

PHYSIO-U **ESPN** Clinical Pattern Recognition

Advanced Cervico-Thoracic & Shoulder Interventions for Upper Limb Symptoms

APTA Combined Sections Meeting Feb 22, 2018, 11:00AM-1:00PM New Orleans, LA

SACRED HEART UNIVERSITY **AZUSA PACIFIC UNIVERSITY**

CSM APTA Combined Sections Meeting
2018 #APTACSM

THANK YOU for inviting us!

- Michael Wong, PT, DPT, OCS, FAAOMPT
- Emmanuel Yung, PT, DPT, OCS, FAAOMPT
- Stephania Bell, PT, OCS, CSCS
- Major Jeremiah Samson, PT, DSc (C), OCS, COMT, FAAOMPT

THE ACADEMY OF HAND & UPPER EXTREMITY PHYSICAL THERAPY, APTA, Inc.

CSM APTA Combined Sections Meeting
New Orleans February 25-28, 2018
jazz
UP THE MOVEMENT PROFESSION IN NEW ORLEANS!

DISCLOSURE
Emmanuel Yung, PT, DPT, MA, OCS, FAAOMPT

NIOSH/NIH Grant for PhD coursework in Ergonomics and Biomechanics at New York University. The funding was through the New York University School of Medicine

Michael Wong, PT, DPT, OCS, FAAOMPT
Emmanuel Yung, PT, DPT, OCS, FAAOMPT

Medical App Co-Developer for iPads/iPhones

PHYSIO-U

Session Learning Objectives

1. Validate fast track treatment decisions regarding contributions of the cervical spine, thorax, and shoulder complex in UE symptoms.
2. Fast track systematic exam the most clinically salient impairments-
3. Real-time assessment of neck, thorax and the shoulder- manual and movement system interventions become self-evident
4. Conclude scientific progression of advanced cervico-thoracic and shoulder interventions


Clinical pattern recognition concepts to **fast track** treatment **decisions** and scientific progression of **advanced interventions**

PHYSIO-U Michael Wong, PT, DPT, OCS, FAAOMPT Associate Professor **Clinical Pattern Recognition**

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Advanced interventions are wasted on irrelevant impairments!

Quick screen for associated impairments:



ds, Shifting our paradigms...

[CLINICAL COMMENTARY]

Management of Lateral Tendinopathy: Not Fit All


[CLINICAL COMMENTARY]

BROOKE K. COOMBS, PhD¹ • LEANNE BISSET, PhD² • BILL VICENZINO, PhD³

Management of Lateral Elbow Tendinopathy: One Size Does Not Fit All


Clinical Examination:

Provoking the local tissue:
Palpation
Resisted extension
Gripping




A more comprehensive physical examination may be necessary to identify (or rule out) coexisting pathologies or other reasons for their pain.

Clinical examination:



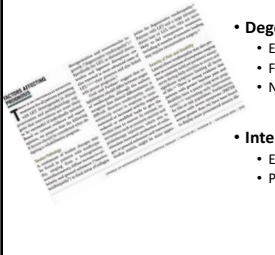
- ROM of the adjacent joints
- Evaluation of cervical and thoracic spine
- Neurodynamic contributions

Staging pathology- reactivity and chronicity



- Reactive tendinopathy
- Occurs as response to unaccustomed or increased activity
- Requires rest or reduced loads for healing

Staging pathology- reactivity and chronicity




- **Degenerative tendinopathy**
 - Evidence of local tissue pathology
 - Fibrofatty infiltrate
 - Neovascularization
- **Interventions**
 - Eccentric exercises
 - Prolotherapy injections
 - Stimulate collagen or ground substance production
 - Restructure tendon matrix

What challenging conditions might this apply to?

- DeQuervain's
- Trigger finger
- Lateral epicondylalgia
- Medial epicondylalgia
- Carpal tunnel syndrome
- Guyon's canal syndrome
- Cubital tunnel syndrome

Severity of Pain and Disability- Lateral epicondylalgia




Baseline Predictors of Pain and Disability One Year Following Extra-Articular Distal Radius Fractures

- Greater baseline pain and disability
- Poorer long-term prognosis
- More pronounced sensory disturbances

Interventions:

- Pharmacological therapies
- Rest and splint
- Counterforce strap
- Diamond taping

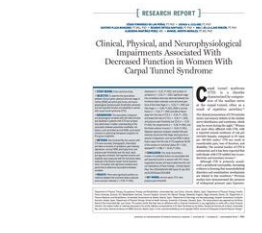
Concomitant neck or shoulder pain



Neck pain is more common in patients with LET than age matched healthy controls

- Physical impairments at C4-C7 segmental levels
- Self-report of shoulder and neck pain in patients with LET indicative of poorer short- or long-term prognosis

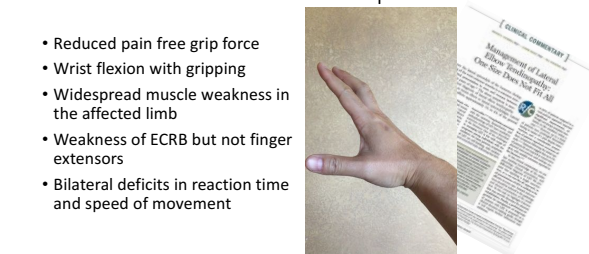
Similar associated impairments in Carpal Tunnel Syndrome



Clinical, Physical, and Neurophysiological Impairments Associated With Decreased Function in Women With Carpal Tunnel Syndrome

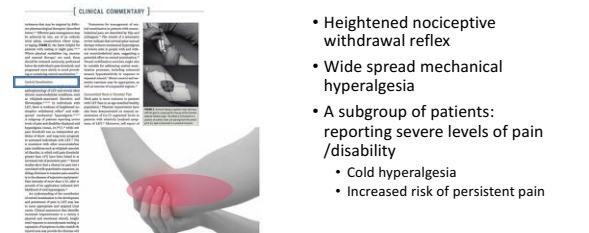
- (+) correlation between function, pain intensity, depression and duration of symptoms
- (-) correlation between function and:
- Pinch grip force of index and little finger
- Cervical flexion, lateral flexion
- Pressure pain threshold over C5-6, Carpal tunnel, tibialis anterior muscle

Associated neuromuscular impairments



- Reduced pain free grip force
- Wrist flexion with gripping
- Widespread muscle weakness in the affected limb
- Weakness of ECRB but not finger extensors
- Bilateral deficits in reaction time and speed of movement

Central Sensitization



Management of Lateral Epicondylalgia: One Size Does Not Fit All

- Heightened nociceptive withdrawal reflex
- Wide spread mechanical hyperalgesia
- A subgroup of patients: reporting severe levels of pain/disability
 - Cold hyperalgesia
 - Increased risk of persistent pain

Clinical pearl:

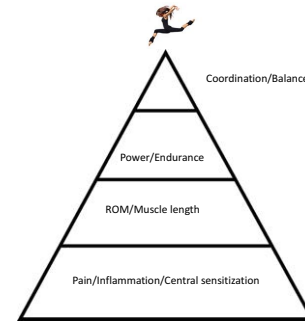
- Apply ice to local tissue pain region
- Pain >5/10
- 90% likelihood of cold hyperalgesia



Taking a step back....

- Of the common upper quarter conditions?
- Duration > 3 months?
- Have you seen many patients with widespread pain?
- Sensitivity to cold?
- Decreased pain free grip strength?
- Complaints of neck and shoulder pain?
- High levels of pain and disability leading to poor prognosis and persistent pain?
- Involved limb weakness?
- Altered motor control?
- Scapular weakness?

How to I get here?

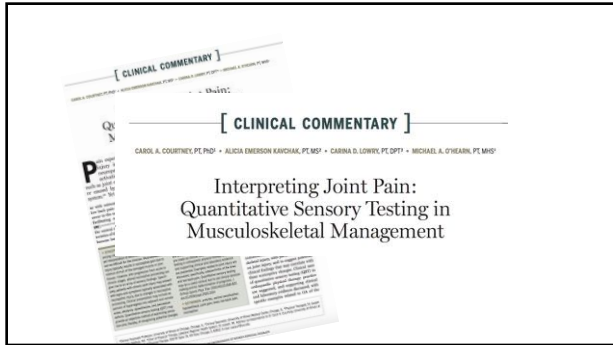


Central sensitization

- An increased responsiveness of nociceptive neurons in the central nervous system to normal or subthreshold afferent input leading to hyperalgesia
- Lateral epicondylalgia (Fernández-Carnero 2009)
- Carpal tunnel syndrome (Fernández-de-las-Peñas 2009)
- Thumb osteoarthritis (CMC OA) (Chiarotto 2013)
- Shoulder impingement (Gwilym 2011)
- Whiplash associated disorders (WAD) (Sterling 2008)
- Headache (Palacios Cena 2016)
- Low-back pain (Sanzarelli 2016)
- Osteoarthritis (knee) (Courtney 2009)
- Patellofemoral joint pain (Pazzianato 2016, Lantz 2016)

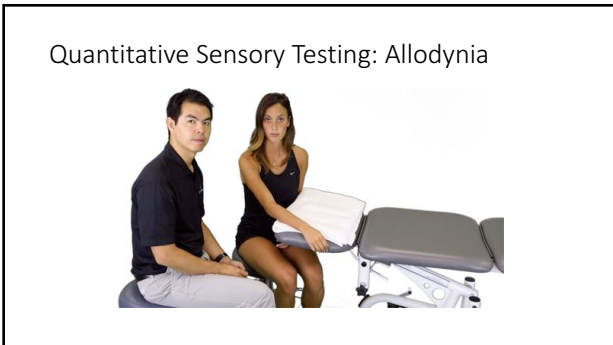
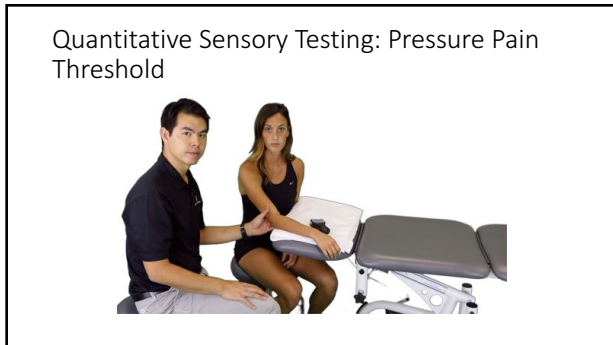
Central sensitization → Contralateral sensitized structures

- Lateral epicondylalgia (Fernández-Carnero 2009)
- Carpal tunnel syndrome (Fernández-de-las-Peñas 2009)
- Carpometacarpal Osteoarthritis (Farrell 2000)



Central sensitization:

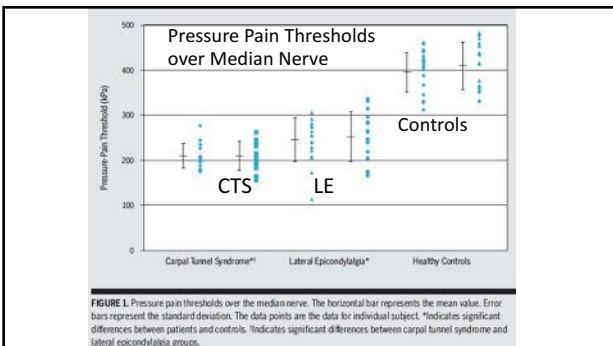
- Increased spread of symptomatic area (decreased pressure pain threshold- PPT)
- Hyperalgesia in the region of injury or inflammation



Specific Mechanical Pain Hypersensitivity Over Peripheral Nerve Trunks in Women With Either Unilateral Epicondylalgia or Carpal Tunnel Syndrome

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 RODRIGO JIMÉNEZ-GARCÍA, PhD⁴ • MANUEL ARROYO-MORALES, PT, PhD⁵ • JOSHUA A. CLELAND, PT, PhD⁶

JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY | VOLUME 40 | NUMBER 11 | NOVEMBER 2010



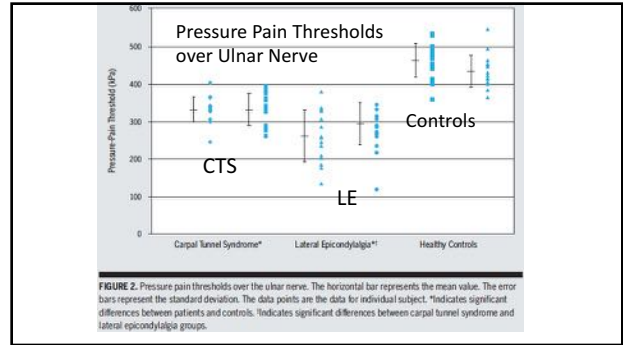
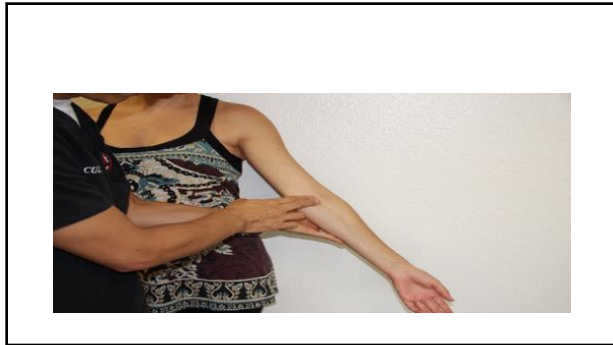


FIGURE 2. Pressure pain thresholds over the ulnar nerve. The horizontal bar represents the mean value. The error bars represent the standard deviation. The data points are the data for individual subject. *Indicates significant differences between patients and controls. †Indicates significant differences between carpal tunnel syndrome and lateral epicondylalgia groups.

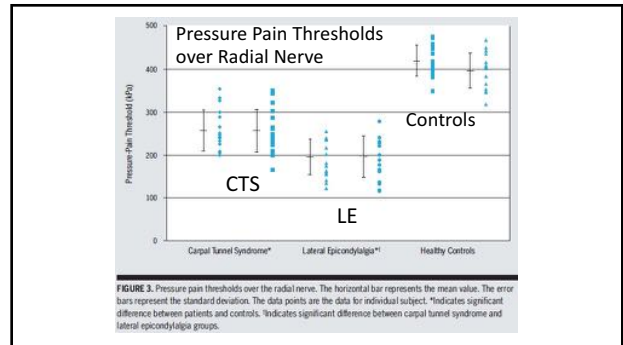
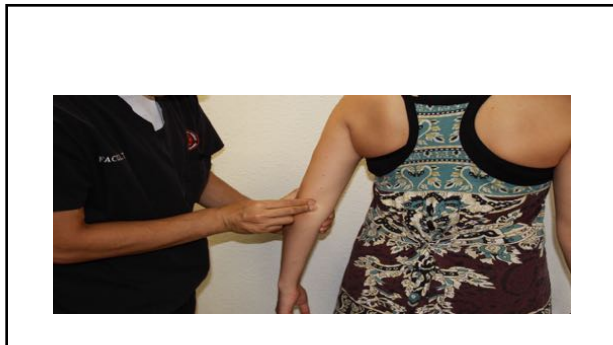


FIGURE 3. Pressure pain thresholds over the radial nerve. The horizontal bar represents the mean value. The error bars represent the standard deviation. The data points are the data for individual subject. *Indicates significant difference between patients and controls. †Indicates significant difference between carpal tunnel syndrome and lateral epicondylalgia groups.

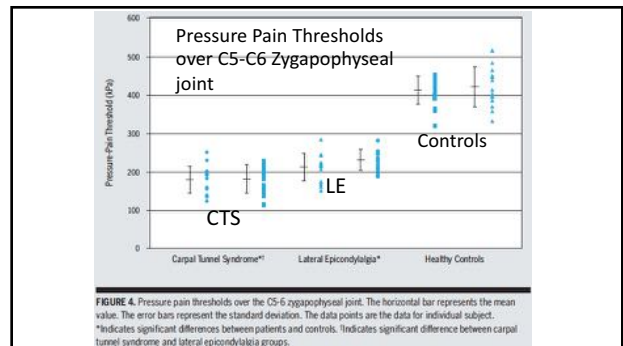
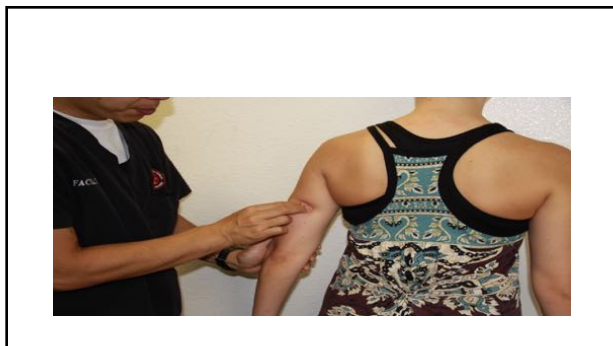


FIGURE 4. Pressure pain thresholds over the C5-6 zygapophysial joint. The horizontal bar represents the mean value. The error bars represent the standard deviation. The data points are the data for individual subject. *Indicates significant differences between patients and controls. †Indicates significant difference between carpal tunnel syndrome and lateral epicondylalgia groups.

Key points:

- Decrease in PPT over 3 main nerve trunks in CTS and LE
- Previous studies demonstrating wide spread pain (decreased PPT over anterior tibialis in CTS and LE)
 - (Fernandez-Carnero 2009)
 - (Fernandez-de-las-Penas 2009)
- In CTS, median nerve was more sensitized
- In LE, radial nerve and ulnar nerve were more sensitized
- The longer the pain duration, the lower the PPT
- The greater the pain intensity, the lower the PPT

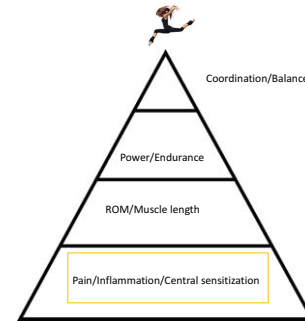
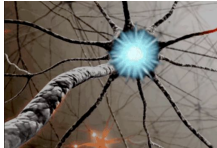
What does this say to you?

- Peripheral nerve sensitization
- Central mechanisms maybe at work
- Nerve sliders must be considered
- Pain education should be considered



Why might this central sensitization occur?

- “The development of central sensitization in local pain syndromes suggests that sustained peripheral noxious inputs to the central nervous system can play a role in the initiation and/or maintenance of this sensitization process”



Modulating pain

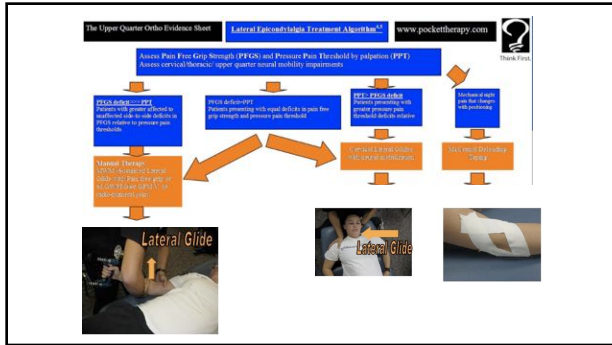
Masterclass

Lateral epicondylalgia: a musculoskeletal physiotherapy perspective

B. Vicenzino
 Department of Physiotherapy, University of Queensland, Australia

Manual Therapy (2003) 8(2), 66–79





Immediate Effects on Pressure Pain Threshold Following a Single Cervical Spine Manipulation in Healthy Subjects

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MIGUEL BREA-RIVERO, OT⁴ • JUAN C. MIANGOLARRA-PAGE, MD, PhD⁴

JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY

VOLUME 37 | NUMBER 6 | JUNE 2007 | 325

- 15 healthy subjects
- 3 treatments sessions
 - Manipulation- C5-C6 level
 - Placebo
 - Control
- Assessment via Pain pressure threshold or PPT

FIGURE 1. Cervical spinal manipulation applied to the left side.

Post manipulation change in pressure pain threshold demonstrates mechanical hypoalgesic effect

FIGURE 2. Percent change in pressure pain threshold after each intervention. Lines represent median (black) and mean (superior part of the box), whereas bars represent SD. *Change postmanipulation was statistically greater than for the other 2 interventions ($P < .001$).

Supporting evidence

- Vincenzino et al: *Lateral glide of cervical spine → immediate increase in PPT with lateral epicondylalgia*
- Paungmali et al, Vincenzino et al: *MWM (mobilization with movement) → immediate increase in PPT with lateral epicondylalgia*

Journal of Orthopaedic & Sports Physical Therapy
Research Report • Cervical and Neck Pain • Focus on the Cervical Pain Topic

Initial Effects of Elbow Taping on Pain-Free Grip Strength and Pressure Pain Threshold

By Vincenzo, PhD, MS, CSCS, Sport Phys Therapist
and Ferdinando, PhD, MS, MPT, Doctor
Juan Brea-Rivero, PhD, MPT, Doctor
Juan C. Miangolarraga-Page, MD, PhD
and Cesar, PhD, MPT, Doctor

A meta-analytic review of the hypoalgesic effects of exercise

Kelly M. Naugle, Roger B. Fillingim, and Joseph L. Riley III
Comprehensive Center for Pain Research, University of Florida

J Pain. 2012 December ; 13(12): 1139–1150

NBII Public Access
 Article Information
 A meta-analytic review of the hypoalgesic effects of exercise

In healthy participants, mean effect sizes for isometric exercise ($d_{hr} = 1.02$, $d_{int} = 0.72$) and dynamic resistance exercise ($d_{hr} = 0.83$, $d_{int} = 0.75$) were large.

Meeus et al. – Cycle ergometry had increased PPTs at multiple body sites

Hoffman et al. demonstrated large effect even 30 minutes post exercise

Isometric quadriceps had large hypoalgesic effects for shoulder myalgia

Moderate submaximal isometrics and vigorous aerobic exercise- moderate to large effect on experimental pain in FMS

Submaximal isometrics at low intensity (10%) increased PPT of deltoids in FMS with large effect

Generally, low to moderate intensity exercise may be the way to modulate pain in FM patients

Contralateral Attenuation of Pain After Short-Duration Submaximal Isometric Exercise


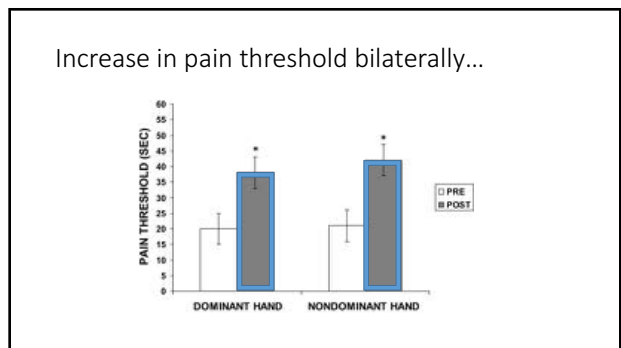
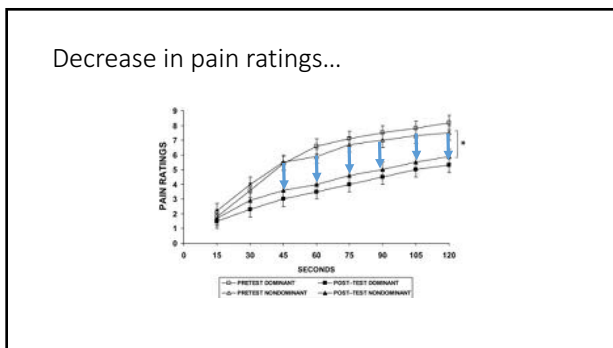
Kelli F. Kolyn and Masataka Umeda
 Department of Kinesiology, University of Wisconsin-Madison, Madison, Wisconsin.

Kolyn KF, Umeda M. Contralateral attenuation of pain after short-duration submaximal isometric exercise. *J Pain* 2007;8:887-92.



What dosage?

- First use dominant hand to determine maximum handgrip contraction strength
- 5 second max contraction
- 1 minute rest
- 40-50% of max contraction for 2 minutes
- 1 minute rest
- 40-50% of max contraction for 2 minutes

Clinical implications:

- What are your thoughts?
- Use of low level isometrics... in non-painful extremity
- As a precursor to daily function
- As a precursor to therapy

Joint mobilizations for Pain modulation?

Joint Mobilization Enhances Mechanisms of Conditioned Pain Modulation in Individuals With Osteoarthritis of the Knee

Courtney 2016

Overall demographics of patients very similar

Characteristic	Total (n = 40)	Impaired CPM (n = 25)	Intact CPM (n = 15)	P
Age, y	53.3 ± 8.28	53.4 ± 8.33	53.3 ± 8.16	
Blood pressure, mmHg				
Systolic	125.53 ± 7.99	127.76 ± 6.87	121.00 ± 9.44	0.04
Diastolic	81.40 ± 7.24	79.27 ± 6.55	77.82 ± 5.87	0.06
Length of pain, y	11.8 ± 8.25	12.2 ± 7.89	9.6 ± 9.47	
Resting pain at the knee (VAS, 0-100 mm)	27.90 ± 24.54	28.03 ± 24.70	27.76 ± 24.31	
Conditioning stimulus pain at the arm (VAS, 0-100 mm)	63.50 ± 12.89	62.23 ± 12.66	64.79 ± 13.05	
BMI, kg/m ²	26.85 ± 3.46	26.85 ± 3.55	26.86 ± 3.25	0.98
Knee Outcome Survey (0%-100%)	45.63 ± 13.73	42.87 ± 12.78	47.77 ± 15.56	0.76
PPT, kPa	103.31 ± 78.13	85.62 ± 59.97	152.68 ± 103.33	0.059
VPT				
Painful affected limb	28.66 ± 8.08	28.91 ± 8.57	28.01 ± 6.43	0.669
Less affected limb	25.55 ± 7.58	25.45 ± 5.33	25.13 ± 8.29	0.463
Comparison of VPT between limbs of dominant				<.01
Concomitant VPT between limbs of dominant				
See Dembla, 1%	27 (67.5)	26 (52)	31 (100)	0.074
See van der Wal, 1%	34 (85)	28 (56)	6 (100)	0.05

Elevated systolic blood pressure in impaired group

Longer duration of pain in impaired group

Musculoskeletal Science and Practice

The immediate cardiovascular response to joint mobilization of the neck - A randomized, placebo-controlled trial in pain-free adults

Yung, Wong 2017

Conditioned pain modulation enhanced!

Variable	Intervention (n = 25)		P Value ^a	Effect Size ^b
	Joint Mobilization ^c	Cetaceous Input Only ^d		
Resting knee pain (VAS, 0-100 mm)				
Baseline	27.34 ± 23.75	26.34 ± 23.86		
Postintervention ^e	9.38 ± 11.04	29.9 ± 26.03	<.0001	0.51
PPT affected knee, kPa				
Baseline	84.18 ± 54.12	88.32 ± 54.12		
Postintervention ^e	115.49 ± 54.19	84.12 ± 54.19	<.0001	0.35
Post-CPM ^f	136.38 ± 54.05	84.67 ± 54.12	.0207	0.20

Management of Lateral Elbow Tendinopathy: One Size Does Not Fit All

FIGURE 6. Wrist extension exercise can be performed over the edge of a table with elastic tubing or free weights. Isometric holds (30-60 seconds in duration) are advocated for reactive or irritable tendinopathy, while concentric and eccentric actions should be performed slowly (4 seconds for each direction), completing 2 to 3 sets of 10 repetitions for patients with less irritable or degenerative tendinopathy. Emphasis is placed on maintaining neutral radial-ulnar deviation of the wrist (by aligning the middle metacarpal bone with the long axis of the forearm). Progression may be achieved by increasing load or performing the exercises with greater elbow extension.

Movement reeducation

FIGURE 6. Sensorimotor palm-side exercise for retraining of wrist extension. With the forearm resting in pronation on a table, the wrist should be slowly extended by sliding the fingertips along the table and lifting the knuckles. Emphasis is placed on avoiding metacarpophalangeal extension and finger flexion. Return to the starting position and repeat 10 times.

Gripping with Wrist in neutral

Looking back....making connections

- Duration > 3 months
- Have you seen many patients with widespread pain?
- High levels of pain and disability leading to poor prognosis and persistent pain?
- Sensitivity to cold?
- Decreased pain free grip strength?
- Complaints of neck and shoulder pain?
- The longer duration pain correlates with decreased PPT and impaired conditioned pain modulation
- Modulating wide spread pain and pain sensitivity via mobilization, isometric exercises, manipulation, neural mobilization, dynamic exercise
- Early focus on modulating pain?

Looking back....making connections

- Involved limb weakness?
- Altered motor control?
- Scapular weakness?
- Movement retraining
- Focus on proximal stability for distal mobility

Advanced manual and movement approaches of the neck-thorax, shoulder region to augment local interventions

Emmanuel Yung, PT, DPT, OCS, FAAOMPT
Clinical Assistant Professor

Clinical Pattern Recognition

JHT READ FOR CREDIT ARTICLE # 154.

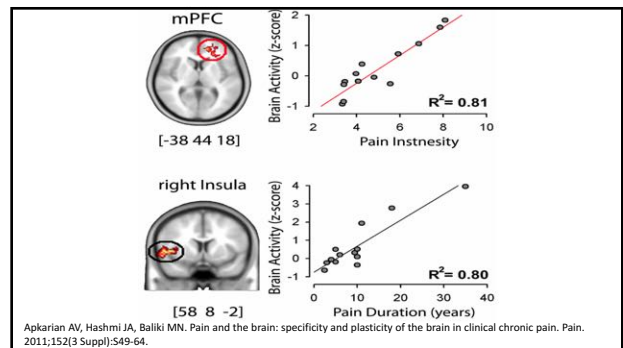
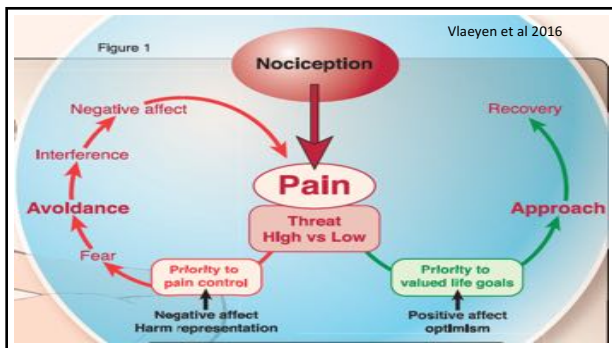
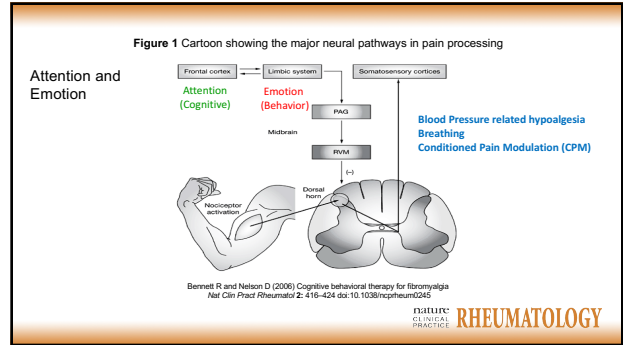
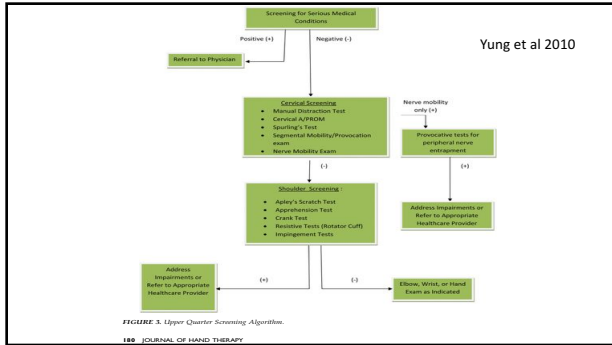
Screening for Head, Neck, and Shoulder Pathology in Patients with Upper Extremity Signs and Symptoms

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ABSTRACT: Narrative Review. Conditions of the head, neck, thorax, and shoulder may occur simultaneously with arm pathology or produce symptoms perceived by the patient to originate in the elbow, wrist, or hand. Identification of the tissue disorder and associated impairments, followed by matching the rehabilitative intervention to address those issues, leads to optimal outcomes. With this goal in mind, the hand therapist needs to recognize clinical findings that signal potentially serious medical conditions of the brain, cervical region, chest, or shoulder. Additionally, low-acuity but potentially debilitating, musculoskeletal or osteogenic pain from proximal sources must also be differentiated from acute pain originating in the elbow, wrist, or hand so that the clinician can decide to further examine and intervene or refer to an appropriate health care provider. This article describes clinical findings that suggest the presence of serious medical pathology in the head, neck, or thorax and presents a screening algorithm to assist in discriminating pain derived from local structures in the distal arm from referred pain originating in the more proximal regions of the shoulder, thorax, neck, or brain.
Level of Evidence: 5.
J HAND THER. 2010;23:173-86.



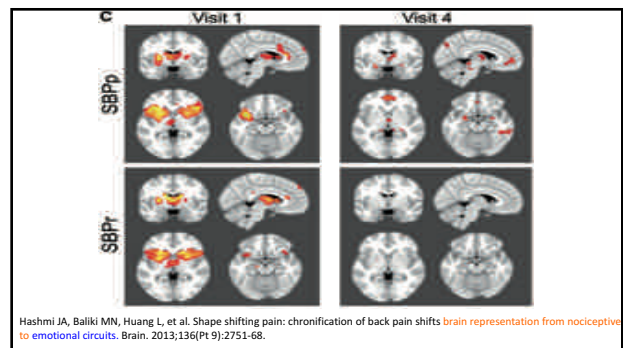
doi:10.1093/brain/awt211 Brain 2013; 136: 2751-2768 | 2751

BRAIN
A JOURNAL OF NEUROLOGY

Shape shifting pain: chronification of back pain shifts brain representation from nociceptive to emotional circuits

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Psychosocial Influences on Low Back Pain: Why Should You Care?

Many PT's would argue that they recognize psychosocial factors...

Evidence suggests that healthcare practitioners are **POOR at identifying psychological factors** associated with LBP

& Foster, 2005

Bishop

O'Sullivan & Lin, 2014

May 2011

Volume 91 Number 5 Physical Therapy

STart Back Screening Tool

Hill et al, 2008 (Keele University)

"A **9-item screening tool** to subgroup patients with LBP based on physical or psychosocial factors useful in matching patients with targeted interventions (Beneick et al, 2013)."

Has **predictive validity for long-term disability outcomes** for patients with LBP in primary care* (Hill et al, 2008) and OP PT (Beneick et al, 2013; Fritz et al, 2011).

*Risk-stratified care vs standard care

↑general health

↑Cost savings of £34 (US \$57.67) in the UK

The STarT Back Screening Tool

Patient name: _____ Date: _____

Thinking about the **last 2 weeks**, tick your response to the following questions:

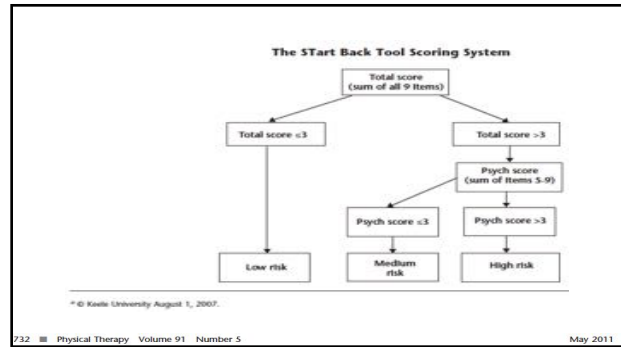
		Disagree 0	Agree 1
1	My back pain has spread down my leg(s) in the last 2 weeks.	<input type="checkbox"/>	<input type="checkbox"/>
2	I have had pain in the shoulder or neck at some time in the last 2 weeks.	<input type="checkbox"/>	<input type="checkbox"/>
3	I have only walked short distances because of my back pain.	<input type="checkbox"/>	<input type="checkbox"/>
4	In the last 2 weeks, I have dressed more slowly than usual because of back pain.	<input type="checkbox"/>	<input type="checkbox"/>
5	It's not really safe for a person with a condition like mine to be physically active.	<input type="checkbox"/>	<input type="checkbox"/>
6	Worrying thoughts have been going through my mind a lot of the time.	<input type="checkbox"/>	<input type="checkbox"/>
7	I feel that my back pain is terrible and it's never going to get any better.	<input type="checkbox"/>	<input type="checkbox"/>
8	In general, I have not enjoyed all the things I used to enjoy.	<input type="checkbox"/>	<input type="checkbox"/>

9. Overall, how bothersome has your back pain been in the last 2 weeks?

Not at all	Slightly	Moderately	Very much	Extremely
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	1	2	3	4

Total score (all 9 items): _____ Psych score (Items 5, 6, 7, 8, 9): _____

732 Physical Therapy Volume 91 Number 5 May 2011



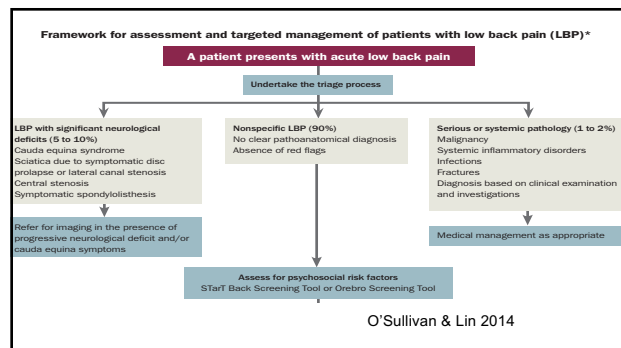
Preliminary Evaluation of a Modified STarT Back Screening Tool Across Different Musculoskeletal Pain Conditions

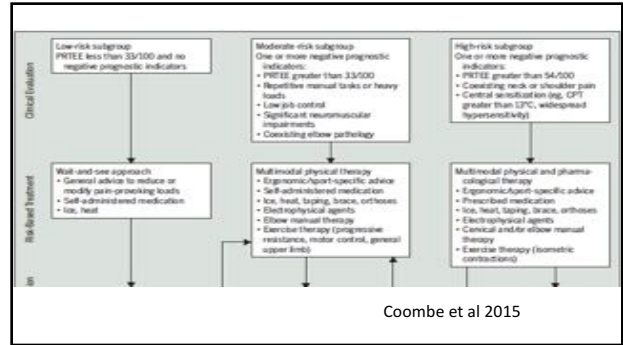
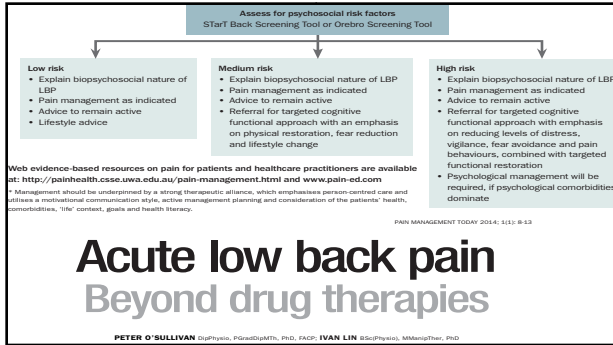
Katie A. Butera, Trevor A. Lentz

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Published Ahead of Print: February 4, 2016
Accepted: January 24, 2016
Submitted: June 1, 2015

Original STarT items	Modified STarT items	Added STarT items
1. My back pain has spread down my leg(s) in the last 2 weeks.	Original STarT	1. My current pain has spread to other body regions at some time in the last 2 weeks.
2. I have had pain in the shoulder or neck at some time in the last 2 weeks.	Original STarT	2. I have had pain in other body regions other than my primary current pain.
3. I have only walked short distances because of my back pain.	Original STarT	3. I have only walked short distances because of my current pain.
4. In the last 2 weeks, I have dressed more slowly than usual because of back pain.	Original STarT	4. In the last 2 weeks, I have dressed more slowly than usual because of my current pain.
5. It's not really safe for a person with a condition like mine to be physically active.	STarT item 5	5. I can't do all the things normal people do because it's too risky for me to get injured.
6. Worrying thoughts have been going through my mind a lot of the time.	STarT item 6	6. I have no worries over something that really doesn't matter.
7. I feel that my back pain is terrible, and it's never going to get any better.	Pain Catastrophizing Scale item 7	7. It's terrible, and I think it's never going to get any better.
8. In general, I have not enjoyed all the things I used to enjoy.	PHQ-9 item 8	8. I have interest or pleasure in doing things.
9. Overall, how bothersome has your back pain been in the last 2 weeks?	Original STarT	9. Overall, how bothersome has your current pain been in the last 2 weeks?

732 Physical Therapy Volume 91 Number 5 May 2011





Reassuring patients: primary care

- About bio-psycho-social nature of acute LBP
- Self care booklet or verbal education
- Evidence-based clinical practice guidelines
- Benign nature
- Generally favorable prognosis
- Advice to stay active
- Graded return to usual activity
- Self-management

Traeger et al 2015
Chou et al 2015

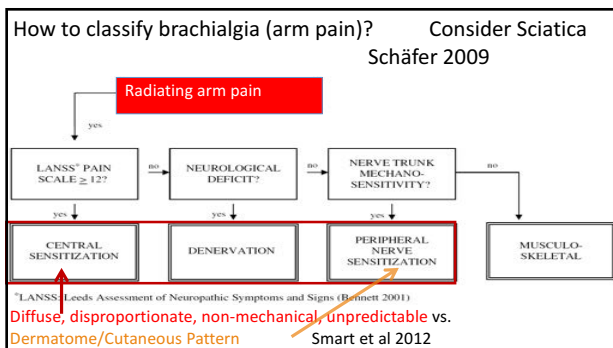
It is cost effective to identify patients who may become chronic early: Central Sensitization

LANSS Pain Scale

Symptom / Sign	Score for "yes"
Does the pain feel like strange unpleasant sensations? (e.g. pricking, tingling, pins/needles)	5
Do painful areas look different? (e.g. mottled, more red/pink than usual)	5
Is the area abnormally sensitive to touch? (e.g. lightly stroked, tight clothes)	3
Do you have sudden unexplained bursts of pain? (e.g. electric shocks, "jumping")	2
Does the skin temperature in the painful area feel abnormal? (e.g. hot, burning)	1
Exam: Does stroking the affected area of skin with cotton produce pain?	5
Exam: Does a pinprick (25 GA) at the affected area feel sharper or duller when compared to an area of normal skin?	3
0 - 12 = likely nociceptive. Score = 12 likely neuroathic	Total

Adapted from: Bennett, M.J. (2001). The LANSS Pain Scale: The Leeds assessment of neuropathic symptoms and signs. Pain, 92(1-2), 147-157. Appendices A and B, pp. 156-157.

The Hartford Institute for Geriatric Nursing
New York University College of Nursing 2009



Randomized Sham-Controlled Trial of a Neurodynamic Technique in the Treatment of Carpal Tunnel Syndrome

JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY | VOLUME 39 | NUMBER 10 | OCTOBER 2009

PubMed
 Ultrasound Med Biol. 2015 Jul;41(7):2062-6. doi: 10.1016/j.ultrasmedbio.2015.03.015. Epub 2015 Apr 11.

Repeatability and Minimal Detectable Change in Longitudinal Median Nerve Excursion Measures During Upper Limb Neurodynamic Techniques in a Mixed Population: A Pilot Study Using Musculoskeletal Ultrasound Imaging.

Phaseltz P¹, Lamontagne M², Higgins J¹, Gleason D¹.

Abstract

This study determined test-retest reliability and minimum detectable change in longitudinal median nerve excursion during upper limb neurodynamic tests (ULNTs). Seven participants with unilateral or bilateral carpal tunnel syndrome and 11 healthy participants were randomly tested with two ULNTs (i.e. tensioner and slider). Each ULNT was performed three times each at 45° and 90° of shoulder abduction on two separate visits. Video sequences of median nerve excursion, recorded by a physical therapist using ultrasound imaging, were quantified using computer software. The generalizability theory, encompassing a G-Study and a D-Study, measured the dependability coefficient (©) along with standard error of measurement (SEM) accuracy and allowed various testing protocols to be proposed. The highest reliability (© = 0.84) and lowest minimal measurement error (SEM = 0.56 mm) of the longitudinal median nerve excursion were reached during the ULNT-slider performed with 45° of shoulder abduction and when measures obtained from three different image sequences recorded during a single visit were averaged. It is recommended that longitudinal median nerve excursion measures computed from three separate image sequences recorded during a single visit be averaged in clinical practice. Ideally, adding a second visit (six image sequences) is also suggested in research protocols.

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RESPONSE OF PAIN INTENSITY TO SOFT TISSUE MOBILIZATION AND NEURODYNAMIC TECHNIQUE: A SERIES OF 18 PATIENTS WITH CHRONIC CARPAL TUNNEL SYNDROME

Paul J. O'Connell, MPT, PhD, FRCPT, FRCPT (Ed), FRCPT (UK), FRCPT (AUS), FRCPT (CAN), FRCPT (NZ), FRCPT (S.A.), FRCPT (INDIA), FRCPT (JAPAN), FRCPT (KOREA), FRCPT (MALAYSIA), FRCPT (PHILIPPINES), FRCPT (RUSSIA), FRCPT (THAILAND), FRCPT (USA), FRCPT (UK), FRCPT (VIETNAM)

Fig. 1. Longitudinal slides over the anterior radial nerve.
 Fig. 2. Soft tissue mobilization of the posterior nerve mass.
 Fig. 3. Longitudinal slides over the ligament apparatus.
 Fig. 4. Soft tissue mobilization of the posterior radial nerve.

Fig. 5. Ultrasound neurodynamic technique targeted in the median nerve. A. Shoulder girdle depression, glenohumeral abduction and lateral rotation, separation of the forearm, elbow flexion and wrist flexion and finger extension. B. Shoulder girdle depression, elbow flexion and forearm extension, abduction of the forearm, elbow extension and wrist flexion and finger flexion.

Table 1. PPTs before an

Practical Application

- The application of soft tissue mobilization and nerve neurodynamic technique in women with chronic CTS did not improve widespread pressure pain sensitivity; however, the intensity of hand pain was decreased.

	Pre	Post	SEM	95% CI
Median nerve affected	151 (48)	168 (45)	198 (60)	17 (2 to 31)
Median nerve unaffected	147 (50)	167 (53)	180 (50)	20 (5 to 34)
Ulnar nerve affected	360 (110)	395 (126)	374 (96)	35 (1.5 to 75)
Ulnar nerve unaffected	351 (120)	354 (123)	373 (94)	3 (-18 to 45)
Radial nerve affected	281 (77)	288 (123)	309 (85)	7 (-40 to 54)
Radial nerve unaffected	289 (84)	302 (108)	310 (100)	13 (-26 to 53)

* Statistically significant group × time effect (repeated-measures ANOVA, P < .05).

Local and UE treatment may NOT be enough!

Journal of Orthopaedic & Sports Physical Therapy
 Official Publication of the Orthopaedic and Sports Physical Therapy Sections of the American Physical Therapy Association

Effectiveness of Manual Physical Therapy to the Cervical Spine in the Management of Lateral Epicondylalgia: A Retrospective Analysis

Joshua A. Cleland, DPT, OCS¹
 Julie M. Whitman, PT, DSc, OCS, FAAOMPT²
 Julie M. Fritz, PT, PhD, ATC³

J Orthop Sports Phys Ther 2004;34:713-724

Conclusion:

- Local and Cervical Manual Therapy had high self reported long term outcome
- Local therapy **combined** with Cervical manual therapy group took fewer visits to get better **5.6 vs 9.7 visits**

JOSPT

EMMANUEL YUNG, PE, DPT, MA, OCS, FRCMPPT¹ • MICHAEL WONG, PE, DPT, OCS, FRCMPPT¹
 HADDIE WILLIAMS, PE, DPT, ATC² • KYLIE MADRICH, PE, DPT³

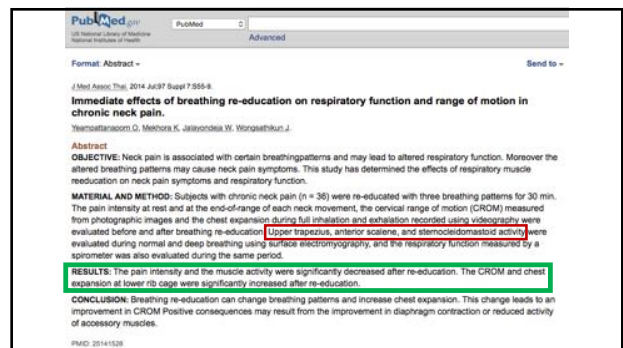
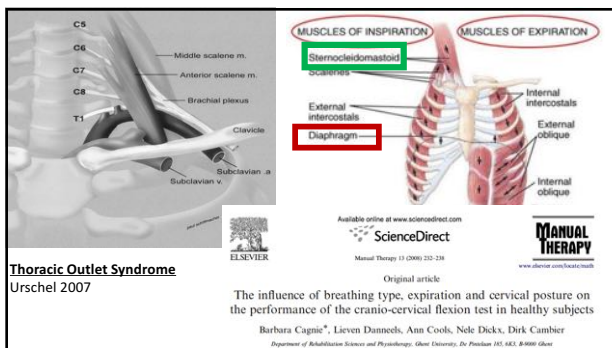
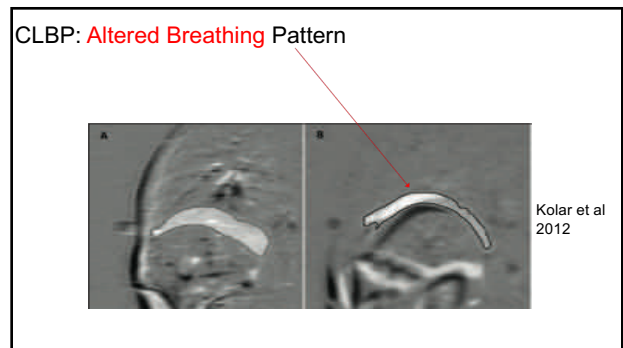
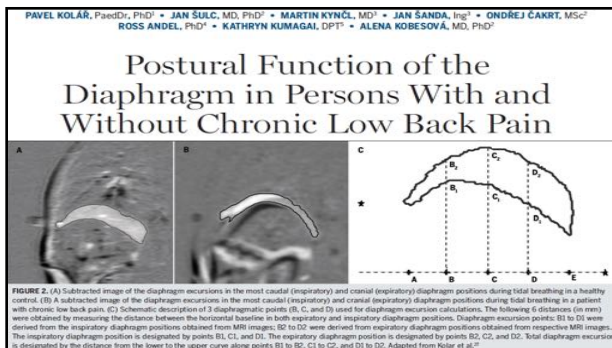
Blood Pressure and Heart Rate Response to Posteriorly Directed Pressure Applied to the Cervical Spine in Young, Pain-Free Individuals: A Randomized, Repeated-Measures, Double-Blind, Placebo-Controlled Study

TABLE 2 WITHIN-GROUP COMPARISONS*		
Measure/Time	AP Group (n = 22)	Flexion Group (n = 17)
Heart rate, bpm		
Baseline to first intervention set	-13 (-45, 19)	16 (-08, 40)
Baseline to 10th intervention set	-31 (-24, 25)	76 (-2, 33)
Baseline to postintervention	-28 (-46, -10)	02 (-14, 16)
Systolic blood pressure, mmHg		
Baseline to first intervention set	00 (-23, 14)	-06 (-23, 11)
Baseline to 10th intervention set	-24 (-24, 66)	14 (-8, -33)
Baseline to postintervention	-24 (-32, -10)	-26 (-42, -10)
Diastolic blood pressure, mmHg		
Baseline to first intervention set	-06 (-24, 12)	08 (-10, 28)
Baseline to 10th intervention set	-11 (-22, 04)	-03 (-24, 23)
Baseline to postintervention	-12 (-30, 06)	-10 (-31, 10)

Abbreviations: AP, anterior-to-posterior pressure.
 *Values are mean difference (95% confidence interval).
 †Significant difference (P < .05).

Suggest **sympatho-inhibition**

May be useful for **chronic pain + high blood pressure**
 ? Impaired BP-related hypoalgesia, PPT, and CPM?



Summary: Diaphragmatic breathing for central sensitization

- In patients with **high level of disability and pain**
- **Focus their attention away** from the **UE** (primary source of pain)
- **Diaphragmatic breathing** helps them to **reduce muscle tone** in accessory respiratory muscles known to induce **nerve entrapment**
- **Relaxation:** ↓ psychosocial factors (added benefits)

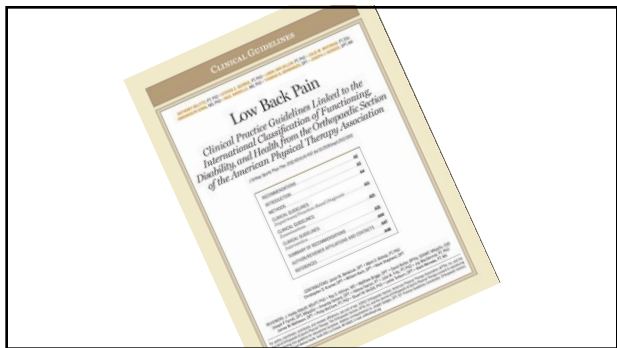
Managing associated impairments

Local tissues vs. Associated impairments

- C/S & T/S mobility impairments (Fernandez-de-las-penas 2010)
- Neurodynamics & STM (De-la-Llave-Rincon 2012, Bialosky 2009)
- Central sensitization- breathing (Cagnie 2008, Yeampattanaporn 2014)
- Scapular impairments (Bhatt et al 2013, Day et al 2015)

Managing neurodynamics

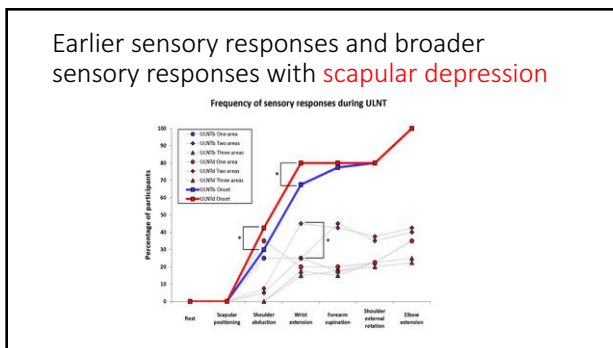
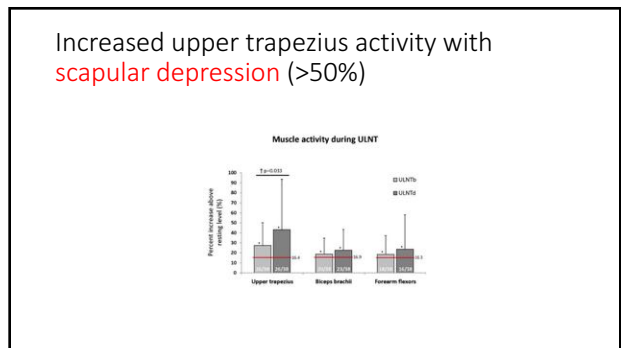
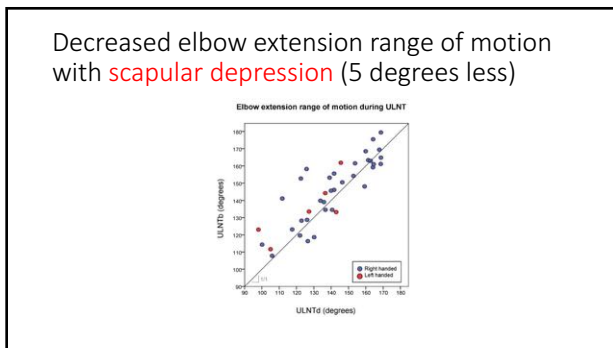
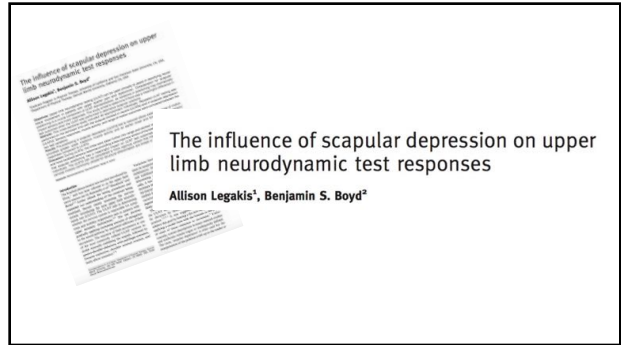
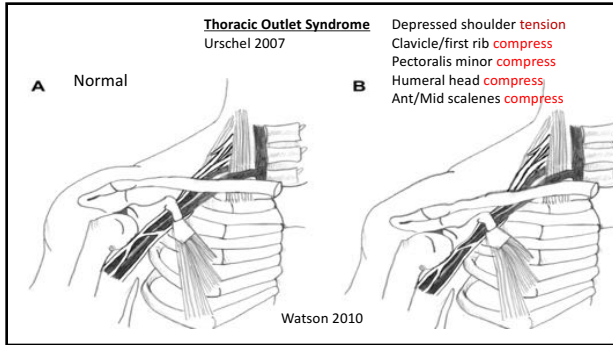
- Acute
- Sub-acute
- Chronic



Acute Low Back Pain with	Acute low back pain with associated (narrow band of) pain in the involved lower extremity	Lower extremity radicular symptoms that are present at rest or produced with initial mid-range spinal mobility, lower-limb sensory tests, straight leg raising, and/or slump test	Signs of nerve root involvement may be present	It is common for the symptoms and impairments of body function in patients who have acute low back pain with radiating pain to also be present in patients who have acute low back pain with related (preferred) lower extremity pain	Lower extremity radicular symptoms that are present at rest or produced with initial mid-range spinal mobility, lower-limb sensory tests, straight leg raising, and/or slump test	Signs of nerve root involvement may be present	It is common for the symptoms and impairments of body function in patients who have acute low back pain with radiating pain to also be present in patients who have acute low back pain with related (preferred) lower extremity pain
Acute Radiating Pain	<ul style="list-style-type: none"> • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Lower extremity paresthesias, numbness, and weakness may be reported
Subacute Low Back Pain with Radiating Pain Lumbago with sciatica	<ul style="list-style-type: none"> • Subacute, recurring, mid-back and/or low back pain with associated radiating pain in the involved lower extremity • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Subacute, recurring, mid-back and/or low back pain with associated radiating pain in the involved lower extremity • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Subacute, recurring, mid-back and/or low back pain with associated radiating pain in the involved lower extremity • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Subacute, recurring, mid-back and/or low back pain with associated radiating pain in the involved lower extremity • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Subacute, recurring, mid-back and/or low back pain with associated radiating pain in the involved lower extremity • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Subacute, recurring, mid-back and/or low back pain with associated radiating pain in the involved lower extremity • Lower extremity paresthesias, numbness, and weakness may be reported 	<ul style="list-style-type: none"> • Subacute, recurring, mid-back and/or low back pain with associated radiating pain in the involved lower extremity • Lower extremity paresthesias, numbness, and weakness may be reported

- Patient education in positions that **reduce strain or compression** to the involved nerves
- **Manual traction**
- **Entrapment reduction**
- exhibit mobility deficits
- Manual or mechanical traction
- Nerve mobility and slump exercises in the mid- to end ranges to improve the mobility of central (dural) and peripheral neural elements

(continued)



- Clinical implications of **scapular depression**:
- May **strain** nervous tissues
 - Increases sensitivity of the nervous system
 - Reduces ROM
 - Muscle guarding

Managing Acute radiating pain: via **scapula**

- **Unload** the **depressed scapula**
- Decrease muscle guarding
- Decrease sensory responses
- Unwind the brain's expectations of movement and pain/paresthasias

Use of Cyriax **Release** Maneuver:
Reduce tension or **compression**

Scapular associated impairments:

Journal of Orthopaedic & Sports Physical Therapy

JOSPT

JITEN B. BHATT, PT, MPT¹ • RANDAL GLASER, PT, DPT¹ • ANDRE CHAVEZ, PT, DPT¹ • EMMANUEL YUNG, PT, DPT^{1*}

Middle and Lower Trapezius Strengthening for the Management of Lateral Epicondylalgia: A Case Report

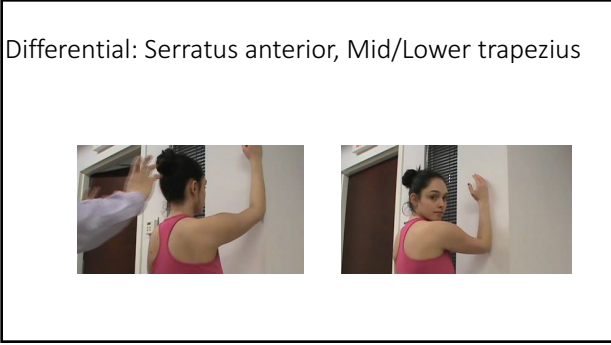
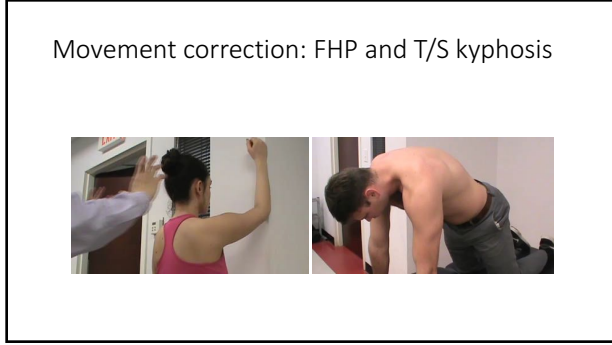
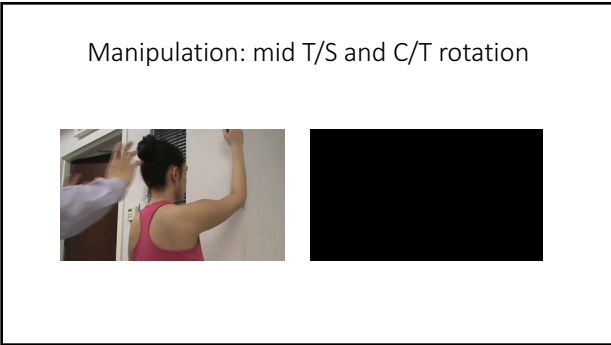
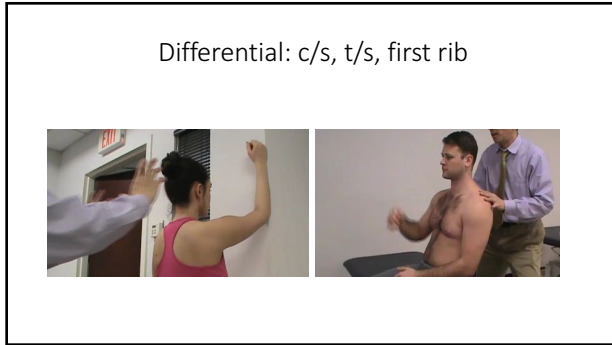
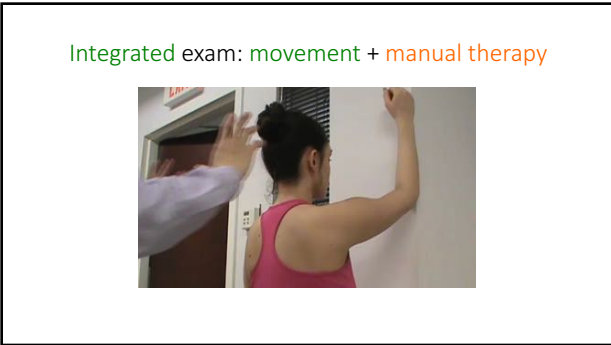
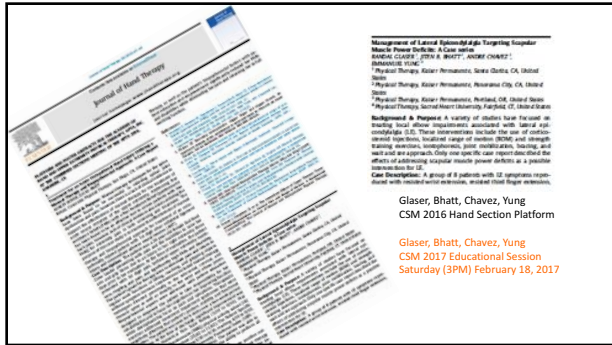
J Orthop Sports Phys Ther 2013;43(11):841-847

Bhatt, Glaser, Chavez, Yung 2013

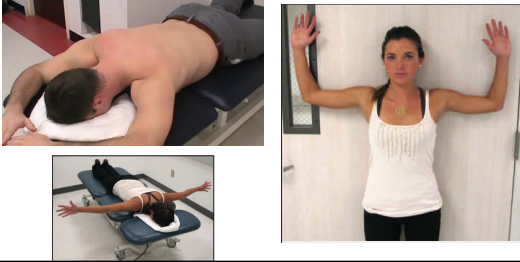
FIGURE 5. Scores on the DASH questionnaire over the course of treatment and at 2- and 6-month follow-ups. DASH scores vary from 100 to 0, with a lower score showing improvement in function. Abbreviation: DASH, Disabilities of the Arm, Shoulder and Hand.

Bhatt, Glaser, Chavez, Yung 2013

FIGURE 6. Scores on the NPRS over the course of treatment and at 2- and 6-month follow-ups. NPRS scores vary from 10 to 0, with a lower score showing decrease in pain. Abbreviation: NPRS, numeric pain rating scale.



Progression of mid/lower trapezius: NWB to **WB**

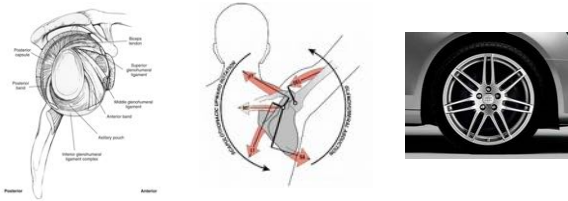


Stabilize scapula: differential rotator cuff



Optimize: **Precise Movement**

- Point of Instantaneous Center of Rotation (**PICR**)-
Margareta Nordin, PT, ScD Shirley Sahrmann, PT, PhD, FAPTA
- Point around which a rigid body rotates at a given instant of time



Centered GHJ: eccentric ER (w/stable scapula)



Concentric neutral ER (scapula freely moving):
traditional vs lead w/fingers "scooping"



Emphasizing ER w/shoulder elevation



Centered GHJ: concentric ER w/scapula moves freely



Summary

1. **Stratifying patients** according to central sensitization (LANSS) and psychosocial risks (mStarT Back Tool)
2. **Focus attention away** from local tissue (i.e. diaphragmatic breathing, proximal scapular strengthening)
3. **Neck AP** mobilization not only addresses nerve entrapment sites, may affect sympathetic nervous system (i.e. lowers SBP/HR)
4. Nerve mobilization & STM reduce pain sensitivity
5. **Manual and movement** approaches to optimize movement

Acknowledgement



Models:

Allison Breakey, DPT
 Lindsey McAlonan, DPT3
 APTA Student Assembly Board of Directors, SPT Delegate
 Erika Doyle, DPT3
 Scott Sheehan, DPT3

Video/Audio:

Jason Grimes, PT, PhD, DPT, OCS, Clinical Assistant Professor
 Sophia Andrews, DPT
 Ariel Branden, DPT3, Jamie O'Donoghue, DPT3 and Shanna Bonaparte

Advanced cervico-thoracic and shoulder movement and injury analysis- professional sports (NFL and/or MLB) case examples

Stephania Bell, PT, MPT, OCS, CSCS
 Senior Injury Analyst

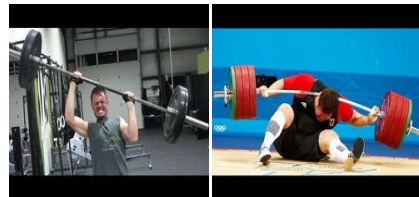


Physical Therapy Management of a Patient With Long-Standing Wrist and Elbow Pain

Major Jeremiah Y. Samson, PT, ScD(C), OCS, COMT, FAAOMPT


What Does A Physical Therapist Do?

- Treat Movement Dysfunction



Targeted Tissue Specific Treatment

- Ultrasound
- Cross Friction Massage
- Local Injection
- * Laser
- * Ice Massage



PT examination

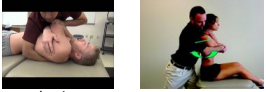
- **ID specific pathological condition**
 - Diagnosis specific treatment
- **ID movement dysfunction leading up to pathological condition**
 - Impairment based treatment
 - Movement dysfunction/Impaired mechanics
 - Address strength/flexibility issues which contribute to impaired motion
 - Motor retraining
 - Address joint and/or soft tissue restriction

Regional Interdependence

- **Treat areas away from the identified tissue source have been shown to be beneficial**

The Short-Term Effects of Thoracic Spine Thrust Manipulation on Patients With Shoulder Impingement Syndrome
Robert E. Boyle, Bradley M. Pittard, Brian M. Miracle, Daniel M. Barling, Mary S. Paul, Josef H. Moore, Shari L. Koppenhaver, Robert S. Wainner

Findings:

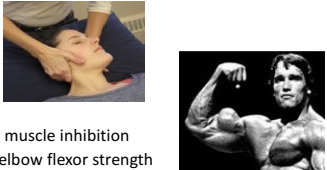


- Decrease in self reported pain measures
- Reduction in level of disability (SPADI)

Upper Quarter

Decrease in Elbow Flexor Inhibition After Cervical Spine Manipulation in Patients with Chronic Neck Pain
Esther Suter, Gordon McMorland

Findings:

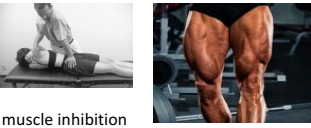


- Decreased muscle inhibition
- Increased elbow flexor strength

Lower Quarter

Decrease in Quadriceps Inhibition After Sacroiliac Joint Manipulation in Patients with Anterior Knee Pain
Suter, E. McMorland, G. Herzog, W. Bray, R

Findings:



- Decrease in muscle inhibition
- Increase in knee extensor torque and activation

Patient

- 45 y/o female
- VA Medical Coder
- Referred to PT by Occupational Therapist providing treatment to her R wrist
- Receiving concurrent Physical Therapy intervention for R shoulder pain

Occupational Therapy Intervention (R wrist pain)

DASH (Initial Eval) – 50%

- Paraffin
- Fluidotherapy
- Moist Heat
- Soft tissue mobilizations of carpal tunnel canal

DASH (6 Wks OT treatment) – 50%

- Grip strengthening
- Tendon gliding exercises
- Median nerve gliding exercises at the hand
- Wrist/Forearm stretching
- Ergonomic education

Physical Therapy Intervention (R shoulder pain)

SPADI – 38/50, DASH – 51/80 (Initial Eval)

- AC joint mobilizations
- 1st rib mobilizations
- Median nerve glides

SPADI/DASH – N/A

- RTC strengthening
- Resisted Scapular retractions
- R scalene stretch
- R SCM stretch

Patient

- UQS/Med Screen requested by OT
- no trend for improvement after 6 wks of intervention
- **DASH (Initial Eval) – 50%**
- **DASH (6 Wks OT treatment) – 50%**

- **Worsening :**

Why med screen

- R/O red/yellow flag conditions

Concept of subgroup & targeting for primary care low back pain

- Insight from START Back Tool

Screening Conclusions

- R/O cervical myelopathy/Central Nervous System
 - Negative TIC
- Reports declining function
- Limited cervical motions
- Palpation findings

~ Questionable history regarding relationship to wrist/UE symptoms

~ Altered/Reproduced distal symptoms

* Will require detailed PT Examination

Body Chart

- R UE pain
- R wrist/hand paresthesia
- R shoulder/Scapular pain
- Neck Pain
- Worsening headaches

- Body Chart Clarification – All symptoms related

History/Subjective


- Chief Complaint: Right upper extremity numbness and tingling with pain along Right arm down to the wrist.
- NPRS: 8/10
- Onset - Sudden (lifting a bag)
 - ER/ED visit
 - Wrist Sprain
- Duration – 2 yrs
- Trend – Worsening

History/Subjective


- Worst in AM
- Cough/Sneeze – positive for symptom provocation
- Balance/Fine Motor – positive for difficulty holding on to light objects with RUE
- Sitting > Standing
- Intermittent PCM visits

Medical Interventions

- ER visit – Hydrocodone
- Renew/Continuation of opioid pain medication

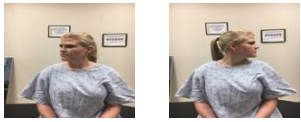


- Received 2nd prednisone taper x 2 wks prior to detailed c-spine evaluation



Physical Exam Findings


- Observation – fwd head/rounded shoulders/thoracic kyphosis
- Cervical AROM – limited R rotation with symptom provocation



- All motions reproduced RUE symptoms at end range

Physical Exam Findings (contd)


- AROM - Pain and limited R arm abduction to approx. 135 degrees



- PROM – WNL's B shoulders
- Hypomobility/Symptom provocation with CPA's/R UPA's: C4-T4

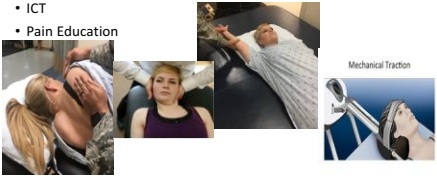
Physical Exam Findings (contd)

- Positive Spurling's, limited rotation to R, Positive Cervical Distraction Test



Revised Treatment Plan

- PA mobilizations to affected levels of thoracic spine
- Cervical side glides to affected levels of cervical spine
- Scapular AROM/Isometrics
- Gravity Eliminated Shoulder AROM/AAROM
- ICT
- Pain Education



Response to Treatment

- **NPRS – 4/10**
- Cervical Rotation – ROM unchanged, **pain remains 4/10 at end range**
- Shoulder Abduction – AROM prior to onset of pain unchanged, **pain remains 4/10 at first onset of AROM**
- Pain location: most dominant in area of axilla and C/T junction

Response to Treatment

- Symptoms in RUE primarily paresthasias, **no longer classify as pain**
- Improved function with **ADL's**
- Has **not taken opioid medication**

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Thoughts/Questions to Ponder

- **> 1 yr before inclusion of pain education and treatment to the proximal segments/axial skeleton!**
- *treat for the cervico-thoracic region sooner?*
- *include pain education sooner?*
- *evidence intervention directed at/around the spine?*
- *evidence for inclusion of pain education?*
- *evidence on how to address specific impairments/movement dysfunction?*

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Treatment for the cervico-thoracic region
The initial effects of a cervical spine manipulative physiotherapy treatment on the pain and dysfunction of lateral epicondylalgia
 Bill Vicenzino, David Collins, Anthony Wright

- Improved PPT
- Improved PFG
- Improved neurodynamics and pain scores

Immediate Hypoalgesic and Motor Effects After a Single Cervical Spine Manipulation in Subjects With Lateral Epicondylalgia
 Josue Fernandez-Carnero, Cesar Fernandez-de-las-Penas, Joshua A. Cleland

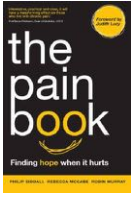
- Increased PPT
- Increased PFG force

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Pain Education

Identification
 * START Back Tool: 8
 LANSS Pain Scale: 16



- Hyperalgesia
- High Fear/Anxiety Level
- Physical contact to cervicothoracic spine provokes distal symptoms




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Pain Education

Long Term: Physical functioning, vitality, mental health, general health perception
 Van Oosterwijk et al, 2013

Positive effect on pain, disability, socialization, and physical performance
 Louw et al, 2011



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Proposed Algorithm

- Med Screen (rule out potential serious conditions)
- Eval
 - ID pathology when possible
 - ID impairments/movement dysfunction or factors leading to movement dysfunction
- Review available evidence for best treatment for ID'd impairment
- Continuously monitor response to treatment by rechecking impairments to determine if you are on the right track

Yung et al

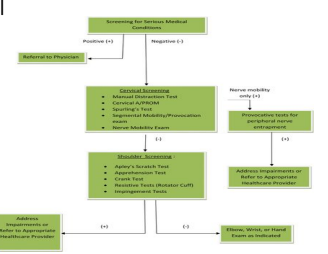


FIGURE 8. Upper Quarter Screening Algorithm.
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Closing Thoughts

- Check proximal segments all the way to the spine
- Dismiss need for further PT given that the patient was receiving PT and OT
- Much credit to our hand therapist (OT), recognized the need for screening
- We can do a better job of identifying those patients who would benefit from proximal treatment and pain education

Questions




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Thank you!




- Videos available at
- Youtube.com: PhysioU
- Playlist: CSM 2017 Advanced Interventions
- https://www.youtube.com/playlist?list=PLRwUa2CZ-5fXZooavcyh1_oSf6xRncud






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