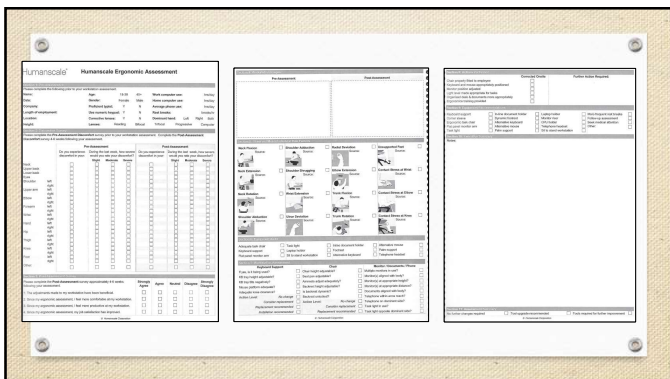
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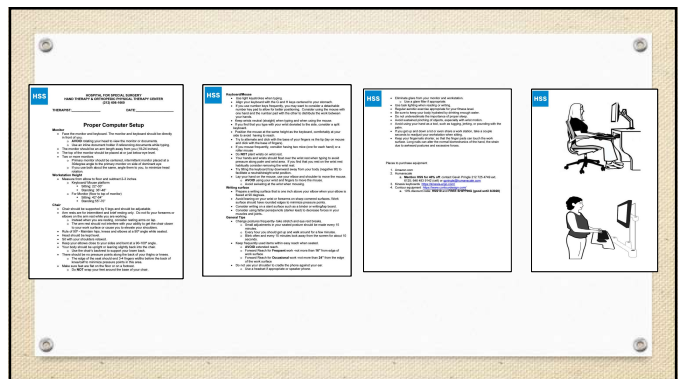
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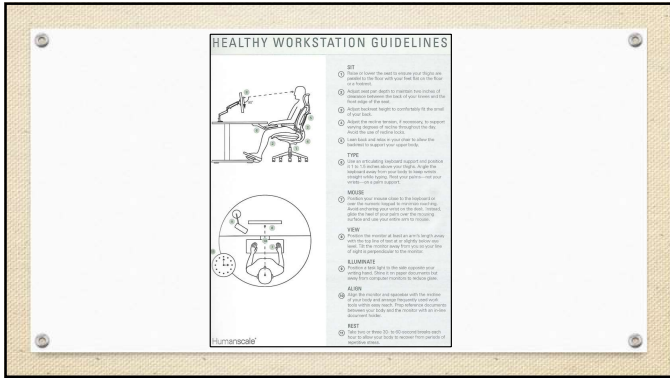
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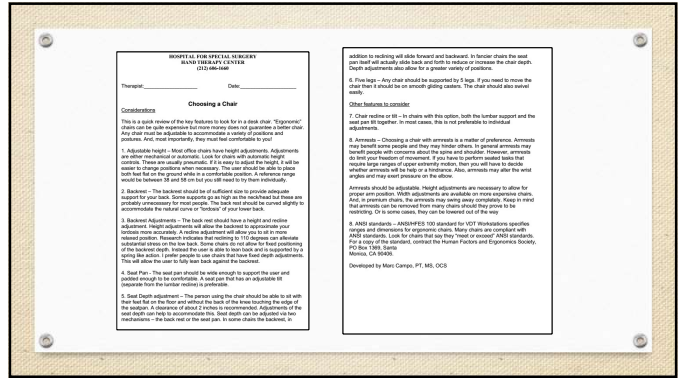
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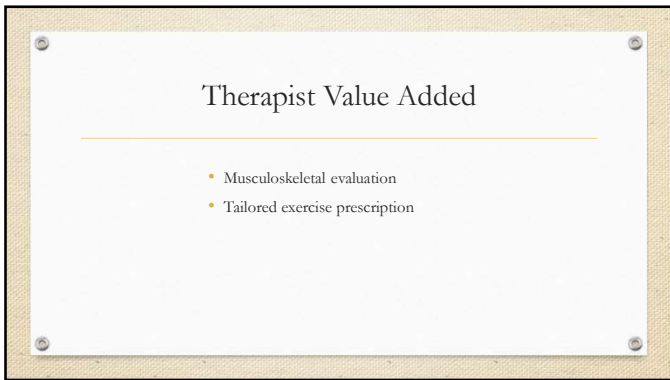
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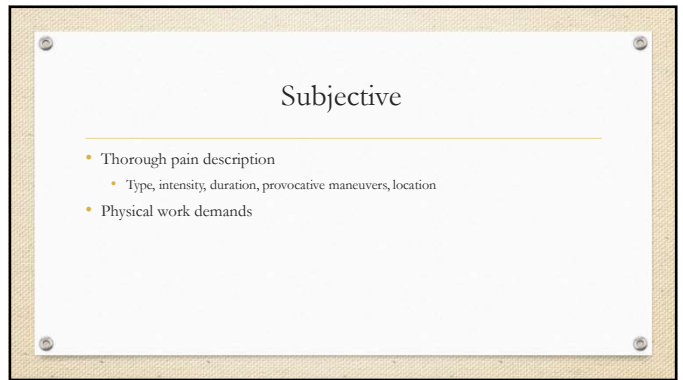
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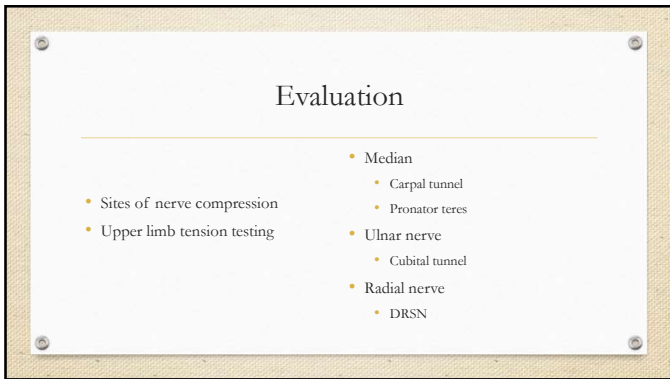
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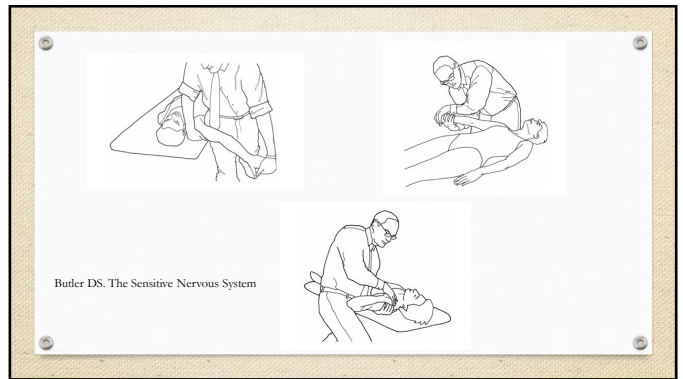
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30

Components of Musculoskeletal Evaluation

- Alignment
- Movement
- Muscle Length/Stiffness
- Muscle Performance
- Neuromuscular control
- Muscle Strength
- Standing
- Supine
- Prone
- Quadriped
- Sitting

32

Challenge

- A thorough upper quarter exam is lengthy and detailed
 - Extends to cervical spin, thoracic spine, abdominal muscle function
- Impossible to do justice to the beautiful complexities of the MSI approach
- Attempt to highlight common patterns seen in office workers, knowing that there are many more details to be considered
- Special attention to alignment

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Muscles: Scapulohumeral (7)

- External Rotators: Suprapinatus, Infraspinatus, Teres minor
- Internal Rotators: Subscapularis, Teres major
- Deltoid
- Coracobrachialis

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Muscles: Axioscapular

- Serratus anterior
- Rhomboid major/minor
- Trapezius
- Levator scapula
- Pectoralis minor

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Muscles: Axiohumeral

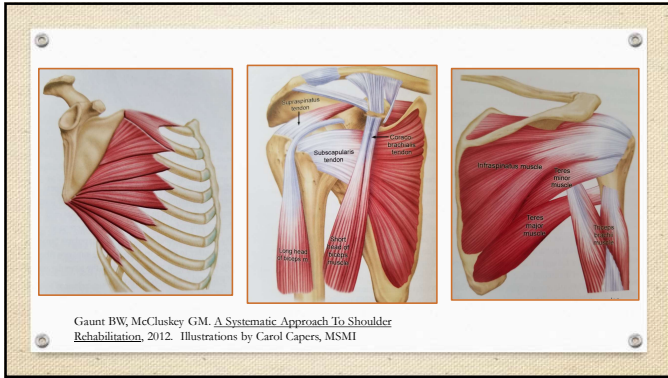
- Latissimus dorsi
- Pectoralis major

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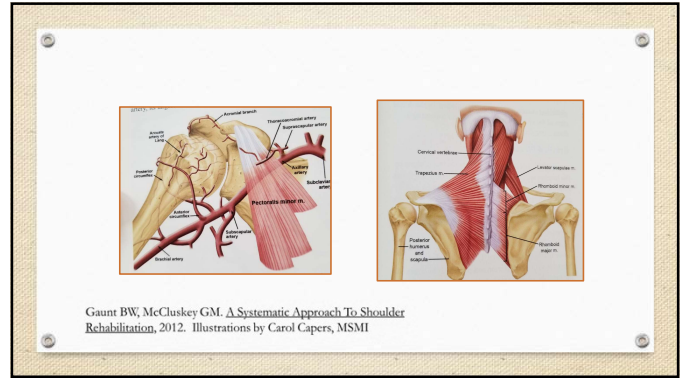
Muscles

- Scapulo-ulnar: triceps long head
- Scapulo-radial: biceps long and short heads

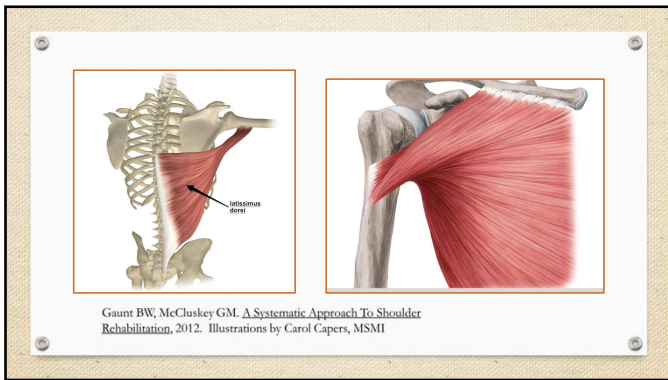
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Sitting

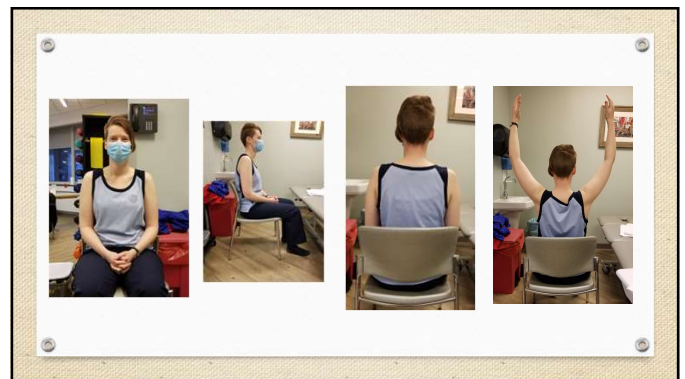
- Alignment: head, neck, thorax, shoulders, scapula, clavicle, humerus
 - Head position: sagittal view; forward head
 - Cervical spine: upper cervical extension
 - Thoracic spine: kyphosis? Flattened curve?
 - Shoulders: humeral head position on glenoid
 - Scapula: position on the thoracic spine: abd/adduction, tilt, depression/elevation
 - Clavicle: scapular position will drive clavicle position
 - Humerus: internal/external rotation at glenohumeral joint

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Sitting

- Active range of motion
 - Thoracic flexion, rotation, side bending
 - Bilateral shoulder flexion
 - Shoulder abduction
 - Shoulder external rotation
 - Cervical range of motion
 - With passive elevated shoulder girdle test


42



43

Sitting


- Serratus anterior muscle performance
 - Face the patient
 - Shoulder FF to 120-130, slight horizontal adduction (hand in front of nose)
 - Check PROM: abd/upward rotation
 - Apply resistance to distal end of humerus (pulling down)
 - Attempt to downwardly rotate scapula



44

Sitting

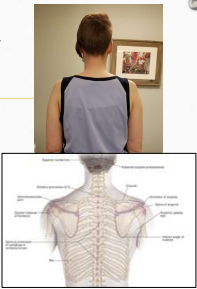
- Upper trapezius muscle performance
 - Resist ability to bring acromion toward the occiput
 - Shoulder shrug
 - Over active?
 - Elongated?



45

Standing-Scapula

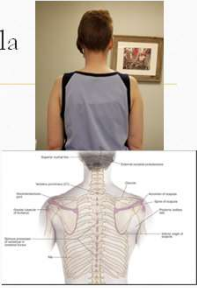
- Slope of shoulders
- Vertebral spinous process 3" from root of scapula
- Vertebral border vertical or slight upward rotation
- 30-40° anterior to frontal plane (internal rotation)
- 10-15° anterior tilt
- Root of scapular spine at T3



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Standing-Scapula


- Upward/downward rotation
- Ab/adducted position
- Elevated/depressed
- Anteriorly/posteriorly tilted
- T2-T7



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Standing-Humerus

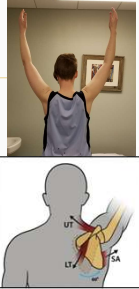
- Internal/External rotation
 - Antecubital crease 30° anterior to the frontal plane
 - Scapular position will influence this
- Clavicle horizontal or slight upward slope



48

Standing Active Motion

- Bilateral shoulder forward flexion
 - Scapula should upwardly rotate, posteriorly tilt 10° and externally rotate
 - Acromion should align with C6/7
 - Root of the spine of the scapula at T3
 - Inferior angle should reach midaxillary line by end of arm elevation
 - Vertebral border of the scapula should reach 55-60°
 - Root of spine should remain 3" from spinous processes
 - Assess glenohumeral creases
 - Assess glenohumeral rotation during elevation. Should externally rotate 60°



49


Supine

- Alignment
 - Head position
 - Cervical spine
 - Thoracic spine
 - Shoulders: humeral head
 - Scapula: influence of pectoralis minor/major
 - Humerus

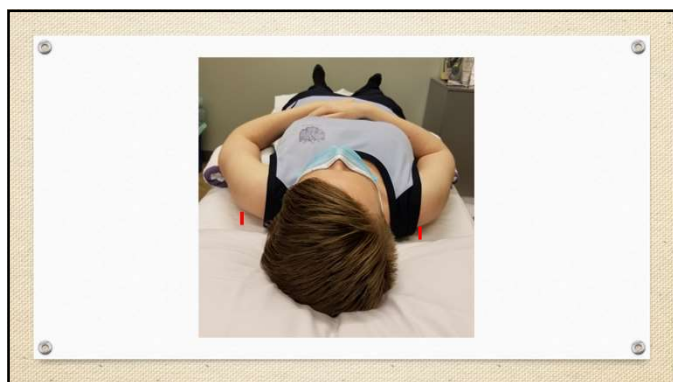
51

Supine

- Length test:
 - Pectoralis minor
 - Towel roll under distal humerus, forearms resting on abdomen
 - Posterior acromion 1" off the table
 - Assess flexibility while watching for rotation or elevation of rib cage (abdominal contribution)




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53

Supine

- Length test:
 - Pectoralis major
 - Sternal fibers: Passive unilateral shoulder forward flexion, arm about 45° away from head, shoulder in ER
 - Compensatory motion: anterior/inferior glide of the humeral head, trunk rotation, rib elevation
 - Clavicular fibers: Horizontal abduction with shoulder ER
 - Compensatory motion: anterior glide of humeral head, trunk rotation



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Supine

- Length test:
 - Latissimus dorsi
 - 1. Hooklying Active bilateral forward flexion
 - Watch for: lumbar extension, ribcage elevation, shoulder IR
 - 2. Hooklying Unilateral passive forward flexion with shoulder ER
 - Watch for: lumbar extension, ribcage elevation




55



56

Supine


- Length test:
 - Scapulohumeral muscles
 - Hooklying. Passive unilateral shoulder forward flexion with shoulder in ER
 - Watch for: lateral border of the scapula protrudes >1/2" from thorax. May also see posterior tilt of scapula, humeral head anterior glide, or scapular abduction
 - Tease out teres major contribution: IR shoulder at end range



57

Supine


- Length test:
 - Biceps: towel roll under distal humerus
 - Actively extend elbow and pronate forearm: watch scapular motion
 - Passively extend elbow: compare pronation vs supination
 - Watch for anterior tilt of scapula or anterior glide of humeral head



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Supine


- Posterior glenohumeral capsule and external rotators
 - Humerus in 90 degrees of abduction, elbow flexed to 90 degrees, towel rolls under distal humerus to put humerus in plane of scapula
 - Assess active and passive internal rotation
 - Compensatory motion: anterior tilting of the scapula or humeral head anterior glide



59

Supine


- Anterior glenohumeral capsule and internal rotators
 - Humerus in 90 degrees of abduction, elbow flexed to 90 degrees, towel rolls under distal humerus to put humerus in plane of scapula
 - Assess active and passive external rotation
 - Compensatory motion: posterior tilting of the scapula, scapular adduction/external rotation or humeral head anterior glide



60

Prone

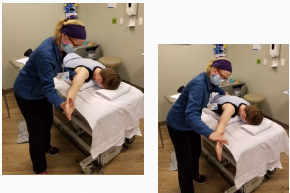
- Shoulder IR/ER muscle performance
 - Shoulder abducted to 90 degrees, forearm hanging off the table, towel roll under proximal shoulder to put scapula and humerus in the same plane and to align scapula on the thorax.
 - Active ER
 - Watch for humeral head anterior glide, scapular anterior tilt, scapular internal rotation, scapular depression, scapular up/downward rotation
 - Active IR
 - Watch for humeral head anterior glide, scapular anterior tilt, scapular internal rotation, scapular elevation, glenohumeral horizontal abduction, and elbow extension



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Prone

- Lower trapezius muscle performance
 - Pillow under chest
 - Towel under forehead
 - Humerus in line with fibers of lower trapezius and externally rotated
 - Palpating at T12
 - Head hand cradles arm
 - Foot hand in axilla to position scapula in adduction and depression
 - Stabilize contralateral pelvis when applying resistance



63

Impaired Alignment

- Elevated
 - Elevation of the superior angle of the scapula but not the acromion
 - Levator scapulae muscle is short
 - Elevation of the entire scapula
 - Upper trap is short
- Adducted
 - Vertebral border of the scapula is less than 3" from the spinous processes
 - Rhomboid and middle trapezius muscles short
 - Serratus anterior is long

70

Impaired Alignment

- Abducted
 - Vertebral border of the scapula is more than 3" from the spinous processes
 - Internally rotated more than 30° anterior to the frontal plane
 - Serratus anterior and pectoralis major are short
- Tilted/Tipped
 - Inferior angle protrudes
 - Shortness of the pectoralis minor

71

Impaired Alignment

- Winged
 - Weakness of serratus anterior
 - Flat thoracic spine, scoliosis
- Upwardly Rotated
 - Root of the spine of the scapula is medial to the inferior angle
 - Short upper trapezius muscle

72

Humerus and Shoulder

- IR/ER: humeral head stays centered on glenoid, no obvious translation
- No > 1/3 of humeral head anterior to the acromion

73

Postures Unique to Workstation

- Neck flexion/extension/rotation
- Shoulder abduction/adduction/shrugging
- Wrist extension/ulnar deviation/radial deviation
- Elbow extension
- Trunk flexion/rotation
- Unsupported feet
- Contact stress: wrist, elbow, knee

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Common Findings

- Short/tight/stiff
 - SCM, Pectoralis Minor, Latissimus Dorsi
 - Anterior tilt of scapula, rounded shoulders, forward head, abducted scapulae, IR GH joint
- Overactive
 - Levator Scapulae, Upper Trapezius, Upper Rhomboids
 - Elevated scapulae
- Weak and Long
 - Middle and Lower Trapezius, Serratus Anterior

75

Common Findings

- Weak/lengthened supinators
- Weak/lengthened triceps
- Stiff/short biceps, pronators, latissimus, upper trapezius
- Weak lower trapezius
- Restricted GH external rotation (adaptive shortening)


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Now What?


- Create a targeted exercise program based on your findings
 - Stretches
 - Strengthening
 - Think about how you are strengthening weak muscles
 - Activate muscles in a shortened position to increase stiffness
 - Just because a muscle is strong doesn't mean it is doing the job
 - Taping: positioning, inhibition, facilitation, nerve mobility
 - Posture
 - Habits

77

Forward Wall Slides With Lift Off



78

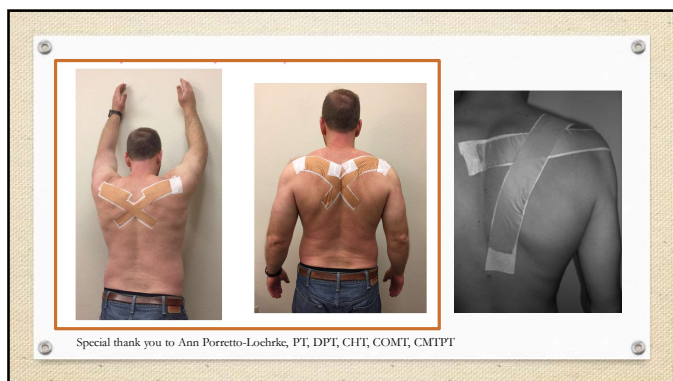


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A Few Go-To Exercises

80

81



82

Challenges

- Time
 - Thorough evaluation
 - Exercise prescription
- Desire for passive interventions and fixes that can be purchased
- “Erroneous Absolutes”
 - Example: “Armrests are bad”, “Wrist rest are bad”
- Resistance to change

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My Goal

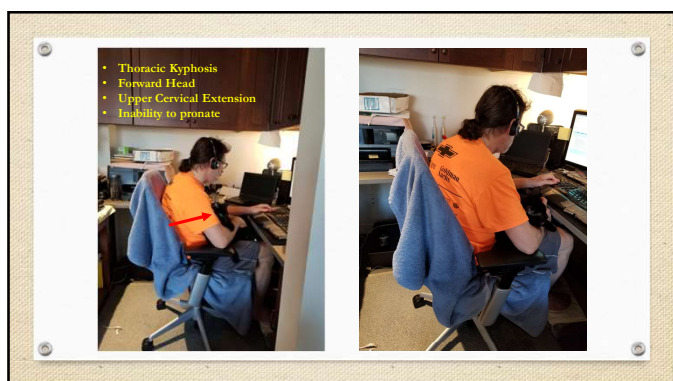
- Revisit your ergonomic evaluation package
- Add a comprehensive, sophisticated, valuable evaluation
- Add a tailored exercise program to address deficits discovered in evaluation
 - Train through movement patterns
 - Strengthen and stretch with precision
 - Train behaviors
 - Use hardware options creatively to fit the patient

85

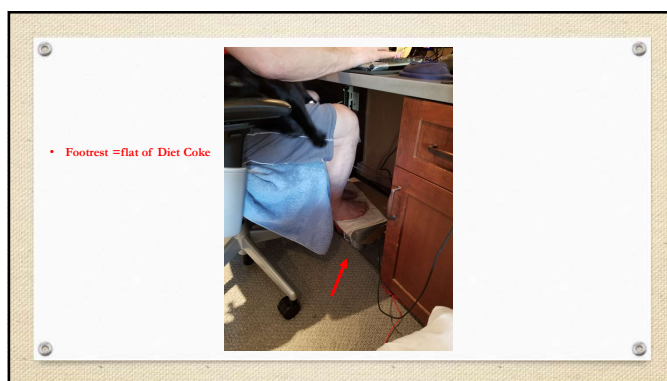
Quick Case Example

- 64 year old computer programmer/project manager
- Large international bank
- Works from home
- Very long days, often 7 days/week
- Runs 40 miles a week
- Enjoys disc golf and hiking

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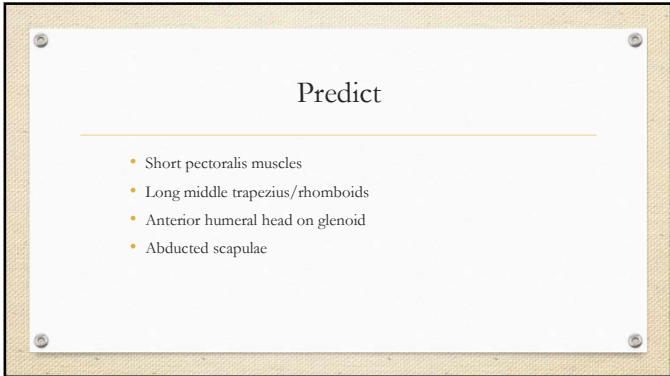
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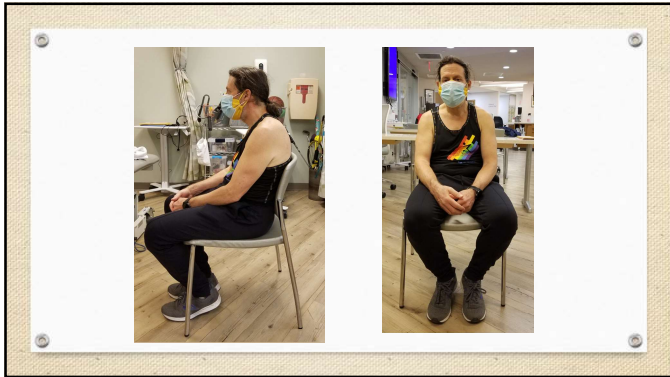
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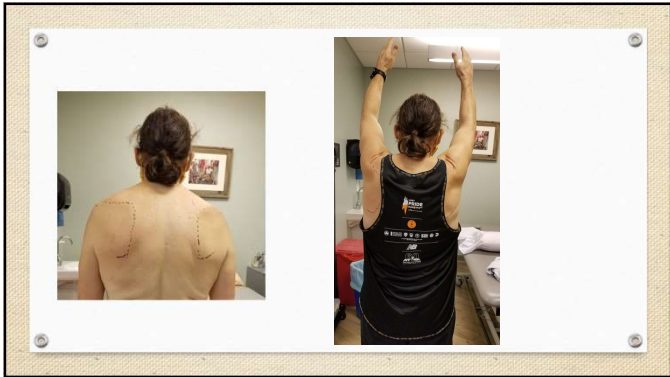
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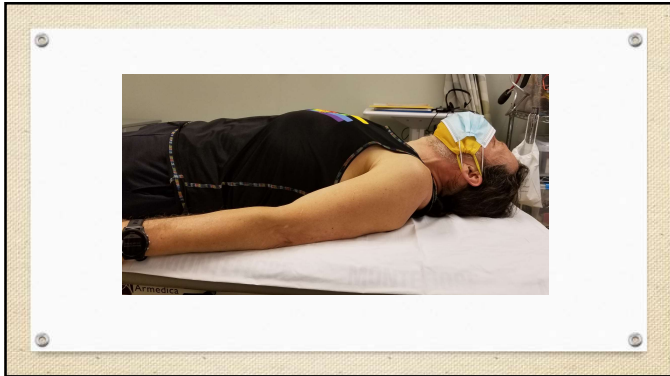
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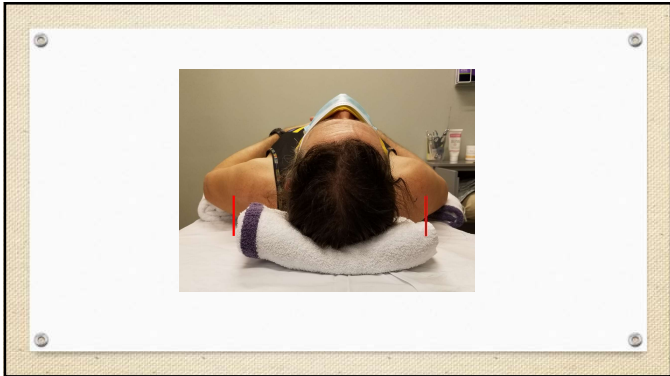
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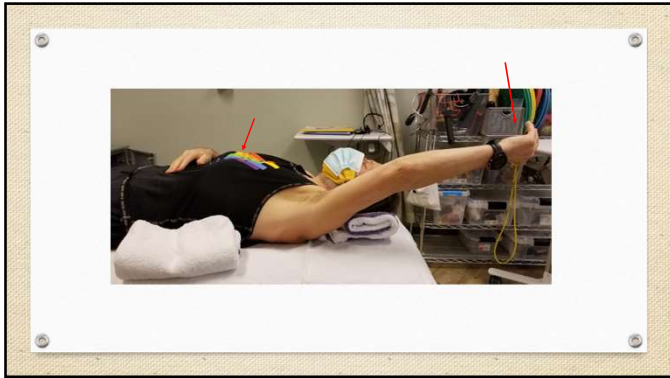
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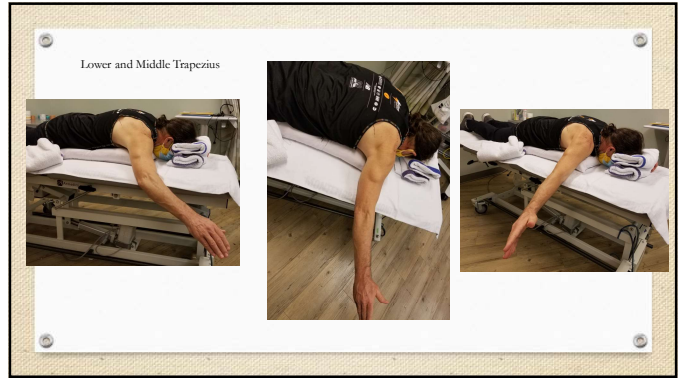
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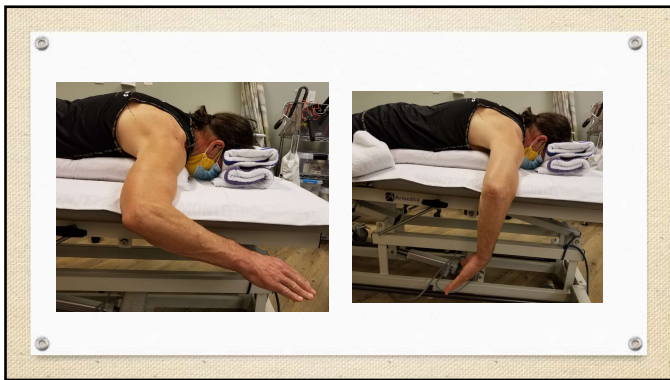
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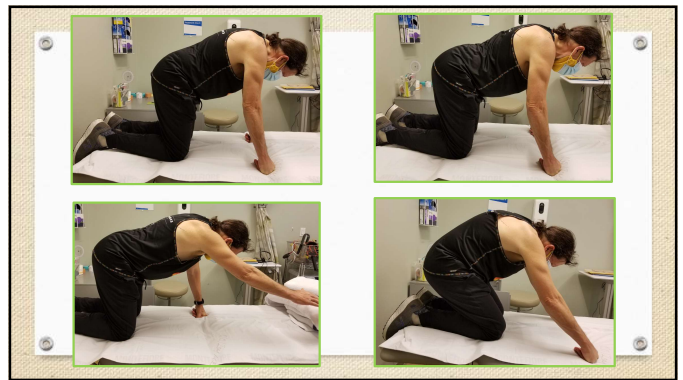
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In Summary

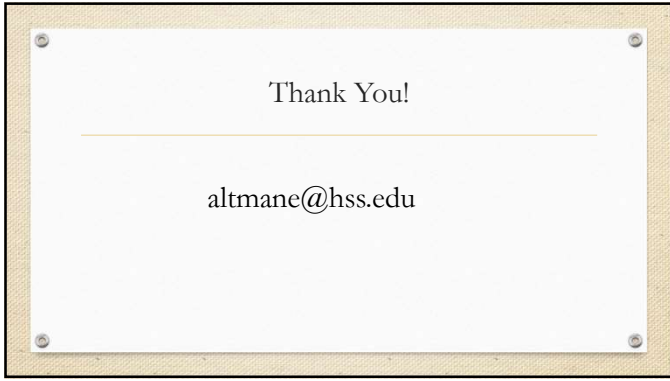
- Importance of a detailed, relevant musculoskeletal evaluation
- Creation of an HEP based on the findings
- Patient education about how they, specifically, fit into and move within their workstation

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Useful Follow Up

- Learnmovementsystem.com
- Maiko Morotani, PT, graduate of Wash U's PT program
- Organizes and runs the MSI courses at Wash U

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