

HOW TO CLINICALLY ASSESS & PLAN A MOVEMENT REHABILITATION STRATEGY FOR PEOPLE WITH MILD TO MODERATE UPPER CERVICAL INSTABILITY

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Upper Cervical Instability (UCI)

- Upper cervical instability (UCI) is a common and potentially debilitating problem in people with hypermobility spectrum disorders and hypermobile Ehler's Danlos Syndrome
- **Mild-Moderate UCI is underdiagnosed due to poor diagnostic evaluation and severity classification of UCI. Furthermore, clinicians often lack consensus on management of UCI in this population**

Our recent publication (Russek et al 2023) provides expert consensus recommendations on this dilemma

(presented in Concurrent Session 8: MSK-B)



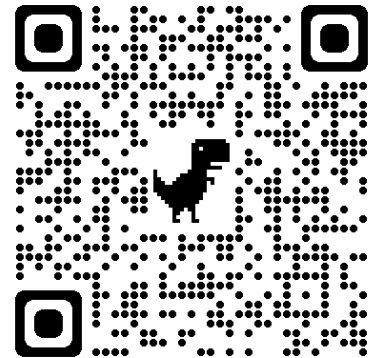
Mild to Moderate Upper Cervical Instability (UCI)

How To session:

- Review of aspects relating to the examination of people with suspected UCI and practical demonstration of relevant postural evaluation, sensorimotor control screening, and active movement evaluation.
- A flow chart detailing graded movement control retraining strategies will be presented for use in clinical practice.

Learning materials provided include downloadable content of relevant tests and strategies for graded movement control retraining

Accessible via QR code link:



Mild to Moderate Upper Cervical Instability (UCI)

Hypermobility = ↑ physiological ROM

Laxity = ↑ accessory / translation motion

Instability is about being unable to control motion at the joint (usually both above)

Indications of UCI

- **Symptoms of either musculoskeletal or neurological UCI** (table: Russek et al, 2023)
- **Symptoms are altered by neck movement or position:**
- **Symptoms are mechanically irritable:**
 - (Caution !) Condition is easily flared and is disproportionate compared with provoking insult or activity
 - Prolonged time to calm after flare – both pain and other symptoms (e.g. nausea, dizziness, other neurological symptoms)

Highly suggestive:

- Heavy/bobble head
- Supporting head/neck decreases symptoms
- Apprehension about travel in vehicle or neck movement
- Lump in throat – trouble swallowing
- Clicking/clunking in neck with movement
- Cervical sensorimotor symptoms – tinnitus, dizziness

Common:

- Post occiput pain
- Suboccipital headaches
- Brain fog
- Inconsistent or poor response to treatment of the neck
- Flare to cervical manual traction or longitudinal compression

Symptoms will be altered by neck movement or pattern:

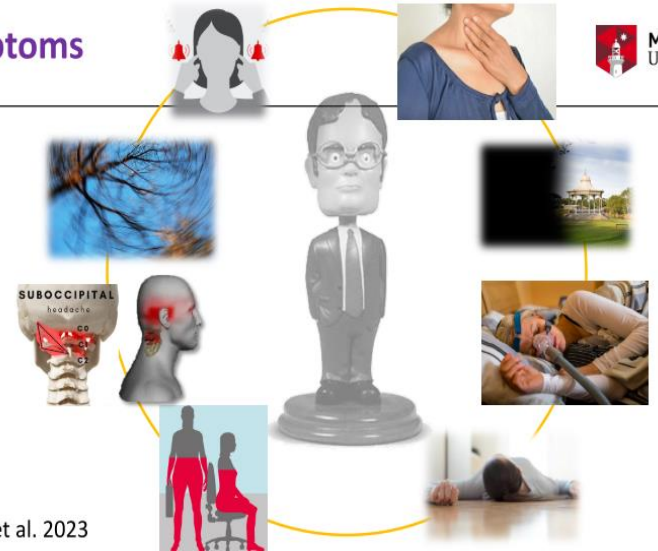
- Leaning forward/looking down
- Prolonged upright (poked chin or rigid upright)
- Apprehensive about cervical extension
- Concerned regarding manual therapy assessment

Mild to Moderate Upper Cervical Instability (UCI)

Symptoms Suggestive of Musculoskeletal or Neurological Upper Cervical Instability

	Common	Highly suggestive
Musculoskeletal UCI		
· Heavy/bobble head, you feel like you need to support or brace your head to decrease symptoms		X
· Apprehension about initiation or maintenance of neck movement or travel in vehicle		X
· Lump in throat, trouble swallowing		X
· Consistent clicking or clunking in the neck associated with neck movement		X
· Cervical sensorimotor symptoms such as tinnitus, dizziness		X
· Suboccipital headaches; Yoke/coat-hanger distribution pain; Neck tension, muscle spasm	X	
· Brain fog	X	
· Inconsistent or poor response to treatment for the neck	X	
· Sleep disturbance, snoring, sleep apnea	X	
Neurological UCI		
· Seizure-like activity, diagnosis of 'non-epileptic seizures' or 'pseudo seizures'		X
· Passing out not associated with dysautonomia (are provoked by neck motion, or without POTS symptoms)		X
· Lump in throat, choking, trouble swallowing, voice changes		X
· Dysautonomia not responding to standard treatment	X	X
· 'Boat rocking' instability (not due to musculoskeletal issues); Ataxia: Poor coordination (not due to joint instability)		X
· Facial tingling/numbness; Pulling sensation in face, head, teeth, tongue (muscle contraction, not just pain)		X
· Vision changes- trouble with convergence, double vision, aura (teichopsia)		X
· Dystonia: involuntary muscle contractions causing involuntary movements or postures		X
· Intermittent dysesthesias (numbness or tingling) in the limbs, not associated with local issues		X
· Sleep disturbance, snoring, sleep apnea	X	
· Cognitive changes, more than brain fog		X

Symptoms



MACQUARIE University

Russek et al. 2023

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Mild to Moderate UCI: Postural evaluation Supplementary Video: 01a

Postural 'Collapse'

- Thoracic slumped in flexion
- Shoulders slouched in forward tilt / depression
- Forward head in low cervical flexion
- +/- Chin poke in upper cervical extension

Correction:

- Lift sternum 'sit tall' - thoracic extension brings head balanced back over the trunk
- Lift shoulders up & back
- Elongate neck (occiput tall)
- Relaxed chin down (avoid chin retraction)



Mild to Moderate UCI: Postural evaluation

Supplementary Video: 01b

Postural 'Rigidity' (protective posture)

- Head retraction / chin 'tuck' / tight jaw (muscle co-contraction & Hyoid dominance)
- Shoulders pulled down with maximal (often active) scapular depression to increase tension in the scapulo-cervical muscles to produce fascial stabilisation of the cervical spine with multiple multi joint muscles

Correction: (caution)

- Support head sitting, standing or lying
- Lift shoulders up (unload shoulder off the head)
- Relaxed chin down ('release' chin retraction)
- Retrain deep stabiliser muscle contribution



Mild to Moderate UCI: Active movement evaluation

CAUTION !

- Ask patient about “apprehension” to a particular movement before getting them to perform the movement
- Stop if symptom provocation is unexpected or “not their normal”
 - pain, dizziness, visual disturbance, autonomic responses
- note the quality / smoothness of movement
 - not just the range of movement

Mild to Moderate UCI: Active movement evaluation

Head / Cervical Rotation

Supplementary Video: 02a

Observe for compensatory chin poke or sidebending during rotation

- assess scapula influence on head rotation ROM
 - with scapula in natural resting alignment
 - with scapula supported in maximum upward rotation / elevation (myofascial unloading)
 - with scapula held in maximum downward rotation / depression (myofascial loading)



Mild to Moderate UCI: Active movement evaluation

Supplementary Video: 02b

Head / Cervical Flexion

Observe for:

- increased upper cervical flexion (hyper mobile)
- increased low cervical flexion (stiff and flexed cervico-thoracic ‘bump’)
- decreased cervical flexion (locked lordosis – prominent fascia nuchae)



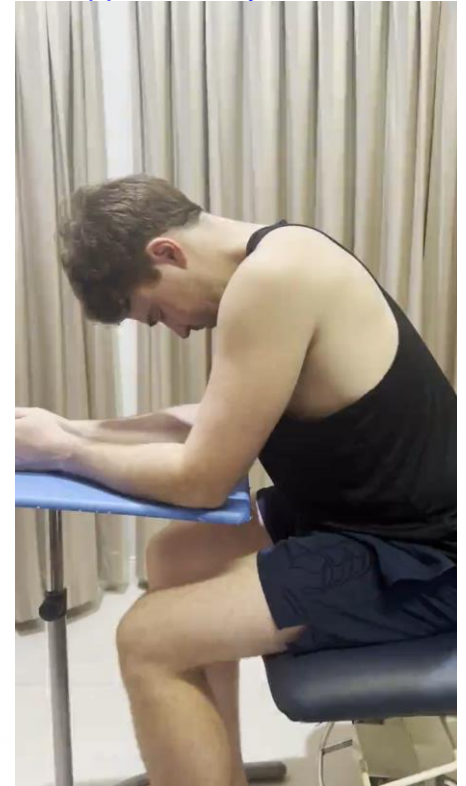
Mild to Moderate UCI: Active movement evaluation

Supplementary Video: 02c

Head / Cervical Extension

Observe for:

- movement initiated with upper cervical extension
- increased upper cervical extension ROM (hyper mobile)
- decreased low cervical extension (stiff, flexed C-T 'bump')
 - **sitting supported forward lean (arms on table)**



Mild to Moderate UCI: Active movement evaluation

Supplementary Video: 02d

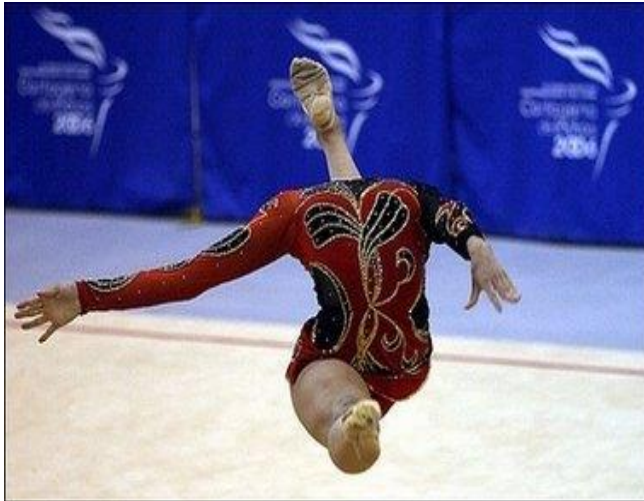
Head / Cervical Extension

Observe for:

- movement initiated with upper cervical extension
- increased upper cervical extension ROM (hyper mobile)
- decreased low cervical extension (stiff, flexed C-T 'bump')

– +/- sitting upright
(head supported by hands)

**** Caution:**
often more than 100 degrees



Mild to Moderate UCI: Sensorimotor evaluation

Trunk-Head Co-ordination

Supplementary Video: 03a



- Keep the head still, focus on a spot in front of you
- Turn trunk as far as you can from left to right.
 - ❑ Inability to keep head still when moving trunk

(Treleaven et al 2020)

Supplementary Video: 03b



Mild to Moderate UCI: Manual joint / articular assessment

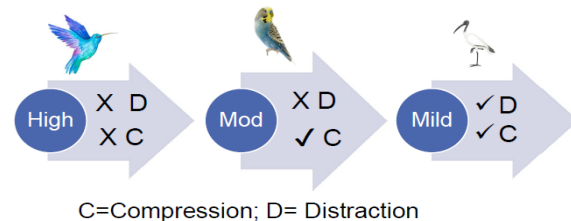
CAUTION !

- Supine with head supported in neutral alignment
- Ask patient about “apprehension” to therapists ‘handling’ / palpation positioning
- Palpate for hypermobile translation/ gliding movement
- Observe & palpate for muscle spasm / guarding that limits assessment
- Stop if symptom provocation is unexpected or “not their normal”
 - pain, dizziness, visual disturbance, autonomic responses

Mild to Moderate UCI: Manual joint / articular assessment

Manual Distraction / Axial Compression

Supplementary Video: 04a



Clinical Tip:

- **Mild UCI:** distraction & compression both feel good. (generally, happy with manual assessment)
- **Moderate UCI:** apprehensive about distraction but compression feels stable. (caution with manual assessment)
- **Severe / Irritable UCI:** apprehensive with both - doesn't tolerate either very well. (avoid or limit manual assessment)

Mild to Moderate UCI: Manual joint / articular assessment

Upper Cervical (C₀₋₁₋₂₋₃) Anterior (P-A) Glide/Translation

Supplementary Video: 04b



Supplementary Video: 04bx



Mild to Moderate UCI: Manual joint / articular assessment

Upper Cervical (C₀₋₁₋₂₋₃) Lateral Glide/Translation

Supplementary Video: 04c



Supplementary Video: 04cx



Mild to Moderate UCI: Cognitive movement control Ax

Testing AND Rehab

Train the upper cervical stabiliser muscles to maintain isometric upper cervical neutral alignment while coping with the challenge of moving at an adjacent (non-symptomatic) adjacent joint or region

Supplementary Video: 05a

Supplementary Video: 05b

Cognitive Upper Cervical Flexion Control:

- control / prevent / limit upper cervical flexion
- + move independent low cervical flexion
- Ideal starting point for flexion symptom management in functional activities



Cognitive Upper Cervical Extension Control:

- control / prevent / limit upper cervical extension
- + move independent low cervical extension
- Ideal starting point for extension symptom management in functional activities



Mild to Moderate UCI: Cognitive movement control Ax

Upper Cervical Flexion Control

Supplementary Video: 05a

Cognitive Upper Cervical Flexion Control: Testing AND Rehab

- control / prevent / limit upper cervical flexion
+ move independent low cervical flexion

Train the upper cervical stabiliser muscles to maintain isometric upper cervical neutral alignment while coping with the challenge of moving at an adjacent (non-symptomatic) adjacent joint or region

- Ideal starting point for flexion symptom management in functional activities



Mild to Moderate UCI: Cognitive movement control Ax

Upper Cervical Extension Control

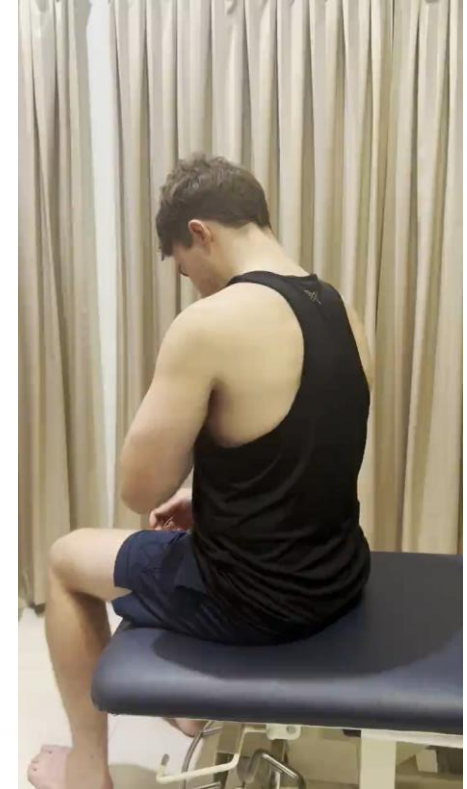
Supplementary Video: 05b

Cognitive Upper Cervical Flexion Control: Testing AND Rehab

- control / prevent / limit upper cervical extension
+ move independent low cervical extension

Train the upper cervical stabiliser muscles to maintain isometric upper cervical neutral alignment while coping with the challenge of moving at an adjacent (non-symptomatic) adjacent joint or region

- Ideal starting point for extension symptom management in functional activities



Mild to Moderate UCI: Deep local Stabiliser activation

Upper Cervical Deep Anterior Flexor Stabilisers

(caution !)

Supplementary Video: 06c



Cognitive activation of the deep cervical flexor muscles:

Testing AND Rehab

- **Isometric recruitment efficiency**

Train the deep upper cervical flexor local stabiliser muscles to recover recruitment efficiency to control intersegmental translation

Progressions:

- small mid-range positioning away from supported neutral alignment (e.g. 1/4 rotation)
- unsupported head load (high incline sitting then progress to supine)

Mild to Moderate UCI: Deep local Stabiliser activation

Upper Cervical Deep Posterior Extensor Stabilisers

Supplementary Video: 06b



Cognitive activation of the deep suboccipital extensor muscles:

Testing AND Rehab

- **Isometric recruitment efficiency**

Train the deep suboccipital extensor local stabiliser muscles to recover recruitment efficiency to control intersegmental translation

Progressions:

- small mid-range positioning away from supported neutral alignment (e.g. 1/4 rotation)
- isometric pressure down into the towel/pillow
- unsupported head load

If there are non-provocative directions of neck movement and provocative directions of neck movement: - move away from provocation in the direction of relieving or non-provocative movement



Cognitively, isometrically control / prevent / limit / minimise movement in the upper cervical spine (palpation or visual feedback to maintain a neutral mid-range position), then move at an adjacent sites / region (e.g. lumbo-pelvic – thoracic spine – scapula – low cervical spine)



Facilitate recruitment / activation of the Global Stabiliser (GS) muscles in the neck (lower Cx spine & upper cervical spine). Priority is given to GS muscles that can isometrically or eccentrically control the provocative / 'unstable' movements

- A. Isometric activation in neutral positions
- B. Small range concentric-eccentric movement towards shortened range (i.e. inner range hold & eccentric return)
- C. Concentric activation through the full available inner range of motion and eccentric control through the non-provocative outer (often hypermobile) range of motion



• Inhibit recruitment substitution & increase flexibility / extensibility of the over-active Global Mobiliser (GM) synergists



- Add fatiguing resistance with a 'rotation challenge' (prioritise GS synergist) to increase strength & endurance efficiency
- Add a perturbation / unpredictable displacement challenge

If there are **NO** non-provocative directions of neck movement (i.e. all directions of neck movement are provocative) - consider whether this is due to:

- a) nociceptive central sensitisation (clinical tip: symptoms do not respond to peripheral analgesics or NSAID medication) – Often requires central acting neuromodulator medication
- and / or
- b) multidirectional uncontrolled translational movement (clinical tip: symptoms do respond well to peripheral analgesics or NSAID medication) – Requires prioritisation of Local Stabiliser (LS) muscle recruitment and retraining



Facilitate recruitment / activation of the Local Stabiliser muscles in the neck (upper Cx spine +/- lower cervical spine) to control excessive / hypermobile intersegmental displacement / translation

- Cognitive isometric recruitment of LS synergists: Initially in a supported mid-range neutral position – with progression into recruitment in multiple different mid-range positions and then into unsupported postures

Mild to Moderate UCI:

Graded Motor Control Retraining:

Principles & Strategies for Upper Cervical Instability

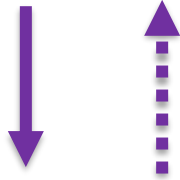
All cognitive recruitment and active movements are performed with low / minimal contraction force (non-fatiguing) and initially with isometric activation and then progressing slowly through small ranges of motion.

Progression into larger ranges of motion is only considered after careful evaluation of tolerance

Mild to Moderate UCI: Graded Motor Control Retraining: Principles & Strategies for Upper Cervical Instability

'Safe' Active Movement

If there are non-provocative directions of neck movement and provocative directions of neck movement: - move away from provocation in the direction of relieving or non-provocative movement



Cognitive 'Site & Direction' Movement Control Training

Cognitively, isometrically control / prevent / limit / minimise movement in the upper cervical spine (palpation or visual feedback to maintain a neutral mid-range position), then move at an adjacent sites / region (e.g. lumbo-pelvic – thoracic spine – scapula – low cervical spine)



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Mild to Moderate UCI: Graded Motor Control Retraining: Principles & Strategies for Upper Cervical Instability

Global Stabiliser Functional Range Control Efficiency

Facilitate recruitment / activation of the Global Stabiliser (GS) muscles in the neck (lower Cx spine & upper cervical spine)

- **Priority is given to GS muscles that can isometrically or eccentrically control the provocative / 'unstable' movements**
 - A. Isometric activation in neutral (mid-range) positions
 - B. **Small range** concentric-eccentric movement towards shortened range (i.e. inner range hold & eccentric return)
 - C. **Concentric** activation through the full available inner range of motion and **eccentric control** through the non-provocative outer range of motion (often hypermobile)

Global stabiliser muscles: retrain full range efficiency

- longus colli (flexor stabilisers)
- multifidus / semispinalis (extensor stabilisers)
- serratus anterior - open and closed chain
- lower trapezius
 - concentric inner range movement
 - isometric Inner range hold
 - eccentric control against gravity

Mild to Moderate UCI: Sensorimotor Movement / Position Sense Retraining

Patterns on wall - follow with laser for feedback

- **Progressions:**

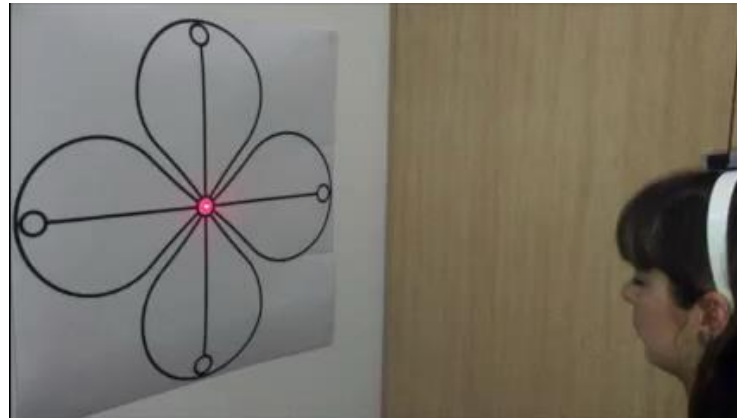
- Increase speed
- More difficult and intricate patterns
- Smaller finer movements

Supplementary Video: 03c



Accuracy training

Supplementary Video: 03d



Velocity training

abcdefghijklmnopqrstuvwxyz

Global Stabiliser Functional Range Control Efficiency

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Global Mobiliser Extensibility & Inhibition

Inhibit recruitment substitution & increase extensibility of the over-active Global Mobiliser (GM) synergists

Beware: inhibit these muscle with caution!

They may be the "last line of defence"

- Ensure some efficient recovery of the global stabiliser synergists prior to inhibiting & lengthening these muscles

Mild to Moderate UCI: Graded Motor Control Retraining: Principles & Strategies for Upper Cervical Instability

Global mobiliser muscles:
recover extensibility &
inhibit excessive substitution

- sterno-cleido-mastoid
- scalenes
- levator scapula
- splenius / longissimus
- pectoralis minor
- latissimus dorsi
- ? hyoids

Global Stabiliser Functional Range Control Efficiency

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Global Mobiliser Extensibility & Inhibition

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Cervical Muscle: Strengthening, Endurance & Perturbation Tolerance Training

- Add fatiguing resistance with a 'rotation challenge' (GS synergist facilitation)
- Axial loading functional progressions
- Perturbation / unpredictable displacement challenge

Mild to Moderate UCI:

Graded Motor Control Retraining:

Principles & Strategies for Upper Cervical Instability

Strength / Resistance Training tips:

? Value of external resistance to sagittal movement

❑ Rotation Challenge

- rotation or lateral movements away from midline
- asymmetrical loading via shoulder girdle movements or trunk positioning

❑ Axial Loading

- light weights or resistance band on top of head
- combined with small rotation / lateral flexion movements

❑ Perturbation training

- unstable base control (e.g. sitting on balance board / ball)
- maintain Cx neutral during fast alternating arm movements

Mild to Moderate UCI:

Graded Motor Control Retraining: Principles & Strategies for Upper Cervical Instability

If all movement directions are Provocative

(there are NO non-provocative directions of movement)
- consider whether this is due to either:

- nociplastic central sensitisation – often requires central acting neuromodulator medication
- multidirectional uncontrolled translational movement
 - Requires prioritisation of Local Stabiliser (LS) muscle recruitment and retraining**

Local Stabiliser Recruitment Efficiency

Facilitate recruitment / activation of the Local Stabiliser muscles in the neck (upper Cx spine +/- lower cervical spine) to control hypermobile intersegmental displacement / translation

Cognitive isometric recruitment of LS synergists:

- Initially in a supported mid-range neutral position
- progression into recruitment in multiple different mid-range positions
- then into unsupported postures

When ALL movement directions are provocative:
Clinical tips for differentiating primary multi-directional instability related pain from dominant central sensitisation pain

- both pain mechanisms are usually coexisting in varying proportions
- multidirectional instability related pain responds to NSAIDs & peripheral analgesics – central sensitisation does not
- Cognitive low threshold local stabiliser activation is symptom reducing & decreases apprehension for instability
... BUT it may be symptom provoking & increase apprehension and anxiety in central dominant pain

Local stabiliser muscles: recover recruitment efficiency & translation control

- sub-occipital cuff
- longus colli (medial fibres)
- cervical multifidus (segmental fibres)
- upper trapezius & fascia nuchae

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Augmented cervical spine support

Taping to unload the upper quadrant from the neck & head

- Dynamic tape
- Rigid tape
- Soft collar options and advice (e.g. mediprotect)
- Rigid collar options and advice (e.g. aspen vista)
- ? Surgical stabilisation options

Taping benefits:

- Unload upper quadrant to ↓ neck pain & ↑ neck function
- Support scapular in upward rotation
- ↑ Proprioceptive facilitation for scapula & spine
- Unload Thoracic Outlet & ↓ arm pain
- Protect neuro-dynamic sensitivity
- ↓ Shoulder impingement pain & biomechanics
- Stabilize A-C joint & ↓ pain

Augmented cervical spine support

Taping to unload the upper quadrant from the neck and head

Supplementary Video: 07a



Dynamic Tape option

(www.dynamictape.com)

Supplementary Video: 07b



Rigid Tape option



Thank You

Mark Comerford

Lucy Thomas

Sharon Hennessey

Clifton Chan,

Leslie Nicholson

Nicole Frost,

Julia Treleaven



Supplementary content accessible via QR code link: