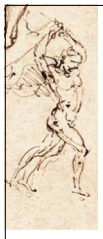
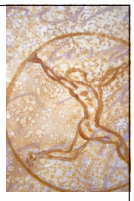


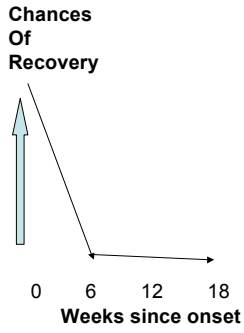


VII) Rehabilitation of the Cervical Spine

L A SPORTS AND SPINE

I) Neck Pain Problem

- **Acutes** have excellent prognosis & require minimal care
- **Chronics** are notoriously difficult to treat
- **Subacutes** can benefit the most from a concerted new management approach



Perpetuating Factors – Psychosocial

- WAD II patients w/ neuropsychologic problems have a worse prognosis over a 3 year follow-up period.
- "…it would be logical to focus the health care system's limited resources on these patients."

Tenenbaum A, Rivano-Fischer M, Tjell C, et al. The Quebec Classification and a new Swedish classification for whiplash-associated disorders… J Rehabil Med 2002;34:114-118.

Assessment

- The false positive rate for imaging in the neck is as high as 75% with the asymptomatic population

Boden SD. McCowin PR, Davis Do, Dina TS, Mark AS, Wiesel S. Abnormal magnetic-resonance scans of the cervical spine in asymptomatic subjects. J Bone Joint Surg 1990;72A:1178-1184.

Assessment

- "In patients with neck pain, there is no difference in reported pain and disability levels between those with and those without evidence of cervical spine degeneration."
  - Mean age of pts – 49 years old

Peterson C, Bolton J, Wood AR, Humphreys BK. A cross-sectional study correlating degeneration of the cervical spine with disability and pain in United Kingdom patients. Spine 2003;28:129-133.

Assessment

- A 10 year prospective study found no predictive value of degree of cervical lordosis and future
  - neck pain
  - degenerative changes

Gore DR. Roentgenographic findings in the cervical spine in asymptomatic persons. A ten-year follow-up. Spine 2001;26:2463-2466.

Why structural pathology & pain don't usually correlate

- Most WADs experience mild soft-tissue injury which does not cause tissue failure and goes undetected by static imaging
- In these injuries the soft tissues are not torn, but are stretched beyond their elastic limit resulting in **instability** and poor healing.

Panjabi MM, Nibu K, Cholewicki J. Whiplash injuries and the potential for mechanical instability. Eur Spine J;7:484-492, 1998.

Assessment - BPS

Tests w/ greatest correlation to pain/disability

- Altered motor control
  1. Altered muscular activity (EMG)
  2. Head repositioning error (kinesthetic sense)
  3. Cranio-cervical flexion incoordination
- Neural provocation testing
- Yellow flags

Assessment – Tests (neck)

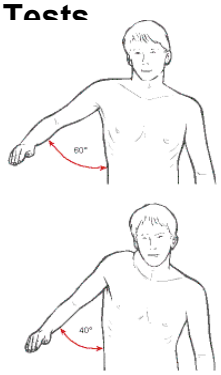
1. Altered muscular activity - EMG

- Underactivity of agonists and overactivity of synergists was able to discriminate chronic WAD's from those who had recovered with 88% accuracy.

Edgerton VR. Wolf SL, Levendowski DJ, Roy RR. Theoretical basis for patterning EMG amplitudes to assess muscle dysfunction. Med Sci Sp Exer;28:744-751, 1996.

Assessment - Tests

- Increased upper scapulae m. activity & decreased lower scapulae fixator activity during arm tasks



Nederhand MJ, Ijzerman MJ, Hermens HK, Baten CTM, Zilvold G. Cervical muscle dysfunction in the chronic whiplash associated disorder Grade II(WAD-II). Spine;15;1938-1943, 2000.

Assessment - Tests

- ↑ EMG activity of the upper trapezius is present in patients w/ cervicogenic headache while performing computer tasks requiring concentration.

Bansevicius D, Sjaastad O: Cervicogenic headache: The influence of mental load on pain level and EMG of shoulder-neck and facial muscles. Headache 1996;36:372-378.

Assessment - Tests

- ↑ activity of the SCM & anterior scalene muscles during low load repetitive upper limb tasks was found in whiplash or idiopathic neck pain patients.

Bilenkij G, Falla D, Jull G. An EMG analysis of neck muscle activity during a repetitive upper limb task in patients with whiplash and idiopathic neck pain (submitted for publication)

Assessment - Tests

2. Repositioning Error (cervical kinaesthesia)

- The ability to reproduce neck positions in space is compromised in neck pain individuals
  - w/ eyes closed pts usually overshoot neutral by at least 5° (3 cm)
  - Normal error is < 2 °

Loudon JK, Ruhl M, Field E. Ability to reproduce head position after whiplash injury. Spine 1997;22:865-868.

Assessment - Tests

- WAD individuals with **dizziness** have increased neck repositioning error
- "Cervical mechanoreceptor dysfunction is a likely cause of dizziness in WAD"

Trelealvan J, Jull G. Sterling M. Dizziness and unsteadiness following whiplash injury: characteristic features and relationship with cervical joint position error. J Rehabil Med 2003; 35:36-43.

Assessment - Tests

3. Cranio-cervical flexion incoordination – p872

- Pts w/ headache or chronic neck pain were less able than asymptomatics to control progressively ↑ range of C0-C1 flexion.

Jull G, Barret C, Magee R, Ho P : Further clinical clarification of the muscle dysfunction in cervical headache. Cephalgia 19: 179-185,1999.

Jull GA. Deep cervical flexor muscle dysfunction in whiplash. Journal of Musculoskeletal Pain 8:143-154, 2000.

Assessment - Tests

- A positive test occurs with:
  - **overactivation of the superficial neck muscles** (SCM)
  - chin poking
    - Loss of pressure on cuff

Assessment - Tests

- *Chronic Neck Pain vs Asymptomatic Subjects:*
  - ↓ activity in the deep neck flexor muscles
  - Incr. activity of the superficial SCM muscles
- Reduced performance of the craniocervical flexion test is associated with dysfunction of the deep cervical flexor muscles

- *Falla DL, et al. Spine. October 1, 2004; Vol. 29, No. 19, pp. 2108-2114.*

Assessment Tests

4. Neural provocation test – Upper Limb Tension Test (ULTT) – p472

- Median nerve/brachial plexus test
- "the straight leg raise test" of the upper extremity

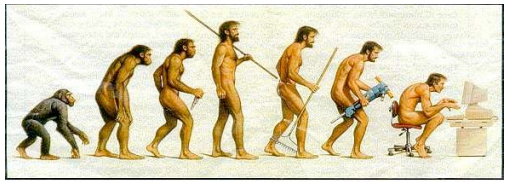
Assessment Tests

- ULTT is a reliable test with greater diagnostic accuracy than even M, S & R exam!
  - All patients had suspected cervical radiculopathy or carpal tunnel syndrome
  - EMG used as "gold standard" for diagnosis

Wainner RS, Fritz JM, Irrgang JJ, et al. Reliability and diagnostic accuracy of the clinical examination and patient self-report measures for cervical radiculopathy. Spine 2003;28:52-62.

II) Functional Pathology of the Motor System

Homo-Sapian to Homo-sedentarius



Somewhere, something went terribly wrong

JANDA

- Modern lifestyle is very sedentary with prolonged, constrained postures being the norm for ADL's
- "homo sedentarius" or "homo erectus vulgaris"
- Postural muscles are overactivated with resultant loss of flexibility, stability, and strength

1. Predictable Muscle Imbalances

- Certain muscles have a tendency to become hypertonic, while other have the opposite tendency towards hypotonicity. These muscles are predictable.

Recent Evidence about Muscle Substitution from UCLA

- Altered muscle activation ratios of synergist spinal muscles was found during a variety of motor tasks in whiplash patients.
- Underactivity of agonists and overactivity of synergists was able to discriminate pain patients with 88% accuracy.

Edgerton R

What does this picture tell us?

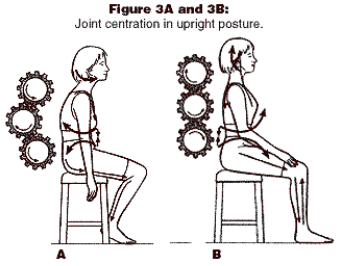
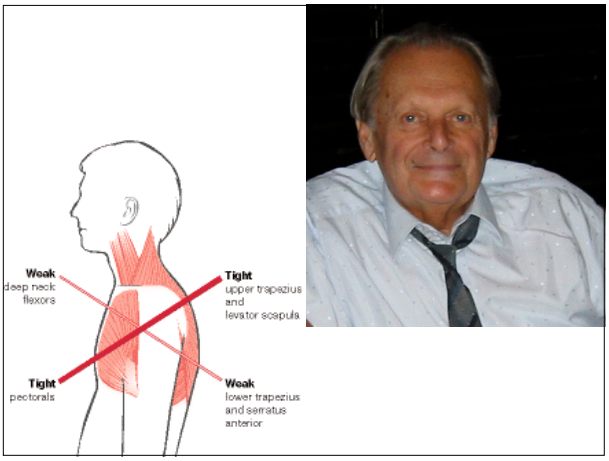


Figure 3A and 3B:
Joint centration in upright posture.

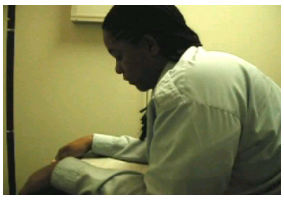


UPPER CROSSED SYNDROME

- 1. mid & lower trapezius **X levator scapulae & upper trapezius**
- 2. serratus anterior **X pectoralis minor**
- 3. longus coli & longus capitus **X suboccipitals, SCM**

Treatment - Evidence

- Treatments (**manual therapy** & **exercise)** which improve cranio-cervical flexion coordination speed recovery in chronic WADs



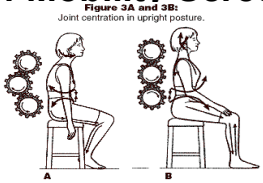
Jull G, Trott P, Potter H, Zito G, Niere K, Emberson J, Marschner I, Richardson C. A randomised control trial of physiotherapy management of cervicogenic headache. Spine 2002;27:1835-1843

III) Assessment of AMC

A Functional Screen:

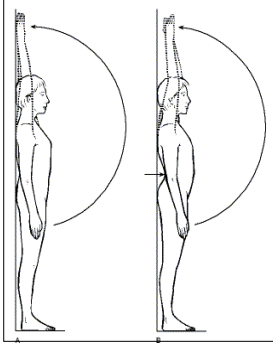
- T4 screen (wall angel)
- Respiration
- Push-up
- Arm abduction
- Janda's neck flexion test
- C0-C1 flexion

1. T4 Mobility Screen



- **Indications:** poor posture in sagital plane
- 2 lordosis should meet between T4-8
- When they don't upright posture is compromised
  - Head forward posture >> Head/neck pain
  - Round shoulders >> Cervico-brachial pain
  - Sway back >> LBP

T4 – Arm Overhead Test



Procedure:

- standing w/ back against a wall or door
- instruct patient to raise their arms overhead

P/F criteria:

Failure if:

- L/P junction hyperextends
- arms don't reach vertical plane
- thoracic kyphosis remains

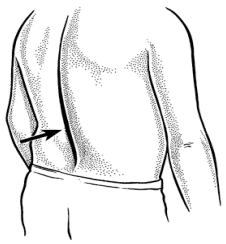
T4 Mobility Screen

- **Test**
- Stand vs. wall w/ arms externally rotated/supinated & feet slightly forward
- Try to flatten back
- Record
  - Does back flatten
  - Where does pt. feel tension (mid-back, left or right side, neck)

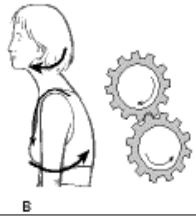
T4 Dysfunction

Signs of Global Muscle Hypertonus

- T/L hypertrophy

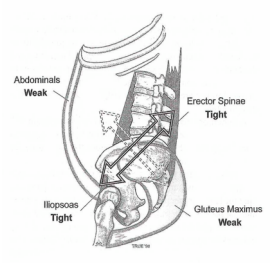


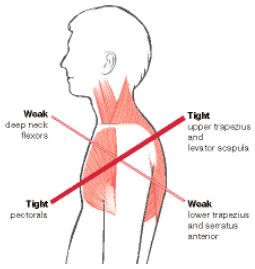
- Head forward/round shouldered posture



T4 Dysfunction

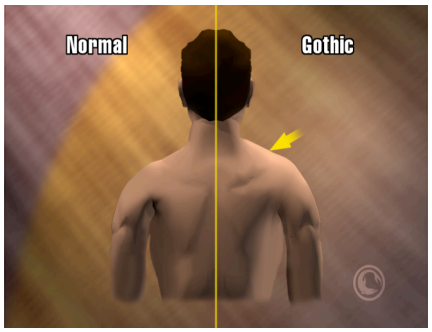
LCS UCS





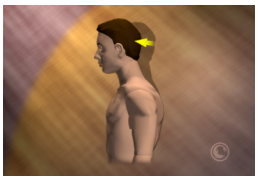
T4 Dysfunction

Shrugged shoulders



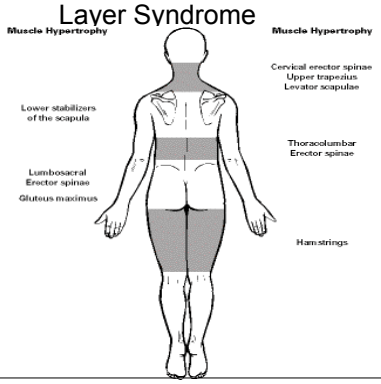
T4 Dysfunction

Rounded shoulders



T4 Dysfunction

Layer Syndrome



Practice Management – T4

- If + tx:
  - T4-8 extension mobilizations
    - Foam
    - Sphinxes
  - Squats
  - Brugger
  - Breathing reeducation
  - Pull – backhand manouvres

2. Respiration

- Most common faulty movement pattern
- Dysfunctional respiration usually occurs with **vertical** chest breathing predominating over lower abdominal and lower rib cage **horizontal** breathing
- Scalene & upper traps overactivity & poor abdominal function result from faulty breathing

Respiration

Test A:

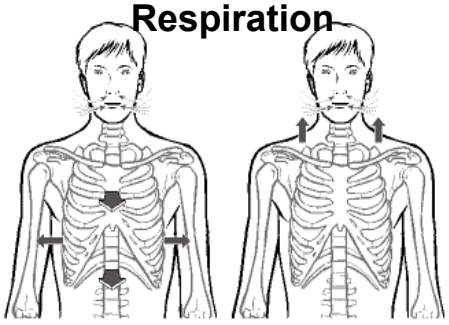
- seated

P/F criteria:

Failure if during normal inhalation

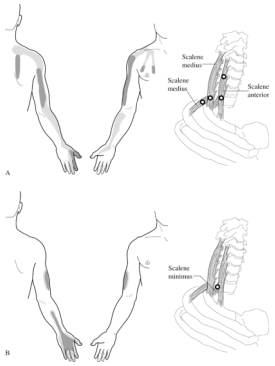
- Observe if clavicles or shoulders elevate
- Palpate if lower rib cage does not widen in the horizontal plane

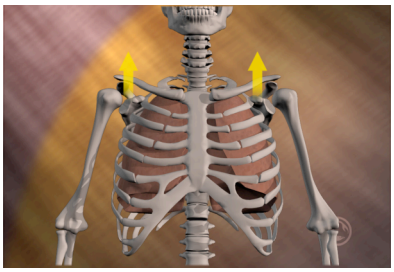
Respiration



- Correct
- Faulty

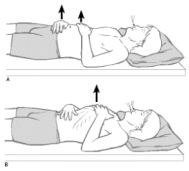
Myofascial Pain





Supine - test

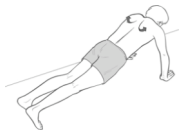
- Score
- **P/F criteria:**
- Failure if during normal inhalation
  - Observe if chest breathing predominates over abdominal breathing (**minor dysfunction**)
- Observe if during inhalation the abdomen moves in, rather than out (paradoxical respiration – **major dysfunction**



If + treatment

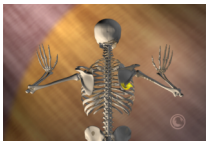
- General relaxation training w/ belly breathing supine on floor or foam
- Brugger active exhalation (navel in)
- PIR scalenes
- T-spine CMT
- Practice breathing & bracing with all core exercises

3. Push-Up



- **Indications:** winged scapulae, shoulder distorders
- **Procedure:** lower trunk from a push-up position
- Score
- Fail if:
  - Scapulae retracts
  - Scapluae wings
  - Shoulders shrug

- **Winged Scapulae**



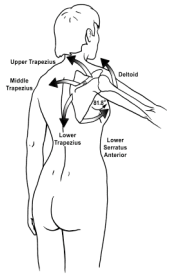
- **Scapulae Retraction**

If + treatment

- Relax pecs, upper traps, lev scap
- Push-up w/ +, tripod, serratus punch, angle lunge with reach, push training w/ bands or pulley

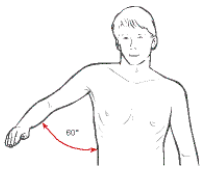
4. Arm Abduction

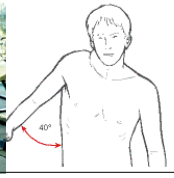
- Shrugged shoulders
- Neck pain
- Headaches
- Rotator cuff disorders



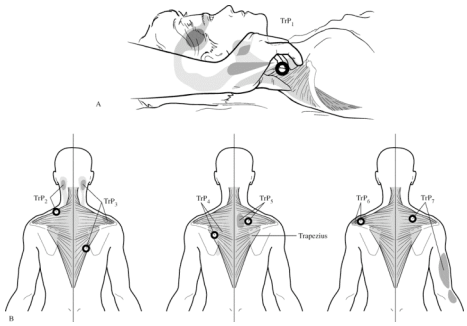
4. Arm Abduction

- a. Scapulo Humeral Rhythm
- During the "setting phase" – 1st 60° shoulder should not elevate



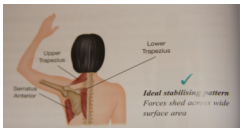


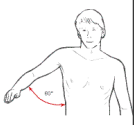
Myofascial Pain



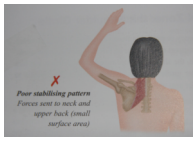
Faulty Biomechanical Movement Pattern - Reaching

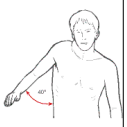
- Ideal arm raising w/ shoulder relaxed





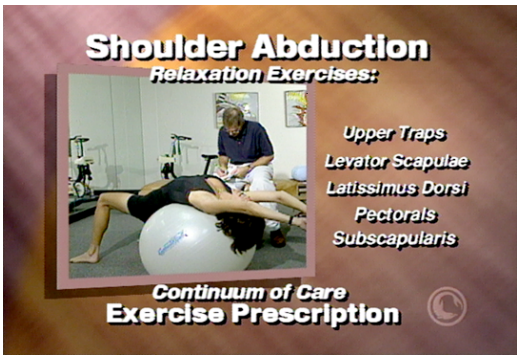
- Poor pattern due to shrugging the shoulder up





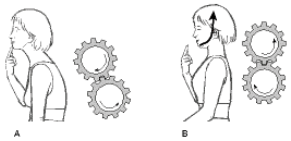
If + treatment

- Mobilize kyphosis
- ST facilitations
- PIR upper traps, lev scap
- Scap depression training: pull downs, push/pull, sword

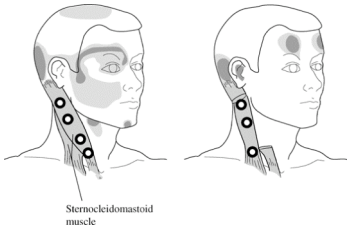


5. Janda's Neck Flexion Test

- Indications:
  - Head forward posture
  - Headache
  - Neck pain

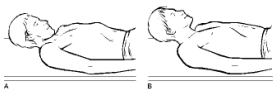


Myofascial Pain



5. Janda's Neck Flexion Test

- Procedure
- Slowly raise head up from table towards chest
- Alternative test:
  - Clinician pre-positions head 1cm off table
  - Patient instructed to hold position steady



Score

- **Fail if:**
- Chin protrusion
- SCM overactivity
- Shaking

If + tx:

- SCM, suboccipital, and upper trapezius PIR
- T4-8 mobilization
- Breathing reeducation
- Cervico-cranial flexion motor retraining (nodding in supine, prone, sitting & standing positions)

6. Cervico-Cranial Flexion

– A positive test occurs with:
  - **overactivation of the superficial neck muscles** (sternocleidomastoid)
  - inability to hold a **constant pressure** with the head against a pressure sensor at all test levels
  - an inability to target higher pressure levels (**26-30mmHg**).

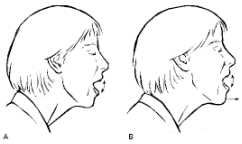
Cervico-Cranial Flexion

Test

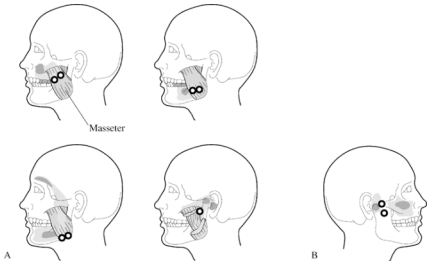
- Pt. demonstrates nodding motion
- Inflate cuff to 20 mmHG
- Pt. ↑'es pressure to 22 mmHG & holds for 10s
- Pt. tries to ↑ pressure to 24, 26, 28 & 30 mmHg

7. Mouth Opening Test

- **Test:** patient open mouth wide
- **Score:** fail if
  – Less than 3 finger width excursion
  – Chin protrudes at initiation



Myofascial Pain

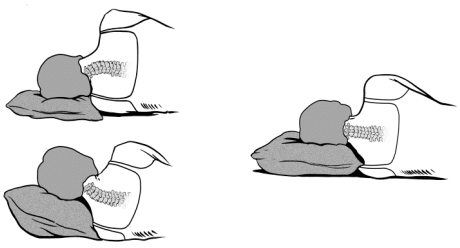


If + treatment

- Mobilize thoracic kyphosis, hyoid, TMJ, c-spine
- PIR lateral ptyergoids, masseters, upper traps, lev scap
- Co-C1 flexion training, Scap depression training, digastricus facilitation, retrusion re-training

IV) Workstation Ergonomics monitor height

Sleep Ergonomics pillow height



Ergonomics
Carrying

- Flexing wrist

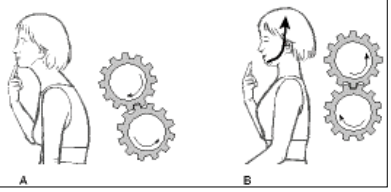
- Mountain climber reflex

Tissue Stabilizing

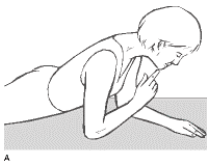
- Sphinx/chin tuck
- Push-up
- Lower Trapezius

1. Training C0-C1 flexion:

- Nodding w/out chin retraction (SCM overactivity)
- Brügger's cogwheels show the importance of addressing thoracic kyphosis

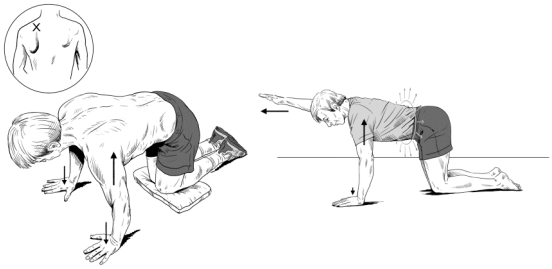


- Nod for the **deep neck flexors**



- Press up for the **serratus anterior**

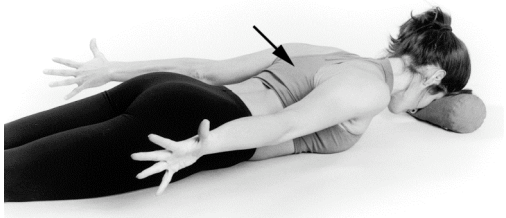
2. Push-Up w/ Plus - Tripod



Training the serratus anterior

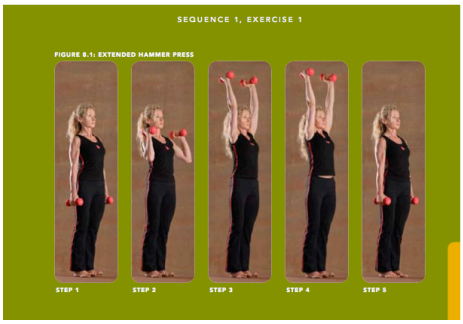
- **Indication:** fail push-up coordination tests. Postural sign winged scapluae
- Key muscle to facilitate: serratus anterior
- Overactive synergists: pectorals, upper traps, levator scapulae

3. Lower Trapezius



DeFranca C, Liebenson CS. The Upper Body Book. The Gym Ball Store, 2001 (800) 393-7255. www.gymball.com.

Extended Hammer Press



- W/ wts overhead, lift your toes & put weight on your heels
- Stretch arms OH
- Tip wrists backwards so dumbbells are higher in front than in back

Training the lower trapezius

- **Indication:** fail SHR coordination tests. Postural sign shrugged shoulder(s).
- Key muscle to facilitate: lower traps
- Overactive synergists:upper traps, levator scapulae

Pull-Downs

- Incorrect

- Correct