Advancement of Rwandan Rehabilitation Services Project

in partnership with

Spinal Course

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Advancement of Rwandan Rehabilitation Services Project

Spinal Course
Session One

CORE DOCUMENTS

ARRSP and Educational Program Objectives

These objectives are intended to guide patient interactions across all of the teaching units presented in Rwanda.

Given a patient with any diagnosis or functional limitation, the therapist will be able to:

1. Perform a patient interview that identifies functional problems
2. Determine if the patient needs to be referred to another health care professional
3. Interpret information from observation of the patient moving
4. Identify impairments to examine specific to the patient's problem
5. Safely, effectively and efficiently perform examination procedures specific to the patient's problem(s)
    a. Determine a 'comparable sign' to assess progress
6. Combine information from the interview, observation and examination to determine a reason why the patient has functional problems
7. Select treatments that address the cause of the functional problems
8. Safely, effectively and efficiently perform treatment procedures
9. Document examination, treatment, progress and functional goals
10. Use functional outcome measures (WHODAS 2) to document progress and to communicate with other healthcare professionals
11. Assess outcomes, modify treatment, and determine when discharge is appropriate
12. Develop a discharge plan including home programs and referral to community resources
13. Adjust and reflect on practice outcomes using knowledge and skills gained during the courses
14. Analyze outcomes and present results to Physiotherapists, Medical and other Healthcare Providers to promote the Physiotherapy profession
15. Identify community resources who will refer patients for Physiotherapy and develop a plan to increase communication with these individuals

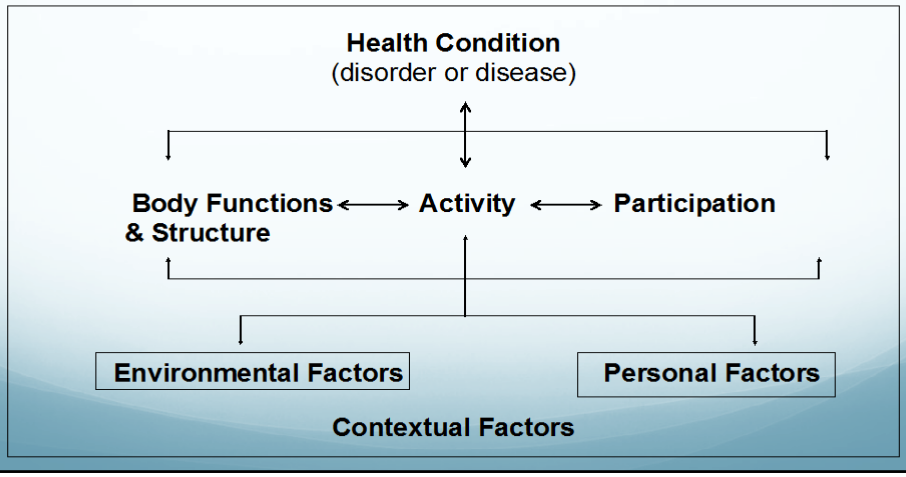
International Classification of Functioning, Disability and Health (ICF) in Clinical Practice

USAID / HVO

Rwanda, 2013 - 2015

International Classification of Functioning, Disability and Health

World Health Organization, 2001



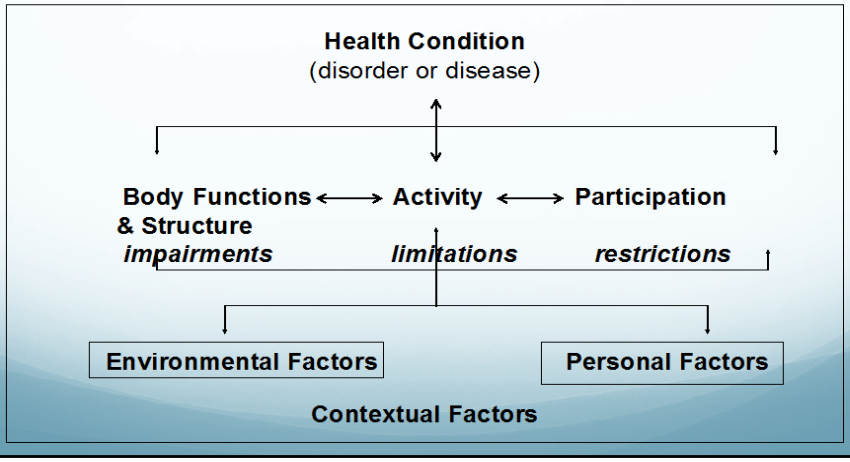
Functioning and Disability

Functioning

Psychological		
Physiological		
Anatomical	Individual	Life Situation
Body Functions & Structure	**Activity**	**Participation**
Impairments	Limitations	Restrictions

Disability

ICF Model



Contextual Factors

Facilitators

Environmental Factors

Barriers

Physical

Social

Attitudinal

Personal Factors

Physical Therapy Clinical Practice

- Identify the functional limitations and participation restrictions that the patient wants to change
- Measure the impairments that contribute to the problem
- Assess the impact of environmental and personal factors
- Direct treatment toward the cause of the impairments
- Goals are based on return to previous levels of activity and participation

Thank you!

- ICF Home Page
  - http://www3.who.int/icf/icftemplate.cfm
- ICF Introduction
  - http://www3.who.int/icf/icftemplate.cfm?myurl=introduction.html%20&mytitle=Introduction
- ICF Beginner's Guide
  - http://www3.who.int/icf/beginners/bg.pdf
- Guide to Physical Therapist Practice. 2nd ed. *Physical Therapy.2001;*81:139-311.

Initial Patient Interview Content

A. What is the problem that the person is coming to see you for?

1. Description of signs and symptoms
    a. Signs - Generally objective findings like blood pressure
    b. Symptoms - Generally subjective complaints like pain
2. Associated activity limitations and participation restrictions (what does the problem keep you from doing?)
3. Location or extent of problem (body structures involved)
4. Frequency - how often does the problem happen?
5. Duration - how long does the problem last each time that it happens?
6. Time of day/24 hour clock – how does the problem happen over a 24 hour period?
7. Aggravating factors - what makes the problem worse?
8. Relieving factors - what makes the problem better?

B. **History of the Problem**

1. When did it start? What makes it happen? How many times has it happened in the past?
2. Current or past treatments for this problem and the effects of treatment
3. Diagnostic tests and the results
4. Special questions - specific to diagnosis or hypothesis

C. **Medical History**

1. Current and past medical history
2. Medications
3. Family medical history
4. Review of body systems
    a. Recent changes in weight, sleep, etc
    b. Signs and symptoms of illness
5. Behavioral health risks - smoking, drugs, alcohol, stress, exercise habits

D. **Environmental and Personal Factors**

1. Demographics - age, sex, language
2. Cultural beliefs and behaviors
    a. Primary language
    b. Patient's understanding of cause of illness/problems
    c. Patient's understanding of the value of physical therapy
3. Cognitive and psychological function - memory, reasoning ability, anxiety, depression
4. Family and caregiver resources
5. Living environment - where the patient lives now or will live after being discharged from the hospital
6. Social support systems
7. Employment/student status
8. Leisure time activities

E. **Closure of Interview**

1. Is there anything else you want to tell me?
2. What would you like to achieve in physiotherapy

* *Adapted from Northwestern University Course Notes by Hedman and Sander*

Principles of Differential Diagnosis

Differential diagnosis is the ongoing process of determining if the patient's problem is appropriate for physical therapy treatment. As a result of the process of differential diagnosis, following the interview the therapist makes a clinical decision to

- **proceed with the examination**
- **proceed with examination and treatment, and refer or consult with another practitioner**
- **refer or consult with another practitioner before proceeding beyond the interview**

The principles that guide this clinical decision are

- Patient history
- Review of systems: general health, cardiovascular, pulmonary, gastrointestinal, urinary, reproductive, integumentary, musculoskeletal
- Associated signs and symptoms of systemic diseases like cancer, heart, liver or kidney disease
    - symptoms such as: fatigue, fever, sweating without cause, unexplained weight loss/gain, change in cough, bowel/bladder function, changes in menstruation, nausea, vomiting, diarrhea, dizziness, bilateral weakness, loss of sensation, skin rashes, nodules
- Pain patterns/pain types
    - Pain described as deep ache, vague, hard to localize, without specific cause, constant and severe, especially at night
- Symptoms that do not change with movement or posture
- Symptoms that do change with the function of some organs (eating, bowel, bladder, cardiac) or pain referred from organs
- Improvement in signs not accompanied by an improvement in symptoms
- Unusual signs and/or symptoms

Reasons to refer to a physician:

- Refer for a suspected medical problems in a system not being treated by PT (skin cancer, swollen lymph nodes, movement usually observed in patients with neurological disorders in a patient with LBP)
- Refer for medication, diagnostic tests
- Refer if examination or treatment are likely to cause harm (medical emergency like Deep Vein Thrombosis, cardiac event, neurological event)
- Refer if symptoms do not respond to treatment or get worse
- Refer for behavior influencing treatment beyond the scope of PT like major depressive disorder, suicide tendencies
- Refer to another PT if patient needs are beyond your knowledge, experience or expertise

References

Boissonnault WG. *Primary Care for the Physical Therapist. Examination and Triage.* 2nd ed. Elsevier/Saunders; 2011.
Goodman CC, Snyder TK. *Differential Diagnosis in Physical Therapists. Screening for Referral.* Elsevier/Saunders; 2007.
Guide to Physical Therapist Practice Part One: A Description of Patient Client Management. 2nd ed. *Phys Ther.* 81:2001.
Maitland GD. *Vertebral Manipulation.* Boston, Mass: Butterworth; 1977.Meadows JTS.
Drug Reference: http://www.medscape.com/medscapetoday

Processing the Patient Interview

Hypothesis generation is an ongoing process of ruling in and ruling out potential causes of the patient's functional problems.

Following the interview, address these questions:

1. What problem(s) does the patient have with function?
    a. Activity limitations
    b. Participation restrictions

2. Why do you think the patient has these problems moving?

3. Can you proceed with the exam or does the patient need to be referred to another provider?

4. What information did you learn from the environmental and personal factors?

5. What do you want to examine?

CASES

Lumbar Disc with Radiculopathy

DEMOGRAPHIC INFORMATION			
Name:	Pascal		
Medical Diagnosis/Reason for Referral/Chief Complaint:	Pain in low back and down the left leg		
Demographics: *age, sex, language*	37 years old	male	French, English
Occupation	Taxi driver		
Address			
Contact			
Insurance			

INTERVIEW/CHART INFORMATION

Signs and symptoms:	• Constant PAIN in Left lumbar area, left buttock; rates as 5 on a 0-10 pain scale where 0=no pain and 10= worse pain possible; wakes at night; worse in the morning • Sharp intermittent pain into lateral left leg below the knee; rates at 8/10; • Occasional tingling into L foot • Pain aggravated by being on feet, bending forward, sitting, coughing • Pain relieved by lying supine with knees bent • Feeling of left leg weakness by patient report
Differential diagnosis	Bowel and bladder signs negative by patient report
Activity Limitations:	Patient is not doing all his duties at home, and finds taxi driving increasingly more painful
Participation Restrictions:	Patient is not currently helping with garden at home
History of current problem[s]:	Gradual onset over past 2 years with increase over the past month after lifting heavy suitcases. Has not received treatment for this problem.
Medical History:	
• *Review of body systems and past medical /surgical history*	Patient has had no surgeries, rarely seen a doctor or nurse
• *Family medical history*	Father deceased at age 61, mother alive, has high blood pressure
• *Results of medical tests*	An x-ray showed narrowing of disc L4-L5, L5-S1
• *Medications*	Aspirin occasionally
• Health risks – smoking, alcohol, lack of exercise	The patient smokes 2 packs a week
Prior and Present level	Fully able taxi driver and participant in home duties, who cannot

function:	now put in the regular hours driving, and is not helping much at home.
Environmental and Personal Factors: *including home, work, school environment*	
• *Describe where the patient lives:*	The patient lives with wife and two children in suburban house with garden
• *Describe the work the patient does:*	Taxi driver, lifts bags, sits for long periods
• *Describe the family and social support*	He has a wife who also works and two children in primary school
Health beliefs: *What the patient believe caused their problem and how to treat it?*	This patient does not know why he should have pain in his leg, and why it is getting worse.
Patient goals from therapy	Patient wants to do full job as taxi driver with no discomfort The patient wants to sleep through the night, not awakened by leg pain He wants to restart his duties at home.

EXAMINATION

Screening Exam:	
• *Cardiopulmonary: vitals and edema*	BP 140/82 mm/Hg; HR 72 bpm; RESP 15 breaths/ minute
• *Integumentary: skin integrity, color, scar formation*	No skin disturbances
• *Musculoskeletal: gross ROM, strength, height, weight*	Height: 180 cm; Weight: 79kg; BMI = 24 Gross strength is within functional limits
• *Neuromuscular: general balance, gait/mobility*	Some difficulty with balance on left foot, general mobility within functional limits
Tests and Measures:	
Posture – standing and sitting	Flat lumbar spine in standing; slump sitting, forward head Patient has lateral trunk shift to the right in standing
Observation of movement problems	Gait is slowed, with slight limp on left
Active Range of Motion	LUMBAR SPINE ROM: Flexion: 4 cm (mean = 6.7 (SD = 1) Extension: .5 cm (mean = 1.6 cm) ; Side bending R = 22cm (mean = 22cm, SD = 5.4); SBL = 16 cm
Repeated movements	Repeated flexion in standing: Increase in leg pain Repeated Extension in Standing: Decreased pain in leg with "pinch" in back Repeated Extension in Lying: decreased pain in left leg
Muscle strength Abdominal strength tested	Gross manual muscle test of lower extremities = 5/5 except extensor hallicus longus on left was weak,

	abdominals flexion 4+/5, extension 5/5 transverse abdominus weak (cannot hold neutral spine posture)
Muscle length	SLR: in supine left painful at 35 degrees. Bilateral hamstring tightness
Palpation	Tenderness to moderate palpation over left piriformis. Spasm in paraspinal muscles L 3- 5 right > left
Accessory motion testing:	Central PAs over lumbar spine painful at L4, L5 Central PAs T10 – L3 hypomobile and non painful
Special tests:	
• Neurological exam	Decreased to light touch over the dorsum of foot and middle 3 toes; great toe extension weak = L5 dermatome and myotome involved
• Straight leg raise	+ for pain at 35 ° of flexion
Comparable Sign	
• Subjective	Pain measurement
• Objective	Improvement in lateral shift
Outcome measures:	WHODAS 2
Functional goals:	Patient will be able to comply with home exercise program 1 week Patient will be able to sit and drive taxi for 2 hours at time comfortably in 4 weeks Patient will be able to sleep through the night comfortably at 6 weeks. Patient will be able to resume his home duties fully at 8 weeks

TREATMENT

Describe why the patient is having functional problem(s)	Patient's job of sitting and lifting increase compression on the lumbar discs. Disc space narrowing shown on x-ray indicates spondylosis and peripheral symptoms indicate nerve compression. Incident of heavy lifting may have increased a disc bulge at L4-5 resulting in L5 sensory and motor involvement. Neural signs should be monitored closely to determine progress. Treatment should focus on postures and exercises that decrease peripheral symptoms.
Treatments:	
Therapeutic exercise	• Prone propping 1 minute • Repeated extension in lying ten times every 2 hours • Repeated extension in standing every 2 hours during work • Neutral spine and abdominal tightening in supine
Manual therapy	• Soft tissue mobilization of lumbar paraspinals and piriformis • Grade 3 Central PA mobilizations T10-L3 • Lateral shift correction • Sciatic nerve mobilization
Modalities	Heat prior to exercise, ice afterward

Functional and Ergonomic activities	Maintain lumbar lordosis during driving Frequent extension breaks throughout the work day Avoid forward bending during gardening Instruction is lifting technique for managing suitcases
Home program	Prone propping 1 minute followed by prone extension 10 times, twice a day Abdominal hallowing in supine, hold for count of 10, repeat 10x, twice a day
Patient Education/Prevention	Importance of spine posture in long term change in symptoms Anti-smoking education
Community Education/Prevention	What do you suggest?

Lumbar Disc with Radiculopathy

Postural Low Back Pain			
DEMOGRAPHIC INFORMATION			
Name:	Etienne		
Medical Diagnosis/Reason for Referral/Chief Complaint:	Ache in low back, ongoing		
Demographics: *age, sex, language*	44	male	English/ French
Occupation	Garbage hauler		
Address			
Contact			
Insurance			

INTERVIEW/CHART INFORMATION	
Signs and symptoms:	Pain in central and low back with limitation of movements. Aggravated by all motions, but most by rotation. Relieved some by rest and aspirin. Describes pain as an ache that increases throughout the workday. Rates pain at 5/10 on average. Describes general stiffness in his back that is worse in the morning and decreases with activity. He wakes several times during the night to move and get comfortable.
Differential diagnosis	Carefully screen medical history for systemic causes of back pain • Pain intensity, constant vs intermittent, changes with motion, changes with body functions (eating, bowel, etc)
Activity Limitations:	He no longer kicks the ball around with his kids, he complains of moving slower, walking slower each passing month
Participation Restrictions:	He can continue on his job but states that he moves more slowly and is concerned that he cannot keep up with the pace required. He helps less at home
History of current problem[s]:	This is a 44 year old male who played quite a lot of football in his youth. He has experienced intermittent back pain for years, but was always able to control it with rest and aspirin. Etienne has been complaining to his wife about increasing low back pain for the past 2 years. He has not had previous treatment for his back.
Medical History:	
• *Review of body systems and past medical /surgical history*	Unremarkable medical history.

• *Family medical history*	Mother is alive at 80, lives with her husband close by. Father is in good health also. They are active and keep a small garden.
• *Results of medical tests*	x-rays show mild degeneration throughout the spine
• *Medications*	He takes aspirin from time to time
• Health risks – smoking, alcohol, lack of exercise	He drinks a beer a day after work; He thinks his work is enough exercise
Prior and Present level function:	Prior: Good team worker on his job and always able to carry his load of the work. Actively involved with his family at home. Present: Slower on the job; unable to be as involved at home
Environmental and Personal Factors: *including home, work, school environment*	Job: garbage hauler for company COPED
• *Describe where the patient lives:*	Patient lives in small village 10k outside Butare
• *Describe the work the patient does:*	He lifts and empties garbage cans for hauling to dumping facility. His job requires that he move constantly from standing, lifting, walking. He sits about 30 minutes at a time when driving the truck to the dump
• *Describe the family and social support*	There is extended family living in the area, two brothers and their wives and children, and aging parents.
Health beliefs: *What the patient believe caused their problem and how to treat it?*	This is a formerly athletic man who feels "like I'm getting old" He feels that his job is contributing to his back pain
Patient goals from therapy	Etienne would like to know how to manage his job and his back pain with some medicine or Physical Therapy.

EXAMINATION

Systems Review:	
• *Cardiopulmonary: vitals and edema*	HR 72 bpm BP: 125/78 mmHg
• *Integumentary: skin integrity, color, scar formation*	unremarkable
• *Musculoskeletal: gross ROM, strength, height, weight*	Height: 173 cm; Weight: 97 kg; BMI = 32
• *Neuromuscular: general balance, gait/mobility*	General balance is good. Gait and movements are slow with pain
Tests and Measures:	
Posture – standing and sitting	Patient has flat back, thoracic kyphosis, forward head posture in standing and sitting
Observation of movement problems	Patient is self-limiting lumbar flexion, extension, rotation. Moves more slowly by end of day
Active Range of Motion	Flexion, extension, side bending and rotation are limited to

	50% of full range. Hip external rotation 30° bilaterally; internal rotation 20° bilaterally
Repeated movements	Extension in standing painful; unable to lie prone Flexion in standing painful at end range, flexion in supine slight pain
Muscle strength	On MMT, superficial trunk flexors (rectus abdominus) and extensors (erector spinae) and gross LE strength = 5/5. Deep abdominals are weak.
Muscle length	Shortened hamstrings and hip flexors bilaterally
Palpation	There is pain and spasm with moderate palpation over lumbar paraspinals, the piriformis, and iliolumbar ligament bilaterally. Trigger points present in quadratus lumborum bilaterally
Accessory motion testing:	Central PA glides are painful L 1-5 Transverse glides painful and hypomobile L1-L5 Central PAs hypomobile T8 – T12
Special tests:	None tested
Comparable Sign	
• Subjective	Average pain rating
• Objective	Number of times he awakens at night
Outcome measures:	WHODAS 2
Functional goals:	Patient will demonstrate sitting posture with neutral spine in one week Patient will demonstrate safe lifting mechanics in 2 weeks Patient will be able to sleep through the night in 8 weeks Patient will be able to kick the football with kids in 3 months

TREATMENT

Describe why the patient is having functional problem(s)	Early sport activity may have initiated spondylosis symptoms in lumbar spine that have been aggravated by current job of repetitive lifting. Postures of spine (forward head, thoracic kyphosis, lack of lumbar lordosis) put stress on the lumbar spine so that the starting position of all of his activities contributes to the problems he is having with moving. Hypomobility in the thoracic spine increases the stress on the lumbar spine. Decreased mobility in the hip joint and hip muscles also put increased stress on the lumbar spine. Weakness in the core stabilizers contribute to poor lifting mechanics. Overweight may also contribute to his slowness in movement and poor lifting mechanics. Need to carefully

	examine work activities to see how the job itself or the mechanics of lifting can be changed.
Treatments:	
Therapeutic exercise	Pain free lumbar rotation in supine Pain free flexion in lying Core abdominal strengthening Stretch hip rotation, hamstrings, hip flexors
Manual therapy	Soft tissue mobilization lumbar muscles with trigger point release to quadratus lumborum Central PAs Grade III, IV T8 – T 12; Transverse glides Grade II L1-L5
Modalities	Patient may use heat prior to stretch, and ice for discomfort
Functional and ergonomic activities	Have patient demonstrate his lifting technique at work. Observe his 'starting posture.' Work to provide stability to his back before he lifts through activation of the transverse abdominus. Teach him to move through his hips in trunk rotation and flexion activities. Teach him to lift using his quadriceps rather than his back. Discuss changes in work site regarding how much and how often he lifts.
Home program	Stretching hip flexors, hamstrings, core strengthening
Patient education/Prevention	Importance of protecting his back in all lifting activities. Discuss losing weight
Community education/Prevention	Educate all workers in the COPED waste management company about correct body mechanics during work activities, maximum amount of weight lifted, sufficient rest breaks

Postural Low Back Pain

DISC PATHOLOGY

A. Signs and Symptoms
   1. Pain in lumbar spine, usually on one side, may radiate into buttocks or down back of leg and into the foot
   2. Tingling, numbness or loss of motor control into the leg
   3. Symptoms aggravated by increased weight bearing: standing, lifting coughing and oftentimes sitting, bending forward
   4. Symptoms relieved by rest and non-weight bearing positions

B. Differential diagnosis
   1. Systemic pain referral from abdominal structures like kidney, ureters. General symptom of illness: fever, sweats, weight loss
   2. Cancer pain referral if recent history of cancer, pain that does not change, age over 50, night pain
   3. Saddle anesthesia – indications of a cauda equina lesion
      a. Compression of the nerve roots below the level where the spinal cord ends, around L1-2
      b. Medical emergency
   2. Sacroiliac or hip pathology
   3. Muscle strain, spondylosis, stenosis, spondylolisthesis

D. Normal Disc
   1. External **annulus fibrosis** with fibers that run in multiple direction for increased strength.
   2. Internal **nucleus pulposus** filled with a jelly-like substance to absorb shock forces
      a. Water content of the nucleus decreases with age
   3. The **vertebral end plates**- a layer of cartilage that separates the disc from the vertebral body

E. Disc failure
   1. **Protrusion**
      a. Nuclear material moves outward through a strain in the annulus
      b. Pressure put on dura and posterior longitudinal ligament producing a dull aching back pain
      c. Usually no leg pain
   2. **Extrusion (prolapse)**
      a. Nuclear material moves through the annulus and into the spinal canal, most frequently in posterolateral direction
      b. Symptoms depend on inflammatory irritants and nerves that are compressed
   3. **Sequestration**
      a. Nuclear material escapes contact with the disc and becomes a free fragment in the intervertebral canal

b. Symptoms depend on inflammatory irritants and nerves that are compressed

F. Potential Disc symptoms at different spinal levels
1. Cervical nerve roots exit above the vertebrae, that is, C5 nerve is affected by a disc at C4-5
2. C8 nerve is affected by at disc at C7-T1. After this point, all nerves exit below the vertebrae

G. Lumbar Discs
1. Age range from 25 – 45
2. Males > females 3:2
3. Smokers have 2-3 x > incidence of LBP

H. Lumbar disc levels
1. T12-L1, L1-2 (affecting L1, L2 nerve roots)
   a. Groin and anterior thigh pain
   b. Often relieved with flexion and increased with extension
2. L2-3 (affecting L3 nerve root)
   a. Pain mid lumbar, upper buttock, anterior thigh, medial knee, above ankle
   b. Positive prone knee flexion test
   c. Decreased sensation of medial knee and lower leg
   d. Reduced or absent patellar reflex
   e. Weakness of hip flexion, knee extension
3. L3-4 (affecting L4 and L5 nerve root)
   a. 40% of disc problems are at this level
   b. Pain in low back, iliac crest, inner buttock, outer thigh and leg, over foot to great toe
   c. Positive straight leg test
   d. Lateral shift of lumbar spine
   e. Decreased sensation of outer lower leg and great toe
   f. Decreased patellar and tibialis anterior reflexes
   g. Weak ankle dorsiflexion
4. L4-5 (affecting L5 nerve root)
   a. 40% of disc problems are at this level
   b. Pain in sacroiliac, lower buttock, lateral thigh and leg, inner 3 toes, medial sole of foot
   c. Positive straight leg raise test
   d. Lateral shift of lumbar spine
   e. Decreased sensation of outer leg, inner three toes, medial sole
   f. Weakness of great toe extensors

5. L5-S1 (affecting S1 nerve root)

a. Pain in low back to buttocks to sole of foot and heel
b. Decreased sensation outer two toes, outer foot
c. Decreased Achilles reflex
d. Weakness in ankle plantar flexors

I. Examination
1. Basic exam including special tests listed below

J. Special Tests
1. Neural exam including dermatomes, myotomes, DTR
2. Neurodynamic testing of sciatic nerve

K. Treatment
1. Lateral shift correction
2. Directional preference extension exercises
3. Sciatic nerve mobilization

L. Cervical discs
1. Age range of 35-55 years
2. C7 nerve most commonly affected followed by C6 and then C5
3. May be caused by trauma, like a hyperextension injury, or from natural degeneration
4. Pain results from an inflammatory process initiated from nerve root compression; pain may be severe
5. Pain present in neck, arm, scapula
6. Sensory and motor deficits in peripheral nerve patterns
7. Central herniation may compress the spinal cord resulting in a myelopathy
a. Hyperreflexia of upper and/or lower extremities
b. Sensory changes in a non-segmental pattern
c. Clonus at the ankle
d. Positive Babinski response
e. General weakness below the lesion level
f. Clumsiness in gait

M. Thoracic discs
1. Herniated discs in the thoracic spine are rare
2. Central herniations could result in myelopathy

Reference:
Dutton, M. Orthopaedic Examination, Evaluation and Intervention. 3rd ed. New York, NY: McGraw Hill; 2012

EXAMINATION

BASIC EXAM

- Screen systems: cardiovascular (vital signs); integumentary (skin intact, edema); musculoskeletal (gross ROM, strength, height, weight); neuromuscular (gait, balance)
- Posture – standing and sitting
- Observation of movement dysfunction/ functional limitation
- Measurement of pain
- Active Range of Motion –observe, measure
    - Repeated flexion/extension
    - With overpressure
- Muscle strength, including lumbar core, deep cervical flexors and extensors
- Muscle length – specific to problem and area
    - Hamstrings and hip flexors for lumbar
    - Upper trapezius, levator, scalenes for cervical
- Palpation for spasm, trigger points
- Accessory motion testing
    - PAIVM (Passive Accessory Intervertebral Motion testing)
    - PPIVM (Passive Physiological Intervertebral Motion testing)
- Special tests
    - Neural exam: dermatomes, myotome, Deep Tendon Reflexes
    - Neurodynamic testing
    - Specific to the problem

11-POINT NUMERIC RATING SCALE OF PAIN

Verbal: "On a scale of 0-10, with 0 representing no pain and 10 representing pain as bad as it can be, how bad is your pain now, over the last 24 hours, etc.?

Written:
Select the number that best describes your pain during the past 24 hours. (Circle one number only.)

0	1	2	3	4	5	6	7	8	9	10
No pain as can be										Pain as bad

This is a measurement of pain intensity.
Approximately 3-point change can be considered clinically meaningful.*
*Stratford PW, Spadoni G. The reliability, consistency, and clinical application of a numeric pain rating scale. *Physiotherapy Canada.* 2001;53(2):88-91.

VISUAL ANALOGUE SCALE

Please indicate on the following line the degree of pain and discomfort you are experiencing now from your problem by making a slash mark across the line at the place that best represents the intensity of the pain you currently feel. (_____)

No pain |————————————————————————| Pain as bad as can be

This is a measurement of pain intensity.
Clinically meaningful change is 1.75 cm

Scott J, Huskisson EC: Graphic representation of pain. Pain 2:175-184, 1976

Lumbar Spinal Active Range of Motion (ROM)

Observational ROM

The end points on the chart represent full ROM. Observe the patient moving through ROM and mark the % of the ROM that the patient has.
Norms = Forward bending (60-80°); Backward bending (25°);
Side bending (25-35°); Rotation (30-45°).

Tape Measure and Goniometry ROM

Motion	Patient position	Instructions	Normative value
Flexion	Standing	Mark a point on the spine at the level of the PSIS and another point 15 cm superior. Align the tape measure between the two marks. Ask the patient to forward bend as far as possible keeping the knees straight. Note the distance between the two marks.	Mean = 6.7 cm (SD 1.0)
Extension	Standing	Using the same markings as for flexion, ask the patient to bend backward as far as possible. ROM is the difference between 15 cm and the length measured.	Mean = 1.6 cm
Thoracic/ lumbar Side Bending	Standing Tape measure method	Make a mark on the thigh where the tip of the middle finger rests. Ask the patient to side bend as far as possible keeping knees straight and feet on the floor. Mark again where the tip of the middle finger rests. ROM is the distance between the two marks.	Mean = 22 cm (SD 5.4)
	Standing Goniometer	Place fulcrum at S1, align proximal arm perpendicular to the floor, distal arm with C7. Ask patient to side bend.	Mean = 18 - 38°
Thoracic/ lumbar rotation	Sitting or Standing	Rotation is best documented by observation	Mean = 30 - 45°

Reference:
Norkin CC, White, DJ. *Measurement of Joint Motion. A Guide to Goniometry.* 3rd ed. Philadelphia, PA: FA Davis; 2003.
Dutton M. *Orthopedic Examination, Evaluation and Intervention* 3rd ed. New York, NY: McGraw Hill Medical; 2012.

Lumbar Manual Muscle Testing

Muscle	Position	Action	Grade 5	Grade 4	Grade 3	
Trunk Flexors	Supine	With chin up, raise head, shoulders and back	Hands at side of head Clears Inferior angle of scapula	Hands crossed on chest Clears Inferior angle of scapula	Arms at sides Clears Inferior angle of scapula	
Trunk Extensors	Prone, hands behind head	Raise head, shoulders and chest	Clears umbilicus with strong contraction	Weakness at end range	Difficulty getting to end range	

A. Key Functional Movements
   1. Standing up on toes – repeat 10 times (S1-S2)
      a. Tests plantar flexors
   2. Unilateral squat while supported ((L3-L4)
      a. Tests quadriceps and hip extensors
   3. Heel walking ((L4)
      a. Tests dorsiflexors

Reference
Hislop HJ, Avers D, Brown, M. *Daniels and Worthingham's Muscle Testing*. 9th ed. St. Louis, MO: Elsevier; 2013.

Lower Extremity Muscle Length

A. Hamstring
   1. Passive straight leg raise
      a. Must have full extension of the knee on the leg being examined
      b. Patient supine, both legs in extension, flatten and stabilize the lumbar spine
      c. Lift leg being examined with knee straight until resistance is felt
      d. Normal = 80-85° hip flexion

B. Hip flexors
   1. Test A
      a. Patient supine, one knee held to chest, opposite leg extended and resting on the table
      b. If extended thigh is raised off the surface of the table, the iliopsoas muscle of that leg is shortened
      c. The amount of shortening can be measured with a goniometer using the hip joint as the fulcrum, the table as the stationary arm and the thigh as the moving arm

   2. Test B (Modified Thomas test)
      a. Patient is sitting on the edge of the table
      b. Patient is assisted in lying down, bringing both knees to chest
      c. Patient performs posterior pelvic tilt to stabilize the pelvis
      d. Non-tested hip is held in flexion by patient or clinician
      e. Leg being measured is lowered over the end of the table in neutral rotation
         i. Iliopsoas shortening is present if the thigh is raised off the surface of the table at the end of available range
      f. From the current position of the thigh, *abduct* the thigh
         i. If the thigh moves closer to the table, tensor fascia latae shortening is suspected
      g. From the current position of the thigh, *extend* the knee
         i. If the thigh moves closer to the table, rectus femoris shortening is suspected

References

Kendall FP, McCreary EK, Provance PG. *Muscles Testing and Function.* 4th ed. Baltimore MD: Williams & Wilkins; 1993.

Hislop HJ, Avers D, Brown M. *Daniels and Worthingham's Muscle Testing.* 9th ed. St. Louis, MO: Elsevier; 2014.

Lumbar Repeated Motion Testing

- The purpose of repeated motion testing is to determine if symptoms are decreased or increased with repeated flexion or extension.
- The goal is always to move symptoms from peripheral to central areas
- Test both flexion and extension motions
- Treat with the motion that centralizes the symptoms
- Perform ONE repetition and check for symptom reproduction
- If no change, or centralization of symptoms, perform 10 repetitions

A. Repeated Flexion
   1. Repeated flexion in standing
      a. The patient is instructed to tuck the chin toward the chest and bend forward at the waist, keeping the knees extended, while attempting to touch the toes.
      b. Look for deviations like rotation or lateral flexion which may indicate pathology
   2. Repeated flexion in supine
      a. Ask patient to bring the knees to the chest
      b. Do symptoms change in this non-weight bearing position?
      c. Overpressure can be applied by patient or therapist

B. Repeated Extension
   1. Repeated extension in standing
      a. The patient is instructed to place hands on the posterior iliac crests and then extend backward from the waist, keeping the knees extended.
      b. Look for deviations like rotation or lateral flexion which may indicate pathology
   2. Repeated extension in prone
      a. Ask the patient to come up on elbows or onto hands if possible.

Reference
McKenzie RA, May S. *The Lumbar Spine: Mechanical Diagnosis & Therapy*. 2nd ed. 2003

Neutral Spine and Core Abdominal Testing

A. Core Stability
- The core functions to maintain postural alignment and equilibrium during functional activities.
- The following positions can be used to test the strength and endurance of the core muscles and can also be used as exercises to increase core stability

1. Finding neutral spine
    a. Patient supine on table with knees bent
    b. Ask patient to flex or flatten back as far as possible, then extend or arch back as far as possible – this is the functional range of lumbar flexion and extension
    c. Ask patient to find a position of comfort midway between full flexion and full extension – this is the patient's neutral spine posture
    d. Patient should be able to find this neutral posture supine with knees straight, sitting and standing

2. Lower abdominal hollowing
    a. Patient supine with knees bent
    b. Locate neutral spine posture
    c. Draw the navel up and in so as to hollow the abdomen
    d. Muscle contraction of the transverse abdominus can be palpated at a point 2 cm medial and inferior to the anterior-superior iliac spine
    e. Muscle contraction of the multifidus can be palpated as a 'swell' just lateral to the spinous processes
    f. Note
        i. This is not a posterior pelvic tilt
        ii. Patient should not hold their breath
    g. Record patient position and length of time the neutral spine posture is maintained
    h. As patient progresses, record the advanced activities the patient is able to do maintaining neutral spine

3. Spine rotators and multifidus
    a. Patient is positioned in quadruped
    b. Locate neutral spine posture and hollow the abdomen
    c. Ask patient to progressively do
        i. Single arm raise
        ii. Single straight leg raise
        iii. Contralateral arm and leg raise

d. Record the posture that is the highest level of contraction obtained
    i. Patient can maintain quadruped position with neutral spine and hold for 10 seconds
    ii. Patient can maintain quadruped position with neutral spine and single arm raise
    iii. etc

4. Double straight leg lowering test
    a. Patient is supine with knees straight
    b. Clinician raises both legs from the ankles until pelvis posteriorly rotates
    c. Patient assumes neutral spine and abdominal hollowing
    d. Patient is asked to lower both legs slowly
    e. The closer the legs get to the table without anterior pelvic rotation, the stronger the core muscles
    f. Record the distance from the table that the patient is able to maintain neutral spine. Monitor movement at the ASIS and anterior pelvic tilt
    g. Note: this is an advanced activity and may not be possible with acute back pain

References

Dutton M. *Orthopedic Examination, Evaluation and Intervention* 3rd ed. New York, NY: McGraw Hill Medical; 2012.

Sahrmann S. *Diagnosis and Treatment of Movement Impairment Syndromes*. St. Louis, MO: Mosby; 2002.

PASSIVE ACCESSORY INTERVERTEBRAL MOTION TESTING (PAIVM)

1. **Patient Position:** Patient is positioned prone with the spine in neutral (cervical spine in midline, extreme lordosis/kyphosis in any part of spine supported/corrected with pillows.)

2. **Therapist Position:** Therapist is standing, elbows extended, arms and body in line with the direction of the force to be delivered. Utilize appropriate body mechanics by adjusting the table height or patient position on the table.

3. **Stabilization** is provided by the patient's body weight on the table.

4. **Palpate** the spine to locate the desired spinous process.

5. **Direction of force:**
    a. Posterior to anterior through the spinous process (Central PA)
    b. Posterior to anterior through the transverse process in thoracic and lumbar, articular pillars in cervical (Unilateral PA)
    c. Transversely (right to left or left to right) through the spinous process (Transverse Pressure (TP))

6. **Mobilization**
    - Force is applied through the therapist's hands in one of the following positions.
        a. Hand over pisiform
        b. Thumb over thumb position
    - Therapist's hands are used to assess the motion and therapist's body-weight is used to produce the force
    - Repeat 2-3 times at each segment assessing through available range each time

7. **Contraindications and precautions**
    a. Absolute: Recent spinal fracture, cauda equine lesions, neoplasm
    b. Relative: Osteoporosis, rheumatoid arthritis, in children (growth plate issues), neurological signs

1. **Documentation**
    b. Direction of force: posterior to anterior (PA), transverse (TP)
    c. Level(s) of involvement
    d. Did the pressure reproduce the patient's symptoms?
    e. Painful or non painful
    f. Motion compared to adjacent segments
        i. Normal
        ii. Hypomobile
        iii. Hypermobile

References

Petersen C., and Foley R. Active and Passive Movement Testing. New York:McGraw-Hill; 2002.

Dutton M. Orthopedic Examination, Evaluation and Intervention *3rd ed. New York, NY: McGraw Hill Medical; 2012.*

Neural Examination

Dermatomes, Myotomes, Deep Tendon Reflexes

- **Dermatome-** Skin sensation served by a single nerve root. Testing identifies sensory involvement of a specific nerve root and spinal nerve
    - Pathways are not precise; will see variations with different charts; importance of gathering a cluster of signs and symptoms to help with diagnosis
- **Myotome-** Muscle or group of muscles served by a single nerve root. Testing identifies motor involvement of a specific spinal nerve root and spinal nerve
- **Deep Tendon Reflex** testing identifies the integrity of the reflex arc (tendon tap > brief stretch of tendon and muscle spindle > sensory receptors of spindle fire > reflex contraction of muscle to take stretch off the spindle)

Dermatomes: Document as 'normal', 'impaired' (hyper or hyposensitive), 'absent'

1. Establish a 'normal' sensation by swiping over the forehead
2. Compare initial tested dermatome to the 'normal'. Compare to opposite side.
3. If uninvolved, the last swiped dermatome becomes 'normal' for the next segment.

Myotome testing: Document as 'strong' or 'weak'

1. Ask patient to hold in isometric contraction
2. Correct joint movement is tested for each spinal level corresponding to muscle groups innervated at each spinal level
   C5 = shoulder abductors/elbow flexors
   C6 = wrist extensors
   C7 = elbow extensors
   C8 = thumb extensor (distal phalanx/ finger flexors (distal phalanx)
   T1 = finger abductors/adductors (2nd 3rd 4th and 5th finger)
   L2 = hip flexors
   L3 = knee extensors
   L4 = ankle dorsiflexors
   L5 = great toe extensors/long toe extensors/ankle evertors
   S1 = ankle plantarflexors
   S2-S5 = "Can you start and stop the flow of urine?"

Deep Tendon Reflex
Tap tendon with reflex hammer or ulnar side of hand

Reflexes	*Stimulation Site*
Biceps (C5,6)	*Biceps tendon (cubital fossa)*
Brachioradialis (C5,6)	*Brachioradialis tendon (proximal to radial styloid)*
Triceps (C7,C8)	*Triceps tendon (proximal to olecranon)*
Quadriceps (L2-4)	*Patellar tendon (between patella and tibial tuberosity)*
Achilles (S1-2)	*Tendo calcaneus (proximal to calcaneus on the posterior leg)*

Document as:

0=no response
0R=no response with reinforcement
1+=decreased
1+R=any response with reinforcement (can't get above 1+ if reinforced)
2+=normal
3+=brisk
4+=very brisk

Interpreting Results

- Initial response to increase in compression of a peripheral nerve is tingling followed by pain as the compression increases.
- With increase in compression the patient will experience numbness and muscle weakness.
- A herniated disc or osteophytes in the spine usually lead to the following symptom presentation:
  Disc level C3-C4 involvement cause symptoms in the C4 distribution
  Disc level C4-C5 involvement cause symptoms in the C5 distribution
  Disc level C5-C6 involvement cause symptoms in the C6 distribution
  Disc level C6-C7 involvement cause symptoms in the C7 distribution
  Disc level C7-TI involvement cause symptoms in the C8 distribution
  Disc level T1-T2 involvement cause symptoms in the T1 distribution
  Disc level L2-L3 involvement cause symptoms in the L3 distribution
  Disc level L3-L4 involvement cause symptoms in the L4 distribution
  Disc level L4-L5 involvement cause symptoms in the L5 distribution
  Disc level L5-S1 involvement cause symptoms in the S1 distribution

Reference
Sander AP. Course Notes. Northwestern University Department of Physical Therapy

Neurodynamic Testing

- In normal activity the peripheral nerves are able to lengthen and shorten within the range of limb motion
- When the mobility of the nerves is restricted by muscle spasm, compression, inflammation or other causes, the patient may experience pain and tingling
    - Poor posture
    - Trauma resulting in scarring
    - Compression from muscle contraction, tight fascia or bone
    - Examples: sciatica, carpal tunnel syndrome
- Neurodynamic testing involves passive movement of the head, trunk and limb to assess mobility in the spinal cord, meninges, nerve roots and peripheral nerves.
- Testing involves passively moving the limb in specific directions that gradually increase tension on the nerve being tested
- At the end of the limb motion, a **sensitizing movement** is added to load the peripheral nervous system more than the overlying muscles or fascia
    - This is a movement that could reasonably increase or decrease tension on the nerve
    - Oftentimes this motion is neck flexion or extension, which will add tension to the nerve through the dura and spinal cord
- A **positive** test
    - Reproduces the patient's symptoms, especially if symptoms change with the sensitizing movement
    - Limitation of range of motion, especially compared to the opposite side
- Contraindications
    - Acute neurological inflammatory or demyelinating diseases
    - Recently repaired peripheral nerves
- Precautions
    - Irritable conditions: easily provoked, marked increase in symptoms that take a long time to subside
    - Acute nerve root signs
- **Safety**
    - Responses may occur up to 24 hours post testing
    - Limit the amount of testing and practice with peers on any given day

The Test Procedures

- Begin with the uninvolved side, then test the involved side
- Take the limb passively through the sequence of movements that puts tension of the nerve being tested
- Assess the patient's response after each motion in the sequence
- At the end of the sequence, add a sensitizing movement
- Document the patient response and the range of motion achieved

1. Passive Neck Flexion [PNF]
    a. Patient supine without pillow, arms at sides
    b. Examiner passively flexes neck, bringing chin to chest
    c. Normal response: No pain, may experience slight stretching in posterior cervical spine.
    d. Positive test response: Pain reproduction
    e. PNF can be used as a sensitizing maneuver for other neural tension tests

2. Straight Leg Raise: Sciatic Nerve bias [SLR]
    a. Patient supine without pillow, arms at sides, trunk and hips neutral
    b. Passively lift one leg, supporting the knee so that it does not bend
    c. Normal response: 50° - 120° of hip flexion
    d. Positive test response: Range is limited by spasm to 70°, reproduction of leg or back symptoms, pain is neurological in nature
    e. Dutton reports sensitivity range of 72-100% and specificity range of 11-44%.
    f. Sensitizing movements
        1. Passive neck flexion
        2. Ankle dorsiflexion
        3. Hip adduction
        4. Hip internal rotation
    g. Tibial nerve bias
        1. Perform SLR
        2. Add dorsiflexion and ankle eversion
    h. Sural nerve bias
        1. Perform SLR
        2. Add dorsiflexion and ankle inversion
    i. Fibular (peroneal) nerve bias
        1. Perform SLR
        2. Add plantarflexion and ankle inversion

3. Slump Test
    a. Patient is seated at edge of table, hands clasped behind back
    b. Note resting symptoms, and symptom reproduction at each sequence of movement that follows.
    c. Patient slumps through the thoracic and lumbar spine into flexion; therapist helps maintain eyes parallel to horizontal.
    d. Examiner applies overpressure to thoracic and lumbar flexion
    e. Patient brings chin to chest in cervical flexion
    f. Examiner applies overpressure into cervical, thoracic and lumbar flexion
    g. Examiner maintains overpressure; patient is asked to extend the knee
    h. Patient dorsiflexes ankle
    i. Examiner releases neck flexion overpressure slowly. Symptoms response is assessed as pressure is released.
    j. Repeat procedure for opposite leg [uninvolved first, then involved].

4. Prone knee flexion: Femoral Nerve bias
    a. Patient positioned prone
    b. Therapist stabilizes ischium to prevent anterior pelvic rotation and lumbar extension
    c. Slowly flex the knee as far as possible
    d. Maintain knee flexion and extend the hip; the addition of hip extension stresses the lateral femoral cutaneous nerve
    e. The dura is stretched between 80-100° of knee flexion
    f. Sensitizing movements are cervical flexion, then extension

References

Butler D: *Mobilization of the Nervous System*. Melbourne: Churchill Livingstone;1991

Dutton M: *Orthopaedic Examination, Evaluation, & Intervention* 3rd ed. New York, NY: McGraw-Hill; 2012

Sander AP. Course Notes. Northwestern University Department of Physical Therapy

TREATMENT

BASIC TREATMENT

- Therapeutic exercise
- Manual therapy
- Electrotherapy / Modalities
- Functional and ergonomic activities
- Home program
- Community education/Prevention

Strengthening the Core

- Once the patient understands the concepts of neutral spine and abdominal hollowing, exercises can be added to increasingly challenge the core muscles
- Exercises postures should progress from supine, prone, sidelying, quadruped, sitting, to standing and functional activities

Core strengthening progression

A. Supine with knees bent. Find neutral spine and tighten lower abdominal muscles (lower abdominal hollowing)

B. **Maintain neutral spine and abdominal contraction while doing all of the subsequent exercises**
   1. Single leg hip flexion to 90° and return to table; repeat with opposite leg
   2. Single leg hip flexion to 90°, hold position, bring alternate hip into 90° flexion; slowly lower one leg, then the other. Repeat starting with opposite leg
   3. Single knee to chest and hold with hands; lift opposite foot off the table; lower foot back to table; repeat with opposite side
   4. Single leg hip flexion to 90°, lift alternate foot and slowly extend hip and knee
   5. Begin supine with hips and knees extended. Find neutral spine and tighten abdominals. Bring both hips into flexion by sliding heels along the table. Slowly extend hips and knees to return to starting position.

C. Advance to prone and quadruped positions

D. Advance to stabilizing the core in functional activities

References

Sahrmann S. *Diagnosis and Treatment of Movement Impairment Syndromes*. Mosby, 2002.

Dutton M. *Orthopedic Examination, Evaluation and Intervention* 3rd ed. New York, NY: McGraw Hill Medical; 2012.

Directional preference EXTENSION exercises

- Select exercises that centralize or relieve symptoms
- Observe the quality of exercise performance
- Repeat exercises as long as patient maintains proper form
- Repeat 1-3 sets of 10 repetitions of extension exercise 3 – 10 times daily
- Gradually introduce flexion activities but only without symptom reproduction

C. Correction of Lateral Shift
   1. Lateral shift should be corrected, if possible, before repeated motions
   2. Manually move hips toward the side of the shifted trunk
   3. Instruct patient to stand with shifted shoulder against a wall with feet placed 10-20 cm from the wall. Gradually allow pelvis to shift toward the wall
   4. Keep shift corrected while doing repeated movements

D. Progression
   1. Prone on pillows
   2. Prone positioning
   3. Prone on elbows
   4. Prone press ups
   5. Prone press ups with exhalation overpressure
   6. Prone press ups with exhalation and manual overpressure

McKenzie RA, May S. *The Lumbar Spine: Mechanical Diagnosis & Therapy*. 2nd ed. 2003

Treatment with PAIVMs

Grade I

Gentle movements of small amplitude carried out in the very beginning of the available range

Grade II

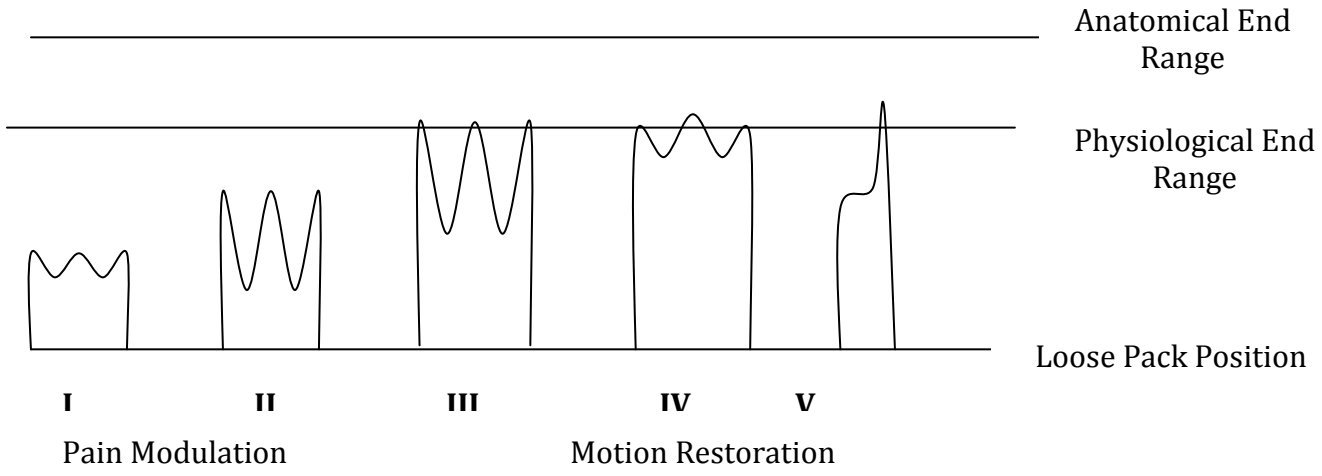
Gentle movements of large amplitude carried out in the mid-range of a joint

Grade 3 III

Moderate movements of large amplitude carried out through the available range of the joint and into the resistance

Grade IV

Small oscillating movements carried out at the end range and into the resistance



References

Maitland GD. Vertebral Manipulation. 5th ed. London: Butterworths; 1986.

Dutton, M. *Orthopaedic Examination, Evaluation and Intervention.* 3rd ed. New York, NY: McGraw Hill; 2012.

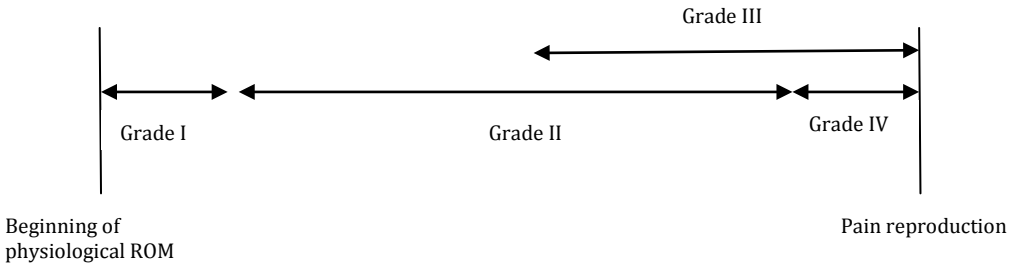
Petersen C, Foley R. Active and Passive Movement Testing. New York: McGraw-Hill; 2002.

Neurodynamic Treatment

1. Treatment out-of-tension [sliding, gliding]
   a. Mobilize one component of the sequence to the point where **no symptoms are reproduced**

2. Treatment in-tension
   a. Mobilize one component of the sequence to the point where **symptoms are reproduced**
   b. Hold a position that combines components to the point where **symptoms are reproduced.** Follow the hold with oscillations to mobilize the nerve.

3. Suggested parameters
   a. Duration
      1. oscillations within selected Grade I-IV for 10-60 seconds
      2. alternate 5-10 sec hold with 5-10 sec rest
      3. prolonged hold up to 20 seconds followed with oscillations
   b. Amplitude
      1. Grades I and II physiological movements for irritable symptoms
      2. Grades III and IV physiological movements for non irritable symptoms
      3. Movements should be performed slowly and rhythmically



   c. Repetitions: 1-10 times based on irritability
   d. Frequency: 1-5 times daily based on irritability

4. Symptoms provoked during treatment should subside when the tension is released

5. Reassess the patient following treatment

6. Progression of treatment
    a. Irritable vs non-irritable symptoms
        1. Irritable conditions present with easily provoked, marked increase in symptoms, that take a long time to subside
        2. Irritable conditions are treated with less aggressive techniques; non-irritable conditions are treated more aggressively
    b. Begin at site remote from primary symptoms and work toward site of symptoms
    c. Begin with nerve gliding and progress to tensioning techniques
    d. Increase the duration, amplitude (Grade I-IV) or repetitions of oscillations
    e. Increase the tension on the nerve by adding more movement components

7. Treatment of non-neural tissues through soft tissue mobilization, joint mobilization, stretching or modalities may need to be done simultaneously with neurodynamic interventions

8. Instruct the patient in new postures and movement patterns

References

Butler D: *Mobilization of the Nervous System*. Melbourne: Churchill Livingstone;1991

Dutton M: *Orthopaedic Examination, Evaluation, & Intervention* 3rd ed. New York, NY: McGraw-Hill; 2012

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Slides for Session One

Differential Diagnosis

- If your patient presented with these symptoms, use the principles of DD to decide what you would do and why
- Postural low back pain case
  1. Symptoms increase with rest and during the night
  2. Symptoms are not changed by movement or posture
  3. Patient has a history of cancer with recent unexplained weight loss
  4. Symptoms cover a large non-specific area

Differential Diagnosis

- If your patient presented with these symptoms, use the principles of DD to decide what you would do and why
- Lumbar disc case
  5. Symptoms move from one area to another
  6. Symptoms change from tingling to numbness
  7. Patient has urinary or bowel incontinence
  8. Patient does not respond as expected to treatment

Basic Exam

- Check the exams that you do regularly
- Circle the skills you would like to have reviewed
- What else would you add to this list?

Missing Component

What is missing in this patient that if we restore this thing he/she will be better?

Comparable Sign

What can be re-assessed at the next treatment session to determine progress?

Basic Treatment

- Check the treatments that you do regularly
- Circle the skills you would like to have reviewed
- What else would you add to this list?

Interview Practice

- Choose a partner to role play a patient interview
  - Disc pain with radiculopathy
  - Postural low back pain
- Use the cases from the course handouts on pages 18 and 23
- OR use a case from your clinical practice

Interview Practice

- As therapist in the role play, interview your patient using the INTERVIEW CONTENT guidelines from the handout p 11
- As patient in the role play, pretend that you have the symptoms of a patient with disc or postural back pain

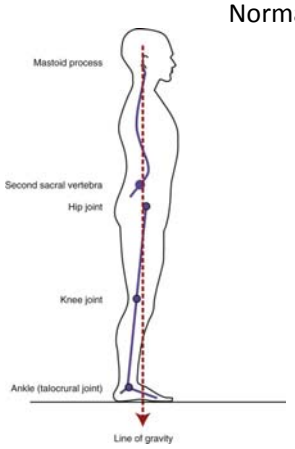
Processing the Patient Interview

- What problems does the patient have with function?
  - Activity limitations
  - Participation restrictions
- Why do you think the patient has these problems?
- Can you proceed with the exam or refer?
- What information did you learn from the environmental and personal factors?

Processing the Patient Interview

- What do you want to examine?
  - Discuss in pairs
  - Report to group

Normal Standing Posture



Through the ear lobe

Anterior to the shoulder joint

Midway of the trunk

Through greater trochanter

Slight anterior to the knee

Sllght Anterior to the ankle

Neumann, 2010

LUMBAR RANGE OF MOTION

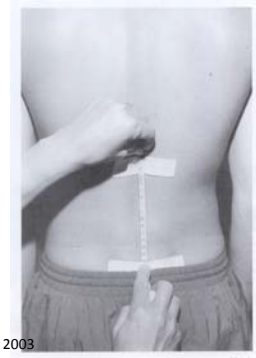
Lumbar Flexion

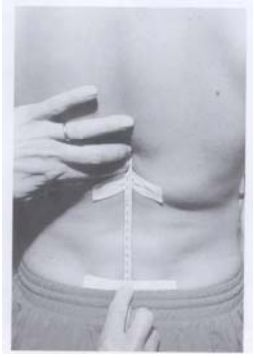
Norkin, 2003

Trunk Flexion with tape measure

Reese, 2010

Lumbar Extension





Norkin, 2003

Lumbar Side Bending

Norkin, 2003

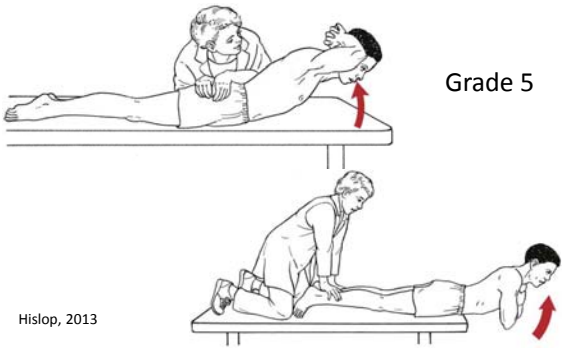
LUMBAR MUSCLE TESTING

Trunk Flexion

- Grade 3
- Grade 4
- Grade 5

Hislop, 2013

Trunk Extension

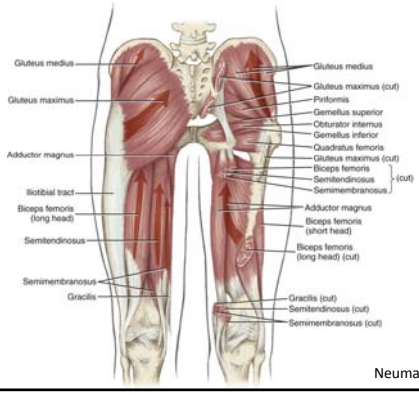


Grade 5

Hislop, 2013

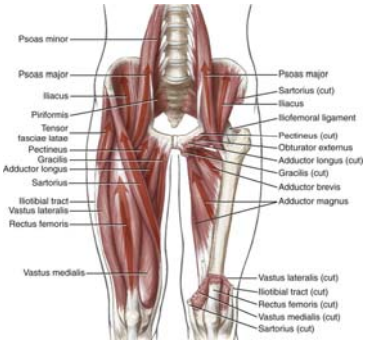
LOWER EXTREMITY MUSCLE LENGTH

Hamstrings



Neumann, 2010

Hip Flexor Muscles



Neumann, 2010

M O D I F I E D

T H O M A S

Sahrmann, 2002

Back flat. Monitor ASIS while lowering relaxed limb. Keep hip in neutral ab/add

Thigh does not reach the table indicating Hip flexor muscle shortening

Abduct hip. If extension increases Indicates tensor shortening

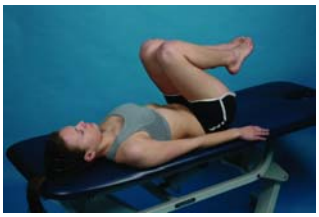
Passively extend knee. If extension Increases, indicates rectus shortening

REPEATED MOTION TESTING

Active lumbar ROM

Dutton, 2012

Repeated flexion in supine



Dutton, 2012

Extension in Standing

Dutton, 2012

DIRECTIONAL PREFERENCE EXTENSION EXERCISES

Lateral Shift Correction

Dutton, 2012

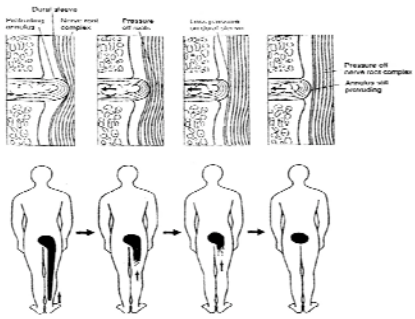
Lateral Shift Correction

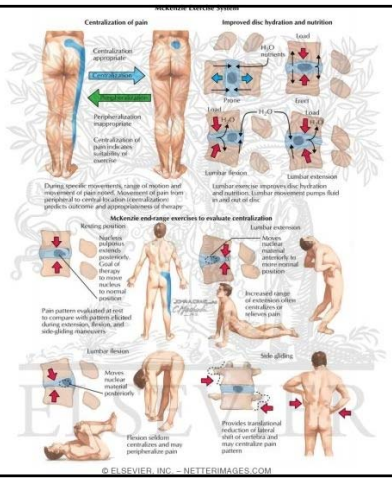
Figure 1: Manual Shift Correction

Web reference

Figure 2: Self Shift Correction

Theory of Centralization





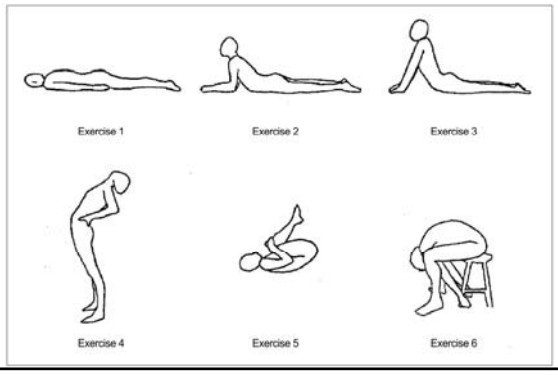
Prone on Elbows

Dutton, 2012

Prone push ups

Dutton, 2012

Passive Extension Progression



NEUTRAL SPINE AND CORE ABDOMINAL TESTING

Abdominal Hollowing Procedure

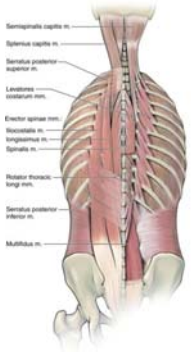
Dutton, 2012

Multifidus Activation

Dutton, 2012

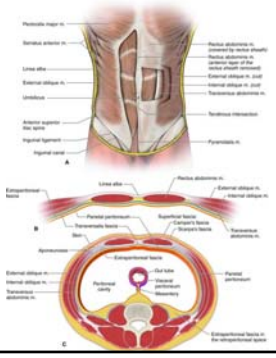
ABDOMINAL CORE STABILIZATION EXERCISES

Posterior Spine Stabilizers

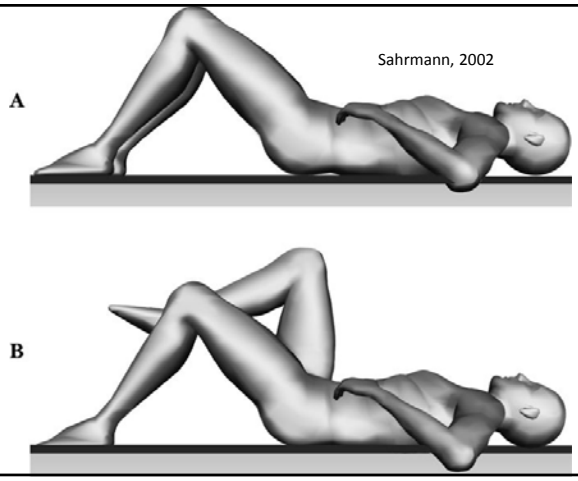


Neumann, 2010

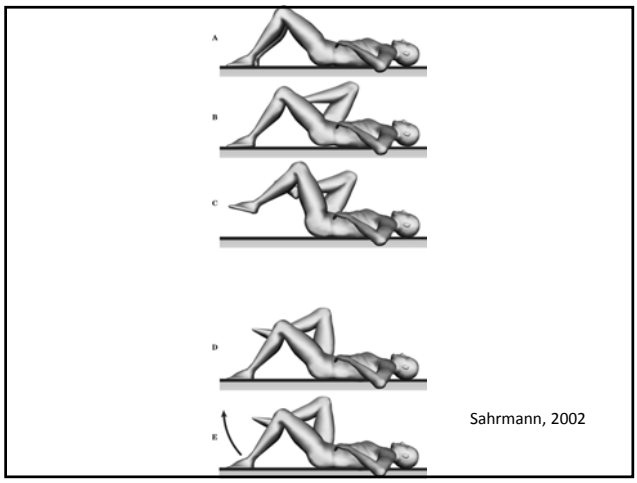
Abdominal Muscles

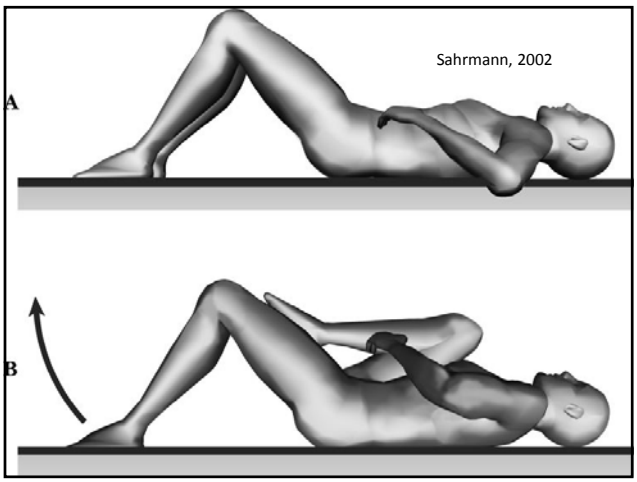


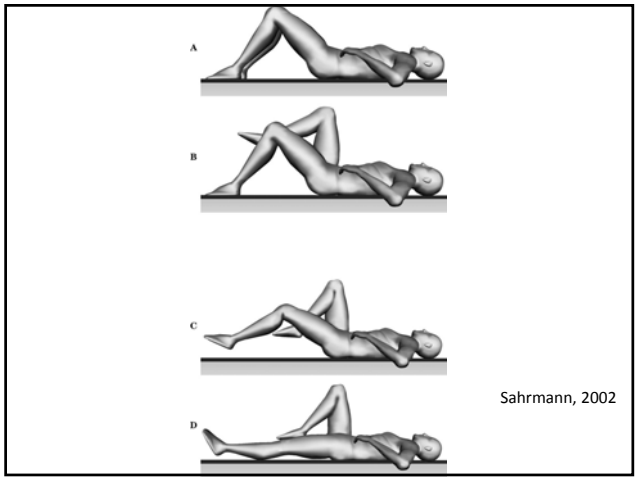
Neumann, 2010

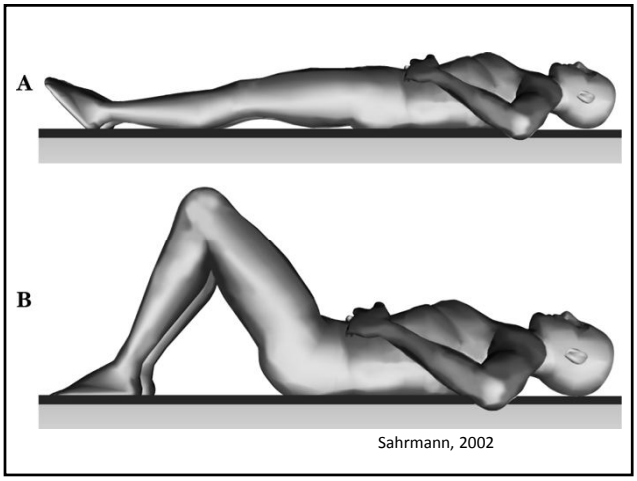


Sahrmann, 2002


A
B
C
D
E
Sahrmann, 2002


Sahrmann, 2002
A
B


A
B
C
D
Sahrmann, 2002


A
B
Sahrmann, 2002

Bent Knee Fall-out

Dutton, 2012

Quadriped Progression

Activates multifidus

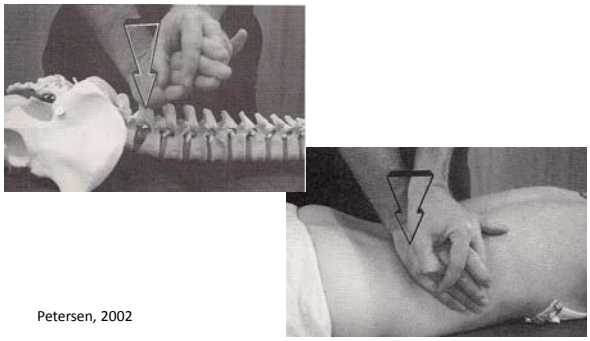
Dutton, 2012

Prone Progression

Dutton, 2012

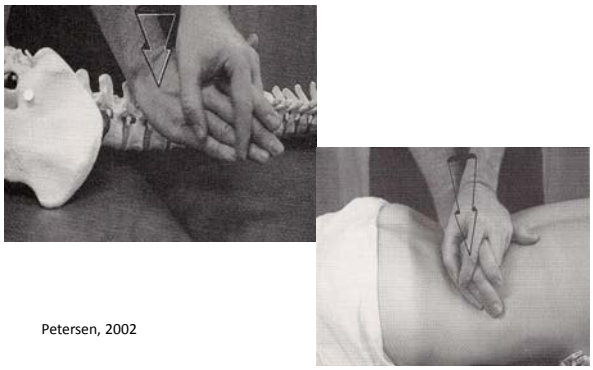
PASSIVE ACCESSORY INTERVERTEBRAL MOTION TESTING (PAIVM)

Lumbar Spine Central PAIVM



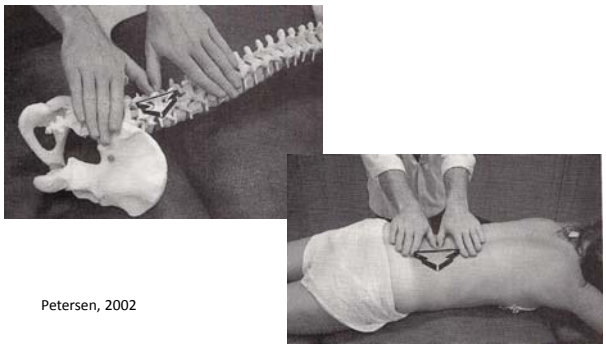
Petersen, 2002

Unilateral Lumbar PA



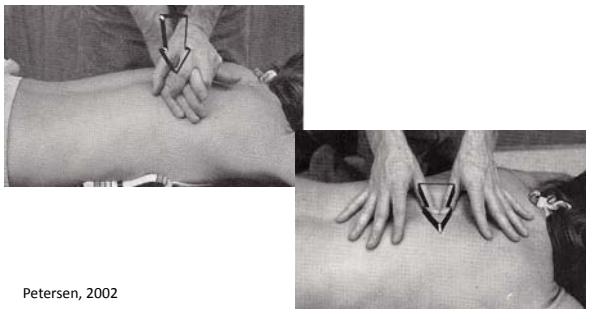
Petersen, 2002

Lumbar Transverse Pressure



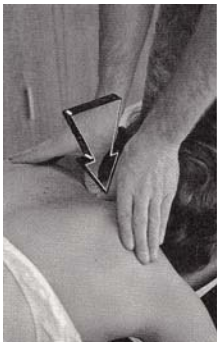
Petersen, 2002

Thoracic Spine Central PAIVM



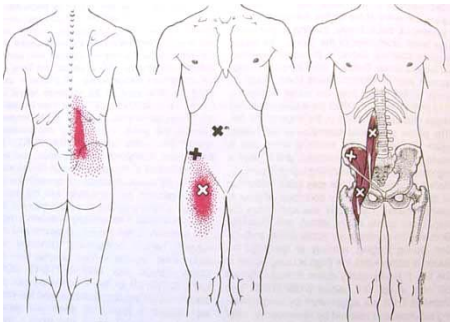
Petersen, 2002

Cervical Spine Central PAIVM



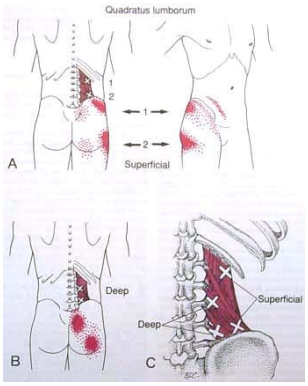
Petersen, 2002

LUMBAR TRIGGER POINTS



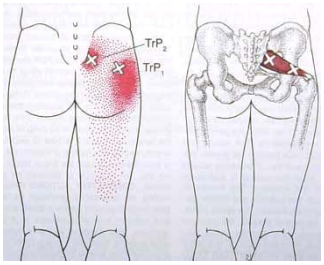
Iliopsoas Trigger Point and Referred Pain Pattern

www.triggerpoints.net



www.triggerpoints.net

Quadratus Lumborum Trigger Points and Referred Pain Patterns

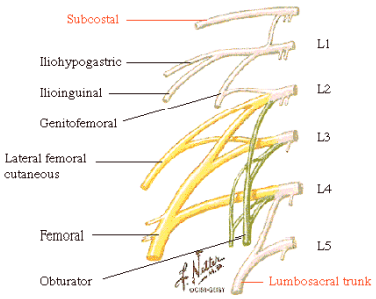


Piriformis Trigger Points and Referred Pain Patterns

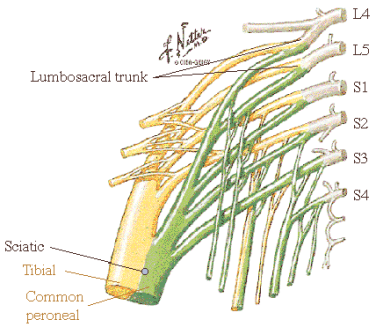
www.triggerpoints.net

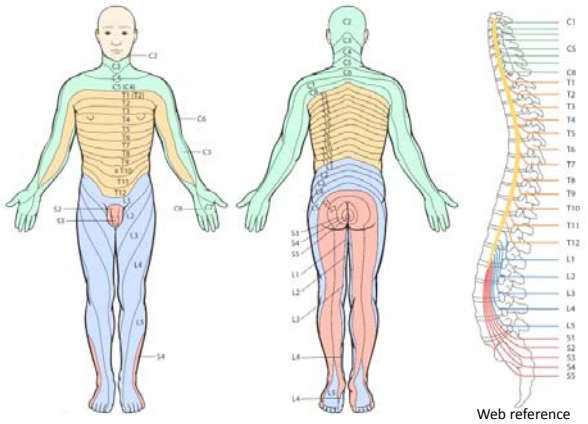
NEURAL EXAMINATION

Lumbar Plexus



Lumbaosacral Plexus





Web reference

LE Dermatomes and Myotomes

https://www.youtube.com/watch?v=xLeAvAb

[redacted]

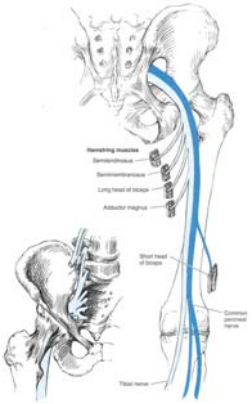
NEURODYNAMIC TESTING

Passive Neck Flexion

Butler, 1991

Sciatic Nerve

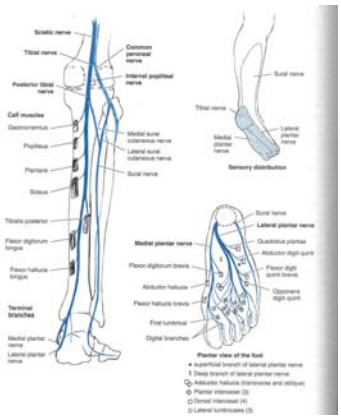
L4-S3



Neumann,2010

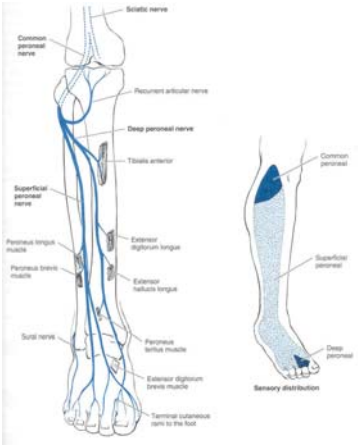
Tibial Nerve

L4- S3

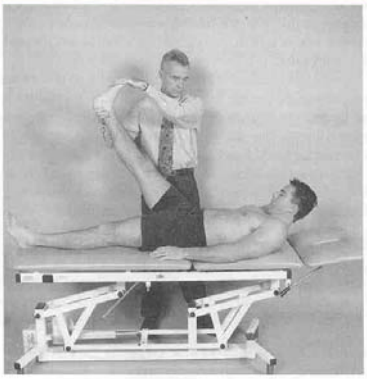


Neumann,2010

Fibular (Peroneal) Nerve L4 – S2



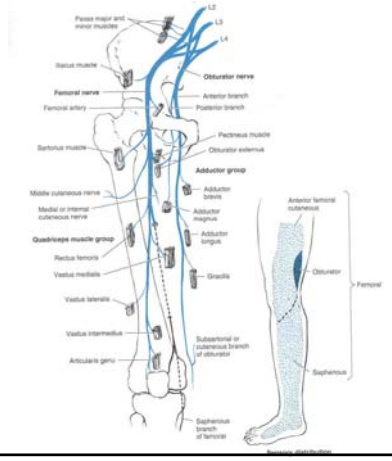
Straight Leg Raise



Dutton, 2012

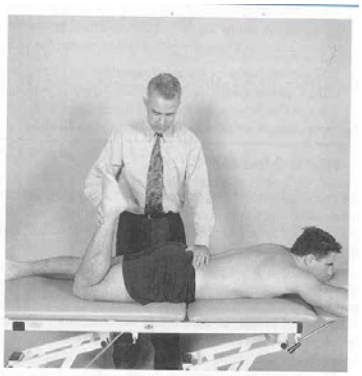
Femoral Nerve

L1-4



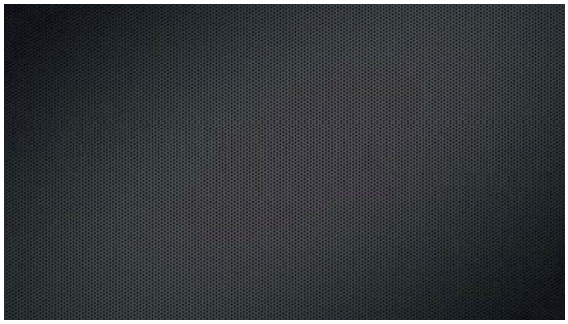
Neumann,2010

Prone Knee Bend



Dutton, 2012

Femoral Nerve Tension Test
https://www.youtube.com/watch?v=dUaM-Mro9asMro9as



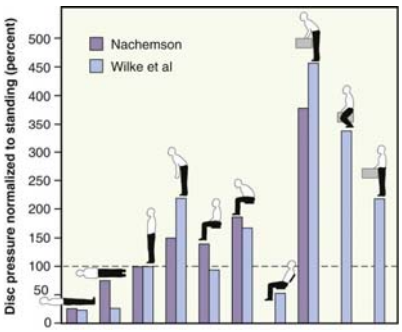
NEURODYNAMIC TREATMENT

Slump Test
https://www.youtube.com/watch?v=kE-9DYa1BYM

Session One

DISC PATHOLOGY

Daily Postures and Pressure on Discs



Nuemann, 2010

Visceral Referred Pain Patterns

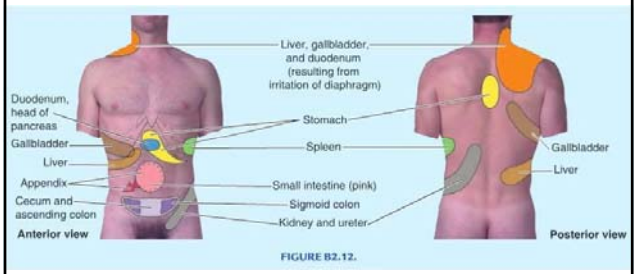
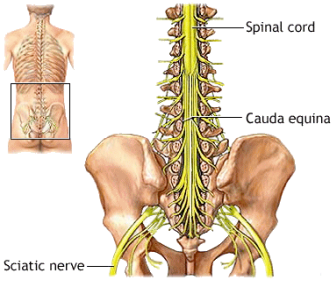


FIGURE B2.12.

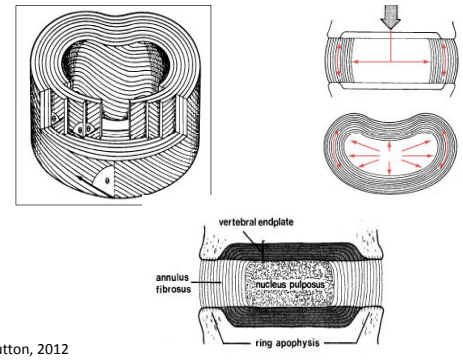
Web reference

Cauda Equina



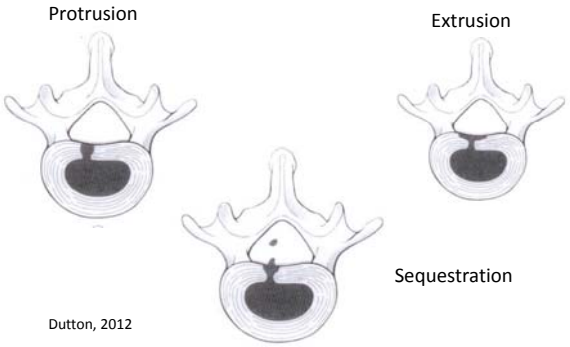
Web reference

The Normal Disc

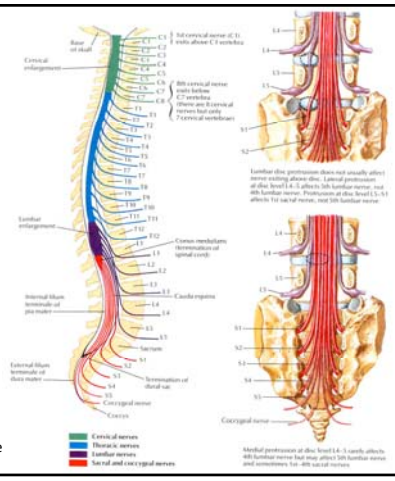


Dutton, 2012

Progression of Herniated Disc



Dutton, 2012



Web reference

MRI lumbar disc at L4-5
Impinging on L5 nerve root

Web reference

Assignment

- Select at least 5 new patients over the next month that you use the process we have discussed this weekend:
  - Principles of interview, differential diagnosis, and observation of movement problems
  - Determine the functional problems
  - Select exam based on functional problems
    - Evaluate repeated flexion and extension
    - Determine transverse abdominal strength

Assignment

- Select treatments that address the functional movement problem
  - Treat with directional preference extension exercises
  - Treat with abdominal stabilization exercises

Assignment

- Bring a copy of written documentation of ONE LUMBAR PATIENT for discussion at the next session. Black out all information that would identify the patient like name, chart number, phone, etc. We will collect these records.
- Be prepared to discuss
  - The patient's functional problem
  - How you decided what to examine
  - How the treatment addressed the functional problems

References for slides

- Butler D: *Mobilization of the Nervous System*. Melbourne: Churchill Livingstone;1991
- Dutton, M. *Orthopaedic Examination, Evaluation and Intervention*. 3rd ed. New York, NY: McGraw Hill; 2012.
- Hislop HJ, Avers D, Brown, M. *Daniels and Worthingham's Muscle Testing*. 9th ed. St. Louis, MO: Elsevier; 2013
- Kendall FP, McCreary EK, Provance PG. *Muscles Testing and Function.* 4th ed. Baltimore MD: Williams & Wilkins; 1993.
- McKenzie RA, May S. *The Lumbar Spine: Mechanical Diagnosis & Therapy*. 2nd ed. 2003
- Neumann DA. *Kinesiology of the Musculoskeletal System.* St. Louis, MO: Elsevier; 2010.
- Norkin CC, White, DJ. *Measurement of Joint Motion. A Guide to Goniometry.* 3rd ed. Philadelphia, PA: FA Davis; 2003.
- Reese, Nancy Berryman. *Joint Range of Motion and Muscle Length Testing, 2nd Edition*. W.B. Saunders Company, 2010.
- Petersen C., and Foley R. *Active and Passive Movement Testing.* New York:McGraw-Hill; 2002.
- Sahrmann S. *Diagnosis and Treatment of Movement Impairment Syndromes*. St. Louis, MO: Mosby; 2002.
- Select web resources

Advancement of Rwandan Rehabilitation Services Project

Spinal Course
Session Two

OBJECTIVES

1. Assess skills previously taught through review lab
2. Assess clinical reasoning of participants through case presentations
3. Demonstrate skills not covered in Session One
4. Apply skills in examination and treatment of disc case
5. Discuss documentation
    a. Practice administration of WHODAS 2 outcome measure
    b. Discuss Oswestry outcome measure
6. Interview, examine and treat a patient with spinal stenosis
    a. Demonstrate quadrant test and bicycle test
    b. Demonstrate flexion exercises

DOCUMENTATION
and
OUTCOME MEASURES

DOCUMENTATION

A. WHY document?
   1. Clinical record of patient care
      a. If another therapist had to step in to treat the patient because the patient's regular therapist was out of the office, does the patient care record provide sufficient information for the seamless delivery of services to the patient?
   2. To combine information about how the department manages a particular diagnosis
   3. To collect information about the department work load
   4. For accreditation
   5. To provide case reports to doctors, therapists
   6. To provide proof of treatment
   7. For legal reports
   8. For case reports and research
   9. For performance contracts and evaluation
   10. *'If it is not documented it did not happen.'*

B. WHAT to document
   1. Demographics (name, age, contact information, insurance, date, etc)
   2. Describe the problem including the functional limitations
   3. Record examination results
   4. Record treatments given including home exercises and patient education
   5. Provide clinical reasoning for why treatments were selected
   6. List goals of therapy
   7. Provide patient's response to the treatment
   8. Measure outcomes

C. WHEN to document
   1. Initial evaluation
   2. SOAP progress notes following each patient visit
   3. Final evaluation and discharge summary

12-item version, self-administered

This questionnaire asks about difficulties due to health conditions. Health conditions include diseases or illnesses, other health problems that may be short or long lasting, injuries, mental or emotional problems, and problems with alcohol or drugs.

Think back over the past 30 days and answer these questions, thinking about how much difficulty you had doing the following activities. For each question, please circle only one response.

In the past 30 days, how much difficulty did you have in:						
S1	Standing for long periods such as 30 minutes?	None	Mild	Moderate	Severe	Extreme or cannot do
S2	Taking care of your household responsibilities?	None	Mild	Moderate	Severe	Extreme or cannot do
S3	Learning a new task, for example, learning how to get to a new place?	None	Mild	Moderate	Severe	Extreme or cannot do
S4	How much of a problem did you have joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?	None	Mild	Moderate	Severe	Extreme or cannot do
S5	How much have you been emotionally affected by your health problems?	None	Mild	Moderate	Severe	Extreme or cannot do

Please continue to next page...

.

In the past 30 days, how much difficulty did you have in:						
S6	Concentrating on doing something for ten minutes?	None	Mild	Moderate	Severe	Extreme or cannot do
S7	Walking a long distance such as a kilometre [or equivalent]?	None	Mild	Moderate	Severe	Extreme or cannot do
S8	Washing your whole body?	None	Mild	Moderate	Severe	Extreme or cannot do
S9	Getting dressed?	None	Mild	Moderate	Severe	Extreme or cannot do
S10	Dealing with people you do not know?	None	Mild	Moderate	Severe	Extreme or cannot do
S11	Maintaining a friendship?	None	Mild	Moderate	Severe	Extreme or cannot do
S12	Your day-to-day work?	None	Mild	Moderate	Severe	Extreme or cannot do

H1	Overall, in the past 30 days, how many days were these difficulties present?	***Record number of days*** ____
H2	In the past 30 days, for how many days were you totally unable to carry out your usual activities or work because of any health condition?	***Record number of days*** ____
H3	In the past 30 days, not counting the days that you were totally unable, for how many days did you cut back or reduce your usual activities or work because of any health condition?	***Record number of days*** ____

This completes the questionnaire. Thank you.

Scoring

WHODAS 2.0 Summary Scores

There are two basic options for computing the summary scores for the WHODAS 2.0 short and full versions

Simple: the scores assigned to each of the items – "none" (1), "mild" (2) "moderate" (3), "severe" (4) and "extreme" (5) – are summed. This method is referred to as simple scoring because the scores from each of the items are simply added up without recoding or collapsing of response categories; thus, there is no weighting of individual items. This approach is practical to use as a hand-scoring approach, and may be the method of choice in busy clinical settings or in paper–pencil interview situations. As a result, the simple sum of the scores of the items across all domains constitutes a statistic that is sufficient to describe the degree of functional limitations.

Higher scores describe more disability. Highest possible score is 60. Record score as xxx/60.

Reference:
http://www.who.int/classifications/icf/whodasii/en/index.html

WHODAS 2.0

WORLD **H**EALTH **O**RGANIZATION
DISABILITY **A**SSESSMENT **S**CHEDULE 2.0

Version 12-item auto-administrée

Ce questionnaire se rapporte aux difficultés causés par votre état de santé. Par état de santé, je veux dire une maladie ou un malaise, ou tout autre problème de santé qui peut être de courte durée ou chronique, une blessure, des problèmes mentaux ou émotionnels et des problèmes liés à l'alcool ou aux drogues.

Réfléchissez à la période des 30 derniers jours et répondez aux questions en pensant aux difficultés que vous avez eues en effectuant les activités suivantes. Pour chaque question, merci de ne donner qu'une seule réponse.

Durant les 30 derniers jours, combien de difficultés avez-vous eues pour :						
S1	être debout pour de longues périodes comme 30 min. ?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire
S2	Vous occuper de vos responsabilités ménagères ?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire
S3	apprendre une nouvelle tâche ou par ex. découvrir un nouveau lieu?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire
S4	A quel point est-ce un problème de vous engager dans des activités communautaires (par ex. fêtes, activité religieuse ou autre) de la même façon que les autres ?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire
S5	A quel point avez-vous été émotionnellement affecté(e) par votre état de santé ?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire

Durant les 30 derniers jours, combien de difficultés avez-vous eues pour :						
S6	vous concentrer sur une tâche pendant dix minutes ?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire
S7	Marcher une longue distance comme 1 kilomètre ?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire
S8	Laver votre corps tout entier ?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire
S9	Vous habiller ?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire
S10	Avoir à faire à des personnes que vous ne connaissez pas ?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire
S11	Entretenir une relation d'amitié?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire
S12	Faire votre travail/vos activités scolaires quotidien(nes) ?	Aucune	Légère	Modérée	Sévère	Extrême /ne peut pas faire

H1	Au total, durant les 30 derniers jours, pendant combien de jours avez-vous eu ces difficultés ?	***Noter le nombre de jours ___***
H2	Durant les 30 derniers jours, pendant combien de jours avez-vous été incapable d'effectuer vos activités habituelles ou travail du fait de votre état de santé ?	***Noter le nombre de jours ___***
H3	Durant les 30 derniers jours, sans compter les jours où vous étiez totalement incapable, pendant combien de temps avez-vous diminué ou réduit vos activités habituelles ou votre travail du fait de votre état de santé ?	***Noter le nombre de jours ___***

Notre entretien est maintenant terminé. Je vous remercie de votre participation.

12-item version, interviewer-administered

Introduction

This instrument was developed by the WHO *Classification, Terminology and Standards* team, within the framework of the WHO/National Institutes of Health (NIH) Joint Project on Assessment and Classification of Disability.

Before using this instrument, interviewers must be trained using the manual *Measuring Health and Disability: Manual for WHO Disability Assessment Schedule – WHODAS 2.0* (WHO, 2010), which includes an interview guide and other training material.

The versions of the interview available are as follows:

- 36-item – Interviewer-administered[a]
- 36-item – Self-administered
- 36-item – Proxy-administered[b]
- 12-item – Interviewer-administered[c]
- 12-item – Self-administered
- 12-item – Proxy-administered
- 12+24-item – Interviewer-administered

[a] A computerized version of the interview (*iShell*) is available for computer-assisted interviews or for data entry
[b] Relatives, friends or caretakers
[c] The 12-item version explains 81% of the variance of the more detailed 36-item version

For more details of the versions please refer to the WHODAS 2.0 manual *Measuring Health and Disability: Manual for WHO Disability Assessment Schedule – WHODAS 2.0* (WHO, 2010).

Permission to translate this instrument into any language should be obtained from WHO, and all translations should be prepared according to the WHO translation guidelines, as detailed in the accompanying manual.

For additional information, please visit www.who.int/whodas or contact:

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This questionnaire contains the interviewer-administered, 12-item version of WHODAS 2.0.

Instructions to the interviewer are written in bold and italics – do not read these aloud

Text for the respondent to hear is written in

standard print in blue.

Read this text aloud

Section 1 Face sheet

Complete items F1–F5 before starting each interview				
F1	Respondent identity number			
F2	Interviewer identity number			
F3	Assessment time point (1, 2, etc)			
F4	Interview date	____ day	____ month	____ year
F5	Living situation at time of interview (circle only one)	Independent in community		1
		Assisted living		2
		Hospitalized		3

Please continue to next page ...

Section 2 Demographic and background information

This interview has been developed by the World Health Organization (WHO) to better understand the difficulties people may have due to their health conditions. The information that you provide in this interview is confidential and will be used only for research. The interview will take 5–10 minutes to complete.

For respondents from the general population (not the clinical population) say:

Even if you are healthy and have no difficulties, I need to ask all of the questions so that the survey is complete.

I will start with some background questions.

A1	***Record sex as observed***	Female	1
		Male	2
A2	How old are you now?	_____ years	
A3	How many years in all did you spend studying in school, college or university?	_____ years	
A4	What is your current marital status? ***(Select the single best option)***	Never married	1
		Currently married	2
		Separated	3
		Divorced	4
		Widowed	5
		Cohabiting	6
A5	Which describes your main work status best? ***(Select the single best option)***	Paid work	1
		Self-employed, such as own your business or farming	2
		Non-paid work, such as volunteer or charity	3
		Student	4
		Keeping house/ homemaker	5
		Retired	6
		Unemployed (health reasons)	7
		Unemployed (other reasons)	8
		Other (specify)_____ _____	9

Please continue to next page...

Section 3 Preamble

Say to respondent:

The interview is about difficulties people have because of health conditions.

Hand flashcard #1 to respondent

By health condition I mean diseases or illnesses, or other health problems that may be short or long lasting; injuries; mental or emotional problems; and problems with alcohol or drugs.

Remember to keep all of your health problems in mind as you answer the questions. When I ask you about difficulties in doing an activity think about...

Point to flashcard #1

- Increased effort
- Discomfort or pain
- Slowness
- Changes in the way you do the activity.

When answering, I'd like you to think back over the past 30 days. I would also like you to answer these questions thinking about how much difficulty you have had, on average, over the past 30 days, while doing the activity as you usually do it.

Hand flashcard #2 to respondent

Use this scale when responding.

Read scale aloud:

None, mild, moderate, severe, extreme or cannot do.

Ensure that the respondent can easily see flashcards #1 and #2 throughout the interview

Please continue to next page...

Section 4 Core questions

Show flashcard #2

In the past 30 days, how much difficulty did you have in:		None	Mild	Moderate	Severe	Extreme or cannot do
S1	Standing for long periods such as 30 minutes?	1	2	3	4	5
S2	Taking care of your household responsibilities?	1	2	3	4	5
S3	Learning a new task, for example, learning how to get to a new place?	1	2	3	4	5
S4	How much of a problem did you have joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?	1	2	3	4	5
S5	How much have you been emotionally affected by your health problems?	1	2	3	4	5

In the past 30 days, how much difficulty did you have in:		None	Mild	Moderate	Severe	Extreme or cannot do
S6	Concentrating on doing something for ten minutes?	1	2	3	4	5
S7	Walking a long distance such as a kilometre [or equivalent]?	1	2	3	4	5
S8	Washing your whole body?	1	2	3	4	5
S9	Getting dressed?	1	2	3	4	5
S10	Dealing with people you do not know?	1	2	3	4	5
S11	Maintaining a friendship?	1	2	3	4	5
S12	Your day-to-day work/school?	1	2	3	4	5

H1	Overall, in the past 30 days, how many days were these difficulties present?	***Record number of days ____***
H2	In the past 30 days, for how many days were you totally unable to carry out your usual activities or work because of any health condition?	***Record number of days ____***
H3	In the past 30 days, not counting the days that you were totally unable, for how many days did you cut back or reduce your usual activities or work because of any health condition?	***Record number of days ____***

This concludes our interview. Thank you for participating.

Health conditions:

- **Diseases, illnesses or other health problems**
- **Injuries**
- **Mental or emotional problems**
- **Problems with alcohol**
- **Problems with drugs**

Having difficulty with an activity means:

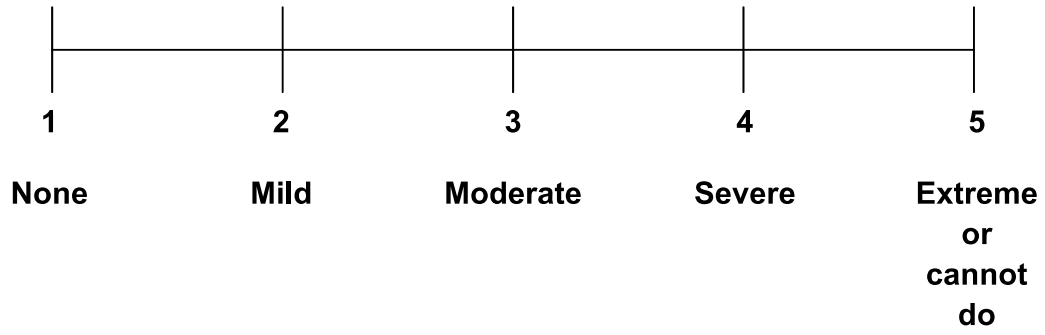
- **Increased effort**
- **Discomfort or pain**
- **Slowness**
- **Changes in the way you do the activity**

Think about the past 30 days only.

WHODAS 2.0

WORLD **H**EALTH **O**RGANIZATION
DISABILITY **A**SSESSMENT **S**CHEDULE 2.0

Flashcard 2



Oswestry Disability Index

Section 1 – Pain Intensity

- ❑ I have no pain at the moment.
- ❑ The pain is very mild at the moment.
- ❑ The pain is moderate at the moment.
- ❑ The pain is fairly severe at the moment.
- ❑ The pain is very severe at the moment.
- ❑ The pain is the worst imaginable at the moment.

Section 2 – Personal Care (washing, dressing, etc.)

- ❑ I can look after myself normally but it is very painful.
- ❑ I can look after myself normally but it is very painful.
- ❑ It is painful to look after myself and I am slow and careful.
- ❑ I need some help but manage most of my personal care.
- ❑ I need help every day in most aspects of my personal care.
- ❑ I need help every day in most aspects of self-care.
- ❑ I do not get dressed, wash with difficulty, and stay in bed.

Section 3 - Lifting

- ❑ I can lift heavy weights without extra pain.
- ❑ I can lift heavy weights but it gives extra pain.
- ❑ Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned (i.e. on a table).
- ❑ Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned.
- ❑ I can lift only very light weights.
- ❑ I cannot lift or carry anything at all.

Section 4 – Walking

- ❑ Pain does not prevent me walking any distance.
- ❑ Pain prevents me walking more than 1mile.
- ❑ Pain prevents me walking more than ¼ of a mile.
- ❑ Pain prevents me walking more than 100 yards.
- ❑ I can only walk using a stick or crutches.
- ❑ I am in bed most of the time and have to crawl to the toilet.

Section 5 – Sitting

- ❑ I can sit in any chair as long as I like.
- ❑ I can sit in my favorite chair as long as I like.
- ❑ Pain prevents me from sitting for more than 1 hour.
- ❑ Pain prevents me from sitting for more than ½ hour.
- ❑ Pain prevents me from sitting for more than 10 minutes.
- ❑ Pain prevents me from sitting at all.

Section 6 – Standing

- ❑ I can stand as long as I want without extra pain.
- ❑ I can stand as long as I want but it gives me extra pain.
- ❑ Pain prevents me from standing more than 1 hour.
- ❑ Pain prevents me from standing for more than ½ an hour.
- ❑ Pain prevents me from standing for more than 10 minutes.
- ❑ Pain prevents me from standing at all.

Section 7 – Sleeping

- ❑ My sleep is never disturbed by pain.
- ❑ My sleep is occasionally disturbed by pain.
- ❑ Because of pain, I have less than 6 hours sleep.
- ❑ Because of pain, I have less than 4 hours sleep.
- ❑ Because of pain, I have less than 2 hours sleep.
- ❑ Pain prevents me from sleeping at all.

Section 8 – Sex life (if applicable)

- ❑ My sex life is normal and causes no extra pain.
- ❑ My sex life is normal but causes some extra pain.
- ❑ My sex life is nearly normal but is very painful.
- ❑ My sex life is severely restricted by pain.
- ❑ My sex life is nearly absent because of pain.
- ❑ Pain prevents any sex life at all.

Section 9 – Social Life

- ❑ My social life is normal and cause me no extra pain.
- ❑ My social life is normal but increases the degree of pain.
- ❑ Pain has no significant effect on my social life apart from limitingmy more energetic interests, i.e. sports.
- ❑ Pain has restricted my social life and I do not go out as often.
- ❑ Pain has restricted social life to my home.
- ❑ I have no social life because of pain.

Section 10 – Traveling

- ❑ I can travel anywhere without pain.
- ❑ I can travel anywhere but it gives extra pain.
- ❑ Pain is bad but I manage journeys of over two hours.
- ❑ Pain restricts me to short necessary journeys under 30 minutes.
- ❑ Pain prevents me from traveling except to receive treatment.

Section 11 - Previous Treatment

Over the past three months have you received treatment, tablets or medicines of any kind for your back or leg pain? Please check the appropriate box.

- ❑ No
- ❑ Yes (if yes, please state the type of treatment you have received)

SCORING TECHNIQUE FOR THE OSWESTRY LOW BACK DISABILITY QUESTIONNAIRE AND NECK DISABILITY INDEX

1. Each of the 10 sections is scored separately (0 to 5 points each) and then added up (max. total = 50).

Example:

Section 1. Pain Intensity	Point Value
A. ___ I have no pain at the moment	0
B. ___ The pain is very mild at the moment	1
C. ___ The pain is moderate at the moment	2
D. ___ The pain is fairly severe at the moment	3
E. ___ The pain is very severe at the moment	4
F. ___ The pain is the worst imaginable	5

2. If all 10 sections are completed, simply double the patient's score.
3. If a section is omitted, divide the patient's total score by the number of sections completed times 5.

Formula:

$$\frac{\text{Patient's Score}}{\text{No. of sections completed x 5}} \text{ X } 100 = _____ \text{ \% DISABILITY}$$

Example:

If 9 of 10 sections are completed, divide the patient's score by 9 x 5 = 45.

Patient's Score 22
Number of sections completed: 9 (9 x 5 = 45)
22/45 x 100 = 48% disability

4. Interpretation of disability scores (from original article):

SCORE INTERPRETATION OF THE OSWESTRY LBP DISABILITY QUESTIONNAIRE	
0-20% Minimal disability	Can cope with most ADLs. Usually no treatment is needed, apart from advice on lifting, sitting, posture, physical fitness, and diet. In this group, some patients have particular difficulty with sitting and this may be important if their occupation is sedentary (typist, driver, etc.)
20-40% Moderate disability	This group experiences more pain and problems with sitting, lifting, and standing. Travel and social life are more difficult and they may well be off work. Personal care, sexual activity, and sleeping are not grossly affected, and the back condition can usually be managed by conservative means.
40-60% Severe disability	Pain remains the main problem in this group of patients, but travel, personal care, social life, sexual activity, and sleep are also affected. These patients require detailed investigation.
60-80% Crippled	Back pain impinges on all aspects of these patients' lives both at home and at work. Positive intervention is required.
80-100%	These patients are either bed-bound or exaggerating their symptoms. This can be evaluated by careful observation of the patient during the medical examination.
Data compiled from Fairbanks et al, 1980.	

References

The Oswestry Disability Index (also known as the Oswestry Low Back Pain Disability Questionnaire) is an extremely important tool that researchers and disability evaluators use to measure a patient's permanent functional disability. The test is considered the 'gold standard' of low back functional outcome tools.

Minimum detectable change (90% confidence): 10% points (change of less than this may be attributable to error in the measurement).

Fairbank JCT & Pynsent, PB (2000) The Oswestry Disability Index. *Spine,* 25(22):2940-2953.

Davidson M & Keating J (2001) A comparison of five low back disability questionnaires: reliability and responsiveness. *Physical Therapy* 2002;82:8-24.

Evaluation de l'Incapacité Fonctionnelle
OSWESTRY DISABILITY INDEX

Référence : Fairbank J, Couper J, Davies J et al. The Oswestry low back pain questionnaire. Physiotherapy 1980; 66:271-3

Merci de remplir ce questionnaire. Il a été élaboré dans le but de connaître l'impact de votre Mal au dos sur vos capacités à réaliser vos activités de la vie quotidienne.

Veuillez répondre à **chaque section.**

Désignez **DANS CHAQUE SECTION** une seule réponse, celle qui décrit au mieux votre état de **CE JOUR.**

Section 1 - Intensité de la douleur

- En ce moment, je ne ressens aucune douleur.
- En ce moment, j'ai des douleurs très légères.
- En ce moment, j'ai des douleurs modérées.
- En ce moment, j'ai des douleurs assez intenses.
- En ce moment, j'ai des douleurs très intenses.
- En ce moment, les douleurs sont les pires que l'on puisse imaginer.

Section 2 - Soins personnels (se laver, s'habiller, etc.)

- Je peux effectuer normalement mes soins personnels sans douleurs supplémentaires.
- Je peux effectuer normalement mes soins personnels, mais c'est très douloureux.
- Je dois effectuer mes soins personnels avec précaution et lenteur, et je ressens des douleurs.
- J'ai besoin d'aide pour les soins personnels, mais j'arrive encore à effectuer la plus grande partie de ceux-ci seul(e).
- J'ai besoin d'aide tous les jours pour la plupart de mes soins personnels.
- Je ne peux plus m'habiller, je me lave avec difficulté et je reste au lit.

Section 3 - Soulever des charges

- Je peux soulever des charges lourdes sans augmentation des douleurs.
- Je peux soulever des charges lourdes, mais cela occasionne une augmentation des douleurs.
- Les douleurs m'empêchent de soulever de lourdes charges depuis le sol, mais cela reste possible si elles sont sur un endroit approprié. (par ex : sur une table)
- Les douleurs m'empêchent de soulever des charges lourdes, mais je peux en soulever de légères à modérées si elles sont sur un endroit approprié.
- Je ne peux soulever que de très légères charges.
- Je ne peux rien soulever, ni porter du tout.

Section 4 - Marche

- Les douleurs ne m'empêchent pas de marcher, quelle que soit la distance.
- Les douleurs m'empêchent de marcher au-delà de 1 km.
- Les douleurs m'empêchent de marcher au-delà de 250 m.
- Les douleurs m'empêchent de marcher au-delà de 100 m.
- Je ne peux marcher qu'avec une canne ou des béquilles.
- Je reste au lit la plupart du temps et dois me traîner jusqu'aux toilettes.

Section 5 - Position assise

- Je peux rester assis(e) aussi longtemps que je le désire sur n'importe quel siège.
- Je peux rester assis(e) aussi longtemps que je le désire sur mon siège favori.
- Les douleurs m'empêchent de rester assis(e) plus d'une heure.
- Les douleurs m'empêchent de rester assis(e) plus d'une demi-heure.
- Les douleurs m'empêchent de rester assis(e) plus de dix minutes.
- Les douleurs m'empêchent toute position assise.

Section 6 - Position debout

- Je peux rester debout aussi longtemps que je le désire sans douleur supplémentaire.
- Je peux rester debout aussi longtemps que je le désire, mais cela occasionne des douleurs supplémentaires.
- Les douleurs m'empêchent de rester debout plus d'une heure.
- Les douleurs m'empêchent de rester debout plus d'une demi-heure.
- Les douleurs m'empêchent de rester debout plus de dix minutes.
- Les douleurs m'empêchent de me tenir debout.

Section 7 - Sommeil

- Mon sommeil n'est jamais perturbé par les douleurs.
- Mon sommeil est parfois perturbé par les douleurs.
- A cause des douleurs, je dors moins de six heures.
- A cause des douleurs, je dors moins de quatre heures
- A cause des douleurs, je dors moins de deux heures.
- Les douleurs m'empêchent de dormir.

Section 8 – Vie sexuelle (si présente)

- Ma vie sexuelle est normale et n'occasionne pas de douleurs supplémentaires.
- Ma vie sexuelle est normale, mais occasionne parfois quelques douleurs supplémentaires.
- Ma vie sexuelle est presque normale, mais très douloureuse.
- Ma vie sexuelle est fortement réduite à cause des douleurs.
- Ma vie sexuelle est presque inexistante à cause des douleurs.
- Les douleurs m'empêchent toute vie sexuelle.

CASE

SPINAL STENOSIS CASE

DEMOGRAPHIC INFORMATION

Name:	*Umutesi Izina*		
Medical Diagnosis/Reason for Referral/Chief Complaint:	Low back pain, worse in the mornings, hampering usual performance of household duties		
Demographics: *age, sex, language*	62	female	Kinyarwanda /French

INTERVIEW/CHART INFORMATION

Signs and symptoms:	Gradual increase in back pain over past 5 years. Current intermittent pain is located L2-L5 right > left; rates as 4/10; increases with standing, walking; decreases with forward bending; Worse in the morning with some improvement as she moves throughout the day. Occasional pain in right calf.
Differential diagnosis	CNS signs like + Babinski; Cauda Equina syndrome; intermittent vascular claudication; Rheumatoid arthritis
Activity Limitations:	Unable to walk .5 K to neighbor's house
Participation Restrictions:	Has quit going to church because back is too painful
History of current problem[s]:	Several years history of low back pain with increase in the last 2 months. Was instructed in flexion stretches 3 years ago and they helped but she quit doing them.
Medical History:	
• *Review of body systems and past medical /surgical history*	Izina had a broken arm as a child, reports several falls lately
• *Family medical history*	Izina's parents are both deceased. She is unsure of the cause of death
• *Results of medical tests*	X-rays show loss of disc height L3-L5, narrowing of the right lateral foramen L2-3, L3-4, L4-5, L5-S1 with osteophytes around the facet joints, and narrowing of the right intervertebral foramen at L4-5
• *Medications*	She is taking a blood pressure pill prescribed by a local nurse
• Health risks – smoking, alcohol, lack of exercise	Her only exercise is her daily duties. She no longer does the PT exercises prescribed several years ago. She has never smoked or used alcohol.
Prior and Present level function:	Prior to recent increase in symptoms she tended to the cooking, cleaning in the house and watched the grandchildren. Currently cannot stand at the stove to cook for longer than 15 minutes, cannot sweep for longer than 10 minutes, and cannot lift the youngest grandchild (11 kg)
Environmental and Personal Factors: *including home, work,*	

school environment	
• *Describe where the patient lives:*	Izina lives with her adult daughter and her husband, helping to care for the three young children. They all live in a small village 45K from town.
• *Describe the work the patient does:*	Izina does the cooking and housework. Both of these require forward bending. She reports that she tires easily and is working more slowly.
• *Describe the family and social support*	There is an extended family with aunts uncles and cousins in the area of her village
Health beliefs: *What the patient believe caused their problem and how to treat it?*	Izina complains that being old causes too much pain, and does not think she can have any control over it
Patient goals from therapy	Izina wants to be able to do her part in helping the family, wants to feel stronger.

EXAMINATION

Systems Review:	
• *Cardiopulmonary: vitals and edema*	BP 145/94 mmHg with medication; HR 80 bpm; Resp: 16 breaths/min
• *Integumentary: skin integrity, color, scar formation*	She has an old scar on her arm, probably the wound from the childhood fracture of arm. The skin on both lower legs is somewhat discolored with bilateral swelling of the feet
• *Musculoskeletal: gross ROM, strength, height, weight*	Height: 157cm; Weight: 75kg BMI = 30.4 Gross lower extremity strength decreased General lumbar stiffness with extension most limited
• *Neuromuscular: general balance, gait/mobility*	Gait slow, balance fair, no complaints of numbness or tingling; Reports that she fell twice in the last 6 months, once when walking outside during the evening hours, and once when getting up from sitting in her home. She was bruised but did not break any bones. She reports that she is afraid she will fall again, so moves more slowly.
Tests and Measures:	
Posture – standing and sitting	Flexed posture in thoracic spine with minimal lumbar lordosis. Hips flexed during gait.
Observation of movement problems	Izina moves slowly with a stooped posture. Feet are spaced apart for balance. She must use her hands to come to standing from a seated position.
Active Range of Motion	Lumbar Flexion: 4 cm (Mean = 5.8 (SD = 0.9); Extension: .5 cm (mean = 1.6); Side bending R = 16cm (mean = 22cm SD =5.4) ; SBL = 16 cm; Rotation R and L = 25% Hip ROM bilateral: extension /flexion = -20° to 95°; Internal rotation 0 to 25°; External rotation 0 to 30°
Repeated movements	Extension in standing increases her back pain and her buttock pain Flexion in supine decreases her back and buttock pain

Muscle strength	Weakness in core stabilizers Bilateral lower extremities strength 3+/5 in quads and hip extensors
Muscle length	General decrease in spine flexibility; hamstring tightness 60° R and L; hip flexor tightness -20° R and L
Palpation	There is pain and muscle tightness in the lumbar paraspinals L3-L5 and both buttocks
Accessory motion testing:	PAIVM: Central PA L2-L5 hypomobile, pain at L4 and L5.
Special tests:	
• Bicycle test	Negative for leg pain
• Quadrant test	Positive for right lumbar pain
Comparable Sign	
• Subjective	Change in pain rating
• Objective	Increase in cooking time
Outcome measures:	WHODAS 2
Functional goals:	• Time standing at the stove will increase to 30 minutes in 4 weeks • Time sweeping the floor will increase to 30 minutes in 6 weeks • Ability to walk 1 K in 8 weeks • Ability to pick up grandchild in 8 weeks

TREATMENT

Describe why the patient is having functional problem(s)	Likely diagnosis of lumbar R lateral stenosis from degenerative changes in the spine over time. Decrease in hip mobility and forward flexed posture contribute to overall stiffness. Weakness in hip and knee extensors make sit to stand activities difficult, and contribute to poor balance.
Treatments:	
Therapeutic exercise	Lumbar flexion exercises to increase lumbar mobility; core stabilization with hip rotation and hip extension; strengthening of gluteals, quadriceps, squats, sit to stand, balance activities
Manual therapy	Unilateral PA left lumbar L2 – L5; Mobilization of bilateral hip joints in lateral distraction; Soft tissue mobilization lumbar
Electrotherapy	Infrared, hot packs, TENS for pain
Functional and Ergonomic activities	Housework ergonomics of cooking, sweeping, picking up children, gait
Home program	Lumbar flexion program to be done twice a day. Core stabilization. Progress to strengthening of extensor muscles.
Community education/Prevention	Encourage a walk every day gradually increasing distance and gait speed. Use a cane or stick if needed for balance. Education about the cause of back pain (stenosis) as a life-long condition that will require life-long management

Spinal Stenosis Case

Spinal Stenosis

A. Signs and Symptoms
   1. Predominantly people > 50 years old
   2. Long history of back pain
   3. Unilateral or bilateral leg pain
   4. Neurogenic claudication
   5. Increased symptoms with extension activities like walking, prolonged standing
   6. Flattened lumbar lordosis
   7. Shortened hip flexors; lengthened hip extensors; overuse of paraspinals

B. Differential diagnosis
   1. CNS signs like + Babinski
   2. Cauda Equina syndrome
   3. Intermittent vascular claudication
   4. Rheumatoid arthritis
   5. Ankylosing Spondylitis

C. Etiology
   1. Narrowing of the spinal canal and intervertebral foramen of the spine due to disc degeneration and bone spur development in the central canal and/or foramen (spondylosis)
   2. Hypertrophy of the ligamentum flavum
   3. **Central Stenosis** is a narrowing of the spinal canal
      a. Compression of spinal cord (cervical) or cauda equina (lumbar)
   4. **Lateral Stenosis** is narrowing of the foramen
      a. Compression of spinal nerves
      b. L4-5 and L5-S1 most common
   5. Neurogenic claudication is pain in the buttock, groin, anterior thigh, posterior leg to feet due to compression of the blood supply to the nerves of the cauda equina
      a. Pain increased in extension; decreased in flexion
      b. Commonly bilateral

D. Across spinal regions
   1. Lateral stenosis more frequent in lumbar spine
   2. Central stenosis more frequent in cervical spine
      a. Can affect both upper extremity and lower extremity function
      b. Can result in cord compression and myelopathy

E. Examination
   1. Basic lumbar exam

F. Special Tests
   1. Bicycle test
   2. Quadrant test

G. Treatment
    1. Flexion exercises
    2. Postural education
    3. Hip flexor and paraspinal muscle stretching
    4. Hip mobilization
    5. Core stabilization targeting abdominals and gluteals

H. Prognosis
    1. Pathology will continue to progress
    2. Patient education and home exercise program may slow progression
    3. Spinal stenosis is the most common pre-operative diagnosis of people over 65 years of age who undergo lumbar spinal surgery.

References

Dutton, M. *Orthopaedic Examination, Evaluation and Intervention*. 3rd ed. New York, NY: McGraw Hill; 2012.

Genevay S, Atlas S. Lumbar spinal stenosis. *Best Practice & Research Clinical Rheumatology.* 2010;24:253-265.

Sleeper M. Course Notes. Northwestern University, Department of Physical Therapy.

SKILLS

Special Test for Spinal Stenosis
Bicycle Test

Differentiates between peripheral vascular disease and neurogenic claudication

1. Have the patient ride a stationary bicycle in an upright postural position until the lower extremity symptoms appear
2. Have the patient continue riding, but have the patient assume a forward bent position
3. If the symptoms disappear, the problem may be neurogenic claudication
    a. The flexed posture may relieve pressure on the spinal nerves thus decreasing pain
4. If the symptoms continue, the problem may be vascular claudication
    a. The patient is continuing to use the calf muscles, so pressure is still put on the arteries in the calf causing the pain

Special Test
Quadrant Test for Lumbar Spine

1. Perform the test first on the uninvolved side, then on the involved side.
2. Patient standing. Patient moves into lumbar extension, side bending and rotation toward the side of pain.
    a. This position closes down the intervertebral foramen
3. Therapist stands behind patient to guide movement with hands on patient's shoulders.
4. Positive sign is reproduction of the patient's symptoms into the leg.
5. If symptoms are not reproduced at the end of available range of motion, therapist applies overpressure into extension, side bending and rotation.
6. Positive sign is reproduction of the patient's symptoms into the leg.
7. A positive test will help to identify the intervertebral foramen as a source of the patient's problem.
8. Spinal stenosis is one diagnosis that affects the intervertebral foramen.

Treatment with PAIVMs

Grade I

Gentle movements of small amplitude carried out in the very beginning of the available range

Grade II

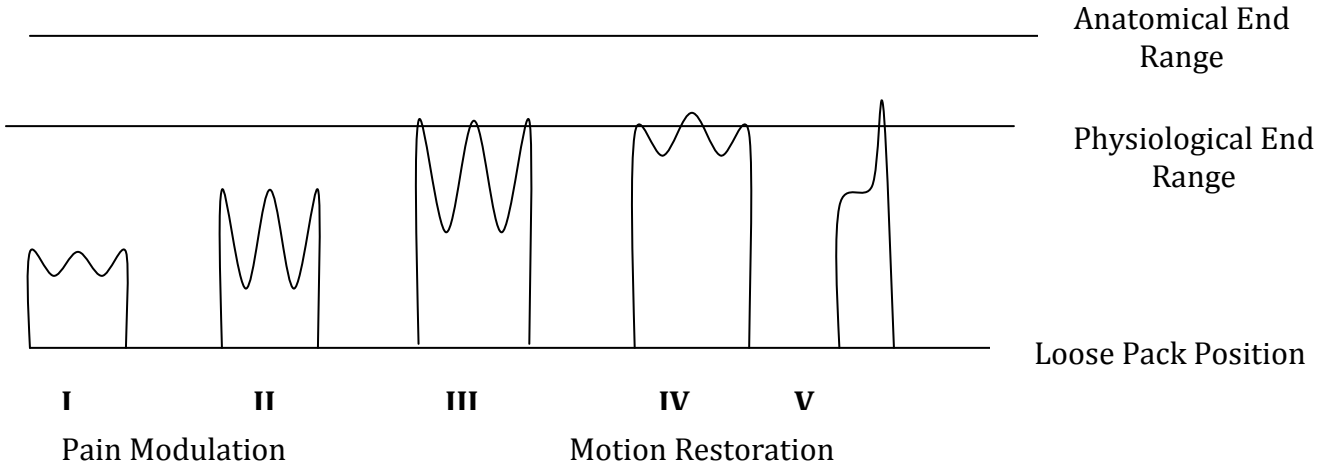
Gentle movements of large amplitude carried out in the mid-range of a joint

Grade 3 III

Moderate movements of large amplitude carried out through the available range of the joint and into the resistance

Grade IV

Small oscillating movements carried out at the end range and into the resistance



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Maitland GD. Vertebral Manipulation. 5th ed. London: Butterworths; 1986.

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Petersen C, Foley R. Active and Passive Movement Testing. New York: McGraw-Hill; 2002.

Trigger Points

1. Trigger points are a zone of intense pain in a hardened muscle band that refers pain distantly when stimulated
2. The muscle band can be palpated as a hard knot within the muscle belly
3. The development of trigger points is not fully understood. It is proposed that the muscle is damaged in a small way through exercise or posture which results in a decrease in blood supply to an area forming a tender knot in the muscle
4. Palpation and pressure are often accompanied by a 'jump' sign as the muscle fibers twitch
5. Referred pain patterns for myofascial trigger points do not necessarily follow anatomical dermatome, myotome or scleratome patterns. Pain is usually dull and aching, may be present at rest, increases with contraction and palpation of the involved muscle.
6. Pain patterns have been determined by local injections of saline irritants that repeatedly produced the same referral pattern, and by clinical observation. Pain disappears when the trigger point is gone.
7. Active trigger points are painful at rest and with activity, with increased pain on palpation, and referred pain in a muscle specific pattern
8. Latent trigger points reproduce pain only with palpation
9. Location of myofascial trigger points
    a. Place muscle in a rest position
    b. Systematically palpate the muscle both parallel and perpendicular to the muscle fibers
    c. Parallel palpation finds a nodule in the muscle that includes the trigger point
    d. Perpendicular palpation finds taut band in the muscle that includes the trigger point; this may be easier to palpate if the muscle is on stretch
10. Treatment of myofascial trigger points
    a. Put steady pressure that is tolerated by the patient on the trigger point and hold for 30-60 seconds. Initially this pressure reproduces the patient's pain.
    b. As the pressure is held, the therapist will feel the knot in the muscle soften and the patient will experience a decrease in pain
    c. Gradually increase the pressure as tolerated by the patient. This will once again increase the pain. Hold for 30-60 seconds while the knot relaxes and the pain decreases
    d. If symptoms are increased after a 60 second trial treatment, discontinue the pressure
11. Follow trigger point release with gentle stretching exercises

Stretching Principles

1. Stretch muscles that have been warmed up by light activity
2. Position limb so that the muscle being stretched is lengthened over all joints that the muscle crosses
3. Hold stretches for a minimum of 15 – 30 seconds
4. Stretching is based on the *creep phenomenon* of soft tissue elasticity. This describes the tendency of muscle tissues to respond to the stresses of load and time.
5. Contract/relax techniques can assist stretching through autogenic inhibition and reciprocal inhibition

Advancement of Rwandan Rehabilitation Services Project
SESSION TWO

Case Presentation

- Age, gender, diagnosis
- Identify the patient's functional problem
- Discuss how you decided what to examine
- Discuss how the treatment addressed the functional problems

Skills Review

- Neutral spine
- Transverse abdominus strengthening
- PAIVM testing and treatment lumbar and thoracic
- Lateral shift correction
- Repeated extension exercises
- Neuromobilization

Clinical Reasoning Process

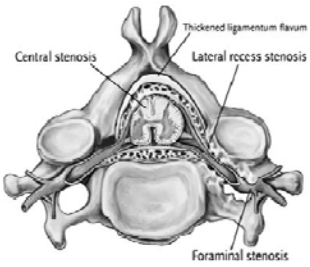
- Interview > Identify Functional problems > Differential diagnosis and need for referral > Determine what to examine > Perform Examination > Determine Comparable sign to measure progress > Determine what to treat > Initiate Treatment > Documentation

STENOSIS

Pathology

- Loss of disc height
- Fibrosis of ligamentum flavum
- Hypertrophy of facet joints
- Vertebral end plate osteophytes
- Central canal and foramen decrease in space with extension and increase with flexion

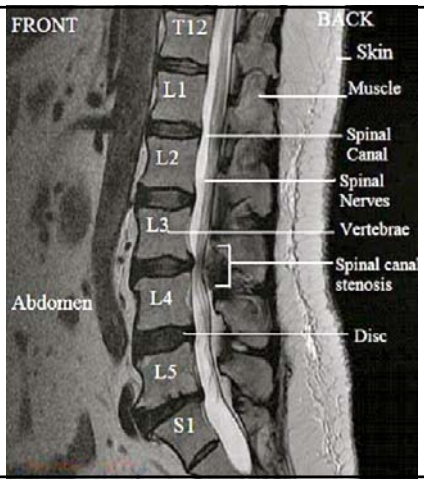
Central and Lateral Stenosis



- Slowly progressive degenerative process
- Affects lower lumbar vertebrae
- Central canal
- Lateral recess
- Foramina

Cervical spine

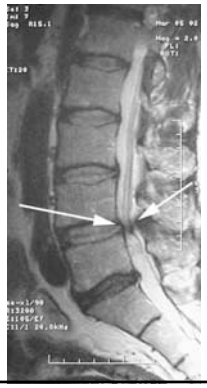
- Flattened lordosis
- Shortened disc height C4-5 and C5-6
- Arthritic changes at all levels



Neurogenic Claudication

- Pain in the buttock, groin and anterior thigh as well as posterior leg to the feet
- Fatigue, heaviness, weakness, paresthesia
- May report night leg cramps
- Unilateral or bilateral and symmetrical

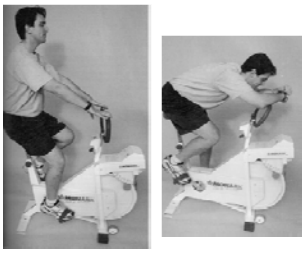
Central Stenosis MRI



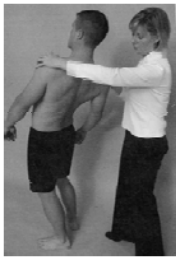
Medical Management of Stenosis

- Medication
- Corticosteroid injections
- Most common reason for lumbar spinal surgery in developed countries
- Decompressive laminectomy for extreme symptoms

Special Tests for Stenosis



Bicycle Test



Quadrant Test

Hip Lateral Distraction

- Patient supine with hip and knee flexed
- Therapist seated or standing with lower leg of patient resting on shoulder
- Place hands in hip crease
- Distract hip joint in an inferior and lateral direction
- Mobilize grade I – IV for 30 seconds. Repeat up to 8 times.

Physical Therapy Management of Stenosis

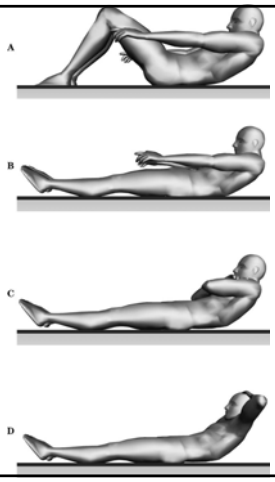
- Repeated flexion decreases symptoms
- Manual therapy to increase lumbar and hip mobility
- Stretching, strengthening, endurance exercises for lumbar spine and hip
- Electrotherapy for pain control

Flexion Exercises

- Single knee to chest
- Double knee to chest
- Repeat 10 times
- Perform 3 sets of 10 repetitions
- Exercise morning and evening

Dutton, 2012

Rectus Abdominal Progression



Sahrmann, 2002

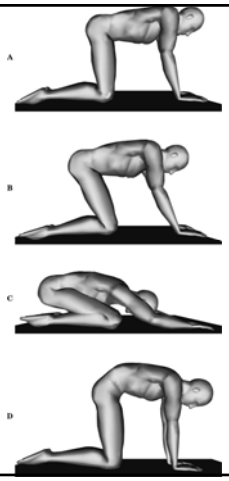
Abdominal sit back

Dutton, 2012

Flexion Exercises
Rectus and Obliques

Dutton, 2012

Quadriped flexion exercises
For lumbar and hip mobility



Sahrmann, 2002

Assignment

- Complete the clinical reasoning chart describing the course of care for three patients with lumbar problems. This chart will be collected next session
- Prepare to present one case to a small group at the next session

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- Dutton, M. *Orthopaedic Examination, Evaluation and Intervention*. 3rd ed. New York, NY: McGraw Hill; 2012.
- Neumann DA. *Kinesiology of the Musculoskeletal System.* St. Louis, MO: Elsevier; 2010.
- Sahrmann S. *Diagnosis and Treatment of Movement Impairment Syndromes*. St. Louis, MO: Mosby; 2002.
- Select web resources

Advancement of Rwandan Rehabilitation Services Project

SPINAL COURSE
SESSION THREE

OBJECTIVES

1. Assess skills previously taught through review lab
2. Assess clinical reasoning of participants through case presentations
3. Discuss use of outcome measures
4. Review anatomy and pathology of SPONDYLOSIS, SPONDYLOLYSIS, SPONDYLOLISTHESIS
5. Demonstrate new skills
    a. Prone instability test
    b. PPIVM assessment and treatment
    c. Multifidus strengthening
    d. Progression of stabilization exercises
6. Apply skills and clinical reasoning to spondylosis and spondylolisthesis cases

OUTCOME MEASURES DISCUSSION

Use of WHODAS	YES	NO
Use of OSWESTRY	YES	NO
Positive Comments		
Negative Comments		
Suggestions		

CASES

Spondylosis

A. Signs and Symptoms
   1. May be asymptomatic
   2. Age over 50
   3. Gradual onset of symptoms over several years.
      a. Dull aching pain over involved spinal segments that is intermittent at first and then more constant
      b. Muscle spasm and trigger points
      c. Tiredness in muscles, especially at end of day
      d. Decreasing range of spinal motion
   4. Posture becomes generally stiff
   5. Usually do not have neural symptoms
   6. Degenerative Joint Disease (DJD)
      a. Extension, over head work, lifting, prone lying, carrying anterior to body
   7. Degenerative Disc Disease (DDD)
      a. Flexion, rotation, prolonged sitting, lifting activities

B. Differential Diagnosis
   1. Stenosis
   2. Rheumatoid arthritis
   3. Ankylosing Spondylitis
   4. Loss of sensation in arms, legs or saddle area
   5. Muscle weakness in arms or legs, especially recent onset

C. Etiology
   1. Degenerative disease of the spine, often called osteoarthritis of the spine.
   2. Natural progression with aging
   3. Involves degeneration in the disc and the facet joints
   4. Degenerative process may be accelerated by trauma, muscle weakness, obesity, poor posture, faulty habits, repetitive lifting

D. Degenerative Disc Disease
   1. Over time the discs become dehydrated
   2. Annulus gradually loses elasticity and tears and clefts occur
   3. The disc spaces gradually decrease so that the bony edges of the vertebral bodies are less stable
   4. Development of bone spurs around the vertebral body in an attempt to stabilize the joints
   5. Results in reduced intervertebral motion and the patient experiences stiffness

E. Degenerative Joint Disease
   1. Laxity in the facet joint capsule due to decrease in disc height
   2. Osteophytes develop on the superior and inferior facet joint surfaces in an attempt to stabilize the joint
   3. Osteophytes on the superior process may project anteriorly and medially leading to narrowing of the lateral recess of the spinal canal. (Lateral stenosis)

4. Osteophytes on the inferior process may project into the central canal leading to narrowing (Central stenosis)

F. Across Spinal Regions
   1. Occurs most often in areas of greatest movement and/or greatest load
      a. L4-L5 and L5-S1
      b. Facet joint related at C3-4 and C4-5
      c. Disc related at C5-6 and C6-7

G. Examination
   1. Basic lumbar exam
   2. Include Passive physiological intervertebral motion testing (PPIVM)

H. Treatment
   1. Rest during times of inflammation
   2. Grades I – IV posterior / anterior mobilizations
   3. Grades I – IV physiological mobilizations in flexion and rotation
   4. Soft tissue mobilization
   5. Core stabilization training
   6. Modification of lifestyle
   7. Exercises that un-weight affected structures
      a. Non weighted extension for disc
      b. Non-weighted flexion for facet

I. Prognosis
   1. Natural process of aging
   2. Unprotected activities, poor posture and repetitive movements will increase the process
   3. Can be slowed with proper self care, and education

References

Dutton, M. Orthopaedic Examination, Evaluation and Interention. 3rd ed. New York, NY: McGraw Hill; 2012.
Sleeper M. Course Notes. Northwestern University, Department of Physical Therapy.

CLINICAL CASE: Lumbar Spondylosis

DEMOGRAPHIC INFORMATION

Name:	MUGIRANEZA, Jean Paul		
Medical Diagnosis/Reason for Referral/Chief Complaint:	Low back pain		
Demographics: *age, sex, language*	59	male	French/ English / Kinyar wanda

INTERVIEW/CHART INFORMATION

Signs and symptoms:	Intermittent bilateral pain in low back R>L, rates at 5/10 at the end of workday; No pain down the legs. Aggravated by lifting and sitting for a long time Relieved by lying down supine with knees flexed or side lying Better in the morning and worse at the end of the work day
Differential diagnosis	Prostatitis, Renal pain, Tumor
Activity Limitations:	Patient has difficulty sitting for over an hour; cannot do lifting around the house; Walking tolerance has decreased, weight gain is happening
Participation Restrictions:	Has stopped going to weekly card game with friends due to sitting intolerance; Asked for shortened work day
History of current problem[s]:	The onset of this back pain is 2 to 3 years, gradually getting worse
Medical History:	
• *Review of body systems and past medical /surgical history*	There is no history of surgery, the patient reports to be typically healthy, only having the flu occasionally
• *Family medical history*	His father is deceased, cause unknown, mother 78 and healthy
• *Results of medical tests*	X ray shows Degenerative Disc Disease with bone spurs around the vertebral bodies and facet joints L3 – L5, R>L
• *Medications*	The patient is taking medication for high blood pressure, and sometimes ibuprofen for discomfort
• Health risks – smoking, alcohol, lack of exercise	The patient denies smoking, but reports not getting exercise, and is worried about weight gain. Drinks urwagwa with friends.
Prior and Present level function:	This patient used to play football in an adult league, but no longer plays. He is unable to help around the house with lifting, and is considering asking to shorten his workday because of increasing pain. He still walks to work but is slow.
Environmental and Personal	

Factors: *including home, work, school environment*	
• *Describe where the patient lives:*	The patient lives 10 minutes from the center city where he works
• *Describe the work the patient does:*	The patient is a billing clerk for Telecom company. He both sits and stands throughout the work day with occasional light lifting < 10 kg.
• *Describe the family and social support*	He has two children age 14 and 16, wife, and mother living with him
Health beliefs: *What the patient believe caused their problem and how to treat it?*	This man believes that his sedentary job contributes to his low back pain.
Patient goals from therapy	This patient would like to be pain free, and have help developing an exercise regimen to help lose weight

EXAMINATION

Systems Review:	
• *Cardiopulmonary: vitals and edema*	BP 140/90 mmHg; HR 78 bpm
• *Integumentary: skin integrity, color, scar formation*	Unremarkable
• *Musculoskeletal: gross ROM, strength, height, weight*	Height 170 cm; Weight 87 kg; BMI 30.1 Lumbar and R hip ROM limited; Lower extremity strength functional; End range tightness bilateral shoulder joints.
• *Neuromuscular: general balance, gait/mobility*	Within functional limits for balance; gait is slow due to pain and stiffness, especially at the end of the day.
Tests and Measures:	
Posture – standing and sitting	Slouched posture in sitting and standing, forward head; lack of lumbar lordosis
Observation of movement problems	Slow in moving from sit to stand, stand to kneel, sit to supine; Gait slow with flexed posture; Lifting done using back and not legs
Active Range of Motion	Lumbar Flexion: 2 cm (Mean = 5.8 SD = 0.9); Extension: .5 cm (mean = 1.6); Side bending R and L = 15 cm (mean = 22cm SD =5.4); Rotation R and L = 75% of full range. R Hip flexion = 0 to 70°, Extension = -10°, External/Internal rotation 0 to 25°
Repeated movements	Repeated flexion of lumbar spine increases back pain Repeated extension of lumbar spine also increases back pain
Muscle strength	Manual Muscle Test of R and L hip flexors, quadriceps, hamstrings, ankle dorsiflexors/plantarflexors = 4/5; hip

	extensors, 3/5; core stabilizers of transverse abdominus and multifidus are weak
Muscle length	Hamstring tightness bilaterally at 45° Hip flexor tightness bilaterally at 20°
Palpation	Can reproduce pain over lumbar paraspinals with deep palpation; pain and trigger points in R paraspinals, multifidus, and piriformis
Accessory motion testing:	PAIVM Central PA L 2, 3 hypomobile, Pain at L4 and L5 PPIVM L2-3, L3-4 Flexion and rotation hypomobile; L4-5, L5-S1 flexion and rotation hypermobile and painful
Special tests:	Repeated flexion and extension in standing are positive for lumbar pain
Comparable Sign	
• Subjective	Pain rating at end of workday
• Objective	Improvement in goniometry of lumbar motions; length of time he can sit
Outcome measures:	WHODAS 2; Oswestry
Functional goals:	Patient will adopt new sitting posture at work in 1 week Patient will lift correctly using his legs in 2 weeks Patient will be able to sit pain free for 1 hour in 4 weeks Patient will be able to walk 3 miles without back pain in 8 weeks

TREATMENT

Describe why the patient is having functional problem(s)	Normal degenerative changes in his lumbar spine involving both the disc and posterior facet joints. Possibly aggravated by playing football in younger years. Sitting posture and inactivity throughout the day contribute to increasing symptoms. Flexor and extensor muscle strength/endurance is decreased contributing to pain and instability.	
Treatments:		
Therapeutic exercise	General core strengthening program including abdominals and multifidus, Stretching for hamstrings and piriformis; walking endurance	
Manual therapy	Grades I – II lumbar PAIVM or PPIVM L4-L5, L5-S1 for pain control Grades III – IV lumbar PAIVM or PPIVM L 1- 2, 2-3, 3-4 for mobility	

	Soft tissue mobilization and trigger point release lumbar paraspinals and R piriformis, multifidus
Electrotherapy	Heat, electrotherapy as needed for pain control
Functional and Ergonomic activities	Check on sitting position at work, education on chair exercises, education on self-evaluation of preferred positions at work. Instruct in safe lifting procedures Provide an at work stretching program for trunk mobility for use during breaks; instruct in pacing skills to change posture every hour during work day. Core stabilization in sitting postures.
Home program	Stretch hamstring, piriformis; abdominal stabilization; Walking, learning to use core muscles during normal daily activities and lifting
Community education/Prevention	Visit work place to observe sitting postures

CLINICAL CASE: Lumbar Spondylosis

Notes and Discussion

1. What else would you like to know about this patient?

2. How do his functional activities contribute to his back problem?

3. What is a key principle for successful treatment?

Spondylolysis and Spondylolisthesis

Spondylolisthesis is a condition of the spine where one vertebrae slips forward or backward compared to the vertebrae below. Forward slippage of one vertebra on another is referred to as anterolisthesis, while backward slippage is referred to as retrolisthesis.

A. Signs and Symptoms
    1. May be asymptomatic
    2. Dull, aching pain in low back area
    3. Sensation usually intact especially in lower grades
    4. May see a 'catch' sign with difficulty returning to standing after forward bending
    5. May report feeling like back will collapse during daily activities
    6. Unsupported flexion may increase symptoms secondary to increasing moment of shear forces.
        a. Lifting in poor positions may increase listhesis
    7. Extension both passive and active will load posterior structures and cause pain
        a. Prolonged standing, over head work, any activity which promotes extension will increase symptoms
    8. X-rays taken in neutral, flexion and extension positions of lumbar spine. Flexion x-rays often reveal anterior displacement

B. Differential diagnosis
    1. Osteoarthritis of the hip
    2. Spinal tumors
    3. Infections

C. Etiology – Spondylolysis
    1. A congenital defect in the pars interarticularis of the vertebral arch (may be unilateral or bilateral).
    2. Leads to unilateral or bilateral fracture of the Pars often from repetitive extension sports injuries in the young or joint degeneration in older patients

D. Etiology - Spondylolisthesis
    1. Anterior or posterior slipping of a vertebral segment on the segment immediately below it
    2. Most common type is secondary to congenital bilateral pars defect or sports related injury
    3. Most common site is L5-S1
    4. May lead to spinal instability
    5. Graded based on the amount of slippage from I – IV with increasing grades more severe
        a. Grade I is a slip of up to 25%,

        b. grade II is between 26%-50%,

        c. grade III is between 51%-75%,

        d. grade IV is between 76% and 100%, and

e. Grade V, or spondyloptosis occurs when the vertebra has completely fallen off the next vertebra.

6. Grades I, II
    1. Hypermobility will stimulate nociceptors in bone, ligament and joint capsule
7. Grade III, IV
    1. Sensory changes secondary to spinal cord compression because of the reduction in the diameter of the spinal canal
    2. Sensory changes secondary to intervertebral foramen diameter reduction as a result of loss of disc height and listhesis activity
    3. Decrease in strength and endurance secondary to prolonged neural compression
8. Higher grade spondylolisthesis twice as common in girls than boys
9. Progression of slippage most common during growth spurt between ages 10-20
10. Higher incidence in the young athletic population, particularly gymnasts, football players, weight lifters, divers and wrestlers

E. Examination
1. Basic lumbar exam
    a. Repeated flexion and extension painful, especially at end range
    b. Often accompanied by weakness in the gluteus maximus muscle and tightness in the hamstrings
    c. Neural exam is essential
    d. Palpation may reveal a 'step-off' at L5-S1

F. Special Tests
1. Passive lumbar extension
    a. Sensitivity 84% = 84% of the people who test positive will have instability
    b. Specificity 90% = 90% of the people who test negative will not have instability
    c. Reference: Dutton, p 395

G. Medical management
1. Acute and subacute patients respond to anti-lordodic bracing and relative rest from sports for 3-4 months, or until bony healing is observed on CT imaging.
2. Chronic patients may not achieve bony healing
3. Surgical intervention includes spinal fusion reserved for patients with chronic pain and/or neurological signs

H. Physical Therapy Treatment
1. Forceful hyperextension activities are contraindicated
2. Determine neutral lumbar spine position that best decreases symptoms
3. Stabilization isometrics, co-contraction of multifidi and abdominals, progressive stabilization into hands and knees, standing, functional activities
4. If there is suspect of spondylolysis, maintenance of strong supportive trunk muscles to keep the spine stable will prolong function.
5. Postural education and body awareness are important

I. Prognosis
    1. Osseous healing not necessary to achieve an excellent clinical outcome
    2. Surgical treatment is generally reserved for people who fail to respond to conservative treatment and who show intractable pain or developing neurological signs.
    3. In a survey of members of the Scoliosis Research Society, in treating high-grade slips, 21% of respondents either recommended against or did not ever allow athletes to return to contact sports. However, 82% of surgeons allowed patients to return to non-contact sports at six months to one year following fusion for high-grade slip. (Rubery PT, Bradford DS. Athletic activity after spine surgery in children and adolescents: results of a survey. *Spine*. 2002; 27:423-427.)

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Sleeper M. Course Notes. Northwestern University, Department of Physical Therapy.

Spondylolysis and Spondylolisthesis Worksheet

*Work in **groups of 3** to complete the examination and treatment sections of this case. Be prepared to discuss the questions at the end of the worksheet with the full class. You have 1 hour to complete the worksheet.*

DEMOGRAPHIC INFORMATION

Name:	Olivier		
Medical Diagnosis/Reason for Referral/Chief Complaint:	Low back pain Grade II spondylolisthesis		
Demographics: *age, sex, language*	16	Male	Kinyarwanda, French, English

INTERVIEW/CHART INFORMATION

Signs and symptoms:	Constant dull ache in low back area rated at 4/10 that increases to 6/10 with both flexion and extension activities. Aggravated by prolonged standing, overhead work, forward bending or attempting to lift anything. Relieved by rest Better in the morning and gets worse with increased activity throughout the day. Back feels tired with increasing activity
Differential diagnosis	Lumbar disc, Muscle strain, joint sprain
Activity Limitations:	Walking or bike riding to school; working in fields; lifting due to back pain.
Participation Restrictions:	Unable to play sports
History of current problem[s]:	Has experienced back pain for short bouts off and on for several years, but it always got better with rest and aspirin. This time pain is much worse and started at the end of rugby season about 4 months ago.
Medical History:	
• *Review of body systems and past medical /surgical history*	Generally healthy except for back pain
• *Family medical history*	Parents and grandparents alive and well
• *Results of medical tests*	x-rays revealed bilateral pars defect with increased anterior displacement of L5 on S1 at end range of flexion x-ray. Diagnosed with Grade II spondylolisthesis.
• *Medications*	Occasional aspirin
• Health risks – smoking, alcohol, lack of exercise	Does not report smoking or drinking. Unable to participate in sport training due to pain
Prior and Present level function:	Attends local school about 1 Kl from home. Walks or rides bike to school daily but has become increasingly more painful. Currently unable to play sports or do any lifting at

	home. Still attending school, but with pain.
Environmental and Personal Factors: *including home, work, school environment*	
• *Describe where the patient lives:*	A rural home
• *Describe the work the patient does:*	High school student involved in year-round sports including rugby and wrestling; helps with family crops
• *Describe the family and social support*	Lives with mother, father and 3 younger sisters
Health beliefs: *What the patient believe caused their problem and how to treat it?*	Believes his back pain is a curse and is worried that he will not be able to continue his athletic activities
Patient goals from therapy	Relief from back pain; return to sports, able to help at the farm

EXAMINATION

Systems Review:	
Tests and Measures:	

Comparable Sign	
• Subjective	
• Objective	
Outcome measures:	
Functional goals:	

TREATMENT

Describe why the patient is having functional problem(s)	
Treatments:	
Therapeutic exercise	
Manual therapy	

Electrotherapy	
Functional and Ergonomic activities	
Home program	
Community education/Prevention	

Spondylolysis and Spondylolisthesis

Full Class Discussion Questions

1. List the functional problems
2. Identify important examination items
3. Why does the patient have this problem now?
4. Identify important treatment items

Clinical Case: Spondylolysis and Spondylolisthesis

DEMOGRAPHIC INFORMATION

Name:	Olivier		
Medical Diagnosis/Reason for Referral/Chief Complaint:	Low back pain Grade II spondylolisthesis		
Demographics: *age, sex, language*	16	Male	Kinyarwanda, French, English

INTERVIEW/CHART INFORMATION

Signs and symptoms:	Constant dull ache in low back area rated at 4/10 that increases to 6/10 with both flexion and extension activities. Aggravated by prolonged standing, overhead work, forward bending or attempting to lift anything. Relieved by rest Better in the morning and gets worse with increased activity throughout the day. Back feels tired with increasing activity
Differential diagnosis	Lumbar disc, Muscle strain, joint sprain
Activity Limitations:	Walking or bike riding to school; working in fields; lifting due to back pain.
Participation Restrictions:	Unable to play sports
History of current problem[s]:	Has experienced back pain for short bouts off and on for several years, but it always got better with rest and aspirin. This time pain is much worse and started at the end of rugby season about 4 months ago.
Medical History:	
• *Review of body systems and past medical /surgical history*	Generally healthy except for back pain
• *Family medical history*	Parents and grandparents alive and well
• *Results of medical tests*	x-rays revealed bilateral pars defect with increased anterior displacement of L5 on S1 at end range of flexion x-ray. Diagnosed with Grade II spondylolisthesis.
• *Medications*	Occasional aspirin
• Health risks – smoking, alcohol, lack of exercise	Does not report smoking or drinking. Unable to participate in sport training due to pain
Prior and Present level	Attends local school about 1 Kl from home. Walks or

function:	rides bike to school daily but has become increasingly more painful. Currently unable to play sports or do any lifting at home. Still attending school, but with pain.
Environmental and Personal Factors: *including home, work, school environment*	
• *Describe where the patient lives:*	A rural home
• *Describe the work the patient does:*	High school student involved in year-round sports including rugby and wrestling; helps with family crops
• *Describe the family and social support*	Lives with mother, father and 3 younger sisters
Health beliefs: *What the patient believe caused their problem and how to treat it?*	Believes his back pain is a curse and is worried that he will not be able to continue his athletic activities
Patient goals from therapy	Relief from back pain; return to sports, able to help at the farm

EXAMINATION

Systems Review:	
• *Cardiopulmonary: vitals and edema*	BP: 120/75 mmHg; Pulse: 70 bpm
• *Integumentary: skin integrity, color, scar formation*	none
• *Musculoskeletal: gross ROM, strength, height, weight*	ROM, strength normal Height 176 cm; Weight 75 kg; BMI 24.2
• *Neuromuscular: general balance, gait/mobility*	Normal
Tests and Measures:	
Posture – standing and sitting	Good head and neck posture. Increase in lumbar lordosis.
Observation of movement problems	Hesitant to move into flexion and extension motions, especially end ranges. Poor quality motion on return to standing from forward bending.
Active Range of Motion	Full range of motion with pain at end range of both flexion and extension. Return to standing from forward bending is difficult
Repeated movements	Increase in pain with repeated motions in both flexion and extension
Muscle strength	Core stabilizers of transverse abdominus and multifidus are weak with poor endurance. Back extensors and

	gluteus maximus 4/5; quadriceps 5/5
Muscle length	10° Iliopsoas tightness bilaterally; hamstring SLR 65° bilaterally
Palpation	Pain paraspinals and spinous process at L4, 5; iliolumbar ligament
Accessory motion testing:	PAIVM Central PAs Hypomobile T 10- L2; hypermobile with pain L4-L5
Special tests:	
• Passive lumbar extension test	+ for instability
Comparable Sign	
• Subjective	Change in pain scores
• Objective	Forward bending without pain
Outcome measures:	WHODAS 2; Oswestry
Functional goals:	Patient will walk 1 Kl to school without pain using back brace in 2 weeks Patient will lift 10 kg without pain in 8 weeks Patient will work in the fields without pain in 12 weeks Patient will return to rugby when pain free and able to perform function stabilization exercises

TREATMENT

Describe why the patient is having functional problem(s)	Bilateral defect in the par interarticularis has led to spondylolisthesis during adolescence growth spurt. Perhaps aggravated by sports activities. Forward displacement of L5 on S1 results in back pain and instability, but has not yet progressed to neural symptoms. Initiate treatment with relative rest from sports and lifting for 1-3 months. May need brace in neutral posture during time of bony healing.
Treatments:	
Therapeutic exercise	Stabilization exercises including transverse abdominus and multifidus training; Strengthening of trunk flexors and extensors. Stretch hip flexors and hamstrings
Manual therapy	PAIVM T10 – L2, Grade III, IV
Electrotherapy	Not needed
Functional and Ergonomic activities	Clear understanding of pathology and protective postures; avoid end ranges of flexion and extension; report changes in neural signs
Home program	Progressive stabilization maintained through flexion and extension activities; lifting, gardening, return to sports
Community education/Prevention	May need to talk to coach about limitations and prognosis

Clinical Case: *Spondylolysis and Spondylolisthesis*

SKILLS

Special Test

Passive Lumbar Extension

1. Patient is positioned prone and asked to relax
2. Therapist grasps both ankles; knees straight
3. Therapist applies a small traction force and lifts both lower extremities about 30 cm off of the table
4. Positive test = pain, apprehension, feeling of "heaviness" in the low back
5. 84% sensitivity; means that 84% of the people who test positive will have instability
6. 90% specificity; means that 90% of the people who test negative will not have instability

Reference

Kasai, Y, Morishita K, et al. A New Evaluation Method for Lumbar Spinal Instability: Passive Lumbar Extension Test. *Phys Ther.* 2006; 86:1661-1667

Lumbar Passive Physiological Intervertebral Motion Testing (PPIVM)

Lumbar Spine

1. **Patient position:** Side lying, near edge of table, trunk neutral

2. **Therapist position:** Standing at level of lumbar spine, facing patient, supporting the lower extremities

3. **Stabilization:**
   - **i.** Therapist's proximal arm on trunk and patient body weight for flexion
   - **ii.** Therapist's distal arm on pelvis for rotation

4. **Palpation:** Palpate the spinous process and interspinous space of the two adjacent segments being tested

5. **Mobilization:**
   - **i.** For flexion support one or both legs with the distal hand and move the hips in the desired direction of force, palpating from L5-L1
   - **ii.** For rotation, use proximal arm to rotate upper trunk posterior palpating from L1-L5

6. **Direction of force**
   - **i.** Flexion : Relative increase in interspinous space and increase in soft tissue tension
   - **ii.** Rotation: Spinous process move into or away from palpating finger, depending on the side being palpated

7. **Documentation**
   - i. Direction of force
   - ii. Level(s) of involvement
   - iii. Pain
   - iv. Motion
     1. Normal compared to adjacent segments
     2. Hypomobile
     3. Hypermobile

Treatment with PPIVMs

Stabilization

- For lumbar flexion, manually stabilize the spinous process of the vertebrae above
- For lumbar rotation, manually stabilize the spinous process of the vertebrae below

Grade I

Gentle movements of small amplitude carried out in the very beginning of the available range

Grade II

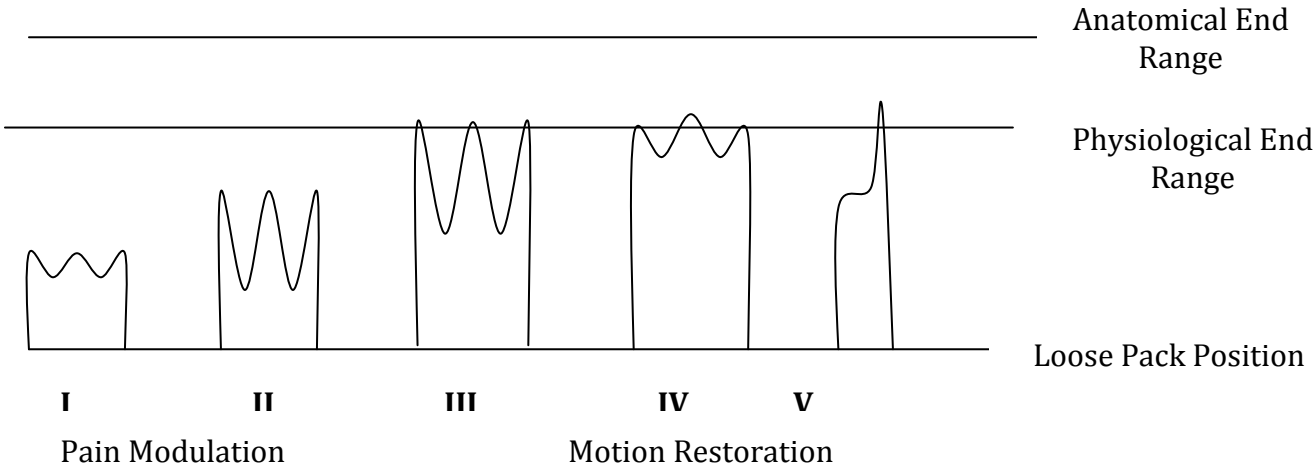
Gentle movements of large amplitude carried out in the mid-range of a joint

Grade 3 III

Moderate movements of large amplitude carried out through the available range of the joint and into the resistance

Grade IV

Small oscillating movements carried out at the end range and into the resistance



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Maitland GD. *Vertebral Manipulation.* 5th ed. London: Butterworths; 1986.

Dutton, M. *Orthopaedic Examination, Evaluation and Intervention.* 3rd ed. New York, NY: McGraw Hill; 2012.

Petersen C, Foley R. *Active and Passive Movement Testing.* New York: McGraw-Hill; 2002.

Review of Trunk Muscle Actions

MUSCLE	Bilateral ACTION	Right side ACTION
Iliocostalis	*Extension*	*Lateral Flexion, Ipsilateral rotation*
Longissimus	*Extension*	*Lateral Flexion, Ipsilateral rotation*
Semispinalis	*Extension*	*Lateral Flexion, contralateral rotation*
Multifidus	*Extension*	*Lateral Flexion, contralateral rotation*
Rotators	*Extension*	*Lateral Flexion, contralateral rotation*
External Oblique	*Flexes the trunk, Posterior tilt of the pelvis*	*Lateral trunk flexion, contralateral rotation*
Internal Oblique	*Flexes the trunk, Posterior tilt of the pelvis*	*Lateral trunk flexion, ipsilateral rotation*
Transversus Abdominus	*Compression of the abdominal cavity and increases thoracolumbar fascia tension*	

SEE SLIDES FOR MULTIFIDUS STRENGTHENING

SEE SLIDES FOR PROGRESSION OF SPINAL EXERCISES

Processing the Patient Interview

Hypothesis generation is an ongoing process of ruling in and ruling out potential causes of the patient's functional problems.

Following the interview, address these questions:

1. What problem(s) does the patient have with function?
    a. Activity limitations
    b. Participation restrictions

2. Why do you think the patient has these problems moving?

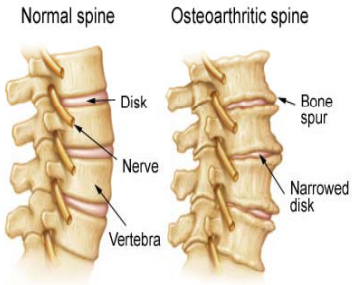
3. Can you proceed with the exam or does the patient need to be referred to another provider?

4. What information did you learn from the environmental and personal factors?

5. What do you want to examine?

Advancement of Rwandan Rehabilitation Services Project
SESSION THREE

Spondylosis
Vertebral Body Changes



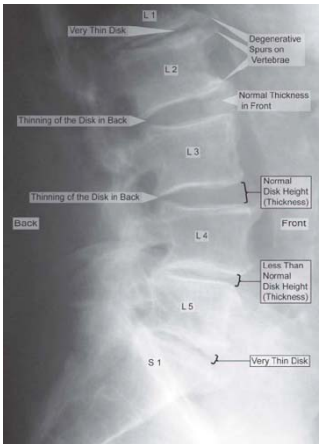
SPONDYLOSIS

Spondylosis
Facet Joint Changes

Disc space narrowing in spondylosis

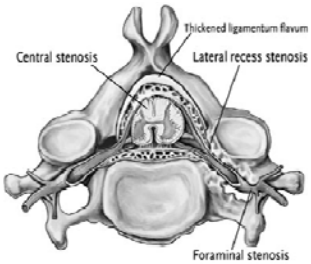
X-Ray of Cervical Spondylosis

Figure 2. X-ray of the neck (side view) showing cervical spondylosis

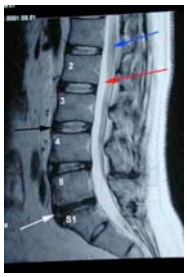


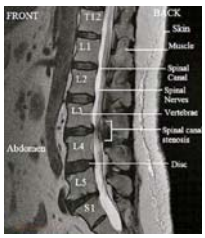
Degenerative Disc Disease

Central and Lateral Stenosis



Spondylosis Stenosis Disc



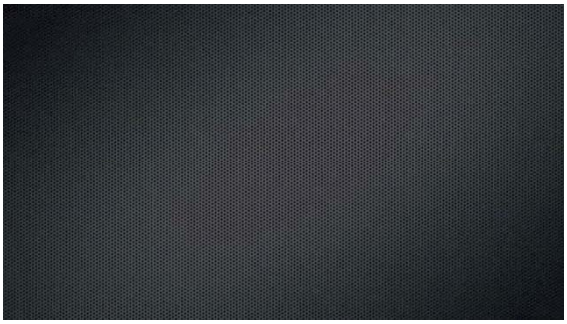


Special Test
Passive Lumbar Extension

84% sensitivity
90% specificity

LUMBAR INSTABILITY TEST

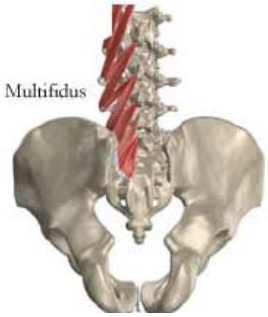
Passive Lumbar Extension test



http://www.youtube.com/watch?v=H3rtA_OI4x0

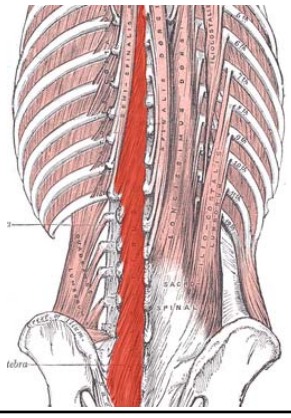
MULTIFIDUS STRENGTHENING

Multifidus actions



- Working bilaterally the multifidus help to extend the spine
- Working unilaterally the multifidus contract at the initiation of
  - Side bending to the same side
  - Rotation to the opposite side

Multifidus(i) Muscles



- Origin
  - Sacrum
  - Ilium
  - Transverse process of vertebrae
- Insertion
  - Spinous processes of vertebrae 2-4 levels superior

Multifidus Stabilization

- The multifidus muscles span three spinal joint segments and work to stabilize the joints at each segmental level
- The stiffness and stability makes each vertebra work more effectively, and reduces the degeneration of the joint structures
- In people without back pain, the multifidus contract prior to functional movements to protect the spine
- In people with back pain the multifidus contraction is late, weak, or not at all

Multifidus Contraction

Step 1: Lie on your side with your spine in a neutral posture. ***Step 2:*** Locate the multifidus muscle. Reach for your back and with your top hand, place three to four fingers across the side of your spine at waistline. The multifidus muscle can be palpated or felt here.
Step 3: Isolate and contract the multifidus muscle. Breathe in and on breath out, contract the multifidus by imagining that you are drawing your thigh into the pelvis. There should be no actual movement of the hips, pelvis or spine. The contraction of the multifidus should feel like a slow, firm 'swelling' or 'bulging' underneath your fingers. Once you are able to isolate and contract your multifidus, you can practice it in many different positions, such as in sitting, standing or bending. You can also progress with arm movements like raising one arm forward and upward while maintaining the multifidus activation.

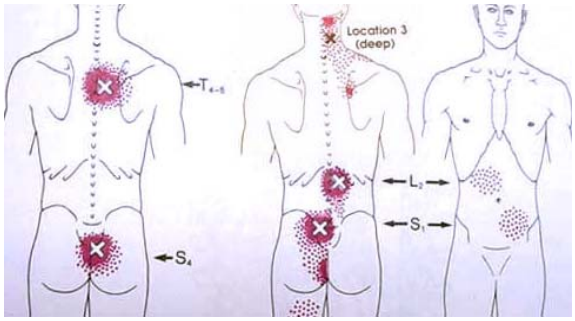
Clinical Assessment of Multifidus

- Patient in all-fours (hands and knees) position
- Neutral spine posture
- Lift R hip and L hand off the floor 1 cm. Repeat on opposite sides
- Observe quality of the neutral posture
  - Normal strength/endurance – should maintain neutral trunk posture
  - Weak strength/endurance – will not maintain neutral trunk posture

Multifidus strengthening

youtube.com/watch?v=XBDz6YUz7xk

Multifidus Trigger Points



PASSIVE PHYSIOLOGICAL INTERVERTEBRAL MOTION TESTING (PPIVM)

Passive Mobility Testing - Rotation

Passive Mobility Testing Flexion

Passive Mobility Testing Rotation

Dutton, 2012

Petersen, 2002

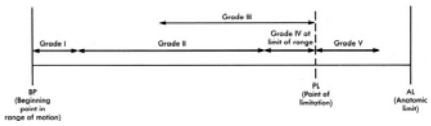
PPIVM lumbar rotation

http://www.youtube.com/watch?v=qcb4XYj5f4Y

Spondylosis Case Discussion

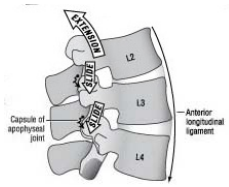
- What else would you like to know about this patient?
- How do his functional activities contribute to his back problem?
- What is a key principle for successful treatment?

Grades of Mobilization



SPONDYLOLISTHESIS

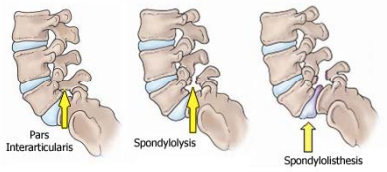
Normal Arthrokinematics



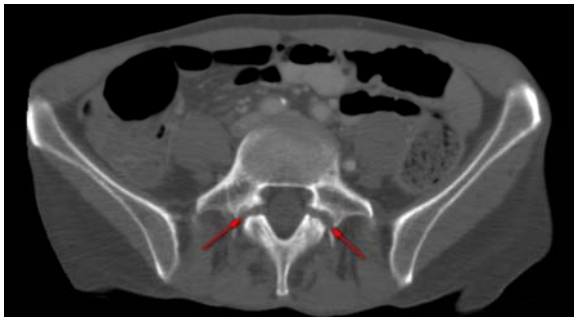
Flexion = anterior roll
anterior translation

Extension = posterior roll
posterior translation

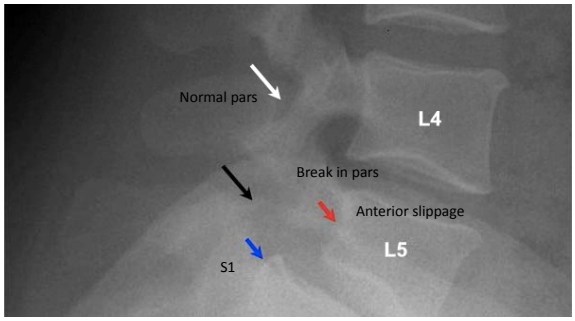
Pars defects



Arrows point to pars defect bilaterally

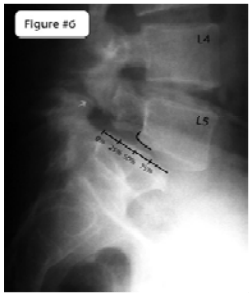


Grade 1-2 Spondylolisthesis



X-Ray and MRI of Spondylolisthesis

Spondylolisthesis L5-S1



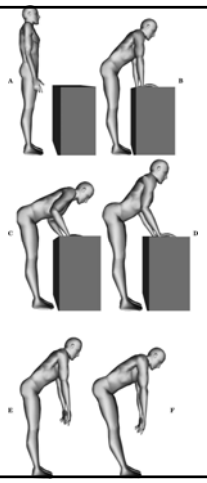
Extension x-ray

Flexion X-ray

Spondylolisthesis Discussion

- List functional problems
- What do you expect to find in the examination?
- Why does the patient have this problem now?
- Identify important treatment items

PROGRESSION OF THERAPEUTIC EXERCISE



Tighten your transverse abdominus

Using a table for support, bend forward by 'sticking your seat out' and bending at the hips

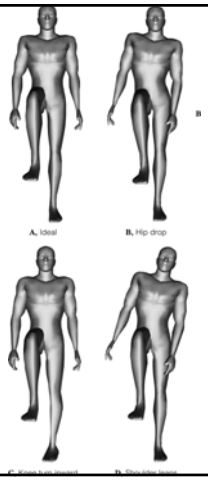
Do not bend your back

DO NOT ARCH YOUR BACK!

Tighten your buttocks and move from your hips in returning to standing

Exercise Principles

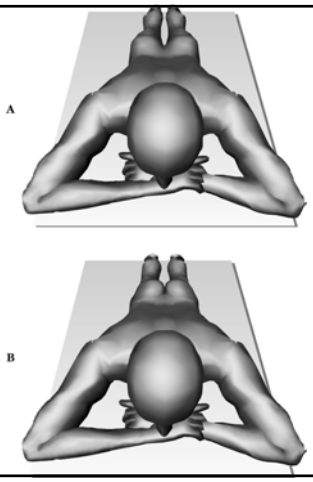
- Exercise should not cause pain
- Parameters of exercise
  - Frequency – how often
  - Intensity – how much
  - Duration - how long
- Types of exercise
  - Passive, active assistive, active, resistive
  - Isometric, concentric, eccentric
- Position
  - Supine, prone, sitting, standing, function
  - Stable to unstable surface



Single leg stance to strengthen the hip abductors

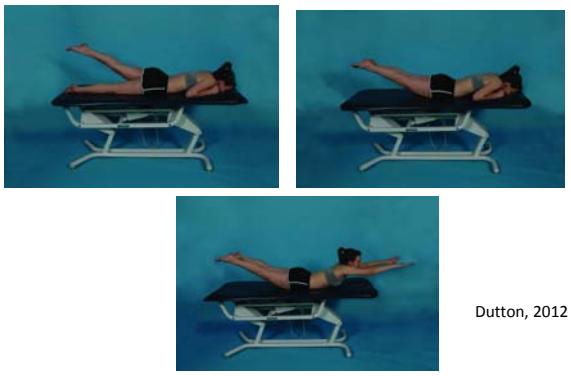
Tighten core stanilizers

Maintain upright posture while lifting one leg and then the other



- Isometric Gluteal contraction to strengthen the hip extensors
- Hold contraction for 6-10 seconds
  - Repeat 10 times

Prone Progression



Dutton, 2012

Quadriped Progression

Activates multifidus

Dutton, 2012

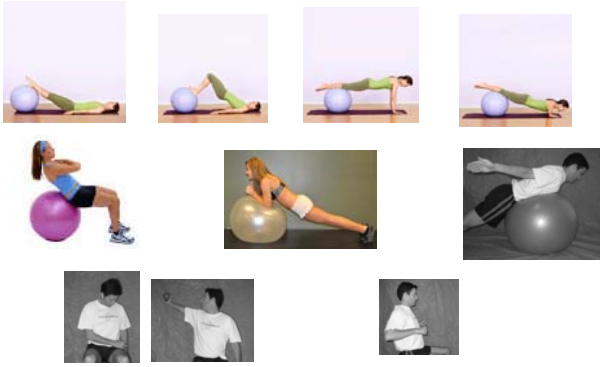
Side Plank

Prone Plank

Progress to dynamic push ups when you can hold the plank for 30-60 seconds

Bicycle crunches for obliques

Theraball exercises



Assignment

- Complete the chart comparing the lumbar diagnoses discussed in class. This will be collected.
- Think about an educational program that would be appropriate for your clinic
  - Case report for the physicians
  - Case report with colleagues
  - Community education/prevention
  - Other ideas?
- Bring your ideas for an educational program to the next session
  - Topic
  - Target audience

Theratubing Exercises

Side walk

Latissimus
Pull down

Trunk rotation

References

- Maitland GD. *Vertebral Manipulation.* 5th ed. London: Butterworths; 1986.
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- Danneels et. al. Differences in electromyographic activity in the multifidus muscle and iliocostalis lumborum between healthy subjects and patients with sub-acute and chronic low back pain. European Spine Journal. 2002; 11:13-19.
- Select web resources

Advancement of Rwandan Rehabilitation Services Project

Spinal Course
Sessions Four and Five

CERVICAL SPINE LECTURE NOTES

OBJECTIVES

1. Assess skills previously taught through review labs
2. Review cervical anatomy and palpation skills
3. Discuss pathology and impairments associated with POSTURAL NECK PAIN and HEADACHES
4. Demonstrate examination and treatment skills for cervical spine problems
5. Discuss evidence for select cervical examination and intervention skills based on Clinical Practice Guidelines
6. Discuss the Neck Disability Index and the Patient-Specific Functional Scale outcome measures
7. Apply skills and clinical reasoning to postural neck pain and headache cases
8. Peer review of topic and target audience for educational program

REVIEW CRITICAL THINKING SKILLS

- Systems review is a screening exam to determine further need for examination
- Observe activity limitations and functional movement problems
- Determine what to examine based on functional problems
- Determine the CAUSE OF THE PROBLEM based on impairments and function
- Treatment is directed toward impairments that contribute to the problem
- Exercise must advance into functional positions

PATHOLOGY AND CASES

INTRODUCTION

A. Cervical spine anatomy and biomechanics in normal movement
    1. Anatomy slides
    2. Facet orientation 45° to transverse plane which allows movement in all planes especially FB and BB
    3. SB and Rotation limited by uncovertebral joints
    4. Flexion – superior glide which opens the facet joints
    5. Extension – posterior/inferior glide which closes the facet joints
    6. Side bending – compressed on ipsilateral side and distracted on contralateral side
    7. Rotation – posterior glide on ipsilateral side; anterior glide on contralateral side
B. The tissue that is causing a patient's neck pain is most often unknown
C. Examination should reveal the impairments that contribute to the patient's problems
D. Treatment should be directed to the impairments identified in the examination that impact the patient's function
E. The goal of treatment is to improve the patient's function
F. Evidence based practice includes selecting interventions based on
    1. Best evidence
    2. Professional expertise
    3. Patient values, expectations and preferences
G. Differential diagnoses that require referral
    1. Signs or symptoms of myelopathy – see slide
    2. Signs or symptoms of vascular compromise – see slide
    3. Fracture, neoplastic conditions, systemic disease

CLASSIFICATION OF CERVICAL PROBLEMS

CLASSIFICATION of NECK PAIN with	**SIGNS & SYMPTOMS**	**EXAMINATION –** in addition to standard exam	**TREATMENT**
Mobility deficits Cervical pain Thoracic pain	Age < 50 Duration < 12 weeks Unilateral pain Onset incident Restricted ROM	Active ROM Segmental mobility Muscle length	Cervical/thoracic mobilization Stretching exercise Coordination, strengthening, endurance flexor and extensor exercises
Radiating pain Spondylosis with radiculopathy Cervical disc with radiculopathy	Radiating pain May have paresthesia, numbness and weakness Decreased cervical rotation	Spurling's test ULTT Cervical distraction Neural exam	Neuromobilization Traction Thoracic mobilization
Movement coordination deficits Strain and sprain Whiplash	Duration > 12 weeks May have precipitating trauma Deep flexor weakness Upper quadrant muscle weakness Pain in neck and referred to UE Mid and end-range of motion pain	Cranial cervical flexion test Deep neck flexor and extensor endurance test MMT scapular muscles Trigger point and muscle length exams Active ROM Cervical PPIVM or PAIVM	Coordination, strengthening, endurance flexor and extensor exercises Trigger point release Stretching exercise Patient education and counseling

Headache Cervicogenic	Unilateral neck pain and referred headache Limited cervical ROM Restricted upper cervical segmental mobility Strength and endurance deficits of deep neck flexor muscles	Active ROM Segmental mobility Cranial cervical flexion test	Cervical mobilization Stretching exercises Coordination, strengthening, endurance flexion exercises

Childs JD, Cleland JA, Elliott JM, et al. Neck Pain: Clinical Practice Guidelines linked to the International Classification of Functioning, Disability, and Health from the Orthopedic Section of the American Physical Therapy Association. *JOSPT*. 2008;38(9):A1-A34. Doi:10.2519/jospt.2008.0303

POSTURAL NECK PAIN

A. Signs and symptoms
   1. Pain and trigger points in neck and shoulder area
   2. May be unilateral or bilateral
   3. Weakness in scapular muscles
   4. Poor posture

B. Forward head posture
   1. Protraction of cranicervical region so that the insertion of the sternocleidomastoid muscle lies anterior to the sternoclavicular joint
      a. Hyperextension injury that results in spasm in the anterior muscles
      b. Progressive shortening of anterior cervical muscles due to habitual postures like using a computer screen
      c. Development of fatigue and trigger points in extensor muscles like suboccipital and levator scapulae

C. Differential diagnosis
   1. Cervical spondylosis
   2. Thoracic outlet syndrome
   3. Fibromyalgia

B. Etiology
   1. Often result from repetitive postures in work or daily activities
   2. Poor motor control of cervical and scapular muscles

C. Examination
   1. Basic cervical exam including posture, muscle length and muscle strength
   2. Assessment of deep neck flexor strength and endurance

D. Special Tests
   1. Cervical distraction – to R/O disc disease
   2. Spurling's – to R/O stenosis
   3. 1 rib mobility

E. Treatment – select based on impairments
   1. Soft tissue mobilization, trigger point release, stretching of tight muscles
   2. Deep cervical flexion and extension muscle strengthening
   3. Strengthening and motor control of scapular muscles
   4. Manual traction if it relieves symptoms
   5. Mobilization of hypomobile cervical and thoracic spinal segments
   6. Mobilization of 1st rib

7. Motor relearning of correct posture
8. Ergonomic workplace design

F. Prognosis
   1. Positive for relief of symptoms if patient changes movements and postures that initiated the problem

References

Dutton, M. *Orthopaedic Examination, Evaluation and Intervention*. 3rd ed. New York, NY: McGraw Hill; 2012.

Neumann DA. *Kinesiology of the Musculoskeletal System: Foundations for Rehabilitation, 2nd Edition*. Mosby, 2010.

HEADACHES

A. Signs and symptoms
    1. Vary with the type of headache, and can often be used to determine type of headache
B. Differential diagnosis
    1. Vertebrobasilar insufficiency
        a. Typically unilateral
        b. Accompanied by vertigo and nausea
        c. Increased symptoms with neck extension and rotation to the side opposite the symptoms
        d. **Refer** patient to a physician
    2. Temporal mandibular joint (TMJ) dysfunction
        a. Screen with active mouth opening and closing and ask if symptoms are reproduced
C. Tension headaches
    1. **Etiology:**
       A tension headache is generally a diffuse, mild to moderate pain in the head that's often described as feeling like a tight band around the head. A tension headache is the most common type of headache, and yet its causes aren't well understood.
    2. **Signs and symptoms**
        a. Bilateral, band-like pain in posterior neck, may radiate to head and forehead
        b. Pressing, tightening, non pulsating quality
        c. Mild to moderate intensity – many inhibit but not prohibit activity
        d. Tenderness in involved muscles
        e. Lasts 30 minutes to several days
        f. Present ≥ 15 days out of a month
        g. Not aggravated by physical activity
        h. No nausea, vomiting
        i. May be light and sound sensitive
D. Migraine
    1. **Etiology**
       A migraine headache can cause intense throbbing or a pulsing sensation in one area of the head and is commonly accompanied by nausea, vomiting, and extreme sensitivity to light and sound.
    2. **Signs and Symptoms**

a. Pain in posterior neck
b. Tenderness in involved muscles
c. May be preceded by an aura
d. Lasts 4-72 hours
e. Unilateral but can change sides
f. Pulsating quality
g. Moderate to severe intensity – limits daily activities
h. Aggravated by physical activity
i. Nausea or vomiting
j. Light and sound sensitive

E. Cervicogenic Headaches

1. **Etiology**

   Any headache beginning in the neck as a result of injury to the cervical structures like muscles, ligaments, discs and joints. Involves central pain mechanisms through interaction between the upper cervical nerve roots and the trigeminal nucleus in the spinal cord.

   a. The trigeminocervical nucleus is a region of the upper cervical spinal cord where sensory nerve fibers in the descending tract of the trigeminal nerve are believed to interact with sensory fibers from the upper cervical roots.
   b. This functional convergence of upper cervical and trigeminal sensory pathways allows the bidirectional referral of painful sensations between the neck and trigeminal sensory receptive fields of the face and head.
   c. A functional convergence of sensorimotor fibers in the spinal accessory nerve (CN XI) and upper cervical nerve roots ultimately converge with the descending tract of the trigeminal nerve and might also be responsible for the referral of cervical pain to the head. (Biondi 2005)

2. **Signs and symptoms**

   a. Four times more likely in women
   b. Unilateral and does not change sides
   c. Associated with same side neck, shoulder or arm pain
   d. Tenderness in involved muscles
   e. Moderate-severe intensity, non-throbbing pain
   f. Pain begins in the neck
   g. Aggravated by neck movements or neck postures
   h. Associated with restricted neck motion
   i. C0 – C4 joint dysfunction
      1. Central PA C2-C7 reproduces pain (Jull 2002)
   j. Decreased strength and endurance in deep cervical flexors and extensors
   k. Forward head posture

F. Examination
    1. History of headache is important including signs and symptoms, timing and frequency over a week or month
    2. Basic cervical exam including neck ROM, cervical joint assessment, deep cervical flexor and extensor muscle performance

G. Special Tests
    1. Screen for signs of neurologic and vascular compromise
    2. C1 –C2 rotation

H. Treatment – select based on impairments
    1. Soft tissue and trigger point release of involved muscles
    2. Stretching of superficial tight muscles
    3. Strengthening of deep cervical flexors and extensors
    4. Accessory motion for pain relief and mobility
    5. Patient education in stress management, posture correction, work modification
    6. Treatment often involves working with other practitioners for medication, biofeedback, injections

I. Prognosis
    1. Assess change in symptoms over time (4-6 months)
    2. Depends on patient's ability to modify behaviors

References

Biondi D. Cervicogenic Headache: A Review of Diagnostic and Treatment Strategies. *JAOA.Supplement 2*, Vol 105 (4). April 2005; S16-22.

Childs JD, Cleland JA, Elliott JM, et al. Neck Pain: Clinical Practice Guidelines linked to the International Classification of Functioning, Disability, and Health from the Orthopedic Section of the American Physical Therapy Association. *JOSPT.* 2008;38(9):A1-A34. Doi:10.2519/jospt.2008.0303.

Dutton, M. *Orthopaedic Examination, Evaluation and Intervention*. 3rd ed. New York, NY: McGraw Hill; 2012.

Jull G. Course Notes. Evidence based solutions for improving cervical spine health and function. RIC and DPTHMS. March 2-3, 2013. Chicago.

Jull G et al. A Randomized Controlled Trial of Exercise and Manipulative Therapy for Cervicogenic Headache. *Spine.* 2002;27:1835–1843.

WHIPLASH

A. Forceful rear-end automobile accident results in cervical hyperextension followed by flexion
B. Strain in the anterior longitudinal ligament from initial impact retraction
C. Severe strain in the craniocervical flexor muscles, especially longus colli and longus capitis
D. Compression of apophyseal joints
E. Alar ligaments are stressed especially if head is rotated on impact
F. Whiplash associated disorders (WAD)

G. Active exercise early post injury is better than soft cervical collar in reducing pain, time off work, and regaining ROM (Rosenfeld M Spine 2003; Vassiliou T Pain 2006; Brison *Spine* 2005)
    1. Gentle active rotation movements from neutral position either supine or sitting, 10 times in one direction and 10 times in the opposite direction.
H. There is strong evidence to support patient education in early movement and to provide assurance that full recovery commonly occurs (CPG, 2008)
I. Treat with deep cervical flexion exercises (Jull 2002)
J. Treat with deep cervical extension exercises (Elliott 2010)

References

- Brison RJ, et al. A Randomized Controlled Trial of an Educational Intervention to Prevent the Chronic Pain of Whiplash Associated Disorders Following Rear-End Motor Vehicle Collisions. *Spine.* 2005;30:1799 –1807
- Elliott JM, O'Leary SP, Cagnie B, Durbridge G, Danneels L, Jull G. Craniocervical orientation affects muscle activation when exercising the cervical extensors in healthy subjects. *Arch Phys Med Rehabil*. 2010;91:1418-22.
- Jull G et al. A Randomized Controlled Trial of Exercise and Manipulative Therapy for Cervicogenic Headache. *Spine.* 2002;27:1835–1843.
- Neumann. *Kinesiology of the Musculoskeletal System: Foundations for Rehabilitation, 2nd Edition*. Mosby, 2010.
- Rosenfeld M, et al. Active Intervention in Patients with Whiplash-Associated Disorders Improves Long-Term Prognosis. *Spine*. 2003;28; 2491–2498
- Vassiliou T, et al. Physical therapy and active exercises – An adequate treatment for prevention of late whiplash syndrome? Randomized controlled trial in 200 patients. *Pain* 124 (2006) 69–76.

TREATMENT PROGRESSION

A 35 year-old male comes to your clinic 1 month after injuring his back while lifting a load of potatoes after cultivating in the field all day. He tells you he has had episodes of back pain off and on for the past 5 years, but by resting overnight he has been able to return to work the next day. He lives with his wife and 2 small children in the village with his parents, brothers, sisters, aunts and uncles near by. He needs to get back to work to support his family.

Patient complains of low back pain and radiating pain into the posterior LLE to the knee. X-rays reveal narrowing of the disc space between L4-L5. Repeated extension decreases peripheral symptoms. Superficial trunk flexors and extensors are 5/5; deep flexors and extensors are weak. From the exam you suspect a lumbar disc.

Complete the chart below by identifying how you would recognize the different stages of injury and how the treatment would change as the patient progresses

	Acute	Subacute	Chronic
Signs/symptoms			
Comparable sign			
Treatment			
Home program			
Criteria for discharge			
Outcome measure			

CASES for Sessions Four and Five

- There are two cases to integrate the pathology and skills presented in Sessions four and five
    - Postural Neck Pain
    - Cervigogenic headache
- The cases will be distributed at the end of Session four on Saturday afternoon
- Each person will be given only one of the cases
- Prepare to role-play your case for a partner therapist at the beginning of Session five.
    - Read the case several times to become familiar with the information
    - In the interview, do not offer information that the therapist does not ask for
    - In the examination, provide data for the exam skills once the therapist has completed the exam correctly
    - In the intervention, follow the instructions of the therapist
- Following the role-play, provide feedback to your peer therapist
    - Did the interview determine functional problems?
    - Did the therapist observe the movement problems?
    - Was the exam based on the functional problems?
    - Did the therapist determine the cause of your problems?
    - Did the treatment address the cause of the problems?

Switch partners and role-play the headache case.

CLINICAL CASE: Postural Neck Pain

OBJECTIVES

1. Apply the process of clinical reasoning to a case
2. Safely, effectively and efficiently perform skills taught in this course

INSTRUCTIONS

1. Read the following case and prepare to role-play this case for a peer partner. Your partner will act as a therapist and perform an interview, examination and treatment of your problems. Your partner will not have access to the information in the case, which you will provide when asked. Once your partner has correctly performed an examination skill you can provide the results of the exam as given in this case.
2. After treatment is completed, provide feedback to your partner, including
    a. Did the interview determine functional problems?
    b. Did the therapist observe the movement problems?
    c. Was the exam based on the functional problems?
    d. Did the therapist determine the cause of your problems?
    e. Did the treatment address the cause of the problems?

DEMOGRAPHIC INFORMATION

Name:	Sonia		
Medical Diagnosis/Reason for Referral/Chief Complaint:	Myofascial Neck pain		
Demographics: *age, sex, language*	33-years old	Female/teacher	English, Kinyarwanda French
Insurance			

INTERVIEW/CHART INFORMATION

Signs and symptoms:	Pain is located posterior neck and left shoulder area. Rates constant pain at 3/10 with increase to 5/10 on a verbal pain scale at end of the workday. Pain aggravated by increased time at the computer; pain relieved by hot shower. End of day increase in neck ache and tiredness.
Differential diagnosis	Clear patient for signs of myelopathy, cervical disc, fibromyalgia
Activity Limitations:	There is difficulty with comfortable sleeping position. Pain and weakness when writing on the blackboard. Patient is

	left-handed.
Participation Restrictions:	Difficulty turning her head when driving. She notices she is not turning her head because it hurts, but is continuing all her normal activities
History of current problem[s]:	Two years ago she reports a similar bout with neck pain and was helped by therapy. She quit doing the exercises when the pain got better. Current episode began three months ago with marked increase in the last month. States that she took an on-line professional development course that increased her computer usage and this is when the symptoms increased.
Medical History:	
• *Review of body systems and past medical /surgical history*	This patient broke her R arm as a child and it was set and casted for 8 weeks. She regained full use of the arm.
• *Family medical history*	Her mother and father are in good health.
• *Results of medical tests*	The nurse sent her to physical therapy after a clinical exam, for further examination and treatment.
• *Medications*	Occasional anti-inflammatory pills when symptoms are very bad
• Health risks – smoking, alcohol, lack of exercise	None
Prior and Present level function:	She isn't getting enough sleep. She is writing less on the blackboard at school. She limits her driving.
Environmental and Personal Factors: *including home, work, school environment*	She has a husband who is a bank consultant, an 11-year old daughter in school. She is an elementary school teacher in a private school
• *Describe where the patient lives:*	She and her family live in the city
• *Describe the work the patient does:*	She mostly stands in front of a classroom, with times of sitting for reading or grading papers. She uses the blackboard regularly throughout the school day and finds that her arm gets tired toward the end of the day. Sometimes she needs to bend down to help a student at their desk. She uses the computer at home daily.
• *Describe the family and social support*	She has a husband and one 11-year-old child. Her parents live in a neighboring area of the city, and help with childcare after school.

Health beliefs: *What the patient believe caused their problem and how to treat it?*	This is an educated woman who has thoughts that her neck position during the school day, and then use of computer, may be the root of her problem
Patient goals from therapy	More comfort during the day; better sleeping; more arm endurance during the work day; ability to write on the blackboard for longer periods; ability to drive for longer distances

EXAMINATION

Systems Review:	
• *Cardiopulmonary : vitals and edema*	BP 122/78 mmHg HR 70 bpm
• *Integumentary: skin integrity, color, scar formation*	unremarkable
• *Musculoskeletal: gross ROM, strength, height, weight*	Cervical ROM limited Strength decreased left scapula Gait within normal limits; Height 180 cm; Weight 65 kg BMI = 20.1
• *Neuromuscular: general balance, gait/mobility*	Balance and mobility are within normal limits
Examination Based on Functional problems	Observe posture at the computer, when writing on blackboard, driving, sleeping Measure ROM; Palpate sore muscles for tightness and trigger points Test muscle strength and endurance Test accessory mobility
Tests and Measures:	
Posture – standing and sitting	Her shoulders are rounded, and head forward. Holds Left shoulder slightly elevated.
Observation of movement problems	She self limits cervical rotation. Left scapula is positioned in elevation and abduction. Forward flexion of the arm is accompanied by scapular elevation.
Active Range of Motion	Cervical Rotation right = 40° and painful on L, rotation left =50°, extension = 50° and painful, flexion = 30° and painful Full L shoulder ROM
Repeated movements	Repeated motions in both flexion and extension improved ROM
Muscle strength	Left Lower trapezius 3/5; L rhomboid and middle trapezius 4/5. Serratus anterior 3/5. Weakness in deep neck flexors and

	extensors
Muscle length	Muscle length decreased in left cervical and scapular muscles; Tightness in upper trapezius, levator, scalenes, pectoral muscles L > R
Palpation	Many trigger points in upper trapezius, levator scapuli and scalenes
Accessory motion testing:	C1-C2 rotation normal R and L Cervical rotation normal movement with slight pain C3-C7 Hypomobile PA T1-T3 with no pain
Special tests:	
• **Cervical distraction**	Distraction – felt good
• **Spurling's test**	No reproduction of radicular symptoms
• **1st rib mobility**	Hypomobile on Left
Comparable Sign	
• Subjective	Pain rating at end of day
• Objective	# of times per night that pain disrupts sleep Length of time she is able to write on blackboard before tiring
Outcome measures:	WHODAS 2; Neck Disability Index; Patient-Specific Functional Scale
Functional goals:	Patient will sleep through the night in 4 weeks Patient will have pain-free cervical ROM in 6 weeks for all functional activities Patient will consistently maintain head posture during teaching activities in 6 weeks

TREATMENT

Describe why the patient is having functional problem(s)	Weakness in the lower and middle trapezius, rhomboids and serratus has resulted in overuse of the upper trapezius. Overtime this overuse resulted in spasm and trigger points creating pain. Weakness in the scapular muscles results in the fatigue felt at the end of the day. Weakness in deep neck flexors and extensors contributes to forward head posture and muscle imbalance that result in pain.
Treatments:	
Therapeutic exercise	Stretching of levator, upper trapezius, scalenes Deep neck flexion and extension exercises Scapular strengthening Postural correction of forward head

Manual therapy	Soft tissue mobilization of cervical and scapular muscles Trigger point release and stretching for scalenes, levator, and upper trapezius, pectoral muscles 1st rib mobilization Manual traction
Electrotherapy/ modalities	Heat or ice at home
Functional and Ergonomic activities	The position of head, neck and scapula during the school day will be self observed, with corrections made Progress exercises into these functional positions
Home program	Stretching and strengthening per therapeutic exercises
Community education / Prevention	Patient has expressed interest in a yoga class, this is encouraged Patient will be encouraged to continue stretching and deep neck strengthening exercises daily

Postural Neck Pain

CLINICAL CASE: Cervicogenic Headache

OBJECTIVES

3. Apply the process of clinical reasoning to a case
4. Safely, effectively and efficiently perform skills taught in this course

INSTRUCTIONS

3. Read the following case and prepare to role-play this case for a peer partner. Your partner will act as a therapist and perform an interview, examination and treatment of your problems. Your partner will not have access to the information in the case, which you will provide when asked. Once your partner has correctly performed an examination skill you can provide the results of the exam as given in this case.
4. After treatment is completed, provide feedback to your partner, including
    a. Did the interview determine functional problems?
    b. Did the therapist observe the movement problems?
    c. Was the exam based on the functional problems?
    d. Did the therapist determine the cause of your problems?
    e. Did the treatment address the cause of the problems?

DEMOGRAPHIC INFORMATION

Name:	Evangeline		
Medical Diagnosis/Reason for Referral/Chief Complaint:	Headaches		
Demographics: *age, sex, language*	45	Female	French, English, Kinyarwanda
Insurance			

INTERVIEW/CHART INFORMATION

Signs and symptoms:	Non-throbbing pain in the back of the neck and into the occipital and temporal regions of the head on right side. Although pain is always present it varies in intensity from 3/10 to 6/10 on a verbal pain scale. Intermittent pain into R shoulder and arm. Neck muscles are very tender. Movement of her neck aggravates pain and she has limited neck motions. Pressure in the suboccipital region also aggravates

	symptoms.
Differential diagnosis:	This patient likely presents with a cervicogenic headache (CGH) and spondylosis. Rule/out Muscle tension headache, Migraine headaches.
Activity Limitations:	Still performing household activities of shopping, cooking but with pain and much more slowly. Has help with cleaning and laundry. Still going to work, but not as productive as previously. Concerned about losing her job.
Participation Restrictions:	Attends only required social functions, as she is often tired at the end of the day. This has caused tension with her family because she misses church and school functions and interactions with friends.
History of current problem[s]:	Neck pain began about 2 years ago following an auto accident and never totally went away. Headaches began about a year ago and are now increasing in frequency and intensity.
Medical History:	
• *Review of body systems and past medical /surgical history*	Generally healthy except for cardiac medications. Gall bladder surgery 6 years ago without complications.
• *Family medical history*	Mother died of breast cancer 10 years ago. Father died of heart attack 2 years ago. Patient was very close to her father and his death was a surprise.
• *Results of medical tests*	Cervical x-ray shows degeneration with osteophytes C4-C6 bilaterally
• *Medications*	Medications for high blood pressure. Anti-inflammatory and muscle relaxers are used regularly for pain control.
• Health risks – smoking, alcohol, lack of exercise	Quit smoking 3 years ago; prior to this smoked a pack a day for 15 years. Social drinker of alcohol. She use to go to a gym for regular exercise but has not had time or energy to do this in the past year.
Prior and Present level function:	Her workday has gradually increased over the past year. She is finding it harder to keep up with her work tasks, and feels stress that she may lose her promotion. She no longer has time for exercise.
Environmental and Personal Factors: *including home, work, school environment*	
• *Describe where the patient lives:*	She lives in the city.
• *Describe the work the patient does:*	Evangeline is an executive at the local bank. She received a promotion in the last year and

	responsibilities increased. She works long days, mostly in meetings or working at a computer.
• *Describe the family and social support*	She has a husband and 3 children ages 10, 12 and 15. Her husband is a Professor at the University and has had to travel frequently in the past year for professional conferences. Her youngest child, age 10, has not been doing well in school.
Health beliefs: *What the patient believe caused their problem and how to treat it?*	She is angry that she now has to deal with headaches on top of all of her other responsibilities. She wants to take more medicine to control the pain.
Patient goals from therapy	She wants the pain to go away so that she can better focus on her work tasks.

EXAMINATION

Systems Review:	
• *Cardiopulmonary: vitals and edema*	BP 140/90 with medication; pulse 88 bpm
• *Integumentary: skin integrity, color, scar formation*	Gall bladder scar well healed
• *Musculoskeletal: gross ROM, strength, height, weight*	Limitations in neck motions. 183 cm tall; 105 kg, BMI = 31.4
• *Neuromuscular: general balance, gait/mobility*	Within functional limits
Examination Based on Functional problems	Signs, symptoms and hypothesis that the problem is CGH will guide the examination. Observation of postures at work and during household tasks will lead to ROM, muscle length and strength, accessory mobility testing
Tests and Measures:	
Posture – standing and sitting	Forward head posture in standing and sitting.
Observation of movement problems	Hesitant in moving the neck in any direction. Moves trunk to turn head
Active Range of Motion Norms = Flexion (45-50°) Extension (45-60°) Side bending (45°) Rotation (60-80°)	Flexion = 45°; Extension = 30°; RR = 45°; LR = 50°; SBR = 40°; SBL = 40° Pain and limitation of active flexion and extension of OA joint Limitation in bilateral AA rotation
Muscle strength	Painful with isometric contraction of neck flexors, extensors, rotators Weakness in deep cervical flexors and extensors Serratus anterior = 3+/5

	Lower trapezius = 3/5
Muscle length	Tightness in sternocleidomastoid, upper trapezius, suboccipital area
Palpation	Tenderness and trigger points in upper trapezius, sternocleidomastoid, sub-occipital muscles. Pain on palpation of right suboccipital nerve and facet joints C2 – C6
Accessory motion testing:	Pain on central PA C1-C3 Hypomobility C3-C7 in side glide and rotation without pain
Special tests:	
• C1-C2 rotation	RR = 25°; LR = 30° (+ findings are < 30° or asymmetry of >10°)
Comparable Sign	
• Subjective	Pain rating
• Objective	Increase C1- C2 ROM % of day with low level headache pain Decrease in # active trigger points Duration of deep cervical flexion exercises
Outcome measures:	WHODAS2, Neck Disability Index, Patient-Specific Functional Scale
Functional goals:	Patient will practice deep breathing 6 x a day in one week Correct forward head posture 50% of the time in 2 weeks Patient will decrease the length of workday in one month Headaches will decrease in intensity on verbal pain scale in 2 months Patient will return to regular physical exercise in 3 months

TREATMENT

Describe why the patient is having functional problem(s)	Initial neck injury from auto accident likely initiated cervicogenic headache symptoms coupled with age and natural degeneration of the cervical spine. Increased stress associated with work tasks, recent death of her father, and issues at home with her youngest child contribute to headache problems. Impairments can be addressed by therapy, but symptoms are not likely to change without changes in lifestyle that decrease stress.
Treatments:	
Therapeutic exercise	Deep breathing for relaxation

Jull G. 2002	Stretch SCM, upper trapezius Deep neck flexor and extensor exercises Scapular strengthening of serratus anterior, lower trapezius using scapular adduction and retraction Postural correction sitting Isometric cervical rotation
Manual therapy	Soft tissue and trigger point release SCM, upper trapezius Passive stretch SCM, upper trapezius Soft tissue sub occipital release Grades I-IV side glide and rotation mobilization C3 – C6 Grade I, II central PAs C1-C3
Electrotherapy / Modalities	Heat or ice at home
Functional and Ergonomic Activities	Correct forward head posture at computer, in meetings Progress deep flexor and extensor exercises into sitting and standing postures
Home program	Deep cervical flexor and extensor exercises
Community education/Prevention	Patient education in stress management strategies Patient awareness that headache may return without lifestyle changes and continued exercise Resumption of gym exercise including aerobic activities

References:

- Jull G et al. A Randomized Controlled Trial of Exercise and Manipulative Therapy for Cervicogenic Headache. *Spine.* 2002;27:1835–1843.
- Hall T. Clinical Evaluation of Cervicogenic Headache: A Clinical Perspective. *The Journal Of Manual & Manipulative Therapy.* 2008; 16(2):73-80.

Cervicogenic Headache

Guidelines for Case Discussions

A. Select a case from clinical practice for discussion with peers. The focus might be on
    1. Results of using a new treatment
    2. Difficulties applying a new treatment (like abdominal stabilization)
    3. A patient who is not getting better with the current treatment
    4. A success story of a patient who got better and why
    5. A challenging case
B. Suggested formats for case presentation to peers
    1. Use the format of the case reports in this course
    2. Use the format of Assignment 2 in this course
C. Gather a group of peers for regular (monthly) discussions of cases and take turns presenting each month
D. Select a journal article for all to read prior to monthly discussion and hold a 'journal club' to discuss the article

Guideline for Writing Case Reports

Case reports should be written with a specific focus. Following are categories of case reports from the Physical Therapy Journal Instructions for Authors web site (http://ptjournal.apta.org/site/misc/ifora.xhtml)
Case Reports describe various aspects of clinical practice related to the field of physical therapy. Case Reports differ from Research Reports in that they do not test hypotheses or establish cause-and-effect relationships. Several types of case reports are described below. Full details can be found on the PTJ website listed above.

Diagnosis/Prognosis

Emphasis is on the diagnostic or prognostic aspect of patient care. May cover the process and logic associated with differential diagnosis (ie, clinical decision making), unusual or difficult diagnostic/prognostic events, missed diagnoses, etc.

Interventions

Emphasis is on the intervention aspect of patient care. May cover the development of a new intervention or a modification to an existing intervention to deal with a clinical problem.

"Full" Traditional Case Report

Case describes the overall management of an unusual case or a condition that is infrequently encountered in practice or poorly described in the literature. The entire care of the patient "from start to finish" is described, with no one aspect of care receiving greater focus.

Application of Theory to Practice
Risk Management
Administrative
Educational
Clinical Measurement Procedures

OUTCOME MEASURES

Neck Disability Index

Office Use Only

Name _____

Date _____

This questionnaire has been designed to give us information as to how your neck pain has affected your ability to manage in everyday life. Please answer every section and **mark in each section only the one box that applies to you**. We realise you may consider that two or more statements in any one section relate to you, but please just mark the box that most closely describes your problem.

Section 1: Pain Intensity

☐ I have no pain at the moment
☐ The pain is very mild at the moment
☐ The pain is moderate at the moment
☐ The pain is fairly severe at the moment
☐ The pain is very severe at the moment
☐ The pain is the worst imaginable at the moment

Section 2: Personal Care (Washing, Dressing, etc.)

☐ I can look after myself normally without causing extra pain
☐ I can look after myself normally but it causes extra pain
☐ It is painful to look after myself and I am slow and careful
☐ I need some help but can manage most of my personal care
☐ I need help every day in most aspects of self care
☐ I do not get dressed, I wash with difficulty and stay in bed

Section 3: Lifting

☐ I can lift heavy weights without extra pain
☐ I can lift heavy weights but it gives extra pain
☐ Pain prevents me lifting heavy weights off the floor, but I can manage if they are conveniently placed, for example on a table
☐ Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned
☐ I can only lift very light weights
☐ I cannot lift or carry anything

Section 4: Reading

☐ I can read as much as I want to with no pain in my neck
☐ I can read as much as I want to with slight pain in my neck
☐ I can read as much as I want with moderate pain in my neck
☐ I can't read as much as I want because of moderate pain in my neck
☐ I can hardly read at all because of severe pain in my neck
☐ I cannot read at all

Section 5: Headaches

☐ I have no headaches at all
☐ I have slight headaches, which come infrequently
☐ I have moderate headaches, which come infrequently
☐ I have moderate headaches, which come frequently
☐ I have severe headaches, which come frequently
☐ I have headaches almost all the time

Section 6: Concentration

☐ I can concentrate fully when I want to with no difficulty
☐ I can concentrate fully when I want to with slight difficulty
☐ I have a fair degree of difficulty in concentrating when I want to
☐ I have a lot of difficulty in concentrating when I want to
☐ I have a great deal of difficulty in concentrating when I want to
☐ I cannot concentrate at all

Section 7: Work

☐ I can do as much work as I want to
☐ I can only do my usual work, but no more
☐ I can do most of my usual work, but no more
☐ I cannot do my usual work
☐ I can hardly do any work at all
☐ I can't do any work at all

Section 8: Driving

☐ I can drive my car without any neck pain
☐ I can drive my car as long as I want with slight pain in my neck
☐ I can drive my car as long as I want with moderate pain in my neck
☐ I can't drive my car as long as I want because of moderate pain in my neck
☐ I can hardly drive at all because of severe pain in my neck
☐ I can't drive my car at all

Section 9: Sleeping

☐ I have no trouble sleeping
☐ My sleep is slightly disturbed (less than 1 hr sleepless)
☐ My sleep is mildly disturbed (1-2 hrs sleepless)
☐ My sleep is moderately disturbed (2-3 hrs sleepless)
☐ My sleep is greatly disturbed (3-5 hrs sleepless)
☐ My sleep is completely disturbed (5-7 hrs sleepless)

Section 10: Recreation

☐ I am able to engage in all my recreation activities with no neck pain at all
☐ I am able to engage in all my recreation activities, with some pain in my neck
☐ I am able to engage in most, but not all of my usual recreation activities because of pain in my neck
☐ I am able to engage in a few of my usual recreation activities because of pain in my neck
☐ I can hardly do any recreation activities because of pain in my neck
☐ I can't do any recreation activities at all

Score: ___/50 Transform to percentage score x 100 = %points

Scoring: For each section the total possible score is 5: if the first statement is marked the section score = 0, if the last statement is marked it = 5. If all ten sections are completed the score is calculated as follows:

Example: 16 (total scored)
50 (total possible score) x 100 = 32%

If one section is missed or not applicable the score is calculated:

16 (total scored)
45 (total possible score) x 100 = 35.5%

Minimum Detectable Change (90% confidence): 5 points or 10 %points

---

NDI developed by: Vernon, H. & Mior, S. (1991). The Neck Disability Index: A study of reliability and validity. Journal of Manipulative and Physiological Therapeutics. 14, 409-415

NDI Neck Disability Index

Directions

- Veuillez utiliser un crayon #2 pour remplir le formulaire.
- Les réponses des textes doivent être enregistrées avec l'interface web. Veuillez répondre toutes les questions si non indiqué différemment.
- Veuillez noircir entièrement les cases de marquage.

Internal Use Only
Not read by scanner

Nom	Prénom	Sexe
Rue		N° du patient
Country code Zip code	City	
Numéro de Sécurity sociale (no. AVS)		Date de naissance (JJ.MM.AAAA)

Informations obligatoires

Ce questionnaire a été établi afin de permettre à votre médecin d'apprécier le retentissement de vos douleurs cervicales sur votre vie au quotidien. Veuillez répondre à toutes les questions en ne cochant que LA case qui vous correspond le mieux. Bien que 2 réponses dans une même rubrique puissent vous correspondre, nous vous remercions de ne cocher qu'une seule case, celle qui se rapporte plus précisément à votre cas.

Date de l'examen

Jour 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Mois 1 2 3 4 5 6 7 8 9 10 11 12 Année 10 11 12 13 14 15 16 17 18 19 20 21 22

Intervalle de l'examen, ... après l'intervention

avant l'intervention | 6 semaines | 3 mois | 6 mois | 9 mois
1 an | 2 ans | 3 ans | 4 ans | 5 ans | 6 ans
7 ans | 8 ans | 9 ans | 10 ans | 11 ans | 12 ans
13 ans | 14 ans | 15 ans | >15 ans .....

1. Intensité des douleurs cervicales

- Je n'ai pas de douleurs en ce moment.
- La douleur est très légère en ce moment.
- La douleur est moyenne en ce moment.
- La douleur est assez intense en ce moment.
- La douleur est très intense en ce moment.
- La douleur est la pire que je puisse imaginer en ce moment.

2. Soins personnels (se laver, s'habiller etc.)

- Je peux prendre soin de moi normalement sans entraîner plus de douleurs que d'ordinaire.
- Je peux prendre soin de moi normalement mais cela provoque plus de douleurs que d'ordinaire.
- M'occuper de moi est douloureux, et je le fais lentement et avec précaution.
- J'ai besoin d'aide mais je me débrouille pour la plupart de mes soins personnels.
- J'ai besoin d'une aide quotidienne pour la plupart de mes soins personnels.
- Je ne peux pas m'habiller, je me lave avec difficulté et je reste au lit.

3. Soulever des charges

- Je peux soulever des charges lourdes sans plus de douleurs que d'ordinaire.
- Je peux soulever des charges lourdes mais cela provoque plus de douleurs que d'ordinaire.
- Les douleurs cervicales m'empêchent de soulever des charges lourdes du sol, mais je peux y arriver si elles sont placées commodément, par exemple sur une table.
- Les douleurs cervicales m'empêchent de soulever des charges lourdes, mais je peux soulever des charges moyennes ou légères si elles sont posées commodément.
- Je ne peux soulever que de très légères charges.
- Je ne peux rien soulever ou porter du tout.

4. Lecture

- Je peux lire autant que je le veux, sans douleurs cervicales
- Je peux lire autant que je le veux, avec de légères douleurs cervicales.
- Je peux lire autant que je le veux, avec des douleurs cervicales modérées.
- Je ne peux pas lire autant que je le veux à cause de douleurs cervicales modérées.
- Je peux à peine lire à cause de douleurs cervicales intenses.
- Je ne pas lire du tout à cause de mes douleurs cervicales.

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5. Maux de tête

- ○ Je n'ai pas du tout de maux de tête.
- ○ J'ai des maux de tête légers et peu fréquents.
- ○ J'ai des maux de tête modérés et peu fréquents.
- ○ J'ai des maux de tête modérés et fréquents.
- ○ J'ai des maux de tête intenses et fréquents.
- ○ J'ai presque tout le temps des maux de tête.

6. Concentration

- ○ Je peux me concentrer complètement sans difficultés, quand je le veux.
- ○ Je peux me concentrer complètement avec de légères difficultés, quand je le veux.
- ○ Il m'est relativement difficile de me concentrer, quand je le veux.
- ○ J'ai beaucoup de difficultés à me concentrer, quand je le veux.
- ○ J'ai d'énormes difficultés à me concentrer, quand je le veux.
- ○ Je n'arrive pas du tout à me concentrer.

7. Travail (professionnel ou personnel)

- ○ Je peux travailler autant que je le veux.
- ○ Je ne peux faire que mon travail courant, mais rien de plus.
- ○ Je peux faire la plus grande partie de mon travail courant, mais rien de plus.
- ○ Je ne peux pas faire mon travail courant.
- ○ Je peux à peine travailler.
- ○ Je ne peux pas travailler du tout.

8. Conduite

- ○ Je peux conduire ma voiture sans aucune douleur cervicale.
- ○ Je peux conduire ma voiture autant que je le veux, avec de légères douleurs cervicales.
- ○ Je peux conduire ma voiture autant que je le veux, avec des douleurs cervicales modérées.
- ○ Je ne peux pas conduire ma voiture autant que je le veux, en raison de douleurs cervicales modérées.
- ○ Je peux à peine conduire en raison de douleurs cervicales intenses.
- ○ Je ne peux pas du tout conduire ma voiture à cause des douleurs cervicales.

9. Sommeil

- ○ Mon sommeil n'est pas perturbé.
- ○ Mon sommeil est à peine perturbé (moins d'1 heure sans dormir).
- ○ Mon sommeil est un peu perturbé (1-2 heures sans dormir).
- ○ Mon sommeil est modérément perturbé (2-3 heures sans dormir).
- ○ Mon sommeil est très perturbé (3-5 heures sans dormir).
- ○ Mon sommeil est complètement perturbé (5-7 heures sans dormir).

10. Loisirs (cuisine, sports, activités manuelles...)

- ○ Je peux participer à toutes mes activités de loisirs sans aucune douleur cervicale.
- ○ Je peux participer à toutes mes activités de loisirs, avec quelques douleurs cervicales.
- ○ Je peux participer à la plupart de mes activités habituelles de loisirs, mais pas à toutes, à cause de mes douleurs cervicales.
- ○ Je ne peux participer qu'à quelques unes de mes activités de loisirs habituelles, à cause de mes douleurs cervicales.
- ○ Je peux à peine participer à des activités de loisirs, à cause de mes douleurs cervicales.
- ○ Je ne peux participer à aucune activité de loisir à cause de mes douleurs cervicales.

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The Patient-Specific Functional Scale

This useful questionnaire can be used to quantify activity limitation and measure functional outcome for patients with any orthopaedic condition.

Clinician to read and fill in below: Complete at the end of the history and prior to physical examination.

Initial Assessment:

I am going to ask you to identify up to three important activities that you are unable to do or are having difficulty with as a result of your _____ problem. Today, are there any activities that you are unable to do or having difficulty with because of your _____ problem? (Clinician: show scale to patient and have the patient rate each activity).

Follow-up Assessments:

When I assessed you on (state previous assessment date), you told me that you had difficulty with (read all activities from list at a time). Today, do you still have difficulty with: (read and have patient score each item in the list)?

Patient-specific activity scoring scheme (Point to one number):

0 1 2 3 4 5 6 7 8 9 10

Unable to

m

(Date and Score)

Activity	Initial					
1.						
2.						
3.						
4.						
5.						
Additional						
Additional						

Total score = sum of the activity scores/number of activities
Minimum detectable change (90%CI) for average score = 2 points
Minimum detectable change (90%CI) for single activity score = 3 points

PSFS developed by: Stratford, P., Gill, C., Westaway, M., & Binkley, J. (1995). Assessing disability and change on individual patients: a report of a patient specific measure. Physiotherapy Canada, 47, 258-263.

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SKILLS

BASIC CERVICAL EXAM

- Screen systems: cardiovascular (vital signs); integumentary (skin intact, edema); musculoskeletal (gross ROM, strength, height, weight); neuromuscular (gait, balance)
- Posture
    - Standing and sitting
    - Forward head posture
- Observation of movement dysfunction/ functional limitation
- Active Range of Motion
    - Cervical spine flexion, extension, side-bending, rotation - observe, measure
    - Assessment of active/passive AA motion
- Muscle strength
    - Cranial cervical flexion test
        - (Chiu JOSPT 2005 – performance poor in chronic neck pain compared to normals)
    - Neck flexor muscle endurance test
    - Cranial cervical extension in neutral
        - (Cagnie, 2011; O'Leary 2011 MRI found impairment in people with neck pain)
    - MMT: isometric contraction of flexion, extension, side bending, rotation
    - MMT of scapular muscles
- Muscle length – specific to problem and area
    - Upper trapezius, levator, scalenes, sternocleidomastoid, pectoral major and minor
- Palpation for spasm, trigger points
    - Upper trapezius, levator, scalenes, sternocleidomastoid, pectoral major and minor
- Accessory motion testing
    - PAIVM cervical and thoracic spinous processes
    - PPIVM cervical side glide, rotation
    - 1st rib mobility
- Special tests
    - Spurling's test
    - Shoulder abduction test
    - C1-C2 rotation
    - Cervical distraction
    - Neural exam: UE dermatomes, myotome, DTR
    - Neurodynamic testing – median nerve
- Outcome measures
    - Neck Disability Index (NDI)
    - Patient specific functional scale (PSFS)
    - WHODAS 2

BASIC CERVICAL TREATMENT

- Therapeutic exercise
  - Craniocervical flexion to target longus capitis and longus colli
    - (Jull, Spine 2002; O'Leary J Pain 2007)
  - Neck endurance training in flexion
    - (Ylinen JAMA 2003 chronic neck pain; O'Leary JOSPT 2009)
  - Isometric low level rotatory resistance to co-contract neck flexors and extensors
    - (Jull, Spine 2002)
  - Cranial cervical extension
    - (Elliott 2010)
  - Scapular strengthening
    - (O'Leary 2009; Jull 2002)
  - Postural correction of forward head
    - (Sahrmann; Raney 2009; Jull 2002)
- Manual therapy
  - Soft tissue mobilization and trigger point release for trapezius, levator, scalene, sternocleidomastoid, pectoral major and minor muscles
  - Stretching of scalenes, upper trapezius, levator scapulae, pectoralis minor, pectoralis major
  - Soft tissue sub occipital release
  - Manual cervical traction
  - Grades I – IV 1st rib mobilization
  - Grades I-IV side glide and rotation cervical mobilization with and without muscle energy
  - Grades I-IV central PAs to cervical and thoracic spine
  - Neurodynamic mobilization of median nerve
- Electrotherapy and other modalities
  - Cervical traction - prefer mechanical intermittent traction
    - Graham 2013; Fritz 2014
- Functional and Ergonomic activities
  - Correct forward head posture during activities
    - (Jull 2002; Raney 2009)
- Home Program
- Community Education and prevention

SKILLS IN SESSIONS FOUR AND FIVE

EXAMINATION SKILLS	**TREATMENT SKILLS**
Forward head posture	Postural correction of forward head
Cervical spine ROM – review notes	
C1-C2 ROM	Sub occipital release
	Isometric cervical rotation
Cranial cervical flexion test	Deep neck flexion strengthening
Neck flexion endurance test	Neck endurance training
Cranial cervical extension test	Cranial cervical extension strengthening
MMT cervical and scapular muscles – review notes	Scapular strengthening
Muscle length: upper trapezius, levator, scalenes – review notes	Passive stretch of upper trapezius, levator, scalenes – review notes
Trigger points: upper trapezius, levator, scalenes, sternocleidomastoid, pectoralis major and minor – review notes	Soft tissue mobilization; Trigger point release – review notes
Central PAIVM cervical and thoracic spinous processes	Grades I – IV mobilizations
PPIVM cervical side glide, rotation	Grades I – IV mobilizations
1st rib mobility	Grades I – IV mobilizations
Spurling's test	
Shoulder abduction test	
Cervical distraction	Cervical traction: manual, mechanical, static
UE neural exam: dermatomes, myotomes, DTR	
Neurodynamic testing median nerve	Neurodynamic mobilization
Neck Disability Index (NDI) outcome measure	
Patient specific functional scale (PSFS) outcome measure	
WHODAS	

Cervical Muscle Actions

MUSCLE	Bilateral ACTION	Right side ACTION
SCM	*Extends O-A, A-A jts.* *Flexes cervical spine*	*Flexion of neck, SB's head and neck to R, rotates L*
Scalenes	*Flex cervical spine*	*SB neck to R and rotate R (rotation a small action for these mm's)*
Longus Colli	*Flexes cervical spine*	*SB neck to R and rotate L (rotation a small action for this mm)*
Longus Capitis	*Flexes head and cervical spine*	*SB head and neck to R and rotate R (rotation a small action for this mm)*
Rectus capitis Anterior	*Flexes head at O-A*	*SB of O-A joint to R*
Rectus capitis Lateralis		*SB of O-A joint to R*
Semispinalis capitis	*Extends head and neck*	*SB head and neck to R and rotates head and neck to L*
Splenius cervicis and capitis	*Extend head and neck*	*SB of head and neck to R and rotation of head and neck to R*
Suboccipitals	*As a group: extension of O-A or A-A joints*	
Upper trapezius	*Head and neck extension*	*Extend head and neck, SB to R and rotate to L*
Levator scapulae	*Neck extension*	*Extend neck and SB to R and rotate to R*

Cervical Muscle Testing and Training

A. Cranial Cervical Flexion Test and treatment (Jull 2002; O'Leary 2007)
   1. Activates the longus capitus and longus colli muscles
   2. Patient supine, knees bent, head in neutral position
   3. Ask patient to nod the head as if saying 'yes' and hold for 10 seconds
   4. Normal response is ability to hold the nod position without using the superficial cervical muscles like the sternocleidomastoid
   5. Repeat and count number of times until fatigue for assessment
   6. Determine intensity, duration and frequency for home program
      a. Perform 10 repetitions twice daily (Raney 2009)

B. Neck Flexor Endurance Test (Harris 2005)
   1. Patient supine with knees bent
   2. Retract head and hold isometrically
   3. Lift head about 2.5 cm off of table while keeping head retracted
   4. Clinician places a hand under occiput
   5. When skin folds in neck decrease or head begins to touch clinician's hand for more than 1 second the test is terminated
   6. Normal hold
      a. Without neck pain = 39 sec (SD 26)
      b. With neck pain = 24 sec (SD 13)

C. Neck Flexor endurance treatment (O'Leary 2009)
   1. Patient supine, knees bent
   2. Perform cranial cervical flexion
   3. Lift head slightly off the table and hold for 10 seconds
   4. Return head to table and rest 10 seconds
   5. Repeat and count the number of times until fatigue
   6. Determine intensity, duration and frequency for home program

D. Neck Extensor training (O'Leary 2009; Elliott 2010)
   1. Targets the semispinalis cervicis and multifidus deep extensor muscles and the semispinalis capitis and splenius capitis superficial extensor muscles
   2. Patient positioned prone on elbows, kneeling or sitting
   3. Head and neck move into flexion and then return to extension in neutral craniocervical position
   4. Patient may visually focus on their hands to train the deep lower cervical extensors while minimizing activity of the more superficial extensors that attach to the occiput.

E. Isometric training of cervical muscles
    1. Flexion
        a. Sitting, fist under chin
        b. Resist nodding
        c. Hold for 6-10 seconds
        d. Repeat until fatigue
    2. Extension
        a. Supine, stand, or sit with head against a table or wall. Place towel under head
        b. Maintain neutral upper cervical position while slowly pushing back of head into the towel
        c. Progress in how hard you push, how long the contraction is held and numer of repetitions
    3. Side bending
        a. Sitting, hands on the side of the head
        b. Use hands to provide resistance to alternate sidebending
        c. Hold for count of 6-10
        d. Repeat in sets of 5, then 10, then 15
    4. Rotation
        a. Sitting, finger tips on head at temple area
        b. Alternately resist rotation to right and left
        c. Hold for 6-10 count
        d. Repeat in sets of 5, then 10, then 15

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- Craniocervical flexion to target longus capitis and longus colli (Jull, Spine 2002; O'Leary J Pain 2007)
- Neck endurance training in flexion (Ylinen JAMA 2003 chronic neck pain; O'Leary JOSPT 2009)
- Isometric low level rotatory resistance to co-contract neck flexors and extensors (Jull, Spine 2002)
- Cranial cervical extension (Elliott 2010)
- Scapular strengthening (O'Leary 2009; Jull 2002)
- Postural correction of forward head (Sahrmann; Raney 2009; Jull 2002)

Cervical Passive Physiological Motion Testing and Treatment
Cervical Side Glide and Rotation

1. **Patient position:** Supine, comfortable
2. **Therapist position:** Standing or seated at the head of patient
3. **Stabilization:** Body weight on table
4. **Palpation:** Palpate the articular pillars (posterior facet region) with the proximal phalanx of the 2nd digit
5. **Mobilization:**
    - **a.** For Side Glide
        - **i.** Slightly flex the head and neck up to the segment being examined. Side glide right to left and left to right at each segment
        - **ii.** Slightly extend the head and neck up to the segment being examined. Side glide right to left and left to right at each segment
        - **iii.** Assess pain and motion relative to adjacent segments
    - **b.** For Rotation
        - **i.** Rotate each segment from C3-C7 to right
        - **ii.** Repeat with rotation of each segment to the left
6. **Direction of force:** Side glide or rotation
7. **Documentation**
    - a. Direction of force
    - b. Level(s) of involvement
    - c. Pain
    - d. Motion
        - i. Normal compared to adjacent segments
        - ii. Hypomobile
        - iii. Hypermobile

Treatment with PPIVMs

Stabilization

- For cervical side glide, manually stabilize the articular pillar of the vertebrae below
- For cervical rotation, manually stabilize the articular pillar of the vertebrae below

Grade I

Gentle movements of small amplitude carried out in the very beginning of the available range

Grade II

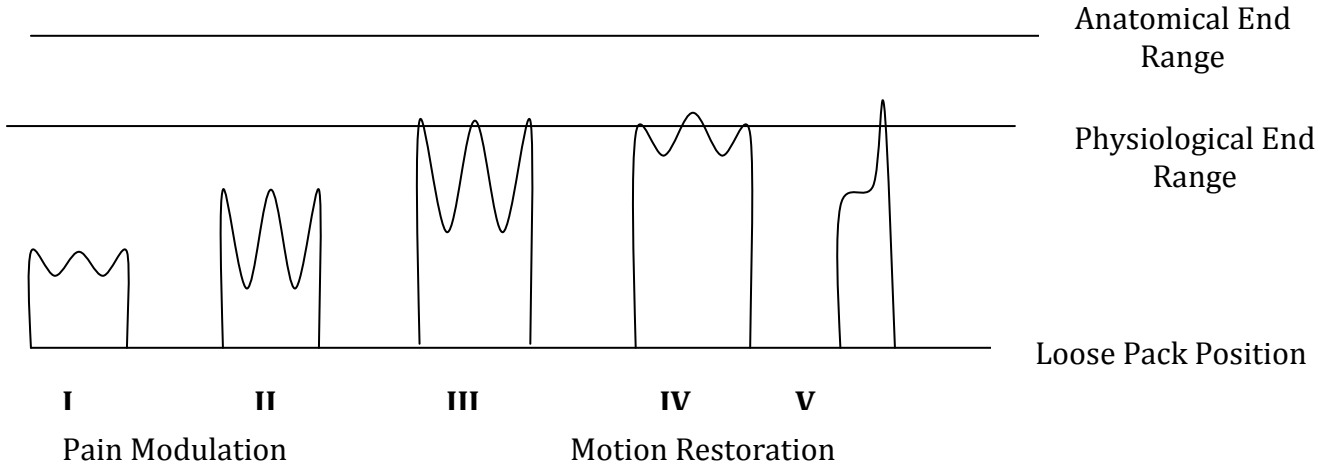
Gentle movements of large amplitude carried out in the mid-range of a joint

Grade 3 III

Moderate movements of large amplitude carried out through the available range of the joint and into the resistance

Grade IV

Small oscillating movements carried out at the end range and into the resistance



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Spurling's Test

Purpose: This test reduces the size of the intervertebral foramen

1. Patient seated
2. Ask patient to sidebend and slightly rotate the head to the painful side
3. Therapist places a compressive force through the top of the head to further narrow the foramen
4. A positive test reproduces the patient's symptoms

Shoulder Abduction Test for nerve root compression

1. Ask patient to abduct the shoulder and place their hand on top of their head.
2. The test is positive if this position relieves cervical pain or radicular symptoms within 30 seconds.

Distraction

Purpose: To identify cervical radiculopathy

1. Patient supine
2. Therapist grasps under the chin and occiput, flexes the head to a position of comfort, and gradually applies a distraction force
3. A positive test will decrease the patient's upper extremity or scapular symptoms
4. If symptoms are relieved, this same motion may be used for treatment

1st Rib Examination and Mobilization

Patient Position: Supine or sitting. Head passively side bent toward rib to be mobilized
Therapist Position: Standing at head of patient, with web space of hand on the first rib, body in line with the hip opposite the rib to be mobilized.
Stabilization: Therapist supports head
Palpation: Follow the rib from T1 spinous process to the manubrium where it inserts below the clavicle.
Direction of Force: diagonally toward the opposite hip

Examination: Compare mobility and pain reproduction between right and left sides
Mobilization:

- Grade I – II for pain relief; Grade III - IV to increase mobility
- 30-90 seconds; 6-10 repetitions

Documentation:

- 1st rib mobilization on (right or left)
- Grade of mobilization
- Patient response

Clinical application:
The first rib often becomes elevated and stiff as a result of shortening, spasm and trigger points in the scalene muscles. When the rib is elevated the patient may experience pain and tingling into the arm due to compression of the brachial plexus as it exits between the 1st rib and the clavicle. Soft tissue and trigger point treatment of the muscles along with downward mobilization of the 1st rib will help to relieve these symptoms. The home exercise program should include stretching of the scalenes.

Reference
Petersen C, Foley R. *Active and Passive Movement Testing*. New York, NY: McGraw-Hill; 2002.

Cervical Spine Active Range of Motion

Observational ROM
The end points on the chart represent full ROM. Observe the patient moving through ROM and mark the % of the ROM that the patient has.
Norms = Flexion (45-50°) Extension (45-60°)
Side bending (45°) Rotation (60-80°)

Motion	Patient Position	Instructions	Normative Value
Flexion	Sitting, back supported.	Align fulcrum of goniometer over the external auditory meatus. Proximal arm perpendicular to the ground; distal arm at base of nose. Ask patient to forward bend.	50°
Extension	Sitting, back supported	Goniometer as for flexion. Ask patient to extend neck.	60°
Side Bending	Sitting, back supported	Fulcrum of goniometer over C7. Proximal arm perpendicular to ground; distal arm dorsal midline of head. Ask patient to side bend head.	45°
Rotation	Sitting, back supported	Fulcrum over center of head. Proximal arm over acromion; distal arm tip of nose. Ask patient to rotate head.	60°

Reference:
Norkin CC, White, DJ. *Measurement of Joint Motion. A Guide to Goniometry.* 3rd ed. Philadelphia, PA: FA Davis; 2003.

Upper Extremity Muscle Length

A. Upper Trapezius
   1. Acting on scapula, the trapezius elevates the shoulder; acting on the neck, the trapezius extends, side-bends to the same side, and rotates the head toward the opposite side.
   2. Test the flexibility of the trapezius by active or passive neck flexion, side bending away, and rotation toward the side being tested.

B. Levator Scapulae
   1. Acting on the scapula, the levator elevates the scapula; acting on the neck, the levator extends, side-bends and rotates the head toward the same side
   2. Test the flexibility of the trapezius by active or passive neck flexion, side bending away, and rotation away from the side being tested.

C. Scalenes
   1. Working on one side, the scalenes (anterior, medius, and posterior) side bend to the same side and rotate to the opposite side.
   2. Test the flexibility of the scalenes by side bending away and rotating toward the side being tested.

D. Sternocleidomastoid
   1. Acting bilaterally the sternocleidomastoid primarily flexes the neck; acting unilaterally, it side bends to the same side and rotates to the opposite side.
   2. Test the flexibility of the sternocleidomastoid with the patient supine. Guide the head into extension, side bending away and rotation toward the side being tested.

References

Kendall FP, McCreary EK, Provance PG. *Muscles Testing and Function.* 4th ed. Baltimore MD: Williams & Wilkins; 1993.

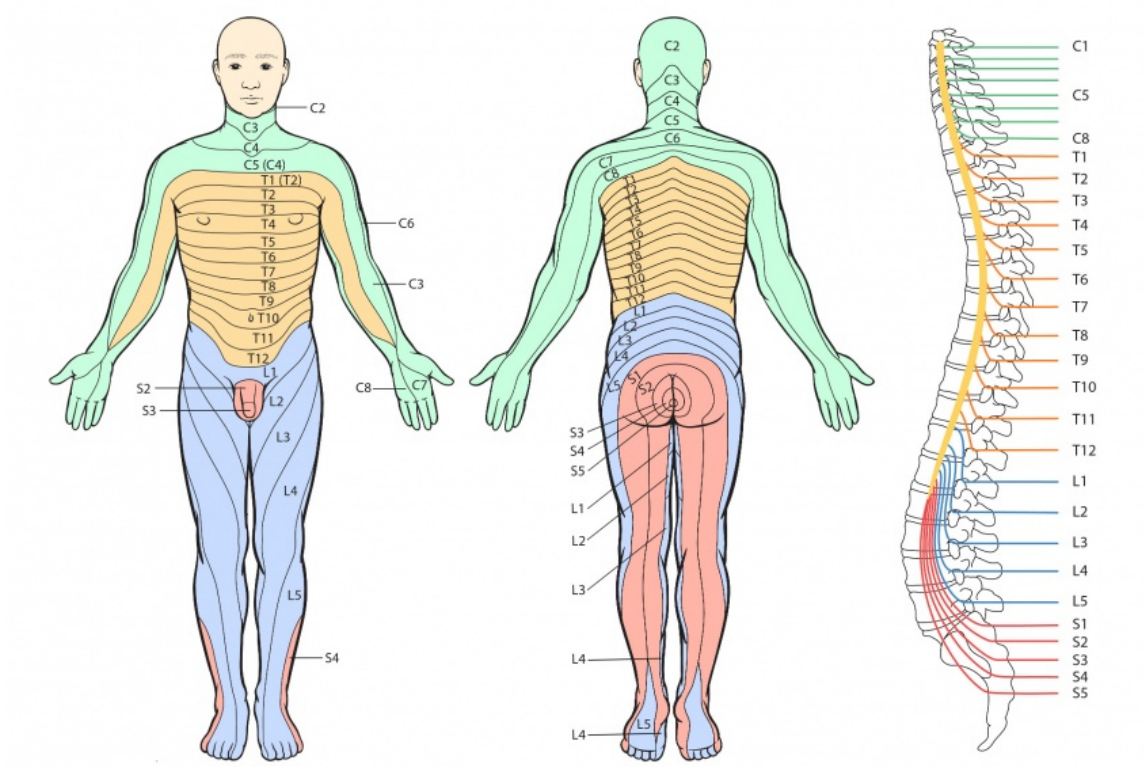
Hislop HJ, Avers D, Brown M. *Daniels and Worthingham's Muscle Testing.* 9th ed. St. Louis, MO: Elsevier; 2014.

Neural Examination
Dermatomes, Myotomes, Deep Tendon Reflexes

- **Dermatome-** Skin sensation served by a single nerve root. Testing identifies <u>sensory</u> involvement of a specific nerve root and spinal nerve
    - Pathways are not precise; will see variations with different charts; importance of gathering a cluster of signs and symptoms to help with diagnosis
- **Myotome-** Muscle or group of muscles served by a single nerve root. Testing identifies <u>motor</u> involvement of a specific spinal nerve root and spinal nerve
- **Deep Tendon Reflex** testing identifies the integrity of the reflex arc (tendon tap > brief stretch of tendon and muscle spindle > sensory receptors of spindle fire > reflex contraction of muscle to take stretch off the spindle)

Dermatomes: Document as 'normal', 'impaired' (hyper or hyposensitive), 'absent'

1. Establish a 'normal' sensation by swiping over the forehead
2. Compare initial tested dermatome to the 'normal'. Compare to opposite side.
3. If uninvolved, the last swiped dermatome becomes 'normal' for the next segment.



<u>Myotome testing</u>: Document as 'strong' or 'weak'

1. Ask patient to hold in isometric contraction
2. Correct joint movement is tested for each spinal level corresponding to muscle groups innervated at each spinal level
   C5 = shoulder abductors/elbow flexors
   C6 = wrist extensors
   C7 = elbow extensors
   C8 = thumb extensor (distal phalanx/ finger flexors (distal phalanx)
   T1 = finger abductors/adductors (2nd 3rd 4th and 5th finger)
   L2 = hip flexors
   L3 = knee extensors
   L4 = ankle dorsiflexors
   L5 = great toe extensors/long toe extensors/ankle evertors
   S1 = ankle plantarflexors
   S2-S5 = "Can you start and stop the flow of urine?"

Deep Tendon Reflex

Tap tendon with reflex hammer or ulnar side of hand

Reflexes	*Stimulation Site*
Biceps (C5,6)	*Biceps tendon (cubital fossa)*
Brachioradialis (C5,6)	*Brachioradialis tendon (proximal to radial styloid)*
Triceps (C7,C8)	*Triceps tendon (proximal to olecranon)*
Quadriceps (L2-4)	*Patellar tendon (between patella and tibial tuberosity)*
Achilles (S1-2)	*Tendo calcaneus (proximal to calcaneus on the posterior leg)*

Document as:

0=no response
0R=no response with reinforcement
1+=decreased
1+R=any response with reinforcement (can't get above 1+ if reinforced)
2+=normal
3+=brisk
4+=very brisk

Interpreting Results

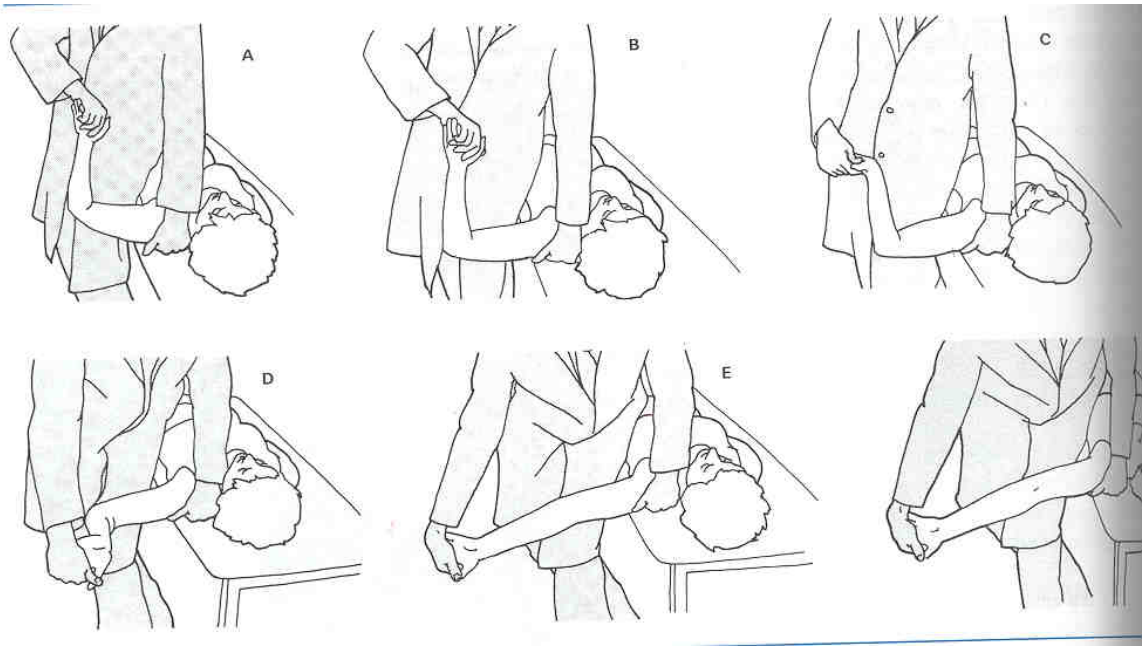
- Initial response to increase in compression of a peripheral nerve is tingling followed by pain as the compression increases.
- With increase in compression the patient will experience numbness and muscle weakness.
- A herniated disc or osteophytes in the spine <u>usually</u> lead to the following symptom presentation:
  Disc level C3-C4 involvement cause symptoms in the C4 distribution
  Disc level C4-C5 involvement cause symptoms in the C5 distribution
  Disc level C5-C6 involvement cause symptoms in the C6 distribution
  Disc level C6-C7 involvement cause symptoms in the C7 distribution

Disc level C7-TI involvement cause symptoms in the C8 distribution
Disc level T1-T2 involvement cause symptoms in the T1 distribution
Disc level L2-L3 involvement cause symptoms in the L3 distribution
Disc level L3-L4 involvement cause symptoms in the L4 distribution
Disc level L4-L5 involvement cause symptoms in the L5 distribution
Disc level L5-S1 involvement cause symptoms in the S1 distribution

Neurodynamic Testing of Median Nerve

Upper Limb Tension Test 1: Median Nerve bias

a. Patient is supine
b. Examiner depresses the shoulder girdle
c. Examiner abducts shoulder to about 110°
d. Examiner supinates the forearm; examiner extends the wrist and fingers
e. Examiner externally rotates the shoulder
f. Examiner slowly extends the elbow
g. Sensitizing movements are cervical side bending away and then towards



Butler DS. *Mobilization of the Nervous System.* Melbourne:Churchill Livingstone; 1991:149.

Neuromobility Treatment of Median Nerve

1. Treatment out-of-tension [sliding, gliding]
   a. Mobilize one component of the sequence to the point where **no symptoms are reproduced**

2. Treatment in-tension
   a. Mobilize one component of the sequence to the point where **symptoms are reproduced**
   b. Hold a position that combines components to the point where **symptoms are reproduced.** Follow the hold with oscillations to mobilize the nerve.

3. Suggested parameters
   a. Duration
      1. oscillations within selected Grade I-IV for 10-60 seconds
      2. alternate 5-10 sec hold with 5-10 sec rest
      3. prolonged hold up to 20 seconds followed with oscillations
   b. Amplitude
      1. Grades I and II physiological movements for irritable symptoms
      2. Grades III and IV physiological movements for non irritable symptoms
      3. Movements should be performed slowly and rhythmically
   c. Repetitions: 1-10 times based on irritability
   d. Frequency: 1-5 times daily based on irritability

4. Symptoms provoked during treatment should subside when the tension is released

5. Reassess the patient following treatment

6. Progression of treatment
   a. Irritable vs non-irritable symptoms
      1. Irritable conditions present with easily provoked, marked increase in symptoms, that take a long time to subside
      2. Irritable conditions are treated with less aggressive techniques; non-irritable conditions are treated more aggressively
   b. Begin at site remote from primary symptoms and work toward site of symptoms
   c. Begin with nerve gliding and progress to tensioning techniques
   d. Increase the duration, amplitude (Grade I-IV) or repetitions of oscillations
   e. Increase the tension on the nerve by adding more movement components

7. Treatment of non-neural tissues through soft tissue mobilization, joint mobilization, stretching or modalities may need to be done simultaneously with neurodynamic interventions

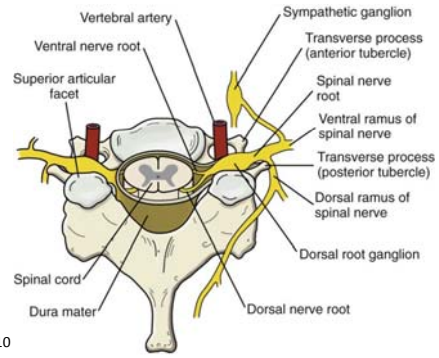
8. Instruct the patient in new postures and movement patterns

Butler DS. *Mobilization of the Nervous System.* Melbourne:Churchill Livingstone; 1991:149.

Advancement of Rwandan Rehabilitation Services Project

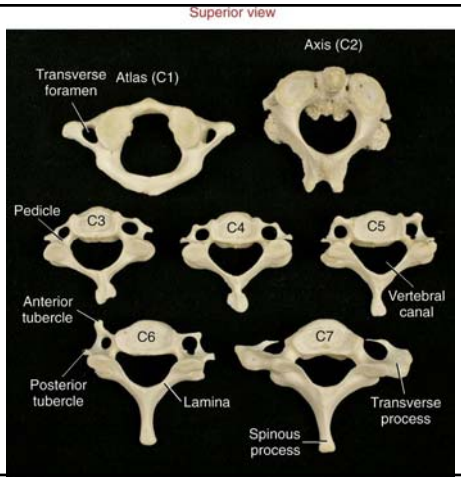
SESSIONS FOUR and FIVE

Cervical Vertebrae

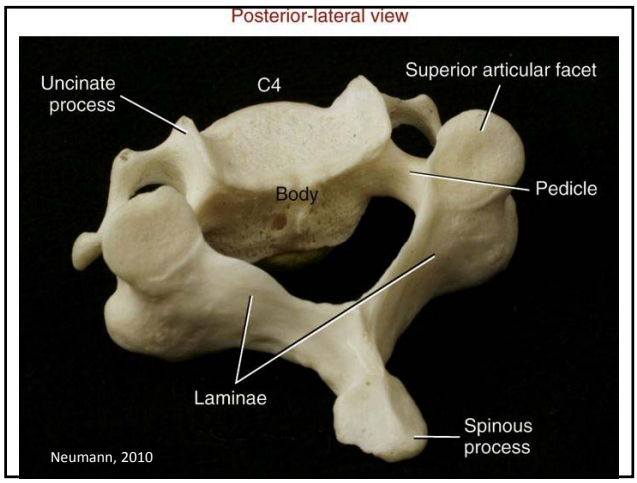


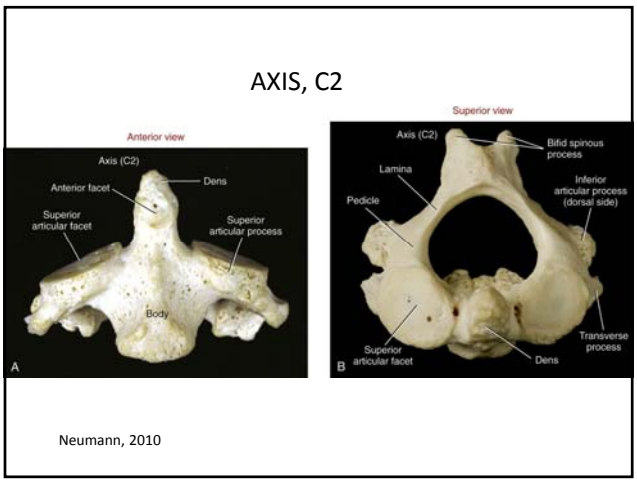
Neuman, 2010

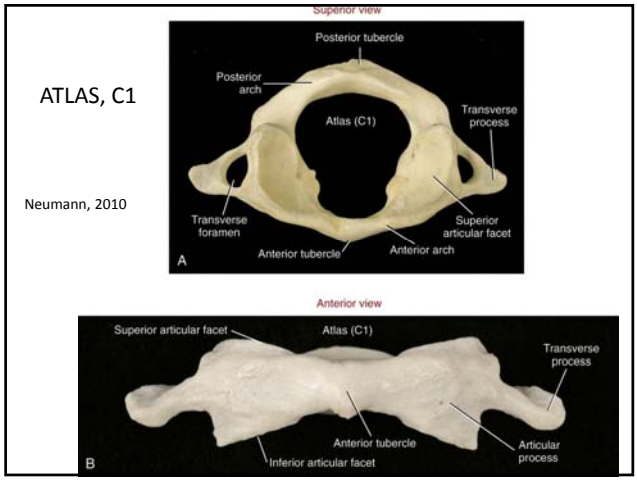
ANATOMY AND PATHOLOGY

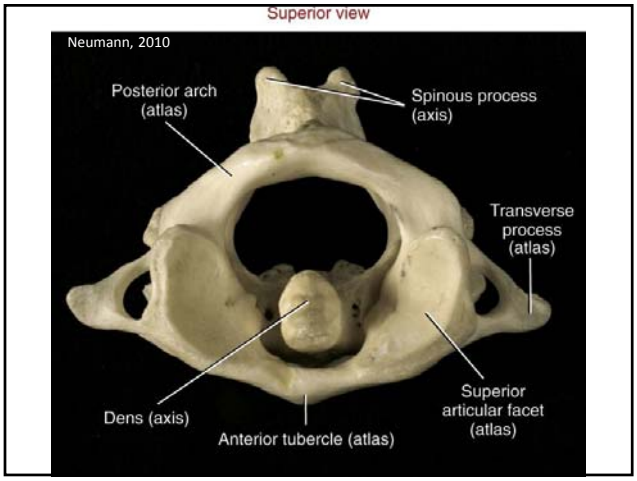


Neumann, 2010

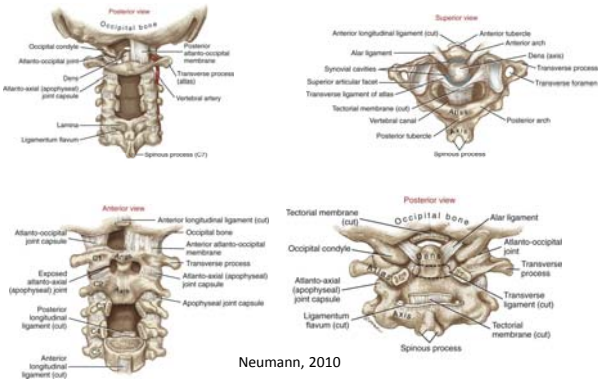

Posterior-lateral view
Uncinate process
C4
Superior articular facet
Body
Pedicle
Laminae
Spinous process
Neumann, 2010


AXIS, C2
Anterior view
Axis (C2)
Anterior facet
Dens
Superior articular facet
Superior articular process
Body
A
Superior view
Axis (C2)
Bifid spinous process
Lamina
Pedicle
Inferior articular process (dorsal side)
Transverse process
Superior articular facet
Dens
B
Neumann, 2010

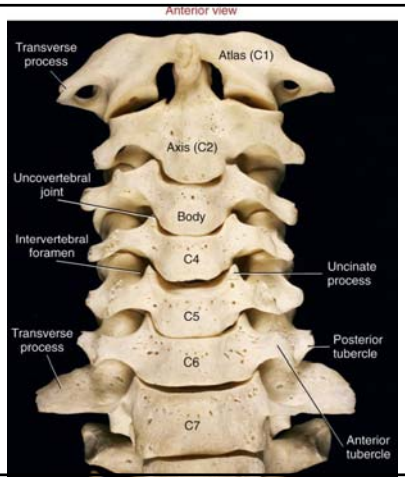

ATLAS, C1
Neumann, 2010
Posterior tubercle
Posterior arch
Atlas (C1)
Transverse process
Transverse foramen
Superior articular facet
Anterior tubercle
Anterior arch
A
Anterior view
Superior articular facet
Atlas (C1)
Transverse process
Anterior tubercle
Articular process
Inferior articular facet
B


Superior view
Neumann, 2010
Posterior arch (atlas)
Spinous process (axis)
Transverse process (atlas)
Dens (axis)
Anterior tubercle (atlas)
Superior articular facet (atlas)

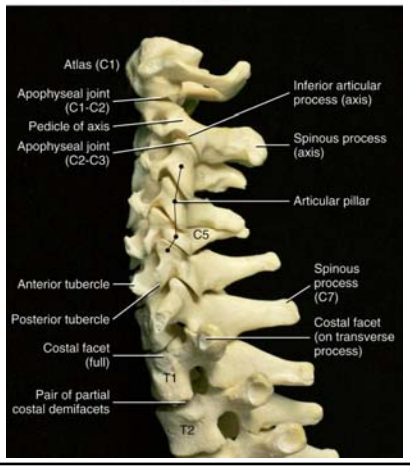
Upper Cervical Anatomy



Neumann, 2010

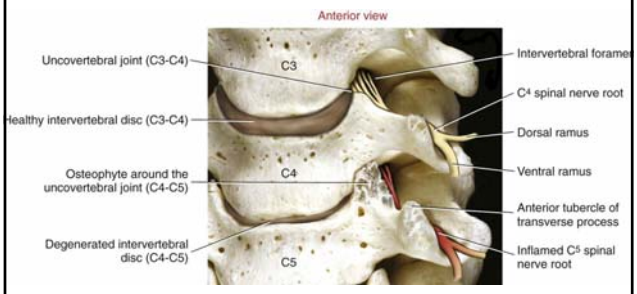


Neumann, 2010



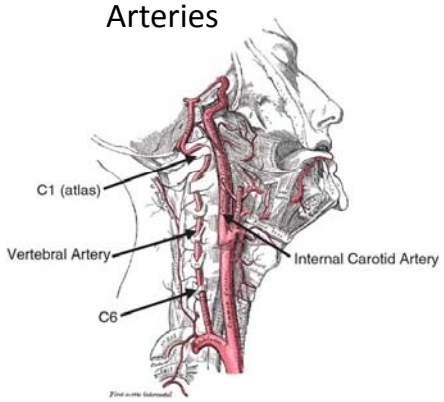
Neumann 2010

Uncovertebral Joint Osteophyte



Neumann 2010

Vetebrobasilar and Internal Carotid Arteries



Kerry, 2006

Cervical myelopathy UMN

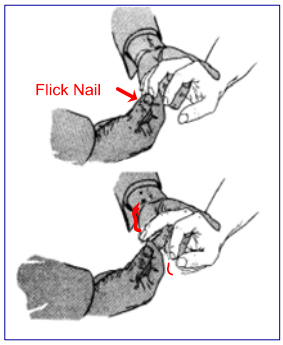
- Causes:
  - **spinal cord compression in the spinal canal due to osteophytes and/or disc degeneration**
- Common symptoms include:
  - **Hyperreflexia of the UE & LE**
  - **Sensory changes in an extrasegmental pattern, often in one or both hands and/or feet**
  - **Clonus at the ankle**
  - **Positive Babinski Response & Hoffman's Reflex**
  - **General weakness below the level of compression**
  - **Clumsiness in gait.**

REFER FOR FURTHER TESTING!

Cervical Artery Insufficiency REFER FOR FURTHER TESTING

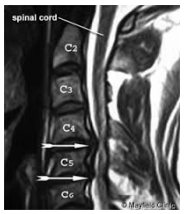
- History reveals atherosclerosis, hypertension, repeated or significant trauma
- Neck pain and headache may be precursors to potential posterior circulation ischemia
- + findings on cranial nerve exam like dysarthria or dysphagia
- Signs of a transient ischemic attack (TIA)
- Vertigo or vision changes
  - Kerry 2006

Pathological Reflexes: Hoffmann



- **Purpose:** + Hoffmann's reflex reflects presence of an upper motor neuron lesion from spinal cord compression
- **Technique:** is elicited by flipping either the volar or dorsal surfaces of the middle finger and observing the reflex contraction (approximation) of the thumb and index finger

Pathological Reflexes: Babinski



MRI disc

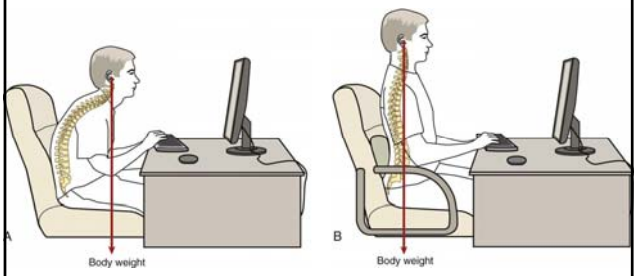
Spondylosis

Classification of Cervical Problems

- Mobility deficits
- Radiating pain
- Movement coordination deficits
- Headache

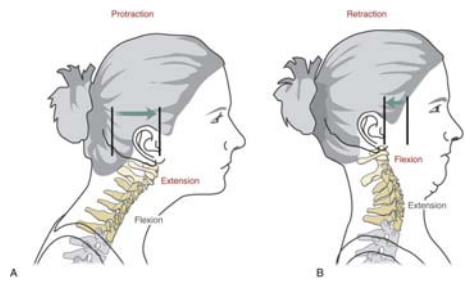
  – Childs et al. Clinical Practice Guidelines. JOSPT 2008

Sitting Posture



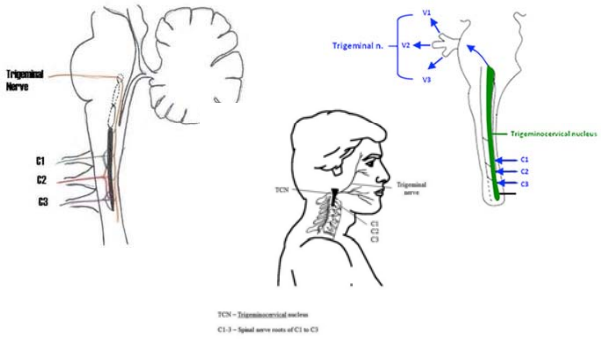
Neumann 2010

Protraction and Retraction

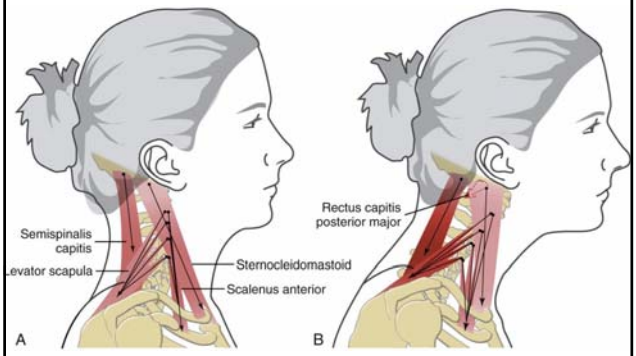


Neumann 2010

Trigeminocervical Nucleus



Muscles active in forward head



Neumann 2010

Trigeminal Nerve
5th Cranial Nerve

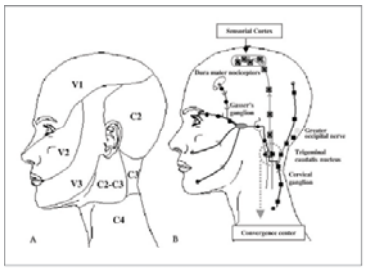
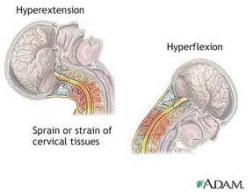
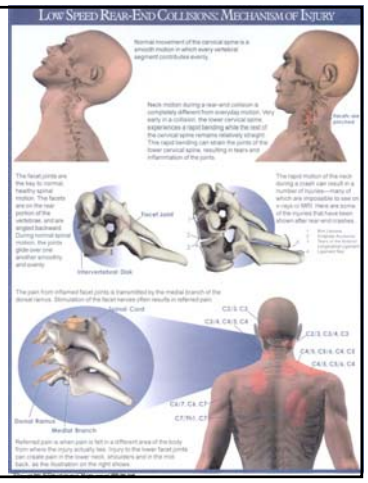
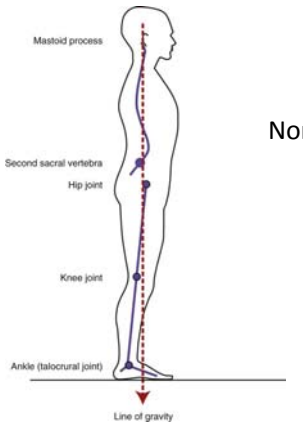


Fig 2. Convergence mechanisms between cervical and trigeminal nociceptive system. (A) Nociceptive distribution of the trigeminal and cervical system; (B) Illustrative convergence mechanisms during the migraine attacks. ▯ Trigeminal input's; ▯ cervical input's; ▯ trigeminal and cervical convergente input's.

Whiplash Injury





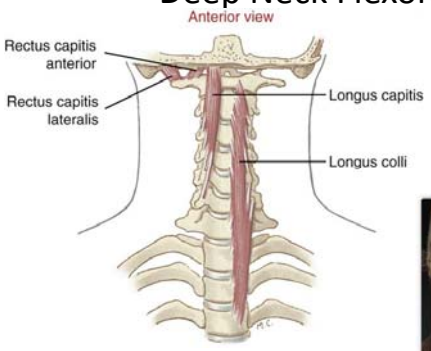


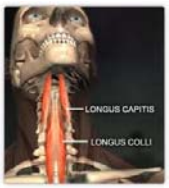
Normal Standing Posture

Neumann 2010

SKILLS

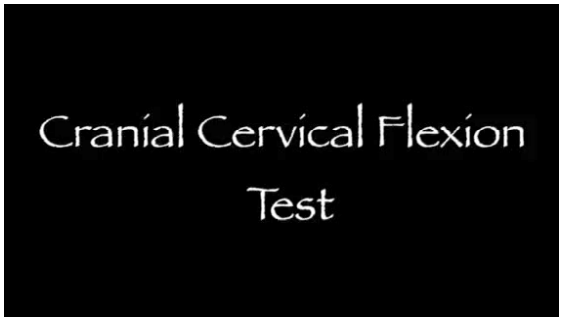
Deep Neck Flexors

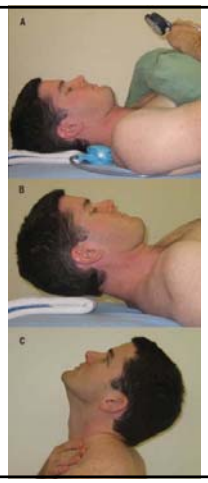




Neumann, 2010

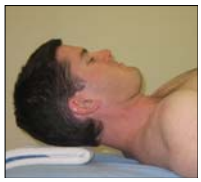
Cranial Cervical Flexion Test (ICC = 0.81)
http://youtube.com/watch?v=9Utqy7RFcXQ





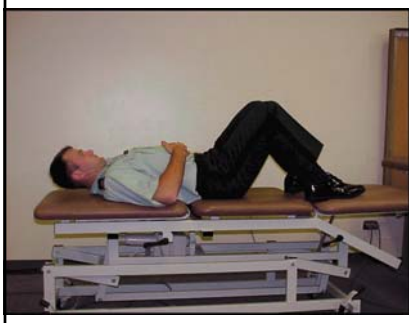
O'Leary 2009

Training Cervical Flexors



O'Leary 2009

Neck Flexor Endurance Test



Retract head
Hold retraction and lift head
Observe changes in neck folds or when the head drops

People without neck pain hold 39 sec (SD 26)

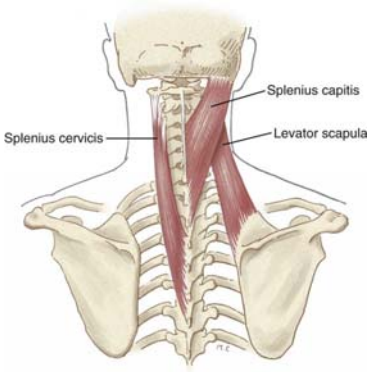
People with neck pain hold 24 sec (SD 13)

Harris 2005

Deep Neck Flexor Traininghttp://youtube.com/watch?v=4FzHcNTZ0l4

Deep Extensors:
Semispinalis cervicis
multifidus

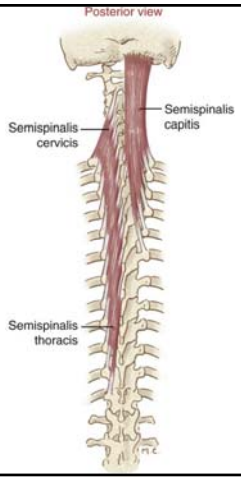
Superficial Extensors:
Splenius capitis
Semispinalis capitis



Neumann, 2010

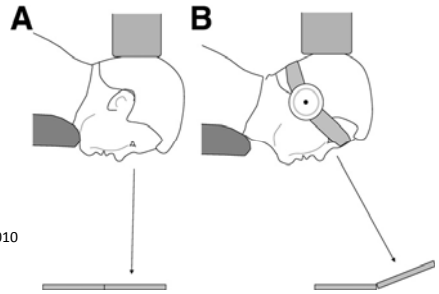
Deep Extensors:
Semispinalis cervicis
multifidus

Superficial Extensors:
Splenius capitis
Semispinalis capitis



Neumann, 2010

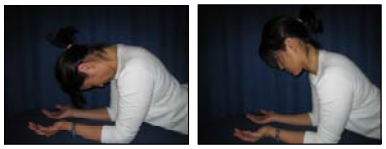
Testing Neck Extensors



Elliott, 2010

Fig 1. Dynamometry method used to perform the (A) cervical extension in CCN and (B) cervical extension in CCE exercises.

Training Lower Cervical Extensors
Keep cranial cervical neutral posture

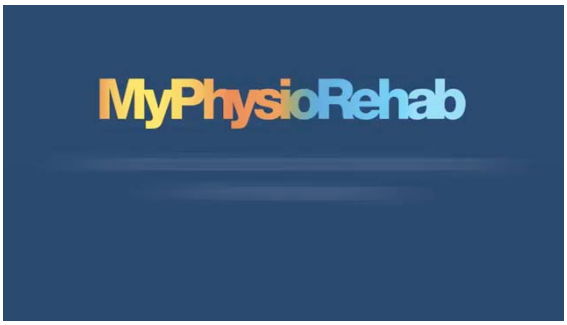


O'Leary, Elliott

Isometric Extension

Cervical Extensor Training

http://youtube.com/watch?v=TuORcyv0tCc



O'Leary 2009

Evidence Based Practice

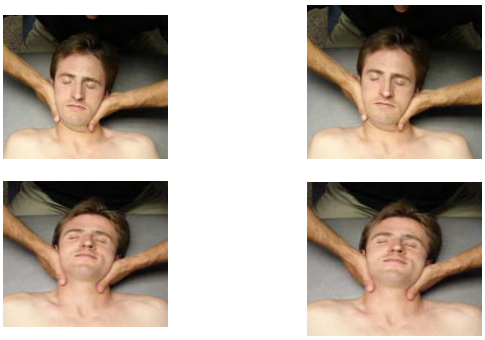
- There is strong evidence to support the use of coordination, strengthening and endurance exercises to reduce neck pain and headache
- There is weak evidence but strong professional expertise to support flexibility exercises in the treatment of neck pain

Childs, CPG 2008

Cervical Palpation

- Base of occiput
- C1 – posterior arch
- C1 - transverse process
- C2 – spinous process
- C3-C7 – facet joints
- C6 – disappears with neck extension
- T1 –T4 – spinous processes

PPIVM Cervical Side Glide



Elliott course notes

PAIVM Cervical Posterior-Anterior Examination and Treatment

Petersen, 2002

There is strong evidence to support the use of cervical mobilizaiton and exercise to reduce neck pain. Childs, CPG 2008

Cervical Flexion/Rotation test

Passively flex neck
Passively rotate to right and then left
Normal rotation 40-44° to each side
Range limited to 32° positive for CGH

Sensitivity 91%
Specificity 90%

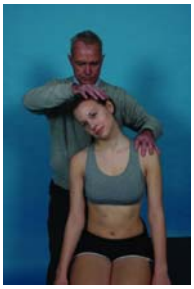
Hall 2008

Rotation Resistance Exercise

- Patient sitting, fingertips on each side of the temple bone
- Apply a low level resistance to isometric neck rotation; hold for 6-10 seconds
- Progress to concentric rotation in pain-free ROM
- Repeat 10x to each side
- This exercise provides co-contraction of neck flexors and extensors
  - Jull *Spine*, 2002

Spurling's Test
http://www.youtube.com/watch?v=DiqXxX2Lun0&list=PLKGeAOhJhe71CQsK7A07P8uBHV-K0AJwO&index=24

Spurling's Test



Sensitivity = 0.50
Specificity = 0.86
Wainner, 2003

Dutton 2012

Shoulder Abduction Test

- Patient sitting
- Ask patient to actively place the hand of the involved side on top of the head
- Relief of pain within 30 seconds is a positive test
- This position relieves tension on the nerve root

Sensitivity = .17
Specificity = .92
Wainner, 2003

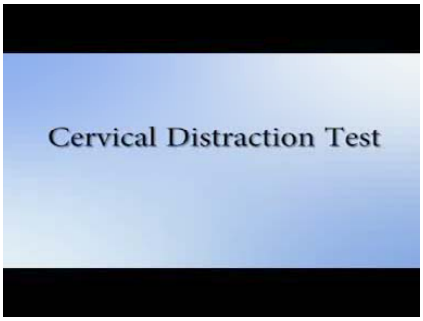
Distraction Test

Sensitivity = 0.44
Specificity = 0.90
Wainner, 2003

1st Rib
Examination and Treatment

Petersen, 2002

Cervical Distraction Test
http://www.youtube.com/watch?v=nvgPTr9Wuxk&list=PLKGeAOhJhe71CQsK7A07P8uBHV-K0AJwO



Sub Occipital Release

CERVICAL TRACTION

Mechanical Traction Protocol

Fritz, 2014

- Patient supine
- Angle of pull 15° cervical flexion or to comfort
- Intermittent traction with 60 second hold and 20 second rest
- Initial pull force of 5.44 kg (12 pounds)
- Force increased based on symptom response
- Relaxation force 50% of pull force
- Treatment duration 15 minutes
- Remained supine 2 minutes post treatment

Clinical Prediction Rule to identify patients most likely to benefit from cervical traction when at least 3/5 variables are present:

1. Peripheralization of symptoms with C4-C7 mobility testing
2. Positive shoulder abduction test
3. Age ≥ 55
4. Positive upper limb tension test median nerve
5. Positive neck distraction test

Raney, 2009

Static Traction Protocol

Fritz, 2014

- Traction unit set up over a door
- Patient seated directly under the unit in straight back chair facing the door, feet flat on floor
- Initial force of 3.63-5.44 kg (8-12 pounds) based on tolerance
- Maximum force 9.07 kg (20 pounds)
- Duration 15 minutes
- Remained seated 2 minutes after treatment

Exercise Protocol

Fritz, 2014

- Craniocervical flexion supine
  - 10 contractions of 10 second holds
- Supine cervical flexion
  - Maintain craniocervical flexion while lifting the head to improve endurance of deep cervical flexors
  - 3 sets of 15 repetitions
- Seated craniocervical flexion
  - 30 repetitions of 10 second holds
- Scapular retraction against resistance
- Prone horizontal abduction and extension
- Prone push ups
  - 3 sets of 10 repetitions

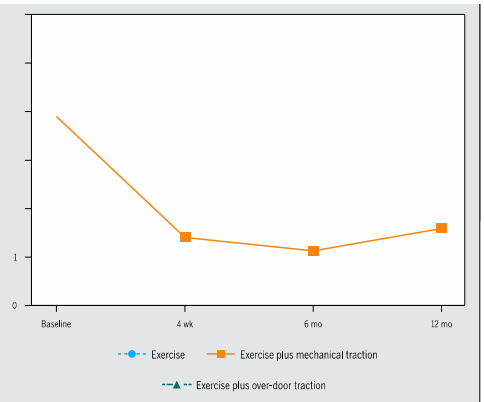


FIGURE 3. Adjusted mean neck pain intensity scores at baseline, 4 weeks, 6 months, and 12 months by treatment group from the intention-to-treat analysis.

Fritz 2014

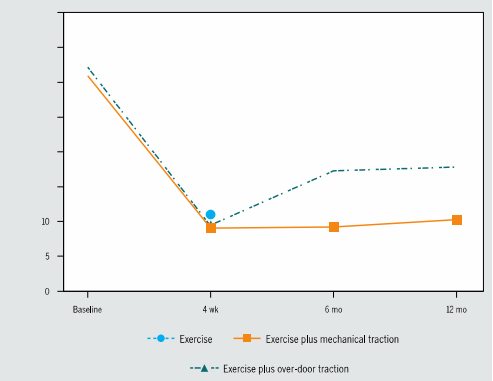
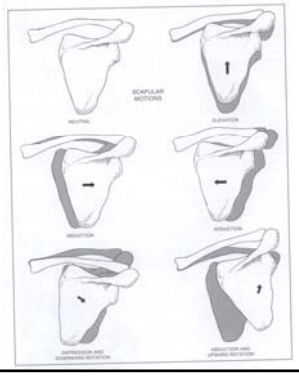


FIGURE 2. Adjusted mean Neck Disability Index scores at baseline, 4 weeks, 6 months, and 12 months by treatment group from the intention-to-treat analysis.

Fritz 2014

SCAPULAR STRENGTHENING

Scapular Motions



Hislop, 2014

In the presence of an abnormally oriented scapulae, determine the relationship between scapular orientation and the patients' symptoms by manually assisting the scapula to a neutral position and testing the effect of repositioning the scapula on –

Neck pain at rest

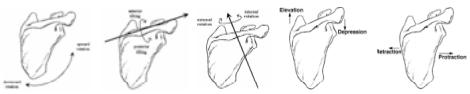
Painful and/or limited cervical movement

Palpable hypertonicity and tenderness

Elliott Course Notes, 2012

Scapular Posture

Axioscapular,Muscle,Func1on,

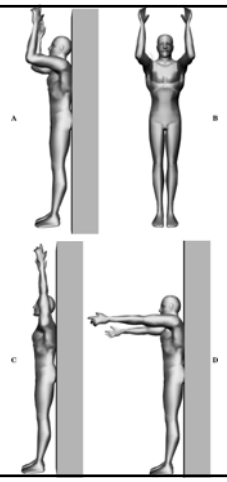


Elliott Course Notes, 2012

Raney, 2009

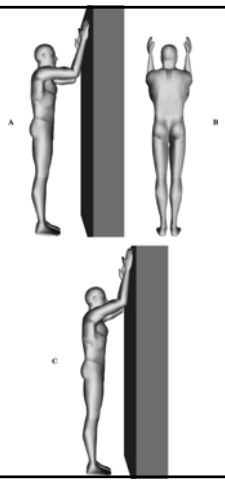
Sit with natural lordosis
Retract and adduct the scapula
Gently elongate the cervical spine
Hold for 10 seconds
Repeat 2x each hour

Supine
Perform slow and controlled cranio-cervical flexion without contracting superficial muscles
Hold for 10 seconds and perform 10 repetitions twice daily



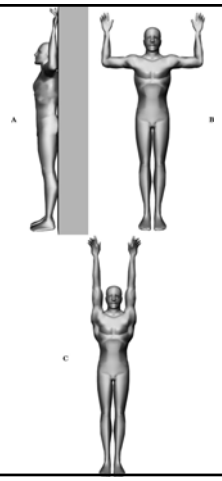
Strengthening scapular muscles

Sahrmann



Strengthening scapular muscles

Sahrmann

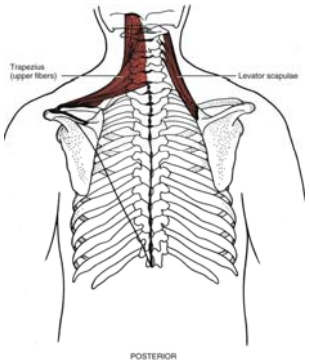


Strengthening scapular muscles

Sahrmann

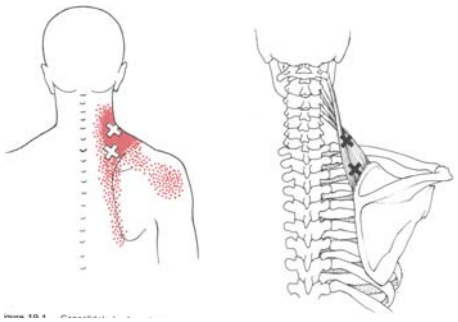
MUSCLES AND TRIGGER POINTS

Upper Trapezius and Levator

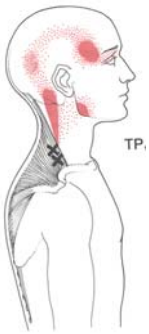


Hislop, 2014

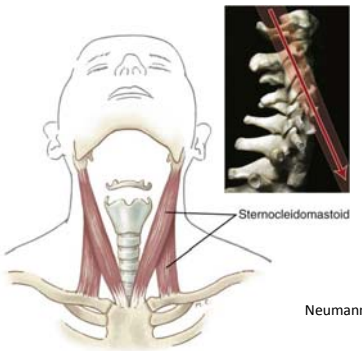
Levator Scapulae trigger points



Upper Trapezius Trigger Points



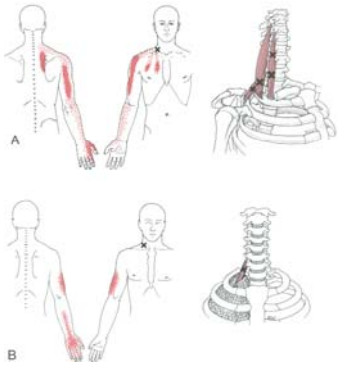
Sternocleidomastoid



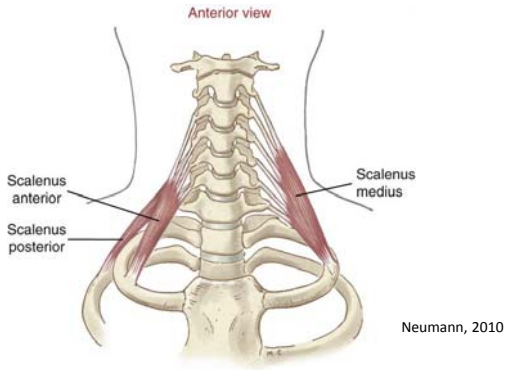
Neumann, 2010

Sternocleidomastoid Trigger Points

Scalene Muscle Trigger Points

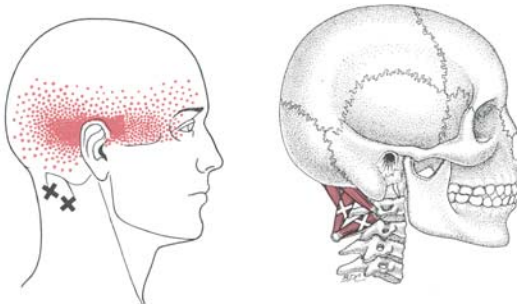


Scalenes



Neumann, 2010

Suboccipital trigger points



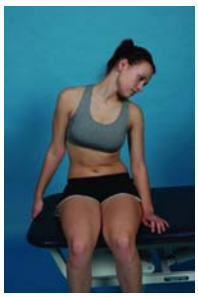
Pectoralis Major stretch

Dutton, 2012

BASIC SKILLS

Self Stretch

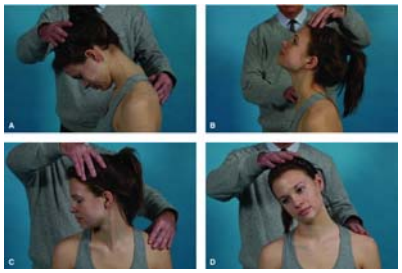
Levator



Upper Trapezius

Dutton, 2012

Cervical Active Range of Motion



Tested with or without overpressure

Dutton, 2012

Cervical Flexion

Norkin, 2003

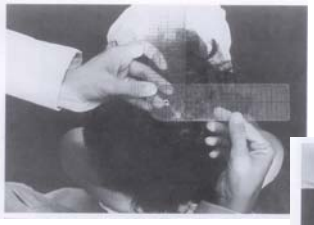
Cervical Side Bending

Norkin, 2003

Cervical Extension

Norkin, 2003

Cervical Rotation



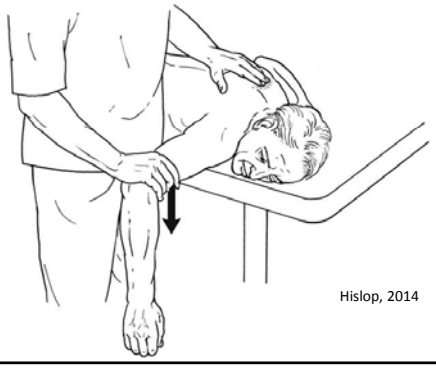
Norkin, 2003

Isometric Muscle Testing

Test flexion, Extension. Side bending, Rotation against resistance

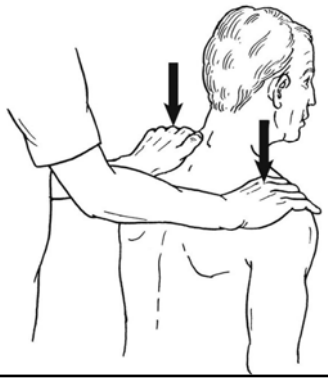
Dutton, 2012

Middle Trapezius MMT



Hislop, 2014

Upper Trapezius MMT



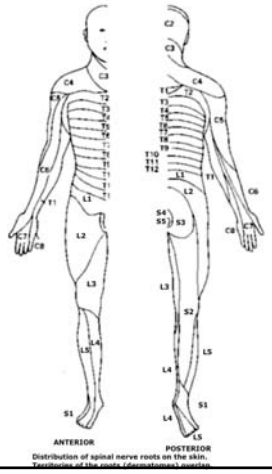
Hislop, 2014

Lower Trapezius MMT

Hislop, 2014

Rhomboid MMT

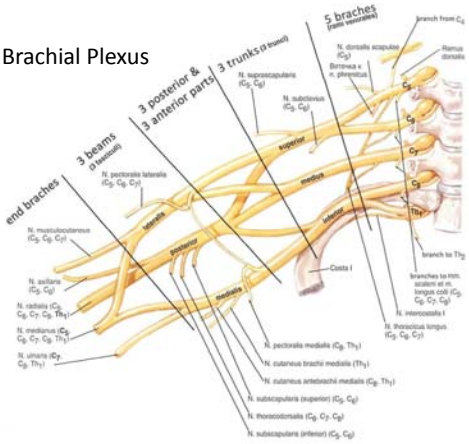
Hislop, 2014



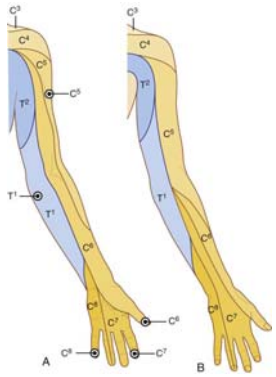
Serratus Anterior MMT

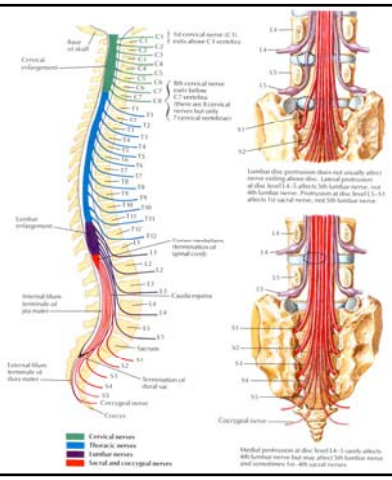
Hislop, 2014

Brachial Plexus



UE Myotomes





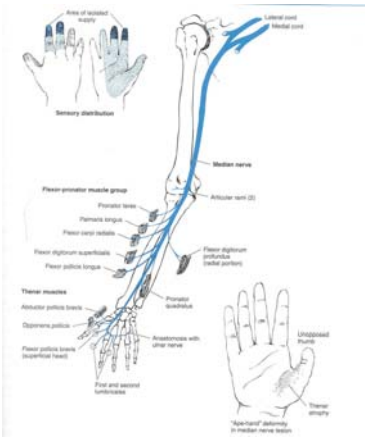
Web reference

UE Dermatomes and Myotomes
https://www.youtube.com/watch?v=7yk91Lhrbrw

[redacted]

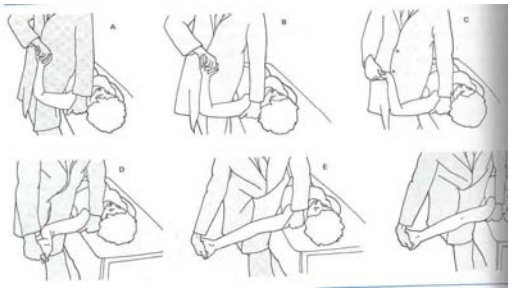
Median Nerve

C5 – T1



ULTT 1 Median Nerve Bias
Sensitivity = 0.97
Specificity = 0.22
Wainner, 2003

There is moderate evidence to support neuromobilization in the treatment of neck pain CPG



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ULTT Median Nerve
http://youtube.com/watch?v=u5_OWtvUx7E

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