ORTHOPEDIC ASSESSMENT ONE

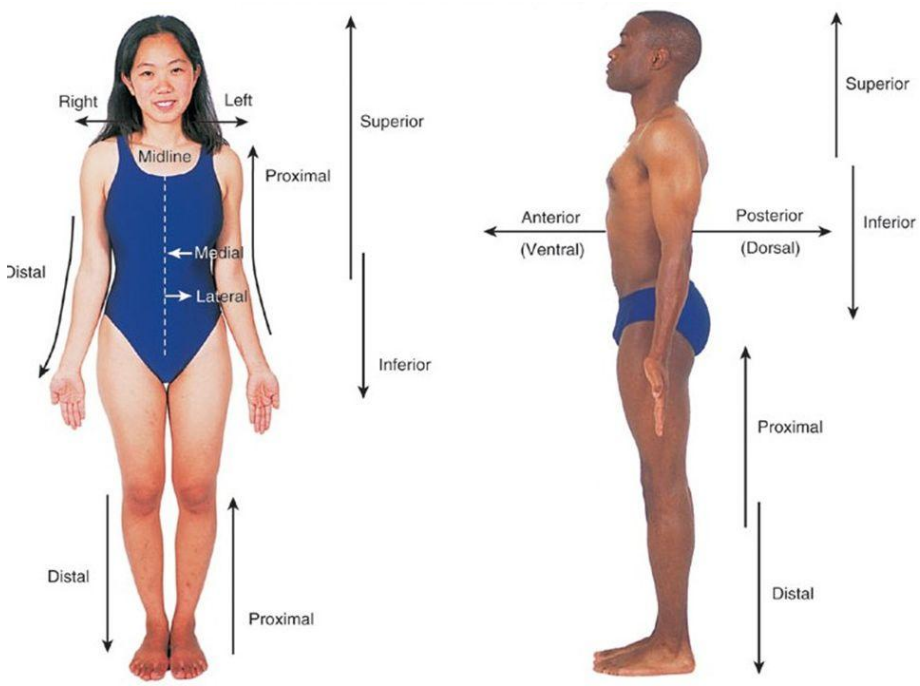
CLASSROOM EXPECTATIONS

- Be on time!
- The textbook supplements the powerpoints, read the chapters for further understanding, textbook material examinable
- Interactive class, need participation otherwise…zzzzzzzzzzzzzzzzzzzz
    - Do not be afraid to ask questions!
- Disruptive behaviour (talking, cell phones…) is not tolerated
- Be prepared– have your textbook on your desk and ready to be used
- RESPECT!!! – respect yourself!– by being present and giving your best. Respect your classmates- treat them how you would want to be treated. There will be absolutely no negative comments about anyone's bodies tolerated.
- Respect your instructors.
- Listen and be attentive
- Clothing necessary for EVERY class:
    - Woman: tanks top, sports bra, shorts (not spanx or volleyball shorts)
    - Men: shorts and muscle shirts

TOPICS TO BE COVERED

Ortho 1 is a 100 hr course

- General Assessment Protocol
- Hopmners or Ohipmners
- LORD FICARA Questions
- Neurological assessment
- Assessment of Posture
- Assessment of Palpation
- Assessment of Gait
- Assessment of Joints
- Assessment of Pain
- Assessment of Cervical
- Assessment of TMJ



MARK BREAKDOWN

Each student's performance is evaluated based on the satisfactory completion of all exercises and assignments to the standard set by the instructor as well as achieving a passing grade on all tests. The passing grade for this subject is 70%.

- Quizzes - 4 each worth 10% of your Grade
- Mid Term Oral Test – 25% of your Grade
- Mid Term Written Exam 20% of your Grade
- Final Oral Exam – 25% of your Grade
- Final Written Exam - 20% of your Grade

ASSIGNMENT SUBMISSION POLICY

- Assignments are due on the dates specified by the instructor.
- Students requiring extensions must make these arrangements prior to the assignment due date.
- Late assignments will be discounted. Individual assignments will be marked down 10% of their value per day, up to a maximum of 2 days. After the second day, the assignment will not be accepted for marks.
- Absenteeism does not excuse students from their responsibilities. In the event of an absence, the student is responsible for the work assigned and for the materials covered, including tests. Missed tests will be recorded at a mark of zero.

ATTENDANCE POLICY

- Each student is required to attend class on a regular basis. Missing even one class can put a student seriously behind, making it difficult to catch up. Students missing more than 10% of class time will not be allowed to write tests without a formal review. As a result, they may not receive credit in the subject. (Special circumstances may be taken into consideration during the review process to determine the student's suitability to continue.)

HOW ARE WE GOING TO GET THERE??

- Notes
- Classroom discussion
- Review
- Flashcards
- Questions
- Hands on practice

LET'S DIVE IN....

WHY ASSESS?

Assessment is essential to the Massage Therapist for a number of reasons. It allows us to :

- ✔ Gather information to further define their dysfunctions, we gather this information in the following ways:
  - ✔ Asking questions
  - ✔ Observing posture and gait
  - ✔ Palpating clients tissues
  - ✔ Performing general and specific tests

WHAT DOES IT TELL US?

By completing a thorough assessment we may have learned all or many of the following:

- Clients present symptoms and chief complaint
- ✔ Overall tissue health
- ✔ Functional abilities (such as walking or sitting)
- ✔ Joints ability to move - free and comfortable or otherwise
- ✔ Specific structures involved (muscle, Joint, connective tissues)
- ✔ Contraindications

WHAT CAN WE DO WITH THIS INFO?

- Having all of this information together helps the therapist to create a SAFE, knowledgeable and effective treatment plan
- The therapist develops a better understanding of the clients condition and determine an educated idea of the suspected condition
- Enables the therapist to treat causes and compensating structures not just where the pain is. It allows us to learn the primary cause of dysfunction not just the secondary pathology
- Determine if there is a need to refer to other health care practitioners/complementary therapies. Either because the dysfunction is out of scope of practice or additional therapies would be helpful to assist with healing

REVIEW AND KEY POINTS FOR ASSESSMENT PROTOCOL – WHY ASSESS

- To fully and clearly understand the client's complaint, problem, health status and history
- To determine what condition the client is displaying signs and symptoms of, and determine the appropriate treatment plan
- To make note of any contraindications to the treatment

****Assessment should be performed in a sequential method: it should be organized, comprehensive and reproducible****

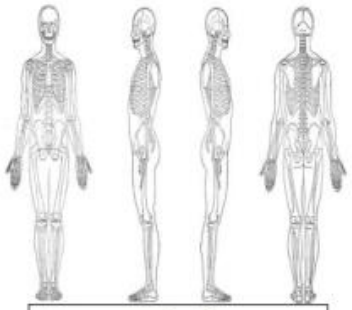
S.O.A.P. NOTE

- S- Subjective
  - What does your patient think
- O- Objective
  - What do you see (non-biased)
    - Observation, palpation, functional tests
- A- Assessment
  - What special tests did you use
- P- Plan
  - Treatment plan, home care
- Treatment and reassessment

ROBERTSON COLLEGE

SOAP NOTE Patient Name _____

Date: _____ Duration _____ Fee _____



Subjective

VAS: ____/10 □ improving □ no change □ worsening

CI's: _____

Objective

Observation:

Palpation:

Functional Tests:

Treatment Goal

Assessment

□ See additional specific assessment forms

Plan

PTR: ___ days _____ wks _____ mth □ PRN

Home care (FID - frequency, intensity, duration):

□ Stretch □ Strengthen □ Postural □ Heat □ Cold

Treatment and Reassessment

Student: _____ Clinic Instructor: _____

ASSESSMENT COMPONENTS

- Remember “HOPMNRS”:
  - History
  - Observation
  - Palpation
  - Movement
  - Neurological
  - Referred Pain
  - Special Tests

HEALTH HISTORY

- What is the purpose of history taking?
    - Develop rapport, and trust with the client
    - Completely understand the condition and your client’s concerns
    - To get a sense of their overall health, pre-existing conditions and contraindications to treatment

ORGANIZATION OF HISTORY TAKING

1. **Initial Onset**
   - Traumatic, degenerative, insidious, gradual, etc.
2. **Mechanism of Injury (MOI)**
   - What were you doing at the time of injury
3. **Pain (LORD FICARA)**
   - Location of complaint: get client to show you
   - Onset of pain: how/when, include mechanism
   - Radiation of pain: does it travel anywhere
   - Duration of complaint: how long since initial onset
   - Frequency of pain: how often do you feel this pain
   - Intensity of pain: on scale of 1-10
   - Character of pain: dull, achy, burning etc
   - Aggravating factors: what makes it worse
   - Relieving factors: what makes it better
   - Associated symptoms: did you notice any other symptoms since onset. Patterns, triggers, association with other medical conditions or hormonal

CONTINUED

4. Neurological Symptoms
    - area, nature, behaviour
    - aggravated, relieved by
5. Client's normal activity (ADL's)
    - vigorous, repetitive use
6. Loss of Motion Experienced
7. Swelling
    - Immediate or within 2-4 hrs is blood (ecchymosis), 8-24 hrs is inflammation or synovial swelling
    - Heamarthrosis (bleeding into joint space) vs. synovial effusion
8. Past History of trauma to region or related region
9. Medical treatment, surgery, test and medication
    - CI's to treatment

CONTINUED

10. Age, sleep, diet, exercise, smoking/drinking
11. Operant factors
    - emotional, lifestyle, stress, client goals for outcome
    - Treatment: short term and long term
12. Other
    - Audible symptoms (crepitus etc.)

RED FLAGS DURING ASSESSMENT

****Possible signs and symptoms that might cause concern pg. 2**

- Cancer:
  - Persistent pain at night
  - constant pain anywhere in the body
  - unexplained weight loss (10-15lbs in 2 weeks or less)
  - loss of appetite
  - Unusual lumps or growths
  - unwarranted fatigue
  - Change in bowel or bladder habits
  - Sores that will not heal
  - Unusual bleeding or discharge
  - Nagging cough or hoarseness

Cardiovascular:

shortness of breath
dizziness
pain or a feeling of heaviness in chest
pulsating pain anywhere in the body
constant or severe pain in lower leg or arm
discoloured or painful feet
swelling (with no history of injury)

CONTINUED

- Gastrointestinal / Genitourinary:
  - frequent or severe abdominal pain
  - frequent heart burn or indigestion
  - frequent nausea or vomiting
  - change in or problems with bowels and/or bladder function
  - unusual menstrual irregularities
- Miscellaneous:
  - fever or night sweats
  - recent severe emotional disturbances
  - swelling or redness in any joint with no history of injury
  - pregnancy complications
- Neurological:
  - changes in hearing
  - frequent or severe headaches with no history of injury
  - problems with swallowing or changes in speech
  - changes in vision
  - problems with balance, coordination or falling
  - faint spells or sudden weakness
  - Sudden weakness
  - Bilateral pins and needles

CONTINUED

- Cauda Equina Syndrome:
  - Neurological symptoms in lower body
  - Altered sensation in saddle region or saddle anesthesia
  - Bladder or bowel incontinence
  - Sharp or stabbing pain in the legs or lower extremities
  - Localized low back pain
- Vertebral Artery Insufficiency:
    - Dizziness
    - Disphagia- difficulty swallowing
    - Dysphasia- impairment in understanding language
    - Diplopia- double vision
    - Drop attacks- falling without fainting
    - Dysarthria- difficulty speaking
    - Nausea
    - Nystagmus
    - Positive cranial nerve signs

OBSERVATION

- Begins immediately when client walks into clinic/treatment room
- Observe their gate and how they move (example: taking off their jacket)
- Compare bilaterally
- Things to look for:
    - Posture (Anterior/posterior/lateral view with plumb-line)
    - Bony alignment/deformities
        - Structural deformities are present even at rest
        - Functional deformities are changed when posture is changed
    - Functional movements (jacket example)
    - Skin and Soft Tissues
        - muscle atrophy, bruising, limb size, limb position, cyanosis, scars, facial expression, and compliance.
    - Shoes
        - Wear patterns and/or Assistive Devices

FUNCTIONAL ASSESSMENT

- ADL's/IADL's
- Balance
- Coordination
- Proprioception
- Etc.

DISCUSSION QUESTION

If a client has been previously assessed and diagnosed by another health care professional is it necessary for you to perform an assessment when they come to see you?

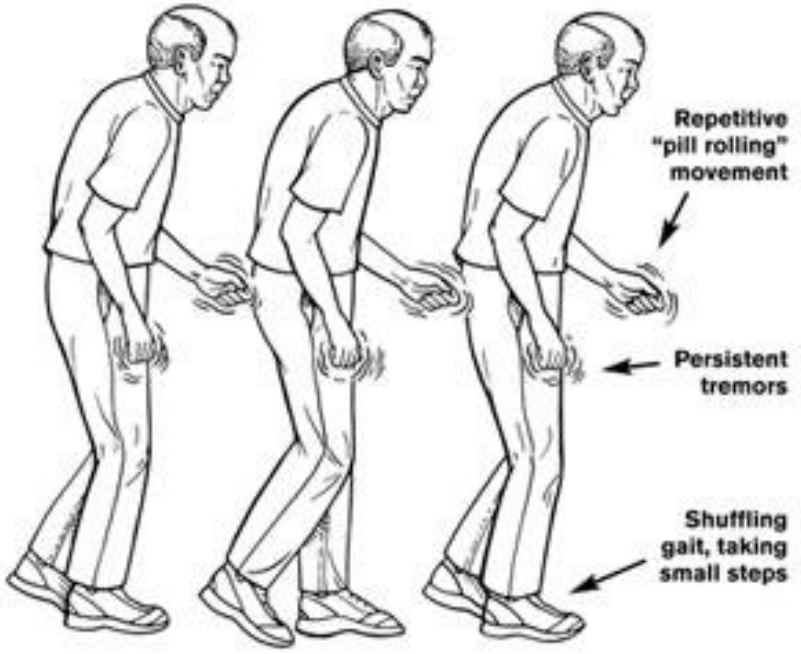
Yes!!!

It is important for us as therapists to have our own understanding of the clients condition as it relates to safe and effective treatment.

A COMPLETE ASSESSMENT

A Complete assessment includes the following

1. Client history and Consultation
2. Gait assessment
3. Postural assessment
4. General assessment
5. Specific assessment



HEALTH HISTORY FORM

One of the first steps in providing our clients with a complete assessment is having them fill out a Health History Form

The Health History form should include:

- Name
- Address
- Date of birth
- Occupation
- Current Physician
- Phone number

HEALTH HISTORY CONTINUED

- Referred by
- Current medical condition and its current status
- Current medications
- Reason for todays TX
- An anatomical figure that allows client to indicate where and what type of pain exists
- A pain scale – at least including current pain , can include average and worst
- Current or previous medical conditions from a list that may cause contraindications or special needs, can include family history as well
- List of symptoms recently experienced

HEALTH HISTORY CONTINUED

Assignment – Complete your own Health History form in class, Hang on to these as we will use them over again.

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Look at another example of a health history form
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WHAT TYPES OF QUESTIONS SHOULD WE ASK?

For the majority of our consultation it is preferable to use open ended questions with our clients.

Open ended question helps us to gain a better understanding of what is happening with the clients condition. We can also learn about their daily tasks and hobbies that make up their ADL (Active daily Living). These can have a great effect on the body, they can effect gait , posture, and can also lead to Repetitive Stress Injuries (RSI) as well as an affect overall emotional well being

EXAMPLES OF OPEN ENDED QUESTIONS

- Do you have a history of pain in this area?
- When did you first notice the pain?
- Can you describe the pain ?
- What type of work do you have?
- What are you hobbies?
- Did the pain come on suddenly?
- What makes the pain worse or better?

CLOSE ENDED QUESTIONS

During your consultation you are going to have a need to get some definitive answers. This is where close ended questions are going to come in handy. A close ended question generally speaking are those that has a specfic answer or a yes or no answer.

Some examples of these questions are:

- On a scale of 1 – 1o what is your pain level for today?
- Based on what you have told me is this correct?
- Fortens finger test – Point to me exactly where your pain is

LET THE ANSWERS BE YOUR GUIDE

One of the best skills we can master as Massage Therapists is to listen to the clues we are given. Some of the words the clients use can help us to determine more about their conditions and help to create a cleared picture. Describing words help to lead us in a more specific direction

- Localized pain – Can be indicative pain which is not as severe and generally more superficial
- Diffuse area – Usually indicates a deeper and/or more severe condition
- Radiating pain – When radiating pain location is quite specific it most likely is caused by pressure on a nerve
- Sharp – If local usually indicates a superficial condition
- Sharp, shooting, radiating – usually nerve condition
- Tingling into both extremities at the same time - indicates spinal or more serious pathology
- Dull, aching pain – joint or deeper problem
- Unrelenting, unbearable, deep boring pain – more serious (joint, disc or visceral)

- Monitoring the change in intensity may help to determine progression of a problem, if condition was getting worse before tx begun and continues to worsen then tx is not effective but likely not the cause. If condition is improving before treatment and stops getting better or worsens since tx the treatment is likely the reason – could only be treating secondary condition OR you are dealing with a more serious pathology

COMMON TYPES OF PAIN

- Dermal (Cutaneous) Pain – from superficial tissues, usually well localized
- Deep Somatic Pain – from muscles, joints, tendons and periosteum. More diffuse Pain and can refer to other parts of the body
- Visceral Pain – from internal organ capsule distention, deep crampy pain, sharp at times, diffuse, and may be immobilizing in more severe cases (heart attack, intestinal cramps, appendicitis)

- Radicular pain – From nerve roots, often described as shooting, electrical and/or burning and in a dermatomal pattern, nerve compression distal to the nerve roots may result in a peripheral nerve distribution pattern of pain
- Referral or referred pain – may come from cutaneous, deeper somatic or visceral tissue, it occurs in tissues that is remote from the original lesion or injury. Referred pain is well localized
- Functional or Psychogenic pain – Believed to arise form the emotions or psyche, but is experienced as tho it originates from an organic disorder

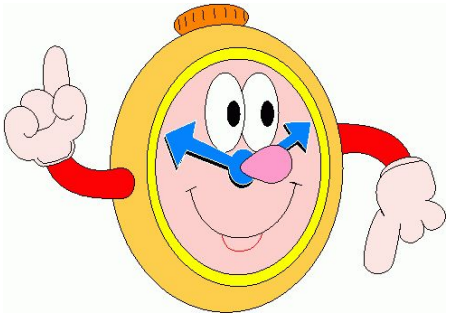
Ouch!!!!!!

DIFFERENIATION OF SYSTEMIC AND MUSCULOSKELETAL PAIN

- Pg 5 table 1.2

PAIN DURATION

- Acute pain – Generally refers to pain associated with the acute stage of inflammation, however can be -described as pain that is unbearable, usually first 48-72 hours
- Sub Acute pain – pain after the acute stage but not yet chronic, more than 72 hours
- Chronic pain – refers to pain associated with the stages healing after the resolution of the inflammatory response – is commonly used in reference to pain of long duration, more than 3 months



WHAT CAN BE DONE TO ENSURE AN EFFECTIVE PAIN ASSESSMENT PROCESS?

First, in general, accept the patient's self-reported pain as accurate and the primary source of information. Pain is inherently subjective experience, and the patient's expression of this experience can be influenced by multiple factors (eg. Gender differences, socially acceptable pain thresholds, culturally acceptable levels of "complaining," a sense of hopelessness, diminished morale, coping and adaptation abilities, and the meaning attached to the experienced pain). Consequently, the health care provider should accept the patient as an expert on his or her own body, and accept that while some patients may exaggerate their pain, this will generally be the exception, and not the rule.

Second, as much as possible within a time constrained service setting, allow the patients to describe their pain in their own word. The primary intention here is to listen to the patient rather than make any potentially false assumptions and erroneous clinical decisions.

Third, listen actively to what the patient says. Rather than engage the patient in a distracted manner, the health care provider should focus attention on the patient, observing behavioral and language, and paraphrasing words when necessary to ensure that what is expressed is clearly understood

Fourth, the location of pain across the body can be determined by showing the patient a picture of the human body, requesting that they indicate the primary and multiple areas of pain, and demonstrate the direction of any radiated pain

Fifth, while it is important to manage an individual's pain as soon as possible, in the assessment process the health care provider should also diagnose the cause of that pain and treat if possible, thus ensuring a longer-term resolution to the presenting pain problem.

Sixth, pain scales (of varying complexity and methodological rigor) can be used to determine the severity of the expressed pain

WAYS TO MEASURE PAIN

Pain Assessment

- The most commonly used tools for assessing pain in cognitively unimpaired adults and the elderly are Visual Analogue Scale (VAS), the Numerical Rating Scale (NRS), and the Verbal Descriptor Scale (VDS).
- The most commonly used tools for assessing children's pain, in addition to the VAS, NRS, and VDS (for some children aged older than 7) are the Wong-Baker FACES Pain Rating Scale (children over 3 years), the Pain thermometer (children over 7 years), and letting them color on a picture of the body to indicate areas that are experiencing pain.

PAIN SCALES

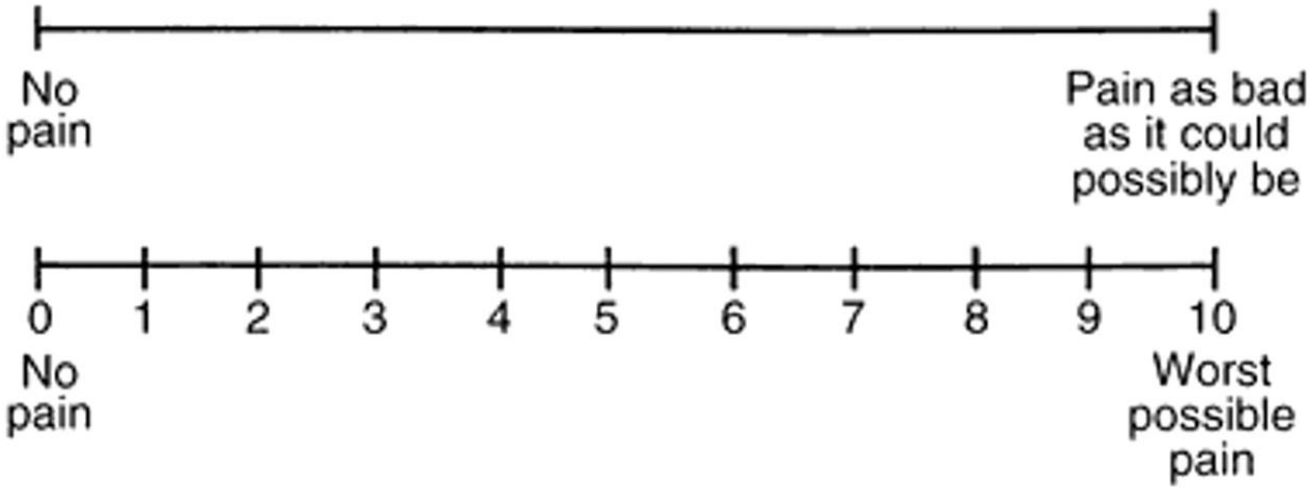
Verbal Numerical Scale

If "0" is "no pain" and "10" is the worst pain you can imagine, where is your pain now? on average? at its worst? at its best?

Word Scale

None Mild Moderate Severe Excruciating

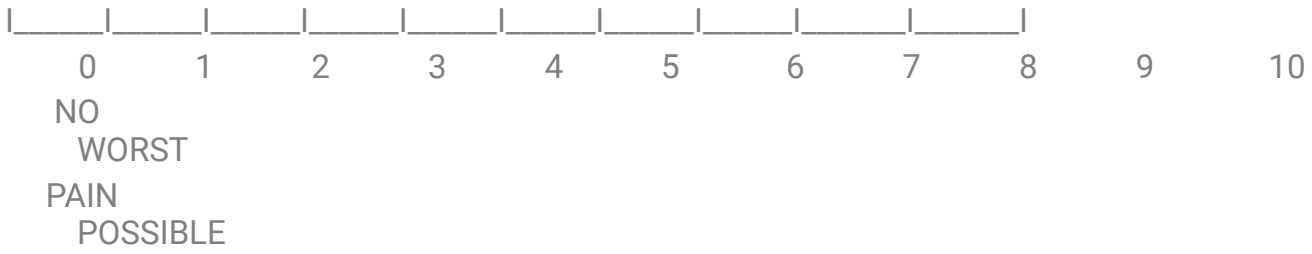
Visual Analogue Scales



VISUAL ANALOGUE SCALES

- The VAS uses a long horizontal line, anchored by the verbal descriptors “no pain” and “worst possible pain”, on which patients make a mark to indicate what they are feel best represents their perception of the intensity or their current pain.

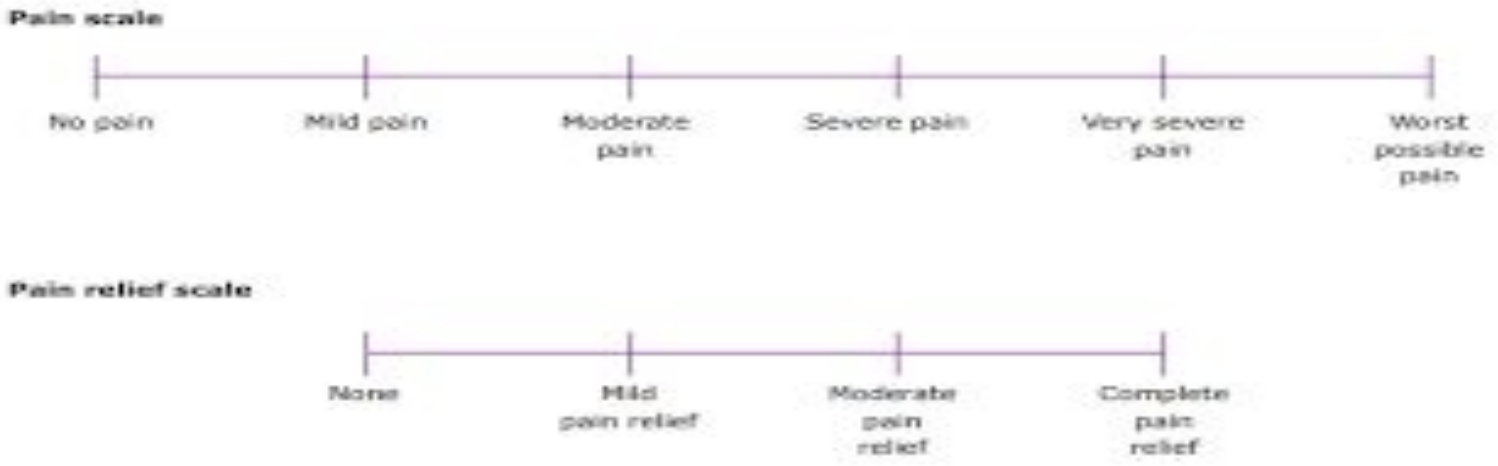
NUMERICAL RATING SCALE (NRS)



Using this scale, the health care provider asks patients to rate their pain intensity on a numerical scale that usually ranges from 0-10.

VERBAL DESCRIPTOR SCALE (VDS)

Health care provider describes the meaning of pain to the patient (significant feelings of unpleasantness, discomfort, and distress, and the significance of the experience for the individual). Then either verbally or visually, the patient is asked to choose the best suited.



WONG–BAKER FACES PAIN RATING SCALE

OTHER USEFUL HINTS

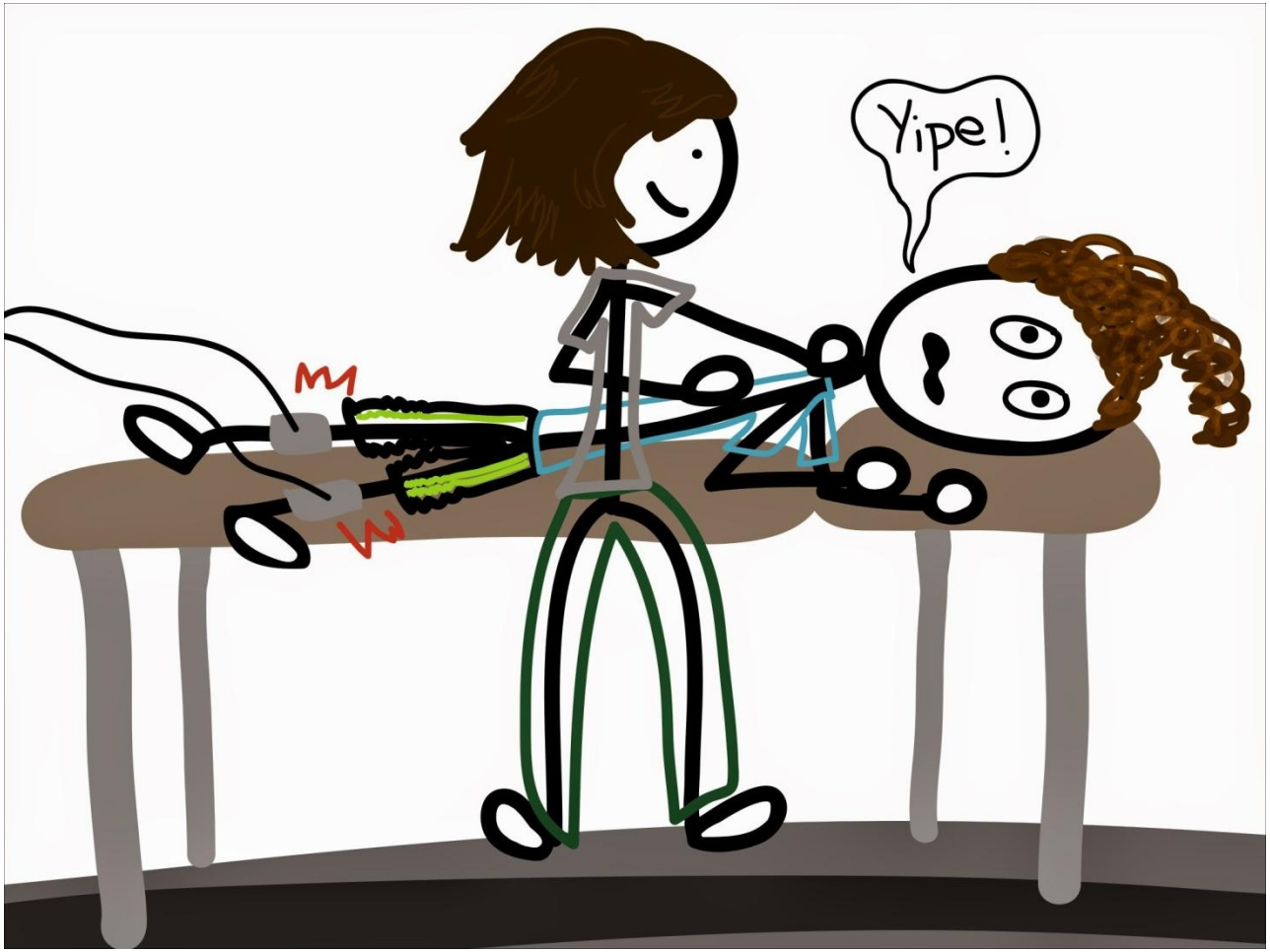
- Pain not aggravated by activity or relieved by rest indicates a pathology and not a muscle problem, possibly a disc problem – however they can be aggravated by sitting and improved by walking
- Morning pain indicates joint problems (caused by inflammation), as well degenerative joint problem or chronic arthritis
- Pain the awakens you may be nerve condition, or shoulder and hip pain by side lying
- Arthritis in early stages will be painful after muscle fatique, as the condition becomes more progressive it is painful in the early stages of exercises then is reduced and become worse if exercise continues too long

FOLLOWING HEALTH HISTORY CONSULTATION

Once you have completed the more formal interview portion of your Assessment, you can start formulating some thoughts on where your assessment will take you. At this point some of the considerations will include:

- What specific tests to include
- What ROM tests will be included
- Where their pain may be originating from
- Are there any treatment types that will be contraindicated
- Are there positions during assessment or treatment where it may not be appropriate to place the client in

- Is a referral to a doctor or any other health practitioner be recommended?



PRACTISE
CONSENT TO ASSESS

- Confidentiality of information
- Why assessment is necessary
- A brief description of what will happen
- What the client will wear if different from street clothes
- The areas to be observed, touched or moved
- That assessment may temporarily exacerbate symptoms, explain why this happens
- That the client should describe any symptoms experienced during assessment
- Does the client have any questions?
- Does the client agree to the assessment?

To gather information to form an knowledgeable Treatment Plan!!!

WHY DO WE ASSESS?

Quiz on all above information next class

GAIT PG 1096

GAIT ASSESSMENT, POSTURAL ASSESSMENT
AKA OBSERVATION

As part of the Observation stage of a complete assessment Gait and postural assessment provide us with some visual clues and gain OBJECTIVE information on our clients dysfunction.

GAIT ASSESSMENT: WHAT AND WHY?

- Simply stated Gait assessment is the observation of moving posture
- It is the first visual assessment which we perform, If possible as they are entering your clinic or treatment room
- Gait Assessment analyzes any imbalances in the way the client walks and monitors gross observable asymmetry
- Gait requires 3 things:
  - 1. Forward progression
  - 2. Balance
  - 3. Support of the upright body

Why?

- Gait analysis determines abnormalities during walking
- Conditions affecting the lumbar spine and lower extremities could alter the client's gait
- By analyzing gait, you could get an idea of what may be causing the altered gait and then perform a further assessment to determine the cause.

DEFINITIONS

- Gait cycle - Is the sequence of motions occurring between 2 consecutive initial contacts of the same foot (eg. Left foot heel strike to left foot heel strike)
- Stance Phase - The gait phase that lasts from heel strike to toe off, which accounts for 60% of a single gait cycle
- Swing Phase - non-weight-bearing phase of gait
- Step – Advancement of a single foot
- Stride – Advancement of both feet (one step by each side of your body)
- Step length – longitudinal distance between 2 feet

- Stride length – Distance covered during 1 cycle = 2 step lengths
- Velocity –stride length/ cycle time (meters per second)
- Ambulation - To walk from place to place
- Cadence – Steps per Minute
- Double Support – Both feet on the ground
- COG – Centre of Gravity

STANCE PHASE

- Makes up 60% of gait cycle
- Occurs when the foot is on the ground and bearing weight
- Allows the lower leg to support the weight of the body
- Acts as a shock absorber while allowing the body to advance over the supporting limb. (Supports the body weight while the body moves over that weight.
- There are five Stages of Stance phase

STAGE ONE

- Initial Contact (Heel Strike) :
  - This makes up the first 10% of stance phase
  - Called the *Weight Loading* or *Weight Acceptance* period
  - The opposite foot is coming off the floor (“toe off”) while the other (“heel strike) is accepting the body weight and absorbing the shock of the initial contact, because both feet are in contact with the floor this is considered a period of **double support**
  - The heel should strike with the knee extended but not locked

STAGE TWO

Load Response (Foot Flat) :

- The ankle plantarflexes and bottom of the foot makes full contact with the floor
- The foot is NOT bearing all the weight yet, opposite foot is in preswing / toe off
- If the client has a fused ankle, foot flat isn’t achieved until midstance

STAGE 3

Midstance (Single – Leg Stance) :

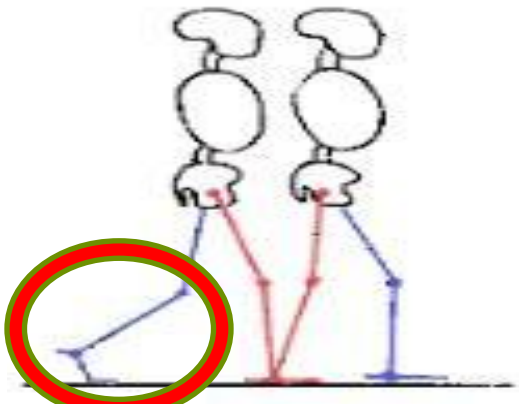
- One leg is supporting the body weight and balancing (Lateral hip stability is important)
- Consists of **single support**
- The knee is extended
- The opposite leg is going through swing phase (midswing)
- The tibia of the stance leg is advancing over the foot

*Together, stage 2&3 make up 40% of the stance phase

STAGE FOUR

Terminal Stance (Heel Off) :

- Plantarflexion begins as the heel raises off the floor
- The stance leg is preparing to unload the body weight to the contralateral limb (now in “heel strike”) and preparing the leg for the swing phase, both feet are in contact with the floor therefore it is a period of **double support**



STAGE FIVE

Preswing (Toe Off) :

- A.K.A. “weight unloading period”
  - Body weight is being transferred to the opposite leg and preparing for the swing phase
  - Both feet are still in contact with the ground and is therefore **double support**
  - MTP joints (metatarsalphalangeal) are extending as the ankle plantarflexes

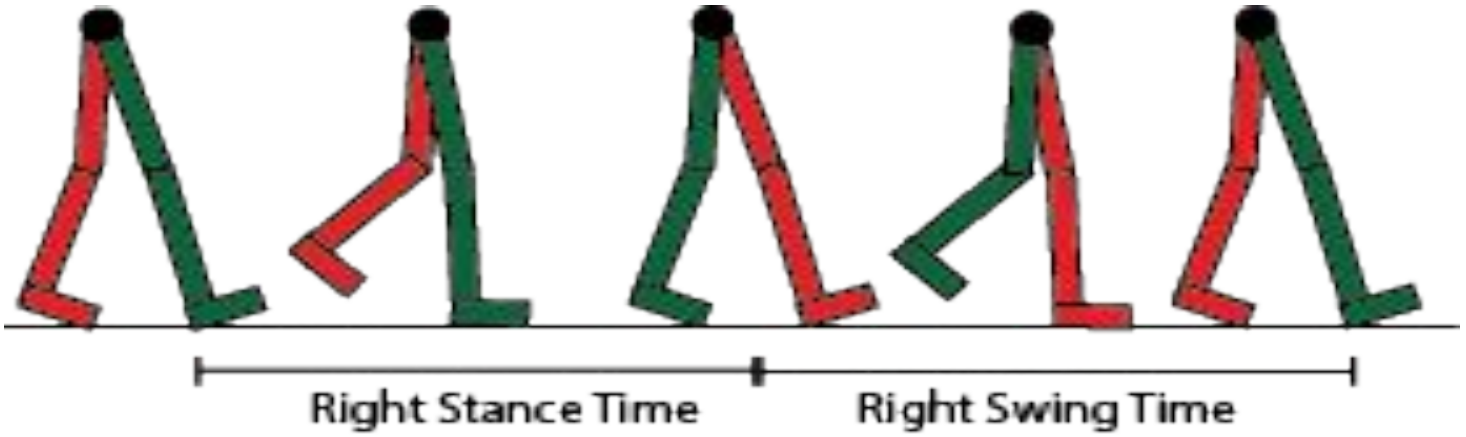
*Together, stage 4&5 make up the last 10% of stance phase

SWING PHASE

Pg 1097

SWING PHASE

- Makes up 35-40% of gait cycle
- Occurs when the foot is off the ground (not weight bearing) and is moving forward
- Allows the toes of the swinging leg to clear the floor and allows for leg length adjustments
- Has three stages



STAGE ONE

Initial swing (Acceleration):

- Occurs when the foot is lifted off the floor, knee flexion and ankle dorsiflexion occur to allow the swing limb to accelerate forward. (eg. Limb is shortened)

STAGE TWO

Midswing:

- Occurs when the swing leg is adjacent to (beside) the weight bearing leg (opposite leg is in midstance)
- The hip and knee are flexed, and the ankle is dorsiflexed
- Hip tilts slightly on the free leg but the abductors (gluteus medius) of the stance leg controls this by contracting strongly

STAGE THREE

Terminal swing (Deceleration):

- Swing leg slows down in preparation for initial contact with the floor (heel strike)
- Quadriceps and *hamstrings* are important in controlling this action

GENERAL CHARACTERISTICS OF NORMAL GAIT

- There are differences in gait when comparing different ages and different sexes
- Normal gait parameters are as follows
  - Base Width: -The distance between the two feet (heel to heel)
  - Usually 5-10 cm
  - A wider base width could indicate inner ear problems (balance disturbances) or tight abductors
  - As speed increases, the base width decreases to 0 or could result in a crossover which alters gait

- Step Length: The distance between successive contact points on the opposite feet (heel to heel)
- -Should be equal for both legs to have a smooth rhythm of walking
- -Approximately 72cm
- -Affected by age, height, fatigue, pain

Stride Length: The linear distance in the plane of progression between successive points of the foot to floor contact of the Same foot

- -Same as gait cycle
- -Approximately 144cm
- -Decreases with age, pain, disease, fatigue

- Lateral Pelvic Shift: Side to side movement of the pelvis during walking
  - Normally 2.5cm-5cm
- Vertical Pelvic Shift: Keeps the center of gravity from moving up or down more than 5cm
  - The high point is at midstance
  - The low point is at initial contact
  - the head is never higher during gait than when standing on both feet
- Pelvic Rotation: The pelvis and thorax counter-rotate to regulate the speed of walking and to maintain balance
  - The pelvis rotates forward on the non-weight bearing side 40^{o} (trochanter to trochanter)

Center of Gravity: 5cm anterior to the 2nd sacral vertebrae (S2)

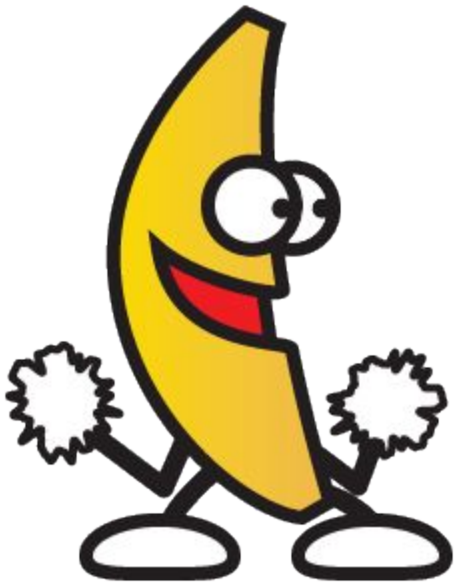
- Slightly higher in men because of excess shoulder weight
- oscillates in a vertical direction 5cm

Normal Cadence:

- 90-120 steps/ minute
- Women take 6-9 steps/minute more than men
- Decreases with age

Gait Speed:

- Approximately 1.4meters/second



VIDEOS TO WATCH ON YOUR OWN TIME

- https://youtu.be/PZBiv0uSXVg
- Gait breakdown
  - https://youtu.be/1u6d1CX7o9c

PRINCIPLES OF ASSESSING GAIT & CLIENT HISTORY

- Gait should be included in any assessment of the lower limb
- Therapist should remember that posture can affect a client's gait
- Therapist must be able to identify the action of each body segment and note any deviations from normal
- It is important for the therapist to know each stage of the gait cycle
- The therapist must read the client's history and note any disease or injury in the past or present that may alter gait

OBSERVATION

- Pg 1109
- Therapist must first take a general overview of the clients posture, looking for any asymmetry
- Then observe the client's gait, looking at stride length, step frequency, time of swing, speed of walking and duration of the complete cycle
- Gait is usually observed with the client in shorts and wearing **no** socks or shoes
- After the client takes approximately 3 steps and the examiner gets a chance to observe, they can then look more specifically at the parts of the gait cycle
- Therapist can observe each joint while the client continues to walk
- Other areas of the body should be observed as well (trunk, arms, hips, knees, ankles)

ANTERIOR VIEW

- Therapist will note if:
  - there is any lateral tilt of the pelvis
  - any sideways swaying of the trunk
  - any rotation of the pelvis on a horizontal plane
  - whether the trunk and arm rotate in an opposite direction to pelvis
  - whether a reciprocal arm swing is present
  - hip movements (rotation, abduction/adduction)
  - knee movements (rotation, abduction/adduction)
  - any bowing of the femurs or tibias
  - ankle and foot movements (plantarflexion/dorsiflexion, supination/ pronation, toe in/out)
  - any abduction or circumduction of the swing leg

LATERAL VIEW

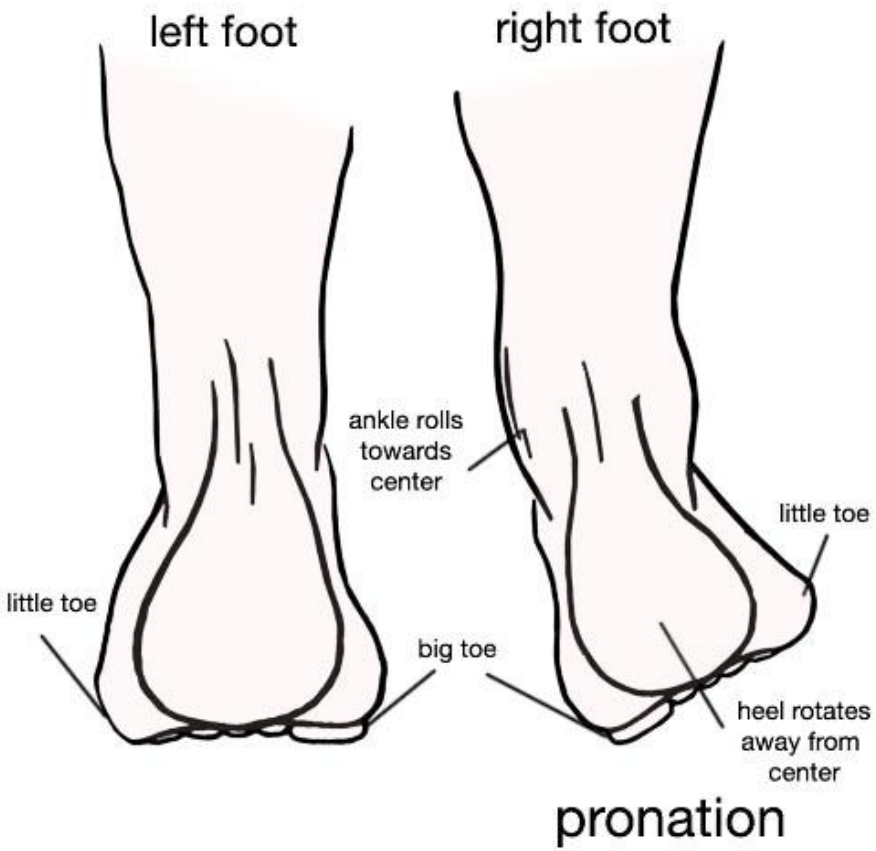
Therapist should observe:

- The rotation of the shoulder and thorax as well as reciprocal arm swing
- Spinal posture, pelvic rotation and movements in the joints of the lower limb
- Therapist can observe the step length, stride length, cadence and other dimensions of gait
- (hyper)extension/flexion of hip/knee/ankle

POSTERIOR VIEW

- Observe rotation of shoulder and thorax and reciprocal arm swing
- Pelvic tilt and rotation may be observed
- Heel rise and base of support is easier to observe posteriorly
- Any abnormal abduction/adduction or lateral displacement of the body should be noted as well
- Musculature of back, glutes, hamstrings, gastrocnemius, Achilles tendon, pronation/supination of feet

FOOT
PRONATION

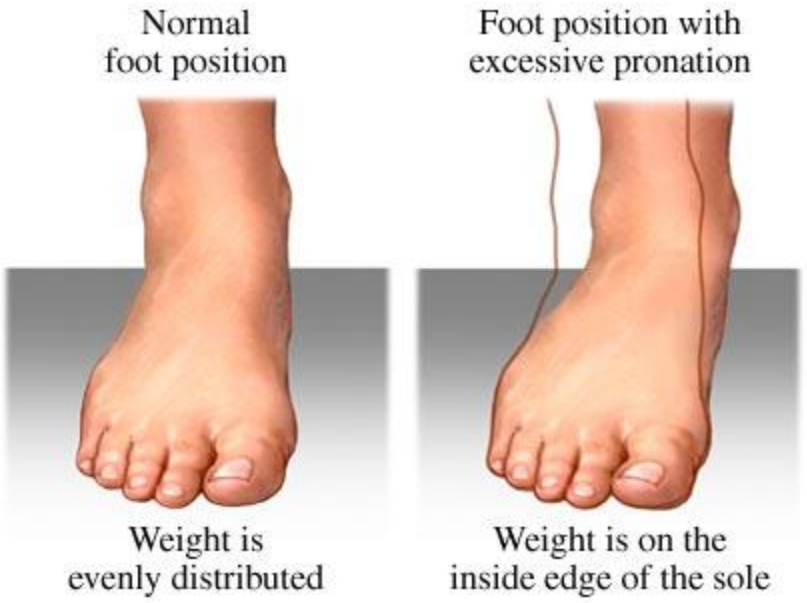


Pronated feet = Subtalar joint everted, Forefoot abducted, Talocrural joint dorsiflexion

Subtalar Joint - comprised of the calcaneus (heel bone) and the talus, the bone that sits above it

Talocrural Joint - It is formed by the bones of the leg and the foot – the tibia, fibula and talus

FOOT PRONATION ANTERIOR VIEW



FOOTWEAR

Observe wear patterns

- Normal pattern should be at the ball of the foot and slightly lateral

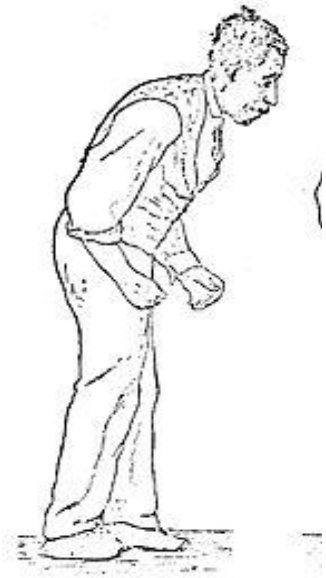
Abnormal wear patterns

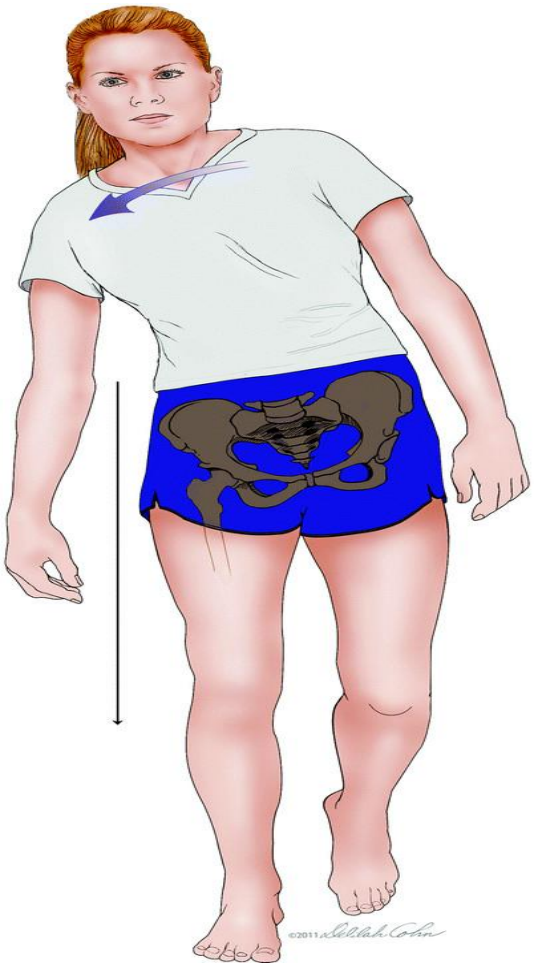
- Medial heel check medial hip rotators
- Lateral heel check lateral hip rotators
- Medial arch/lateral arch check valgus/varus strain at the knee
- Excessive wear on the ball of foot check metatarsal arch or a dysfunction of the tibial
- Tip of the shoe check anterior compartment of the lower leg

AREAS TO WATCH FOR DYSFUNCTION

- Leg Swing (comparing Bilaterally)
  - Swing more lateral, Swing more forward, shorter steps, foot in non weight bearing more lateral or medial, foot scuff on one side, heavy heel strike or toe drag
- Neck Position
  - Extended forward
- Arm Swing
  - Swings more medial or lateral
- Torso
  - Excessively flexed forward or erect posture, side bent

Forward Flexed Gait

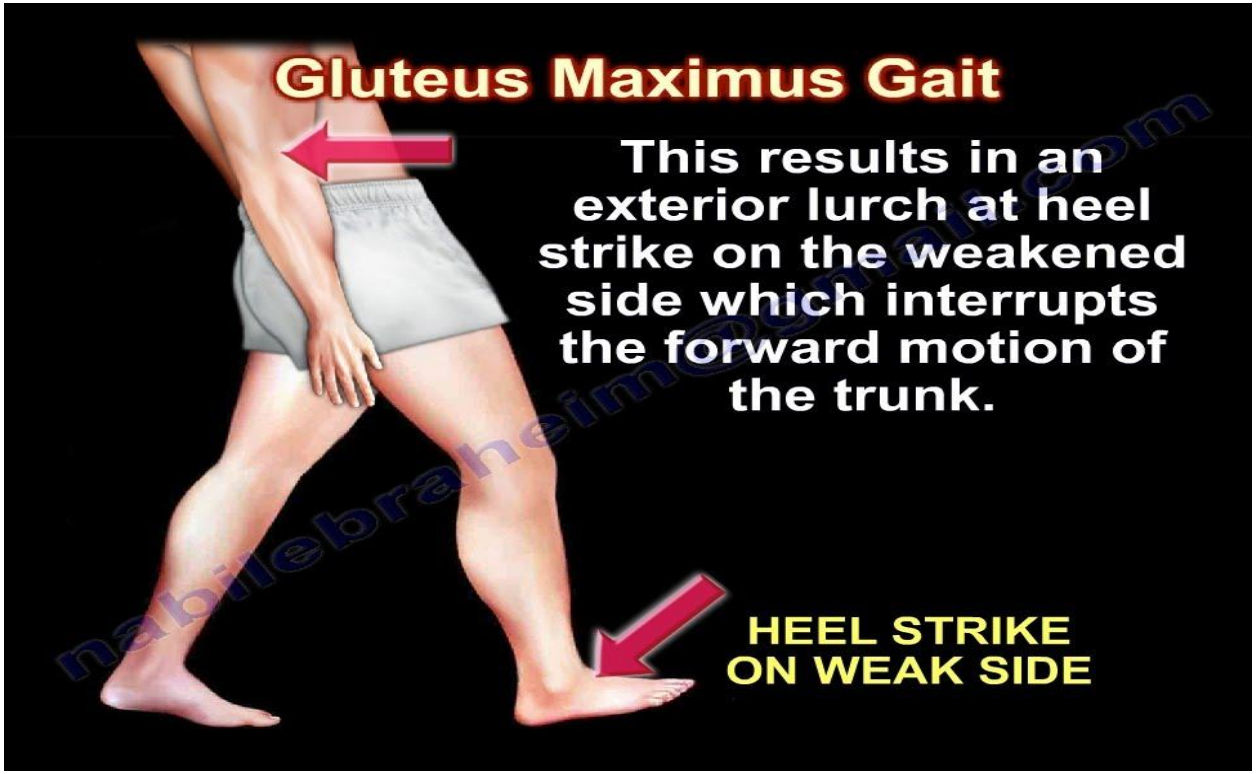


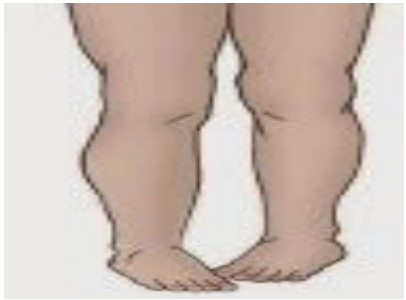


Trendelenburg Gait

Scissors Gait

Steppage Gait





Equinus Gait (Club Foot)

Shoe Wear - Pronation

ABNORMAL GAIT DESCRIPTIONS

Pg 1117

Antalgic Gait

- Also known as painful gait
- It is self protective and is the result of injury to the pelvis, hip, knee, ankle or foot
- Stance phase is decreased to remove weight off the affected leg (limp)

Arthrogenic Gait

- Results from stiffness, laxity or deformity and it may be painful or pain free
- Leads to circumduction of the hip on the affected leg and exaggerated plantarflexion of the ankle of the unaffected leg to allow the toe to clear (sometimes called “circumducted gait”)
- Eg. Unable to bend the knee due to cast / fused knee or hip

Ataxic Gait

- A staggering and unsteady gait. Uncontrolled / Uncoordinated muscle movements
- Includes a stagger and all movements are exaggerated, gait appears to be irregular, jerky and weaving
- *Cerebellar ataxia:* exaggerated movements, poor coordination and balance, wider base
- *Sensory ataxia*: feet slap the ground and client watches his/ her feet because they can't be felt

Contracture Gait

- Joints of the lower limb may exhibit contracture if immobilization has been prolonged or pathology of the joint has not been properly cared for
- Specific gait alterations will depend on what joint in the lower leg has the contracture
- Muscles surrounding a joint are immobilized resulting in contractures, therefore decreased mobility at that joint causes other joints to create more movement

Gluteus Medius (Trendelenburg) Gait

- Weak hip abductors (gluteus medius & minimus) means that stance phase is unstable and causing excessive lateral shift
- Pelvis of the swing leg drops and the thorax moves laterally to maintain the center of gravity
- Bilateral weakness = side to side wobbling; “chorus girl swing”
- Also seen with coxa vara or congenital hip dislocation

Hemiplegic / Hemiparetic Gait

- A.K.A. Neurogenic / flaccid gait: loss of motor control
- Patient circumducts hip / leg, of paraplegic leg or pushes it forward
- Obvious sign: holding pattern of arm

Parkinson’s Gait

- Head, trunk, knees are flexed, arms held out stiffly
- Client often starts off slowly, walking on the toes, then festinates
- Festination: shuffling, moving progressively faster, appears unable to stop

Psoatic Limp

- Weak /Denervation /reflex inhibition of psoas major
- Causes difficulty of swing-through (hip flexion), therefore the client thrusts the pelvis forward to increase momentum of leg to move forward
- Affected hip is flexed, laterally rotated and adducted

Quadriceps Gait

- Injured quadriceps = difficulty extending knee
- Therefore, the client leans forward at the trunk and strongly plantarflexes

Equinus Gait (Club Foot)

- Also known as toe walking
- Most often seen in children
- All the weight is focused on the toes or lateral aspect of the foot
- The weight bearing phase on the affected limb is decreased, and a limp is present.
- The pelvis and femur are laterally rotated to partially compensate for tibial and foot medial rotation

Gluteus Maximus Gait

- Weak gluteus maximus = limited hip extension
- Therefore, the thorax must extend to maintain extension

Scissors / Spastic Gait

- Can also be referred to as a neurogenic gait
- Base width is less than 0
- Spastic paralysis of the hip adductors draws the knees together

Short Leg Gait (structural)

- Client shifts laterally to the affected side
- Tries to supinate the foot on the affected side to make the leg longer

Steppage or Drop Foot Gait

- Weak / paralyzed dorsiflexors cause the client's knee to lift (increase hip flexion) higher than normal to avoid dragging toes
- Client cannot control the foot to place it on the ground, therefore the foot "slaps" ground

TIME TO PRACTICE

- Take out your health history form
- Pair up with a class member
- In 15 minutes go through consultation, analyze their gait
- Record your findings and if there is a direction you think it may be leading

Quiz 2 next class on Gait

POSTURAL ASSESSMENT

Pg 1127

POSTURAL ASSESSMENT WHAT AND WHY?

- A bilateral comparison to check levels of distance from the PLUMB-LINE.
- Used to detect any possible health problems and gain a better understanding of a client's predisposition to injury or overuse.

****Normal Posture:** Is maintained by balance, strong and flexible muscle, intact ligaments, properly functioning joints. As well as a balanced line of gravity and good postural habits.

****Change in Posture:** may be secondary to structural imbalances, joint degeneration, a change in centre of gravity, poor postural habits or pain

****Faulty Alignment:** Creates unnecessary stress and strain on the body, elongating muscle and adaptive shortening of muscle, creates a decrease in efficiency for the body.

POSTURAL ALIGNMENT STRATEGIES

From Clinical Massage Therapy, Rattray and Ludwig 2000

"A thorough postural assessment by the therapist will help to indicate any imbalances and misalignments of the body. During the assesment, the bony prominences and joint positions provide landmarks for bilateral comparison. Relative muscle bulk and muscle outlines are observed bilaterally for symmetry. The source or contributing factors of a clients problem will frequently be revealed by this process. By combining the results of a postural assessment and specific muscle length and strength testing , a treatment plan can be formed to correct any imbalances using both a massage and remedial exercise plan"

POSTURAL DEVELOPMENT

- Posture is the relative disposition of the body
- The position of each joint has an effect on the positions of other joints at that time
- Correct posture is the position in which minimum stress is applied at each joint
- Minimal muscle activity is needed to maintain normal position
- Any static position that increases stress to the joint could be called faulty/pathological posture
- Curves of the spine at birth are called primary curves (thoracic and sacral curves remain the same through development)
- Secondary curves (cervical and lumbar) appear and are convex at about the age of 3 months
- Through adolescence there are postural changes due to hormonal changes
- Poor posture habits tend to arise at this time of development

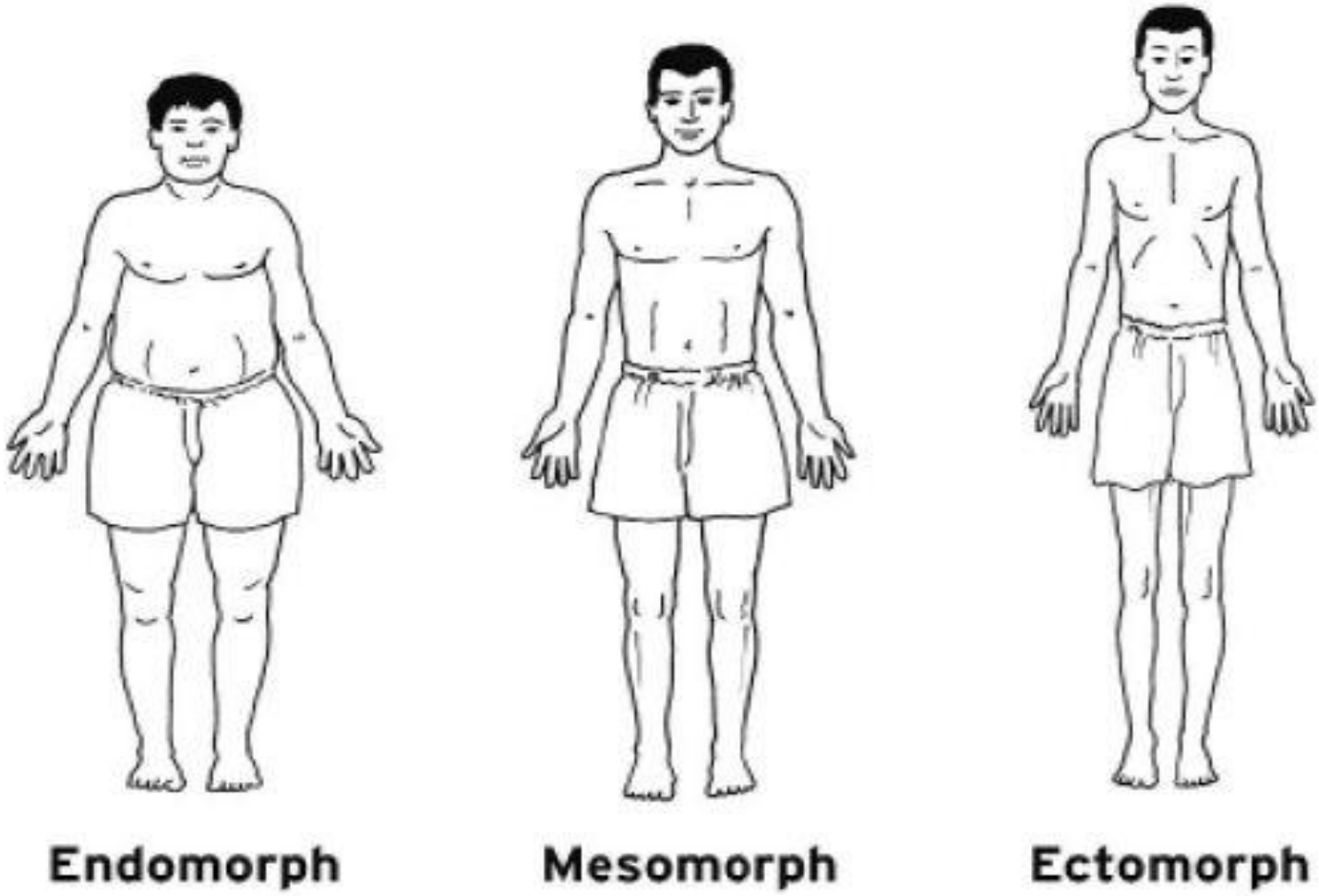
BODY TYPES

3 different body types:

- Ectomorph (thin build)
- Mesomorph (muscular build)
- Endomorph (additional adipose evident)

- Therapist should also note the emotional attitude of the client i.e. Tense, bored, lethargic
- Therapist is to remember that posture can be a reflection of the clients personality, sense of well being and self esteem

BODY TYPES EXAMPLES



FACTORS EFFECTING POSTURE

- Functional (positional)Factors
  - Habitual poor posture, eg. Tall people that slouch
  - Seen in individuals that stand or sit for long periods of time (CREEP)
  - Maintenance of appropriate posture requires muscles to be strong, flexible and easily adaptable to environmental changes
  - Muscle imbalances can be common in adolescences, may create long term problems
  - Pain could be a contributing factor to a postural dysfunction
  - Respiratory conditions can cause weakness, weight gain, altered posture and painful musculoskeletal structures
  - Many postural faults are correctable after identification and rehabilitation
  - General treatment protocols involve strengthening of weak muscles along with stretching shortened structure. This is combined with postural education for the client

FACTORS EFFECTING POSTURE CONT.

- Structural (skeletal) Factors
  - A result of congenital anomalies, developmental problems, trauma, or disease
  - Frequently involves changes in bone development and therefore not easily correctable
  - Bony Contours
  - Laxity of ligaments
  - Fascial and musculotendinous tightness
  - Muscle tone
  - Pelvic angle
  - Joint position and mobility

OTHER FACTORS

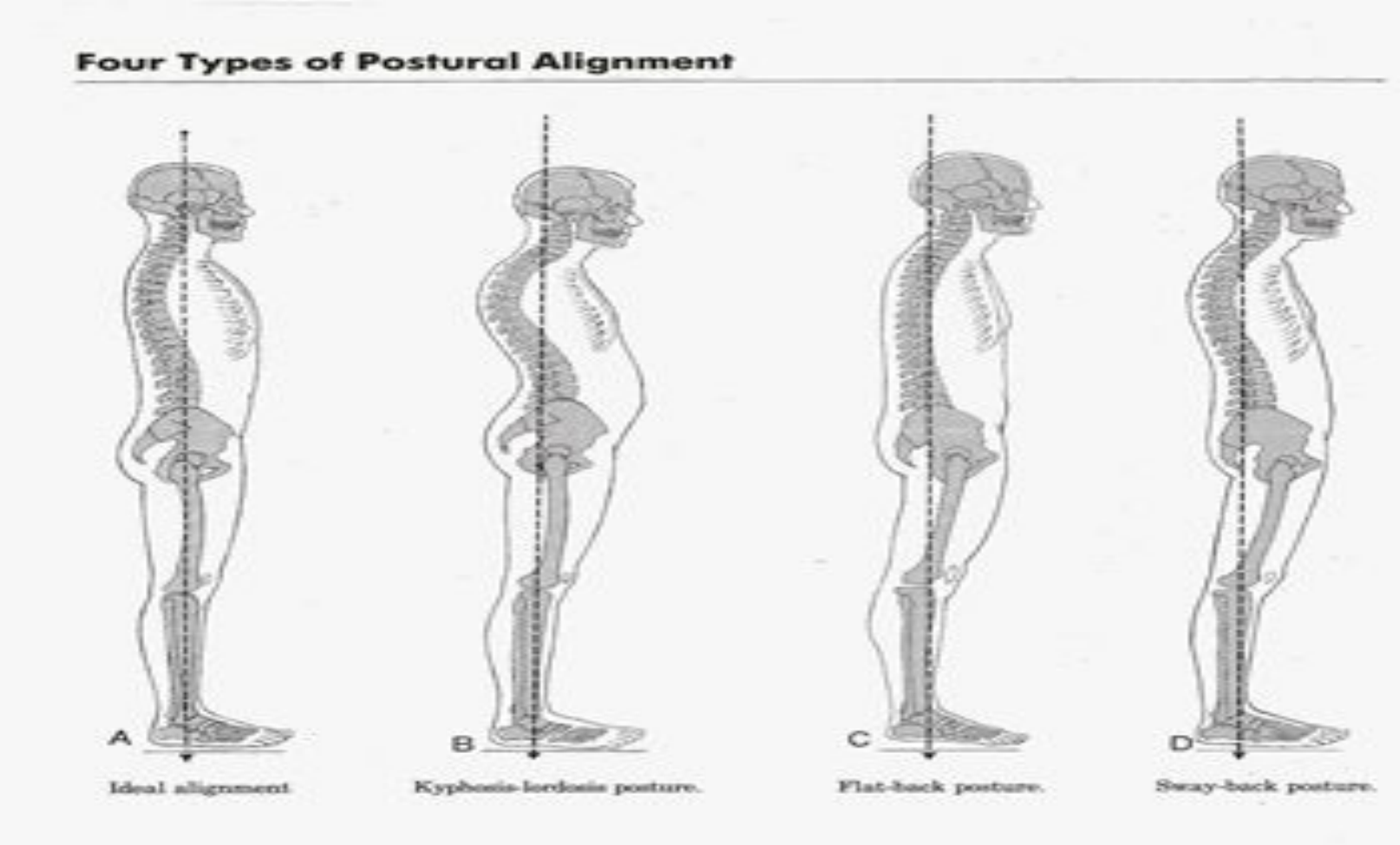
- Age
- Psychological/ emotional changes
- Pathalogical
- Occupational
- Recreational
- Enviromental
- Social/cultural

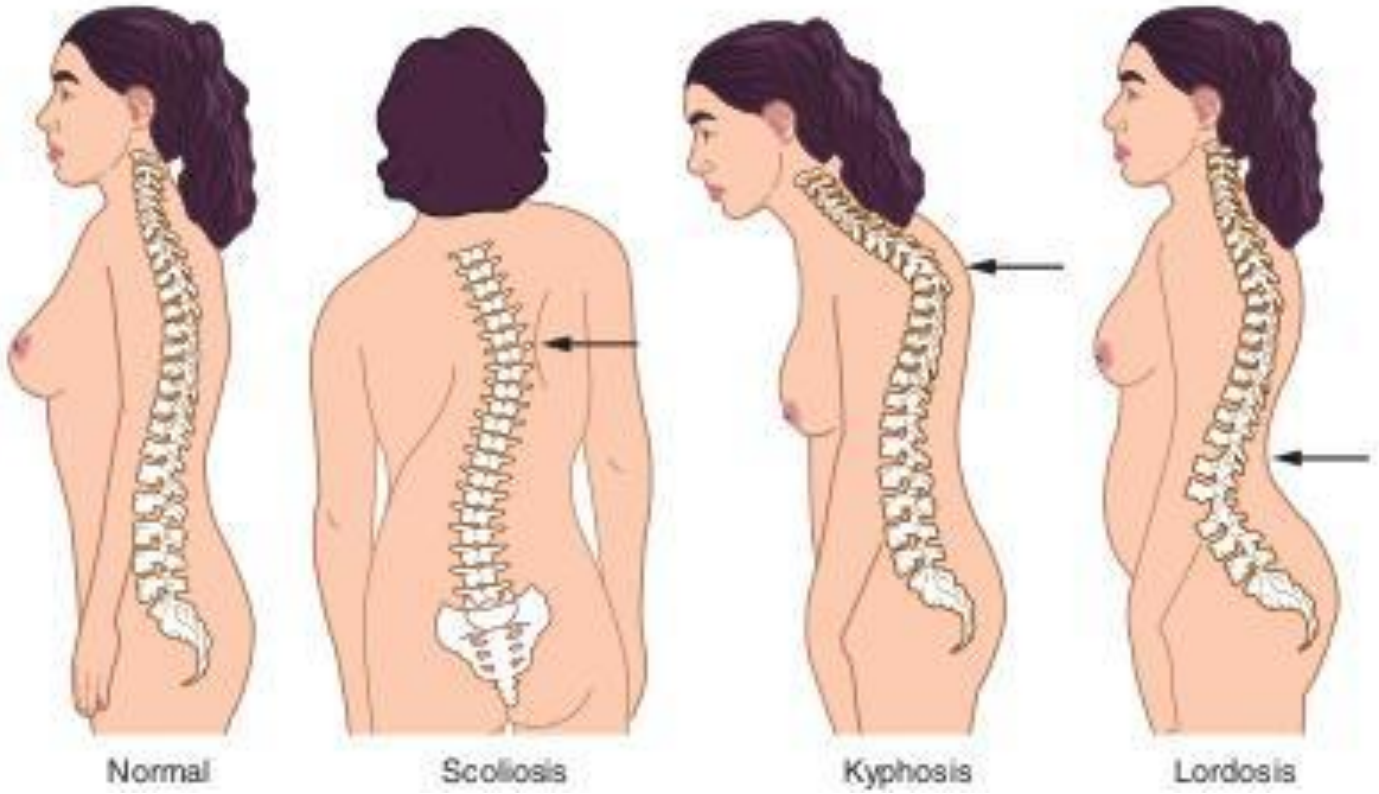
COMMON SPINAL DEFORMITIES

Pg 1134

- Lordosis
  - Lordosis is an anterior curvature of the spine
  - Hyperlordosis is an exaggeration of the normal curves in the cervical and lumbar spine
- Kyphosis
  - Kyphosis is the posterior curvature of the spine
  - Hyperkyphosis is an exaggeration of the normal curvature of the thoracic spine
- Scoliosis
  - Scoliosis is a lateral curvature of he spine
  - Usually the most visible spinal deformity
  - can be Functional (non-structural) Scoliosis, or Structural (skeletal) Scoliosis

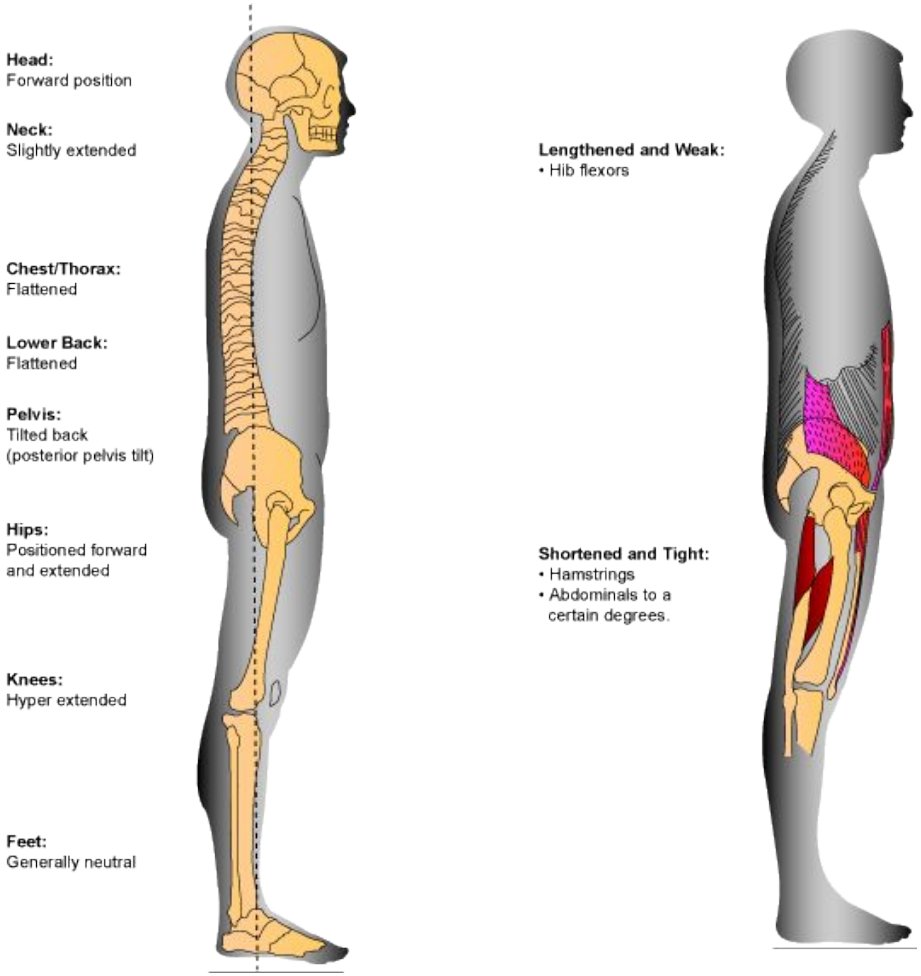
POSTURAL ALIGNMENT



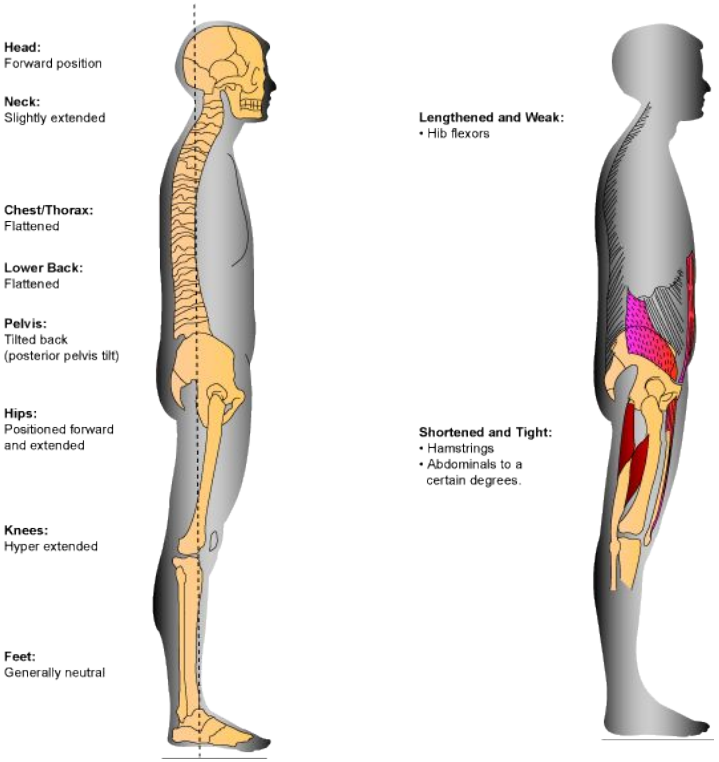

Normal
Scoliosis
Kyphosis
Lordosis

BODY POSITION – FLAT BACK POSTURE

- Head - Forward position
- Neck – Slightly extended
- Chest/Thorax – Flattened
- Lower back – Flattened
- Pelvis – Tilted back, (Posterior tilt)
- Hips – Positioned forward and extended
- Knees – Hyperextended
- Feet – Generally neutral



FLAT BACK POSTURE – EFFECT ON THE MUSCLES



Lengthened and Weak –

Hip flexors – Quadriceps, Illiacus, Psoas, and Sartorius

Shortened and Tight –

Hamstrings and Abdominals to a certain extent

KYPHOTIC LORDOTIC POSTURE

Head - Forward

Neck – Increased neck flex

Scapula - abducted

Thorax – Increased Kyphosis

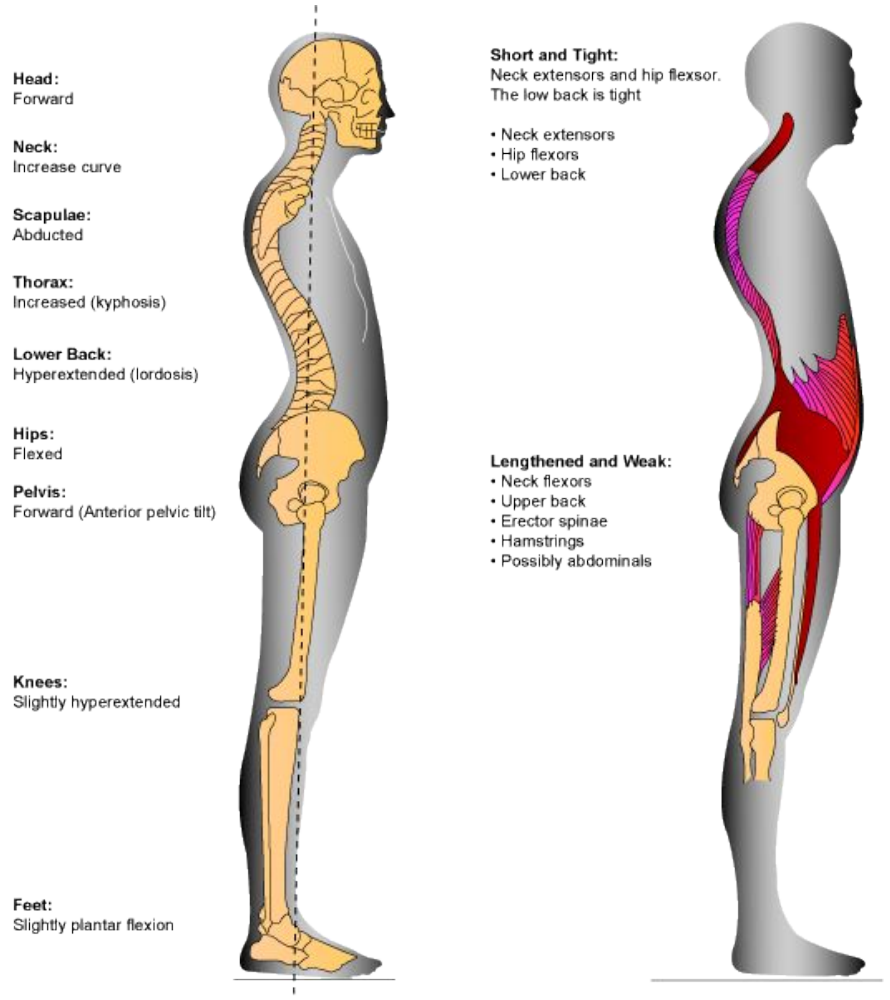
Low back – Increased Lordosis

Hips – Flexed

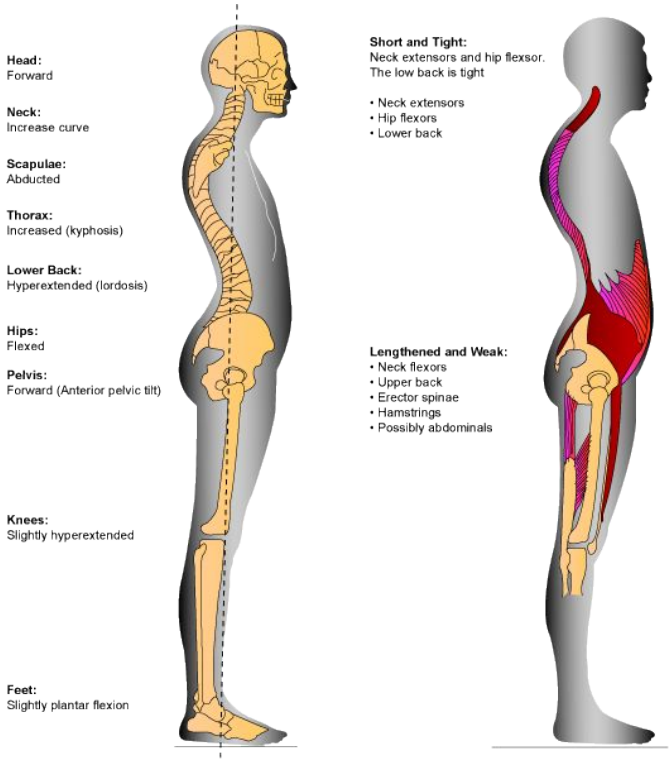
Pelvis – anterior Pelvic tilt

Knees – Slightly hyperextended

Feet – Slightly plantar flexed



KYPHOTIC LORDOTIC POSTURE – EFFECT ON THE MUSCLES



<u>Lengthened and Weakened</u>

Neck Flexors – SCM, Longus Capitis & Coli, rectus capitis anterior

Upper back

Erector Spinae

Hamstrings

Possibly abdominals

<u>Shortened and Tightened</u>

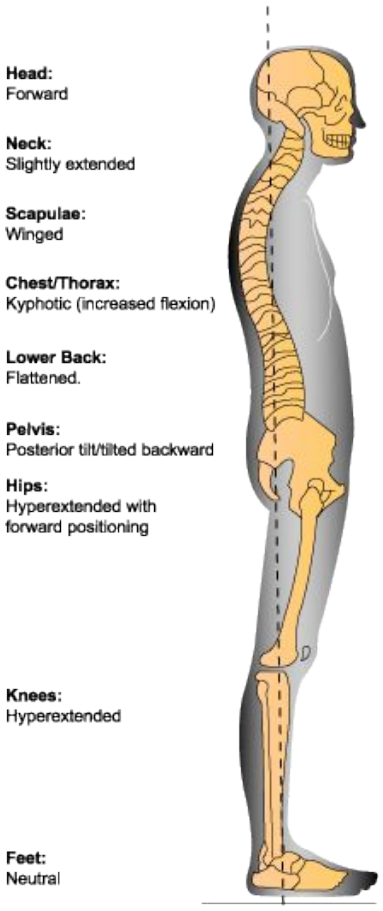
Neck Extensors – Trapezius, splenius capitis and cervicus, longissimus capitis and suboccipitals

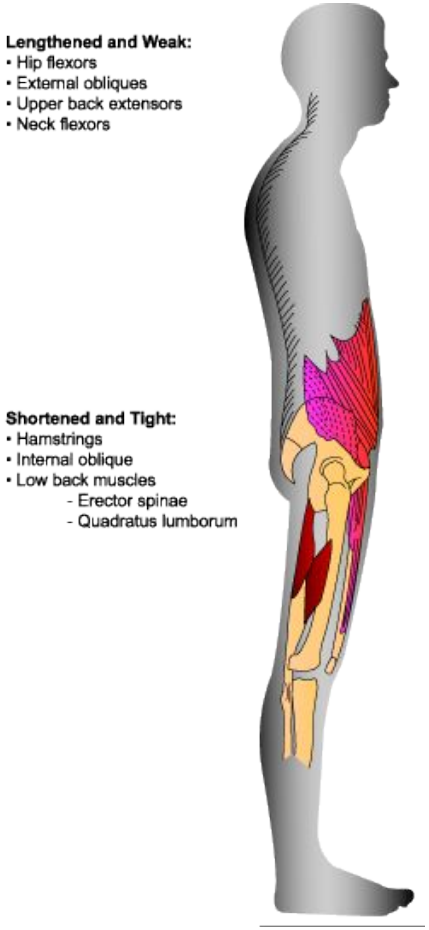
Low back

Hip Flexors - Quadriceps, Illiacus, Psoas, and Sartorius

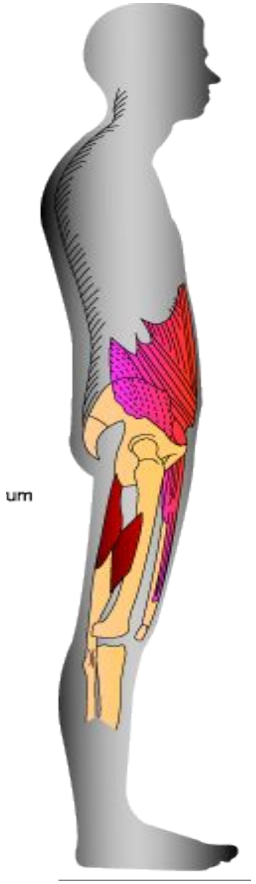
SWAY-BACK POSTURE

- Head – Forward
- Neck – Slightly Extended
- Scapula – Winged
- Chest –Kyphotic – increased Flexion
- Lower Back – Flattened
- Pelvis – Hyperextended with forward positioning
- Hips –Hyperextended
- Knees – neutral
- Feet - Neutral





SWAY-BACK POSTURE – EFFECTS ON THE MUSCLE



<u>Lengthened and Weak</u>

Hip Flexors

External Obliques

Upper back Extensors – Erector spinae & multifidi

Neck Flexors - SCM, Longus Capitis & Coli, rectus capitis anterior

<u>Shortened and Tight</u>

Hamstrings

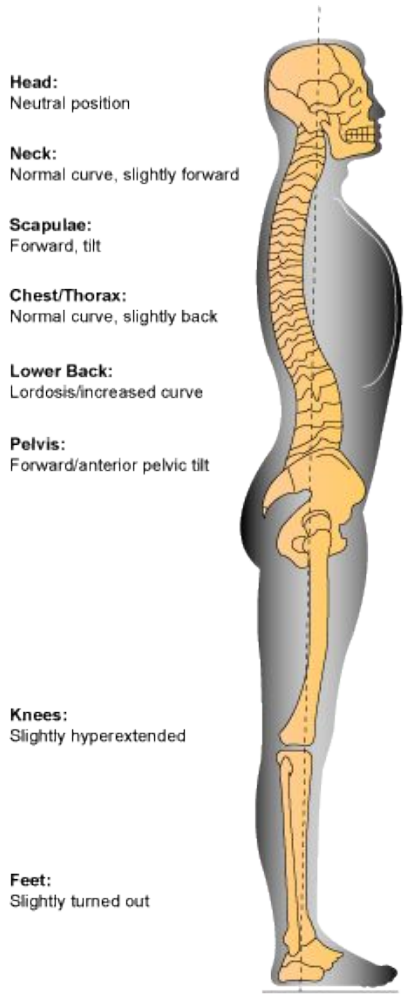
Internal Obliques

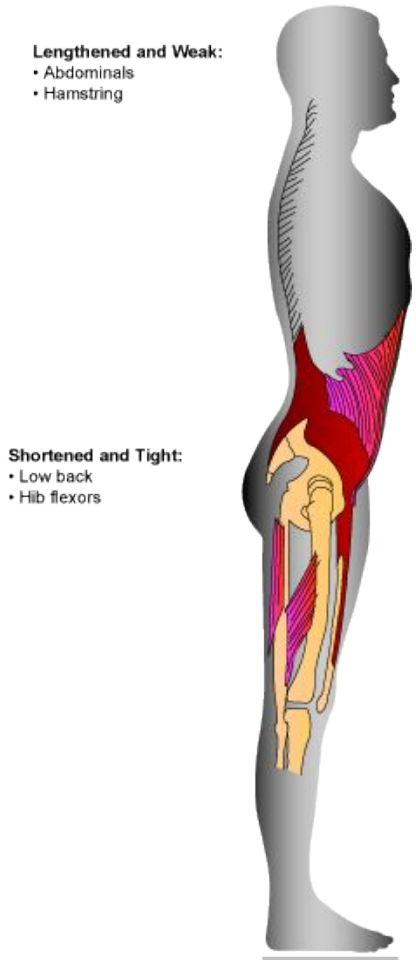
Low back muscles

- Erector Spinae
- Quadratus Lumboram

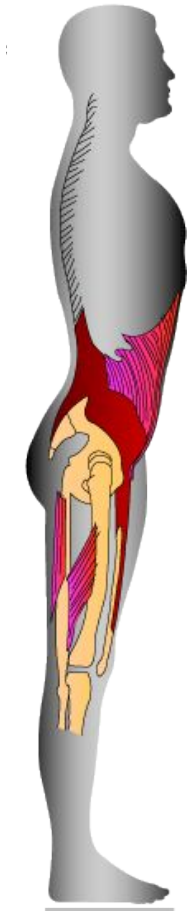
MILITARY POSTURE

- Head – Neutral
- Neck – Normal, Slightly forward
- Scapula – Forward, Tilt
- Chest – Normal curve, slightly back
- Lower Back – Lordosis/ increased curve
- Pelvis – Forward/anterior tilt
- knees - Slightly extended
- Feet – slightly pointed out





MILITARY POSTURE
EFFECT ON THE MUSCLES



<u>Lengthened and Weak</u>

Abdominals

Hamstrings

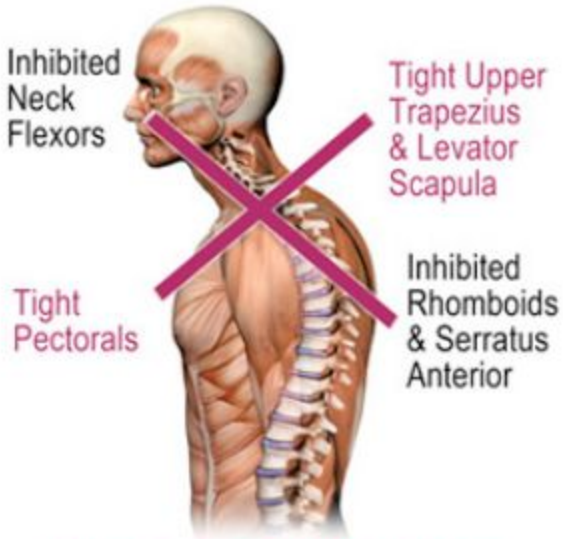
<u>Shortened and Tight</u>

Low Back

Hip Flexors

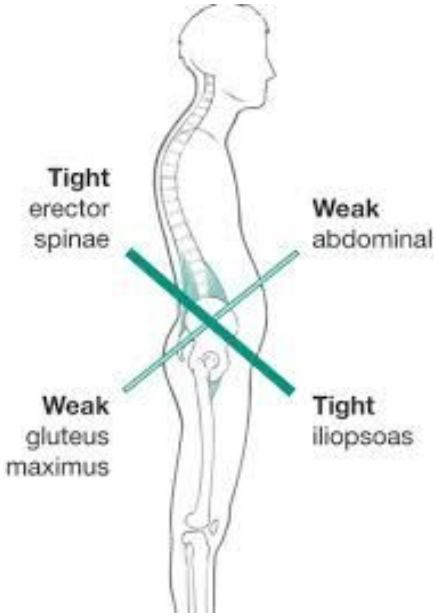
UPPER CROSSED SYNDROME

- Protraction and forward head posture (“chin poke”)
- Shortening of occipital muscles
  - C/S alignment changes→ increased stress on facet joints and posterior disc/elements
  - Chin poke→ C1-2 extension
    Mid-low C/S flexion
- Weakening of deep neck flexors, rhomboids, serratus anterior, LFT
- Tight pecs, UFT, l/s

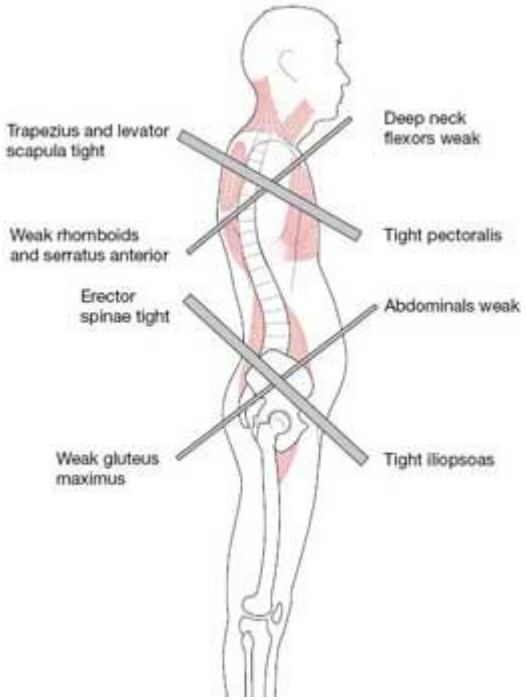


PELVIC CROSSED SYNDROME

- Effect of muscle imbalance due to inability to maintain neutral pelvis
  - What is “neutral pelvis”?
- Weakened glut max and abdominals
  - Result in increased activity of HS/erector spinae to assist with hip extension
  - Weak multifidus, TA and rotators
- Weak glut med
  - Results in increased activity of QL and ipsilateral TFL
- Tight hip flexors (iliopsoas) and back extensors
- Increased lumbar lordosis, anterior pelvic tilt, hip flexion contracture/over-activity due to compensation for weak abdominals



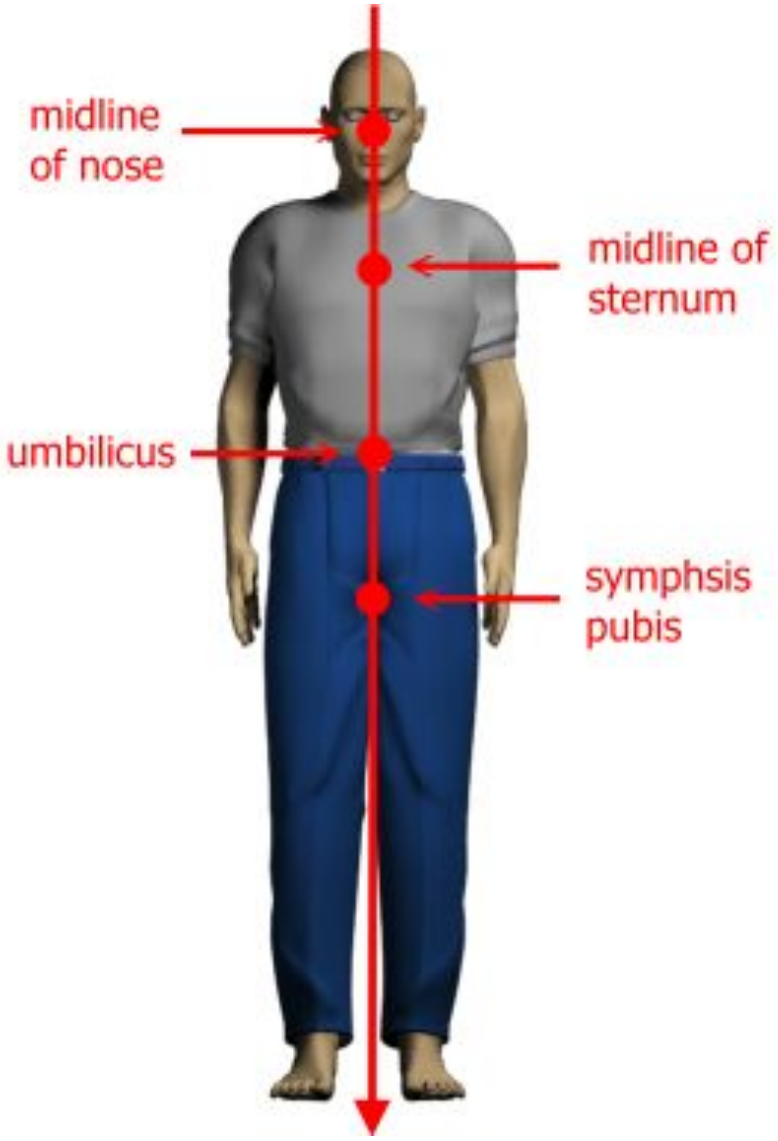
UPPER AND LOWER CROSSED SYNDROME

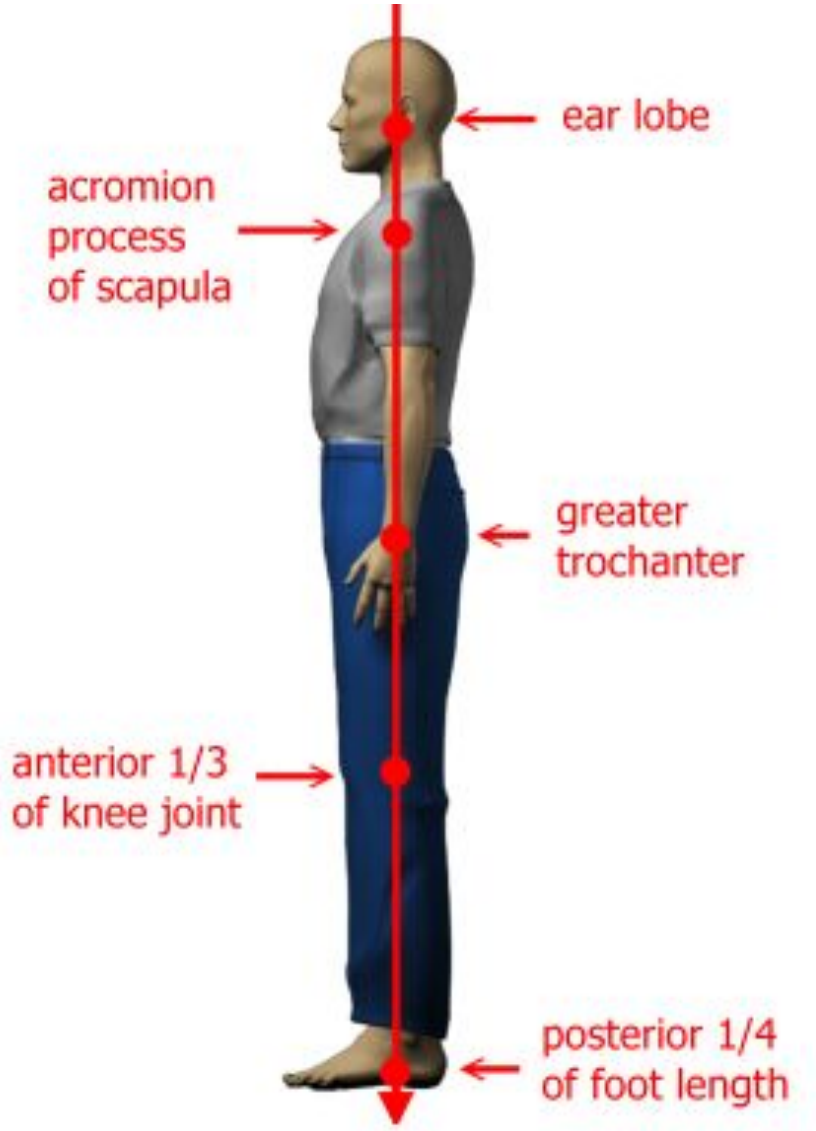


WHAT IS PLUMB LINE

- A plumb line is often used as a reference of alignment for the body when examining posture.
  A plumb line is a string suspended overhead with a small weight, or plumb bob, attached at the end near the floor. Position the patient behind the line so you can see the body bisected by the plumb line.
- When we perform postural assessment generally the plumb line is imaginary. Over the next few slides we are going to look at what structures the plumb line should pass through . Remember we are looking for symmetry and comparing bilaterally
- Your textbook also refers to this as that ideal line of gravity

PLUMB LINE POSITIONING ANTERIOR AND LATERAL





IN CLASS ASSIGNMENT
BONY LANDMARKS

Palpate the following bony landmarks on a partner

- External Auditory Meatus
- Odontoid Process
- Cervical Vertebrae
- Mandible
- Scapula
- Acromion Process
- Xiphoid Process
- Lumbar Vertebrae

- Iliac Crest
- Greater Trochanter
- ASIS
- PSIS
- Ischial Tuberosity
- Patella
- Head of Fibula
- Malleoli (medial and lateral)

ANTERIOR VIEW

BODY SEGMENT	PLUM LINE LOCATION	OBSERVARTION
Head	Passes through the midline of forehead, nose and chin	Eyes and ears should be level and symmetrical
Neck / Shoulders	Clavicular notch	Right and left angles between the shoulders and neck should be symmetrical and clavicles should be symmetrical
Chest	Passes through midline of the xiphoid process	Ribs on each side should be symmetrical
Abdomen / Hips	Passes through umbilicus	Right and left waist angles should be symmetrical
Hips / Pelvis	Passes on a line equal distance from the right and left ASIS and passes through symphysis pubis	ASIS should be level
Knees	Passes between knees equal distance from medial femoral condyles	Patella should be symmetrical and facing straight ahead
Ankles / Feet	Passes between ankles and equal distance from the medial malleoli	Malleoli should be symmetrical and feet should be parallel, toes should not be curled, overlapping or deviated to one side

ANTERIOR VIEW
ADDITIONAL OBSERVATIONS

- Head- aligned, forward, flexed, extended
- Mandible- resting position, retracted
- Shoulders- level, uneven
- Rib Cage- symmetric, asymmetric
- Pelvis- level, anterior/posterior tilt, rotations
- Hips- coxa vara, coxa valga, anteversion, retroversion *
- Femurs- alignment, torsion
- Knees- level, genu varum/valgrum
- Patella- position
- Tibias- alignment, torsion
- Ankles- inversion, eversion
- Feet- pes cavus/planus, supination, pronation
- Toes- alignment, deformities
- Leg Length
- * Anteversion: The hip joint has a greater than normal ability to internally rotate and lesser than normal ability to laterally rotate.
- Retroversion: The hip joint has a greater than normal ability to laterally rotate and lesser than normal ability to internally rotate.

LATERAL VIEW

BODY SEGMENT	PLUM LINE LOCATION	OBSERVATION
Head	Passes through external auditory meatus	Chin and head in balance directly above shoulders
Neck / Shoulders	Passes through the acromion process	Upper back normally rounded
Chest	Midline of the body	No chest deformity and trunk is erect and straight
Abdomen / Hips	Midline of the body	Flat
Hips / Pelvis	Passes through the highest point of the iliac crest, slightly posterior to greater trochanter	Normal pelvic angle (PSIS is slightly higher than ASIS) regular lumbar curve
Knees	Midline of the knee, slightly posterior to patella	Knees are straight
Ankles / Feet	Midline of the ankle, slightly anterior to lateral malleoli	Feet are flat on the ground, raised arch of foot.

LATERAL VIEW
ADDITIONAL OBSERVATIONS

- Head- forward, flexed, extended
- Mandible- resting position, protracted, retracted
- Scapulae- winging, elevated, depressed
- Thoracic Kyphosis- increased, decreased
- Lumbar Lordosis- increased, decreased
- Pelvis- anterior/posterior tilt
- Knees- hyperextended, flexed
- Feet- longitudinal arch

POSTERIOR VIEW

BODY SEGMENT	PLUM LINE LOCATION	OBSERVATION
Head	Passes through midline of head and inion	Head should be straight with no lateral tilting, angles between shoulders and neck should be equal
Neck / Shoulders	Passes along vertebral column	Arms should be hanging neutral with palms of hands facing sides of body
Chest	Passes along vertebral column	Scapulae should lie flat against the rib cage and equal distance from plum line
Hips / Pelvis	Passes through the gluteal cleft and is equal distance from each PSIS	PSIS should be level and gluteal folds level and symmetrical
Knees	Passes between knees equal distance from medial aspects of the knee	Knees should be level
Ankles / Feet	Passes between ankle equal distance from medial malleoli	The Achilles tendon should be vertical and malleoli should be level

POSTERIOR VIEW
ADDITIONAL OBSERVATIONS

- Head- alignment, tilt
- Shoulders- level
- Scapulae- bilateral symmetry
- Spine (C1 to sacrum)- rotations, deviations
- Pelvis- level, tilt
- Sacrum- level at base and inferior lateral angle
- Hips- level, uneven
- Knees- creases level/uneven
- Leg- rearfoot alignment
- Ankles- inversion, eversion
- Calcaneus position- inverted, everted

VIDEO TIME

https://youtu.be/Ft79kVcTzyI

https://youtu.be/pyfuG-CaVUs

https://youtu.be/fwh3ZB3hBlM

PRACTICE TIME!!!

SPECIAL TESTS FOR CLINIC

- VBI
- Valsalva

VALSALVA TEST

- What is it?
  - Performed to assess for the possibility of disc Pathology
- How do we do it?
  - Ask client if the experience the pain reoccur or become more severe while bearing down to have a bowel movement
- What is a positive Result?
  - A positive response to the questioning

VBI TEST

- What is it?
  - Insufficent blood supply to the brain due to disruption in blood flow supplied by carotid or vertebral Artery
- How do we do it?
  - Client seated or supine
  - Examiner support clients head then places the clients head into
    - Extension and rotation
  - Hold position for 30 seconds
- What is a positive Result?
  - Pre syncope, nyastagmus, vertigo (dizziness), slurred speech, visual changes, nausea *Indicates – VBI, cervicogenic vertigo, cervical instability with brainstem compression* Tingling or electric arm pain *nerve root compression*
- What next?

RANGE OF MOTION

Page 29-39

EXAMINATION PHASE

- Principles of examination
  - Tell client what you are doing
  - Test the unaffected side first - Compare Bilaterally
  - Active movements are done first, then passive and then resisted
  - Do painful movements last
  - Apply overpressure with care to test the end feel
  - Repeat movements or sustain certain postures or positions if history indicates
  - Do resisted isometric movements are done at midrange to protect joint and where there is the greatest amount of actin/myocin overlap
  - Remember that with passive movements and ligamentous testing both degree and quality (end feel) of opening are important
  - With ligamentous testing repeat with increasing stress
  - With myotome testing make sure that contractions are held for 5 seconds
  - Warn the client of possible exacerbations
  - Maintain the client's dignity
  - Refer out if necessary

RANGE OF MOTION TESTING

What is Range of motion of a joint??

Motion which is available determined by shape joint and soft tissue surrounding it. Joints have a specific type of movement and amount of movement

What is range of motion of a muscle??

The distance a muscle can shorten from the maximum lengthening to maximum shortening

MOTION TESTING

- When doing movement testing the therapist should note whether pain or restriction predominates
  - If pain predominates the condition may be more acute. A conservative/gentle assessment and treatment may be required.
  - If restriction predominates the condition may be sub-acute or chronic. Potentially a more vigorous assessment and treatment can be performed.

ACTIVE RANGE OF MOTION (AROM) AND (AAROM)

- *Pg 29*
- *Active Range of Motion* (AROM) – is performed when the client actively contracts the muscles crossing the joint, moving the joint through available range
- *Active Assisted Range of Motion* (AAROM) – is active range of motion performed with assistance as required by the client to complete the active movement

EFFECTS OF AROM AND AAROM

- Maintains joint range of motion
- Proprioception
- Circulation and lymphatic flow
- Successive action of the joint

CONTRAINDICATIONS TO AROM AND AAROM

- Excessive pain/acute stage of healing

ACTIVE RANGE OF MOTION

- Is performed by the client's voluntary muscles. Combines tests of neurological control, joint range/control, muscle engagement, and the client's willingness to perform the movement
- Sometimes referred to as physiological movements
- Contractile, nervous and inert tissues are involved

WHAT IS AN ACTIVE TEST

- Client moves through the Range of Motion preferable against gravity
- Done first to protect client going past their point of pain
- During active testing the therapist is looking for two things:
  - Pain and Asymmetry
- This is a general test and can indicate three possibilities of dysfunction including:
  - Muscle strength (agonist)
  - Muscle ability to lengthen (antagonist)
  - Joint problem
- Active testing can also be a form of treatment
- Remember that specific problems aren't isolated

AROM – WHAT TO LOOK FOR..

- Therapist should note if any of the movements cause pain or other symptoms, and the amount and quality of the pain/symptom
- Therapist should note rhythm/ease of movement
- Active movements could appear abnormal for several reasons; pain, muscle weakness, paralysis, spasm, shortened tissue, altered length-tension relationship, neuromuscular factor, and joint – muscle interactions
- Active movement should be performed at a smooth and constant speed

CONTINUED

- Therapist should note …
  - When and where during each movement the onset of pain occurs
  - Whether the movements increase the intensity and quality of pain
  - The reaction of the client
  - The amount of observable restriction and its nature
  - The pattern of movement
  - The movement of associated joints
  - The willingness of the client to move the part

AVAILABLE MOTIONS AT THE JOINTS

Active free ROM

C-Spine
Flexion
Extension
Lateral Flexion – L&R
Rotation –L&R

Shoulder Joint
Flexion
Extension
Internal Rotation
External Rotation
Abduction
Adduction
Horizontal Abduction
Horizontal Adduction

Elbow
Flexion
Extension
Supination or the forearm
Pronation of the forearm

Wrist
Wrist Abduction –Radial deviation
Wrist Adduction – Ulnar deviation
Wrist flexion
Wrist extension

Hand
Finger Flexion
Finger Extension
Finger abduction
Finger adduction
Thumb flexion
Thumb extension
Thumb abduction
Thumb adduction
Thumb opposition

Pelvis
Put hand on iliac crest, and thumbs on PSIS, have person march on the spot. (When in hip flexion, ilium drops and ischial tuberosity moves laterally)

TMJ
Opening of mouth
Closing of mouth
Protrusion of mandible
Lateral deviation R&L

T-Spine
Flexion
Extension
Lateral flexion R&L
Rotation R&L

L-Spine
Flexion
Extension
Lateral flexion R&L
Rotation R&L

Hip
Flexion
Extension
Abduction
Adduction
Lateral Rotation
Medial Rotation

Knee
Flexion
Extension

Ankle
Plantarflexion
Dorsiflexion
Eversion
Inversion
Toe Flexion
Toe extension

PROM

- Group read pg 30-35

PASSIVE RANGE OF MOTION (PROM)

- *Passive (Relaxed) Range of Motion* (PROM) – is movement within the unrestricted range of motion of a joint. Produced by an external force (therapist, gravity or another part of the client's body)

B

EFFECTS OF PROM

- Maintains joint range of motion
- Proprioception
- Assists in lymphatic drainage of a limb
- Increase the successive action of the joint
- Reduces the formation of adhesions and contractures

CONTRAINDICATIONS TO PROM

- Pain/acute stage of healing
- Any movement that may disrupt the healing process and is painful
- In sub-acute stages of healing therapist should stay within the client's pain tolerance, using reduced speed and greater awareness

PROM

- May be referred to as anatomical movements
- Passive movement is generally more than active movement
- Therapist must consider the positioning of the client as it may have an effect on the results
- Differences in ROM between active and passive might be due to muscle contraction, spasm, muscle deficiency, neurological deficit, contractures or pain

WHAT IS A PASSIVE TEST

- Move the client through entire Range of Motion without any client involvement, Compare Bilaterally – unaffected side first
- Why? Takes out the contractile component (prime mover or agonist of an action) and tests inert structures
- Tests for quantity (how much), quality of motion and endfeel
- This is a specific test which tests the following components:
  - Antagonists ability to elongate
  - Joint

THERAPIST SHOULD NOTE.....

- When and where during each of the movements the pain begins
- Whether the movement increases the intensity and quality of pain
- The pattern of limited movement
- The movement of associated joints
- The range of motion available

CONTINUED

- **Each movement must be compared to that of the opposite side – UNAFFECTED SIDE FIRST**
- Therapist is looking for limited range (hypomobility) or excessive range (hypermobility) when performing each movement
- Hypermobile joints are more susceptible to ligament sprains, joint effusion, chronic pain, recurrent injury, paratendonitis resulting from lack of control (instability) and early osteoarthritis
- Hypomobile joints are more susceptible to muscle strains, compressed nerve syndromes, tendinopathies resulting from overstress
- Therapist to determine the cause of hypermobility (injury, occupational, genetic, disease) or hypomobility (pain, spasm, adhesions, compression)

WHAT IS ENDFEEL?

- The end feel is the quality of movement perceived by the practitioner at the very end of the available range of motion. The end feel can reveal a great deal about the nature of various pathologies. James Cyriax, the British orthopedic physician who developed one of the most commonly used systems for physical examination, specified six different end feels when he first described them in his writings

TYPES OF ENDFEELS

Bone to Bone

- **Normal**
  - this is a “hard’ unyielding sensation that is painless
- **Abnormal**
  - similar to normal bone to bone endfeel but the restriction occurs before the end of ROM should occur
  - bone to bone endfeel would not be expected

TYPES OF END FEELS

- **Soft Tissue Approximation**
  - there is a yielding compression (mushy feel) that stops further movement (compression of soft tissues)
- **Tissue Stretch**
  - there is a hard or firm (springy) type of movement with a slight give
  - springy or elastic resistance near the end of range
  - has a feeling of rising tension or stiffness
  - can be sub divided into elastic (soft) or capsular (hard)

TYPES OF END FEELS

- **Muscle Spasm**
  - invoked by movement with a sudden stop of movement often accompanied by pain
  - feel is sudden and hard
  - early muscle spasm occurs early in the range almost as soon as the movement starts
  - late muscle spasm occurs late in the range near the end of range
- **Spasticity**
  - seen with upper motor neuron lesions
  - form of muscle hypertonicity that offers increased resistance to stretch
  - involves primarily the flexors of the upper limb and extensors of the lower limb

TYPES OF END FEELS

- **Capsular**
  - similar to tissue stretch but does not occur when one would expect
  - tends to have a thicker feel to it
  - ROM is reduced caused by the joint capsule
  - Hard capsular – end feel has a thicker stretching quality, seen more in chronic conditions
  - Soft capsular – “boggy” similar to normal tissue stretch but seen more in acute conditions
- **Empty**
  - Detected when movement produces considerable pain
  - Movement can not be performed or stopped because of the pain although no real mechanical resistance is being detected

TYPES OF END FEELS

- **Springy Block**
  - Similar to tissue stretch but occurs where not expected
  - Tends to be found in joints with meniscus
  - There is a rebound effect with a thick stretching feel
  - Usually indicates an internal derangement within the joint
  - Can be found in the knee with a torn meniscus

EXAMPLES OF END FEELS

NORMAL ENDFEEL	**EXAMPLE**
Bone to Bone	Elbow extension
Soft Tissue Approximation	Knee flexion
Tissue Stretch	Ankle dorsiflexion, Shoulder lateral rot, Finger extension
ABNORMAL ENDFEEL	
Early Muscle Spasm	Protective spasm following injury
Late Muscle Spasm	Spasm resulting from instability or pain
"Mushy" Tissue Stretch	Tight muscle
Spasticity	Upper Motor Neuron Lesion
Hard Capsular	Frozen Shoulder
Soft Capsular	Synovitis, soft tissue edema
Bone to Bone	Osteophyte formation
Empty	Acute Subacromial Bursitis
Springy Block	Meniscus Tear

CAPSULAR AND NON CAPSULAR PG 33

Group read pg 32-33

Massage today article on capsular pattern

PROM FOR C-SPINE AND SHOULDER JOINT

C-Spine

- Client lies supine, so head will be off the table
- Therapist cups their head in hands
- Move the client through flexion, extension, lateral flexion, rotation

Shoulder joint

- Client is supine
- Bend elbow to 90 degrees
- One hand stabilizes the extremity
- While the other hand is used to move the joint through flexion, extension, internal/external rotation, abd/add, horizontal abd/add

Lets consider alternate position for these motions as for many of the shoulder motions your scapula also comes into play so having it compressed on the table may not always be the most ideal positioning

PROM FOR ELBOW AND WRIST

Elbow

- For Flexion/Extension
  - Tuck the client's elbow into the waist – hold it into their body
  - Cup the olecranon process in your hand
  - your other hand is just above the wrist – Flex and extend
- For Supination/Pronation
  - Same as above, but you hand grips their hand in a handshake – Supinate/Pronate

Wrist

- Place your hand at the client's distal end of forearm
- Hold their hand with your hand
- move wrist into flexion/extension, radial/ulnar deviation

PROM OF THE HAND

- For Finger Flexion/Extension

-Place your hand around the ulnar border of client hand – so your thumb is in their palm and your fingers spread across the dorsum of their hand

-Other hand- your thumb on palmer surface of their proximal phalanges and your fingers spread across the dorsum of their hand

-Now move the MCP joints into flexion/extension

-Can test fingers separately and together

- For Abduction/Adduction

-Stabilize finger at MCP joint and the proximal phalanx of the finger

-Now move finger into abduction/adduction

- For thumb flexion/extension

-isolate joint with one hand

-with the other hand flex and extend thumb

- For thumb Abduction (palmer abduction)/Adduction (dorsal adduction)

-Place hand proximal to thumb at level of anatomical snuff box and radial styloid process

-other hand on first metacarpal, move thumb away from palm (Abduction), move towards palm (Adduction)

- Opposition

-Hold metacarpal bone of the thumb at MCP joint

-move thumb toward palm to touch the tip of the pinky finger

PROM OF T-SPINE AND L-SPINE

- Thoracic spine
  - Make sure that you are assessing just the thoracic spine and not lumbar or hips, client can be sitting to minimize this. Have the client place their arms in front of them or on the opposite shoulders.
  - Flexion, extension, side flexion and rotation
- Lumbar spine
  - During all ROM for lumbar spine you will have your clients place their hands behind their head to isolate the lumbar spine
  - Flexion, extension, side flexion and rotation

PROM OF HIP

- For extension

-Client lies prone
-Place your arm over the iliac crest and lower L-spine
-Have client slightly bend knees (relaxes hamstrings)
-place your other hand under thigh and lift leg up into hip extension

- For Flexion

-Known as Thomas Test
-Client supine
-place hand under the L-spine
-flex their hip with the other hand
-notice when their back touches you hand the lordosis is gone
-now flex hip up higher as this is when hip flexion occurs
-Normal: Anterior thigh touches the abdomen, almost the chest
-If can’t or if the hip rises up, this is a sign of hip flexion contracture

CONTINUED....

- For Abduction, Adduction

-Client supine

-Place forearm across the abdomen and your hand is on opposite ASIS

-Hold on to ankle, and abduct the leg

-To bring into adduction, bring leg across the other

- For Internal/External Rotation

-Client lays supine, leg extended

-stand at foot of the table

-Hold feet above malleoli

-rotate leg internally and externally

-Look to patella as a guideline: Internal 30°, External 45°

PROM OF THE KNEE

- For Flexion/Extension

-Client supine

-Flex the knee by bringing the heel to the glute

-Extend by straightening the leg while supporting the distal end of the femur

- For Internal/External rotation

- Client is seated, examiner places one hand on the ankle and the other stabilizes the thigh against the table at the distal end of the femur

-Rotate the tibia internally and externally

PROM OF ANKLE AND TOES

Ankle

- For Dorsiflexion/Plantarflexion

-Client Supine, feet dangle off table

-Hold calcaneous

-grip forefoot, push foot into dorsi/plantarflexion

- For Inversion/Eversion

-Same position as above

-Hold distal end of tibia

-grip calcaneous, invert/evert

Toes-

-Hold foot, move toes into flexion/extension

RESISTED RANGE OF MOTION RROM

- These are tested last in the examination of a joint
- Consists of a strong, static (isometric), voluntary muscle contraction
- Used primarily to detect whether the contractile tissue is the tissue at fault
- Joint is placed at midrange position so that minimal stress is placed on the joint and it is the optimal actin/myosin overlap
- Client is asked to contract the muscle against a non-yeilding resistance for 6 seconds (allowing for recruitment to occur)
- The best way of achieving this is positioning the client effectively and then stating to the client “Do not let me move you.” Also we do not want the client to move us, so ask them to not use their complete strength

RIM

- Is used to verify other tests
- Determines if there is an agonist weakness
- Can be used to pinpoint pain

MUSCLE TEST GRADING

TABLE **1.19**

Muscle Test Grading (Modified Oxford Scale)

Grade	Value	Movement Grade
5+	Normal (100%)	Complete ROM against gravity with maximal resistance
4	Good (75%)	Complete ROM against gravity with some (moderate) resistance
3+	Fair+	Complete ROM against gravity with minimal resistance
3	Fair (50%)	Complete ROM against gravity
3–	Fair–	Some but not complete ROM against gravity
2+	Poor+	Initiates motion against gravity
2	Poor (25%)	Complete ROM with gravity eliminated
2–	Poor–	Initiates motion if gravity is eliminated
1	Trace	Evidence of slight contractility but no joint motion
0	Zero	No contraction palpated

ROM, Range of motion.

PALPATION

- What is it?
  - Placement of the therapist hands on the clients tissues to assess their condition
- Palpation is one of the most important tools that a therapist will possess. The more different clients that you work on the more differences in tissues you will begin to notice. Improving this skill takes a concentrated effort
- The three common mistakes that occur during palpation
  - Lack of concentration
  - Too much movement of paplating fingers
  - Excessive pressure

WHAT ARE WE ASSESSING FOR (4 T'S)

- Temperature
  - Hot may indicate inflammation, or cool indicating ischemia (an inadequate blood supply to an organ or part of the body)
- Texture
  - Swelling in acute injury is often more hard, in a chronic condition Edema is more boggy or congested
  - Healthy tissue has an even texture throughout
  - Trophic changes (muscle wasting) feels soft or little resistance)
  - Adhesions feels like there is less movement in the tissue or that it is stuck together
  - Crepitus – (grating sound or sensation produced by friction between bone and cartilage or the fractured parts of a bone.) roughness in the joint may also have an audible crunching sound associated

- Tenderness – Can be indicated if client winces or pulls away with tissue compression or may be too painful to be palpated. Therapist should make note of pain or any other unusual sensation experienced by the patient
- Tone – Tissue may be hypertonic – An increase in tone relative to nearby tissues, or Hypotonic - a decrease in tone compared to relative tissues nearby

WENDY NICKLE'S SCALE

Soft Tissue Guide (Palpated by therapist)

Rating	Description	Adjectives
-1/5	Very soft, lacking in tone or firmness	Hollow, Hypotonic
0/5	Normal tone, firm, yet supple –can penetrate entire muscle	Pliable, relaxed
1/5	Minimal tension –able to press through tissue but tension is present	Stressed
2/5	Mild tension –able to penetrate ¾ of muscle, small nodules may be present	Tense, congested
3/5	Moderate tension –able to penetrate ½ of muscle –scattered nodules may be present	Stiff, taut, hypertonic
4/5	Severe tension –able to penetrate ¼ of muscle, large nodules & taut fibers may be present	Knotted, tight, constricted
5/5	Extremely severe tension –very hard to the touch, little or no penetration	Contracted, hard, solid, impenetrable

Behavioural Response to Massage

Rating	Description	Possible Statements
0/5	Normal – No tenderness	No complaints
1/5	Patient reports mild discomfort with deep pressure	"it's very tolerable"
2/5	Patient reports moderate discomfort with deep pressure –No visible flinching/grimacing	"it's a little tender"
3/5	Patient grimaces with deep pressure –reports tolerable tenderness with moderate pressure	"it's a good hurt"
4/5	Patient flinches with deep pressure, grimaces with moderate pressure, may hold breath, or contract muscles in a different area	"that's on the edge"
5/5	Patient flinches with slight pressure – reports extreme tenderness, moderate pressure is intolerable	"that's too much"

Journal of Soft Tissue Manipulation February/March 1994

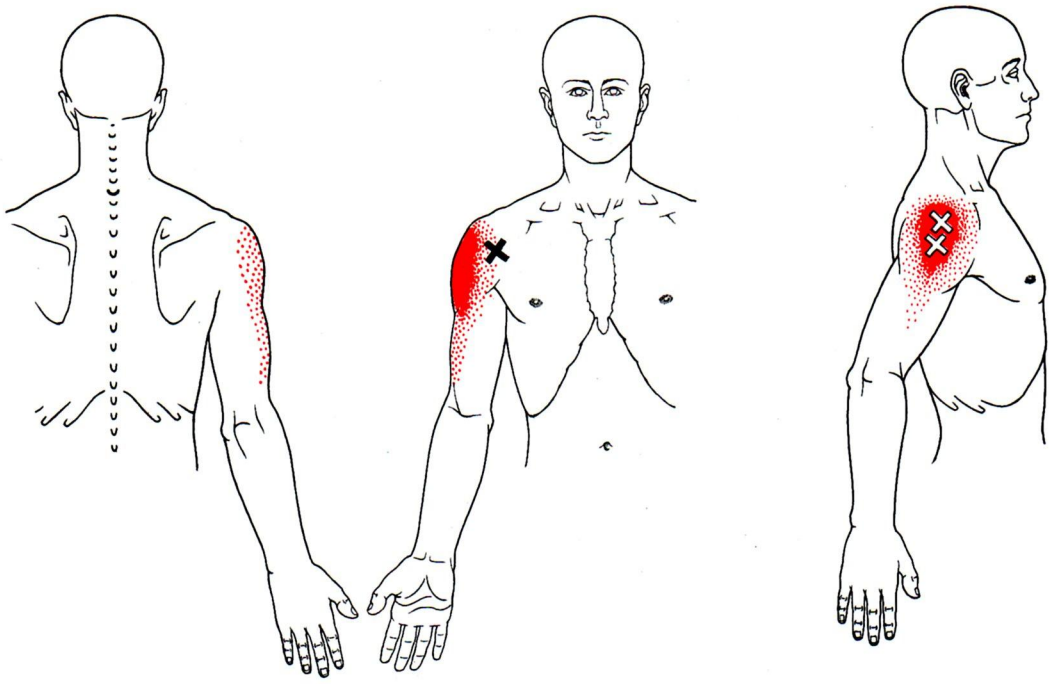
REFERRED PAIN

- Myofascial Trigger Point Referral Pattern – A hyperirritable spot usually with a taught band of skeletal muscle or its fascia, point is tender on site, often exhibits predictable pain referral pattern and causes a shortening of the affected muscle (see chapter 17 Clinical Massage Therapy text book)
- Nerve root impingement – ex: Sciatic Pain
- Visceral origin – Gall bladder - left shoulder blade area
- Infection
- Psychogenic origin/overlay – the emotional component of a symptom that has an organic basis (physical change in structure of organ or body part)

VISCERAL REFERRED PAIN CHART

Lungs Liver, stomach, oesophagus, ribs, sternum, costal cartilage Rib 1 – stellate ganglion T1-4 Cervical spine	**Large Intestine** Acute or chronic low back pain Sciatica left (venous circulation problems) Sciatica right (caecum) Varicose veins – left Joint pains in lower limbs Glenohumeral periarthritis Sacroiliac problems
Liver C4-5 right of bilateral Right scapula Right glenohumeral joint Cervical/brachial plexus and fascia T7-10, Ribs 7-10 right, costovertebral joints Cranial base restriction – right Sciatica left – venous hepatic origin Sciatica right – related to hepatic fascia, right kidney, ascending colon	**Kidneys** T6-7 T 10-12 T11-12 costovertebral Inferior navicular (K2 acupuncture point)
Stomach Cervical spine – left with left sternoclavicular joint Glenohumeral periarthritis – left T6-11 T6 – left costovertebral (stomach dermatome) Rib 7 – right T12 – L3 (crura) Sacroiliac – left (related to L1)	**Jejunoileum** T10-12 Acute of chronic low back pain Sciatica left (venous circulation problems) Joint pains in lower limbs
Duodenum T12-L1 (right > left)	**Bladder** L2-3 – associated with incontinence Sacrococcygeal – associated with feet
Gallbladder C-4-6 left C4 transverse process T7-9 right costovertebral joint	**Female reproductive system** Lumbosacral – urogenital problems Knee – genitocrural nerve C2-4 – hormone problems, via hypothalamic-pituitary axis
	Coccyx Refers to bladder and uterus

EXAMPLE DELTOID MFTP REFERRAL PATTERN



SPECIAL TESTS FOR CLINIC

- VBI
- Valsalva

VALSALVA TEST

- What is it?
  - Performed to assess for the possibility of disc Pathology
- How do we do it?
  - Ask client if the experience the pain reoccur or become more severe while bearing down to have a bowel movement
- What is a positive Result?
  - A positive response to the questioning

VBI TEST

- What is it?
  - Insufficent blood supply to the brain due to disruption in blood flow supplied by carotid or vertebral Artery
- How do we do it?
  - Client seated or supine
  - Examiner support clients head then places the clients head into
    - Extension and rotation
  - Hold position for 30 seconds
- What is a positive Result?
  - Pre syncope, nyastagmus, vertigo (dizziness), slurred speech, visual changes, nausea *Indicates – VBI, cervicogenic vertigo, cervical instability with brainstem compression* Tingling or electric arm pain *nerve root compression*
- What next?

Quiz 3 Next class

NEUROLOGICAL ASSESSMENT

NEUROLOGICAL TESTING

- **Spinal Cord and Nerve Roots**
- Examiner must have a clear understanding of signs and symptoms arising from the spinal cord, and nerve roots of the body and those that are arising from peripheral nerves.
- The scanning examination helps to determine whether the pathology is caused by tissues being innervated by a nerve root, or peripheral nerve that is referring symptoms distally.
- The **Nerve Root** is the portion of a peripheral nerve that “connects” the nerve to the spinal cord. Nerve roots arise from each level of the spinal cord (e.g. C3,C4) and many, but not all, intermingle in a plexus (brachial, lumbar or lumbosacral) to form different peripheral nerves.
- This arrangement can result in a single nerve root supplying more than one peripheral nerve. (e.g. the median nerve is derived from the C6, C7,C8 and T1 nerve roots, whereas the ulnar nerve is derived from C7, C8 and T1.)

- For this reason, if pressure is applied to the nerve root, the distribution of the sensation or motor function is often felt or exhibited in more than one peripheral nerve distribution.
- Symptoms seen in a nerve root lesion (paresthesia, pain, muscle weakness) may be similar to those seen in peripheral nerves, the signs (e.g. area of paresthesia, where pain occurs, which muscles are weak) are commonly different.
- The examiner must be able to differentiate a dermatome (nerve root) from the sensory distribution of a peripheral nerve, and a myotome (nerve root) from muscles supplied by a specific peripheral nerve.
- Nerve roots are made up of anterior (ventral) and posterior (dorsal) portions that unite near or in the intervertebral foramen to form a single nerve root or spinal nerve. (The most proximal parts of the peripheral nervous system)

- Human body has 31 nerve root pairs: 8 cervical, 12 thoracic, 5 lumbar, 5 sacral and 1 coccygeal
- Each nerve root has 2 components: a **somatic** portion, which innervates the skeletal muscles and provides sensory input from the skin, fascia, muscles, and joints. And then a **visceral** component, which is part of the autonomic nervous system. The autonomic system supplies the blood vessels, dura mater, periosteum, ligaments, and intervertebral discs, among many other structures.
- The sensory distribution of each nerve root is called the **dermatome**. A dermatome is defined as the area of skin that is supplied by a single nerve root. The area innervated by a nerve root is larger than that innervated by a peripheral nerve. Slight differences occur between everyone.

- **Myotomes** are defined as groups of muscles supplied by a single nerve root. A lesion of a single nerve root is usually associated with paresis (incomplete paralysis) of the myotome (muscles) supplied by that nerve root (the weakness takes time to become evident on resisted isometric or myotome testing). However, a lesion of a peripheral nerve leads to complete paralysis of the muscles supplied by that nerve (weakness is evident right away).

- A **sclerotome** is an area of bone or fascia supplied by a single nerve root.

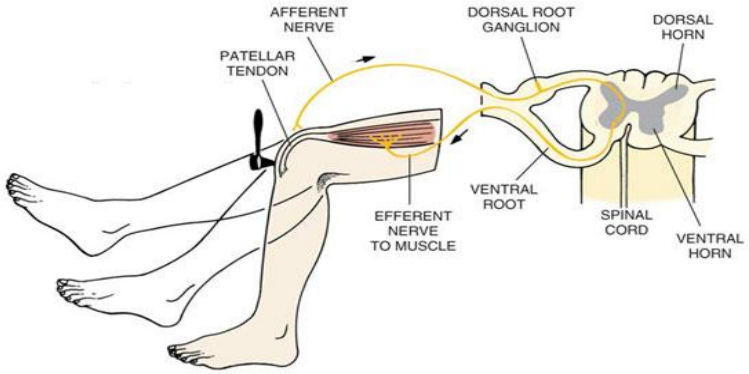
- The complex nature of dermatomes, myotomes and sclerotomes can lead to referred pain.

REFLEXES AND CUTANEOUS DISTRIBUTION

- After the special test, the examiner can test the superficial, deep tendon, and pathological reflexes to obtain an indication of the state of the nerve or nerve roots supplying the reflex.
- If the neurological system is thought to be normal, there is no need to test the reflexes or cutaneous distribution. However, if the examiner is unsure whether there is neurological involvement, both reflexes and sensation scans should be tested to clarify the problem and where the problem actually is.
- With loss or abnormality of nerve conduction, there is a diminished (hyporeflexia) or loss (areflexia) of the deep tendon reflex (aka. muscle stretch reflex).
- Aging also causes a decreased response

- Upper Motor Neuron Lesions (UMNL) produce findings of spasticity, hyperreflexia (overactive or overresponsive reflexes) hypertonicity, reduced or absent superficial reflexes, and weakness of muscles distal to the lesion

- Lower Motor Neuron Lesions (LMNL) involving nerve roots or peripheral nerves produce findings of flaccidity, hyporeflexia, or areflexia, (below normal or absent reflexes) hypotonicity, and weakness and atrophy of the involved muscles.



MYOTOME TESTING

- Myotomes are tested by resisted isometric contraction with the joint at or near the resting position (which is usually neutral)
- Contraction should be held for at least 5 seconds so that weakness, if any, can be noted
- Where applicable both sides are tested at the same time to provide a comparison
- Performed maximally where applicable
- https://www.youtube.com/watch?v=kPuQPqBMGj0

DERMATOME (SENSORY SCANNING) EXAMINATION

- Diagrams of Dermatomes Netters Plate 171
- This is accomplished by running a stimulus (paper clip) over various areas on the clients' skin. Always test unaffected side first, then affected side.
- Client then states if there was any altered sensation at any time during this test
- 2 point testing is to find barriers of dermatomes. If they only feel 1 point, both are within the same dermatome. If they feel 2 points, you have crossed over into another dermatome
- Can also test sensitivity to temperature (hot vs cold), sensitivity to vibration (tuning fork against bony prominences..how long until vibration stops), Deep pressure pain (muscle squeezing to Achilles/traps/thenar web), Proprioception & motion (passive movements to client fingers/toes, with eyes closed, client determines end point of movement)
- https://www.youtube.com/watch?v=CK3cs4AInSE

DEEP TENDON REFLEX TESTING

- Performed to test the integrity of the spinal reflex, which has a sensory (afferent) and motor (efferent) component
- Reflexes are tested with a reflex hammer or appropriate blunt object
- To properly test a DTR, the client must be relaxed and the therapist must make sure the muscle associated with the tendon to be tested is relaxed
- Contract the muscle to be tested for 5 seconds at 50% strength.
- The tendon to be tested should be put into a light stretch and then the stimulus is applied (reflex hammer) to the tendon 8-10 times
- If no reflex is elicited or if the patient is muscle guarding, distract the patient by asking them a question or getting them to look away and repeat the alphabet

- To properly test a DTR, the client must be relaxed and the therapist must make sure the muscle associated with the tendon to be tested is relaxed
- The tendon to be tested should be put into a light stretch and then the stimulus is applied (reflex hammer) to the tendon
- *The examiner should not be overly concerned if the reflexes are absent, diminished, or excessive on both sides, especially in young people, unless a central lesion is suspected. Exercise just before testing or patient anxiety or tenderness may lead to accentuated tendon reflexes.
- Hyporeflexia or areflexia indicates a lesion of the peripheral nerve, or spinal nerve root as a result of impingement, entrapment, or injury (eg. Nerve root compression, cauda equine syndrome or peripheral neuropathy)
- Hyperactive or exaggerated reflexes (hyperreflexia) indicate upper motor neuron lesions as seen in neurological disease and cerebral or brain stem impairment. In the cervical spine, if a disc herniation and compression occur above the cervical enlargement, the reflexes of the upper extremity are exaggerated. If the cervical enlargement is involved (more commonly the case), then some reflexes are exaggerated and some are decreased.

Quiz 4 next class (neurological assessments)

SPECIAL TESTS

These test are performed on patients to rule out more severe dysfunctions/ pathologies prior to treating

SPECIAL TESTS

- A combination of
  - Muscle length tests
  - Active, Passive, Resisted tests
  - Neurological tests
- These tests are used to isolate a specific structure or provoke a certain symptom the client is experiencing
- Often named for the person who designed them or the action performed during the test
- Example – Adsons test combines passive relaxed extension, external rotation of humerus, active free rotation of the neck and the client is actively inhaling and holding there breath, combined all these items place maximum compression on the neurovascular bundle supplying the the arm and are designed to provoke the symptoms of Thoracic Outlet Pain syndrome

STANDING FLEXION TEST

- What is it? A general test used to helped determine if there is Illio-sacral dysfunction. Can also indicate hamstring dysfunction*
- How do we do it? Have the patient stand with their legs about shoulder width apart, toes pointing forward, Therapist places pads of thumbs at inferior slope of PSIS, ask the patient to lean forward without bending there knees to as far as they can comfortably bend
- What is a positive Result? If the PSIS on ONE SIDE moves MORE SUPERIORLY than the other this is considered a positive result
- What next? If we get a positive result we should always follow up with a seated flexion test to determine what if any possible dysfunction we are dealing with

STANDING FLEXION TEST CONTINUED

Why is the more superiorly moving PSIS indicative of restriction or dysfunction?

The pelvis is part of the lower extremities where as the sacrum is part of the spine and should move cephaldly freely with the rest of the spine, however when dysfunction occurs at the joint it will cause the pelvis to be picked up and move with the sacrum on the dysfunctional side

VIDEO EXAMPLE OF STANDING FLEXION TEST

https://www.youtube.com/watch?v=HBapDoZZ_T8

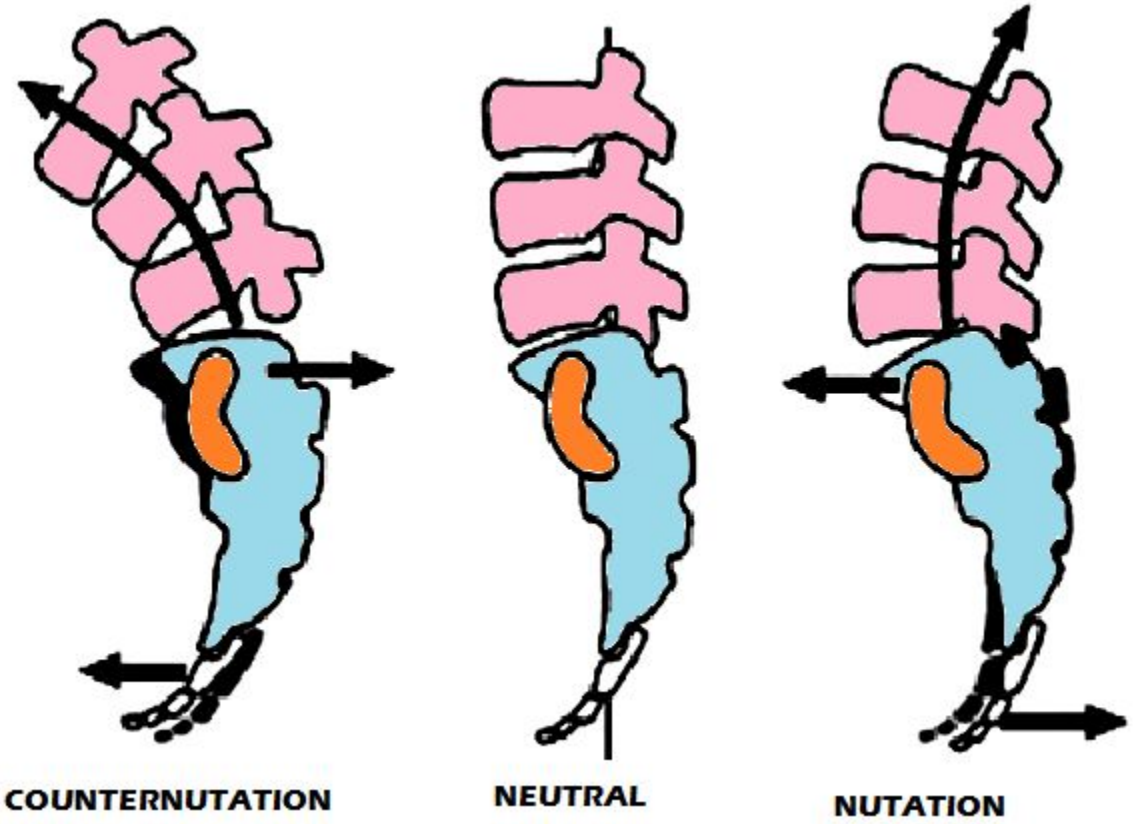
SEATED FLEXION TEST

- What is it? A general test used to helped determine if there is sacral-illio or Illio-sacral dysfunction. Can also help determine whether there is hamstring dysfunction present
- How do we do it? Have client seated on a low stool so there legs are at a 90 degree angle, feet shoulder width apart, ask the patient to bend forward as far as they can with their arms placed between their legs, Therapist places thumbs on inferior portion of the PSIS just as in Standing Flexion test, monitor if one side travels more superior or cephaled than the other side
- What is a positive Result? +Standing Flexion with a – seated flexion equals Illio-sacral dysfunction so more of a lower extremity dysfunction. This Also indicates that you SHOULD further investigate Hamstrings as when they were taken out of the equation there was no effect on PSIS. If you have a – Standing Flexion with a a+Seated flexion indicates sacro-illiac dysfunction, if both tests are postive there may be both types of dysfuction
- What next? More specific tests based on your findings – for example ROM of Hamstrings, sacral sulcus testing ILA comparsion of the sacrum . Will be covered in further chapters

VIDEO EXAMPLE OF SEATED FLEXION TEST

https://youtu.be/UazkhCUVHJo

NUTATION /COUNTERNUTATION OF SACRUM



SQUAT TEST

- What is it? A general assessment test for almost all the lower extremities joints
- How do we do it? Ask the client to perform a squat asking them to try and keep their heels on the floor
- What is a positive Result? Watch for them favoring one leg going up or down – may indicate dysfunction of the favored leg. If one leg is relied on completely more than the other - possible asymmetrical strength of quads. Does a heel lift off the floor – possible dysfunction in calf muscles
- What next? ROM Testing or specialized testing in the areas indicated

SQUAT TEST VIDEO EXAMPLE

https://youtu.be/FbqkcH56eRM

UPPER EXTREMITY TEST- PAINFUL ARC TEST

- How its done?
  - Client is standing, takes arm actively through abduction
- Positive sign
  - Pain occurring between 60-120°= subaccrominal bursa and rotator cuff tendons specifically supraspinatus being pinched between humerus and ac
  - Pain in the last 10-20°= AC joint if local and impingement if pain is in the anterior shoulder

VALSALVA TEST

- What is it?
  - Performed to assess for the possibility of disc Pathology
- How do we do it?
  - Ask client if the experience the pain reoccur or become more severe while bearing down to have a bowel movement
- What is a positive Result?
  - A positive response to the questioning

VBI TEST

- What is it?
  - Insufficent blood supply to the brain due to disruption in blood flow supplied by carotid or vertebral Artery
- How do we do it?
  - Client seated or supine
  - Examiner support clients head then places the clients head into
    - Extension and rotation
  - Hold position for 30 seconds
- What is a positive Result?
  - Pre syncope, nyastagmus, vertigo (dizziness), slurred speech, visual changes, nausea *Indicates – VBI, cervicogenic vertigo, cervical instability with brainstem compression* Tingling or electric arm pain *nerve root compression*
- What next?

JOINT PLAY ASSESSMENT

JOINT PLAY PG 51

- These movements are not under voluntary control
- They are necessary for full painless function of the joint and full ROM of the joint
- Joint dysfunction indicates a loss of joint play movements
- If any joint play movement is found to be absent or decreased, this movement must be restored before the client can regain functional voluntary movement
- In most joints this movement is 4mm or less in any direction

LOOSE (RESTING) PACKED POSITIONS

- The position at which the joint in under the least amount of stress
- Position in which the capsule has its greatest capacity
- The ligaments are in the position of greatest laxity and passive separation between the joint surfaces being the greatest
- This position is usually considered to be midrange of the joint

JOINT	POSITION
Facet	Midway between flexion and extension
Temperomadibular	Mouth slightly open (freeway space)
Glenohumeral	55° abduction, 30° horizontal adduction
Acromioclavicular	Arm resting by side in normal anatomical position
Sternoclavicular	Arm resting by side in normal anatomical position
Ulnohumeral (elbow)	70° flexion, 10° supination,
Radiohumeral	Full extension, full supination
Proximal radioulnar	70° flexion, 35° supination
Distal radioulnar	10° supination
Radiocarpal (wrist)	Neutral with slight ulnar deviation
Carpometacarpal	Midway between abduction-adduction and flexion-extension
Metacarpophalangeal	Slight flexion
Interphalangeal	Slight flexion
Hip	30° flexion, 30° abduction, slight lateral rotation
Knee	25° flexion
Talocrural (ankle)	10° plantar flexion, midway between maximum inversion and eversion
Subtalar	Midway between extremes of ROM
Midtarsal	Midway between extremes of ROM
Tarsometatarsal	Midway between extremes of ROM
Metatarsophalangeal	Neutral
Interphalangeal	Slight flexion

CLOSE PACKED POSITION

- Should be avoided as much as possible during assessment except to stabilize an adjacent joint
- The majority of the structures are under maximum tension
- The two joint surfaces fit together precisely and are fully congruent
- The ligaments and capsule of the joint are maximally tight
- The joint surfaces can not be separated by distractive forces
- Maximum joint stability

PALPATION

- Initially palpation for tenderness in not included because referred tenderness is real and can be misleading
- To palpate properly the area must be as relaxed as possible
- The body part must be supported as much as possible
- The therapist should be able to observe the following when performing a palpation assessment …
  - Differences in tissue tension and texture
  - Differences in tissue thickness
  - Abnormalities
  - Temperature variations
  - Pulses and tremors
  - Pathological state of tissue
  - Dryness or excessive moisture
  - Abnormal sensation

PALPATION CONTINUED…

- Palpation of joints and surrounding tissue must be done in a systematic fashion to ensure that all the structures are examined
- The therapist must have a starting point and work slowly and carefully
- A light pressure must be applied initially and working into a deep palpation and feeling for changes in tissue
- The unaffected side should be palpated first so that the client has an idea of what to expect and so that the therapist can distinguish what “normal” is for this client
- All abnormalities or changes should be noted

- Group read pg 51-54

JOINT MOBILIZATIONS (JOINT PLAY)

- Manual therapy technique
  - Used to modulate pain
  - Used to increase ROM
  - Used to treat joint dysfunctions that limit ROM by specifically addressing altered joint mechanics
- Factors that may alter joint mechanics:
  - Pain & Muscle guarding
  - Joint hypomobility
  - Joint effusion
  - Contractures or adhesions in the joint capsules or supporting ligaments
  - Malalignment or subluxation of bony surfaces

Discuss: Would you perform joint mobilizations on someone who has a hypermobile joint?

TERMINOLOGY

Mobilization – passive joint movement for increasing ROM or decreasing pain

- Applied to joints & related soft tissues at varying speeds & amplitudes using physiologic or accessory motions
- Force is light enough that patient's can stop the movement

Manipulation – passive joint movement for increasing joint mobility

- Incorporates a sudden, forceful thrust that is beyond the patient's control

TERMINOLOGY

Self-Mobilization (Automobilization)

- self-stretching techniques that specifically use joint traction or glides that direct the stretch force to the joint capsule

Mobilization with Movement (MWM)

- Concurrent application of a sustained accessory mobilization applied by a clinician & an active physiologic movement to end range applied by the patient
- Applied in a pain-free direction

TERMINOLOGY

Physiologic Movements – movements done voluntarily

- Osteokinematics – motions of the bones

Accessory Movements – movements within the joint & surrounding tissues necessary for normal ROM, but can not be voluntarily performed

Component motions – motions that accompany active motion, but are not under voluntary control. Example: Upward rotation of scapula & rotation of clavicle that occur with shoulder flexion

TERMINOLOGY

Joint play – motions that occur within the joint

- Determined by joint capsule's laxity
- Can be demonstrated passively, but not performed actively

Arthrokinematics – motions of bone surfaces within the joint

  - 5 motions - Roll, Slide, Spin, Compression, Distraction

TERMINOLOGY

Muscle energy

- use an active contraction of deep muscles that attach near the joint & whose line of pull can cause the desired accessory motion
- Clinician stabilizes segment on which the distal aspect of the muscle attaches; command for an isometric contraction of the muscle is given, which causes the accessory movement of the joint

Thrust – high-velocity, short-amplitude motion that the patient cannot prevent

- Performed at end of pathologic limit of the joint (snap adhesions, stimulate joint receptors)
- Outside the Massage Therapy scope of practice.

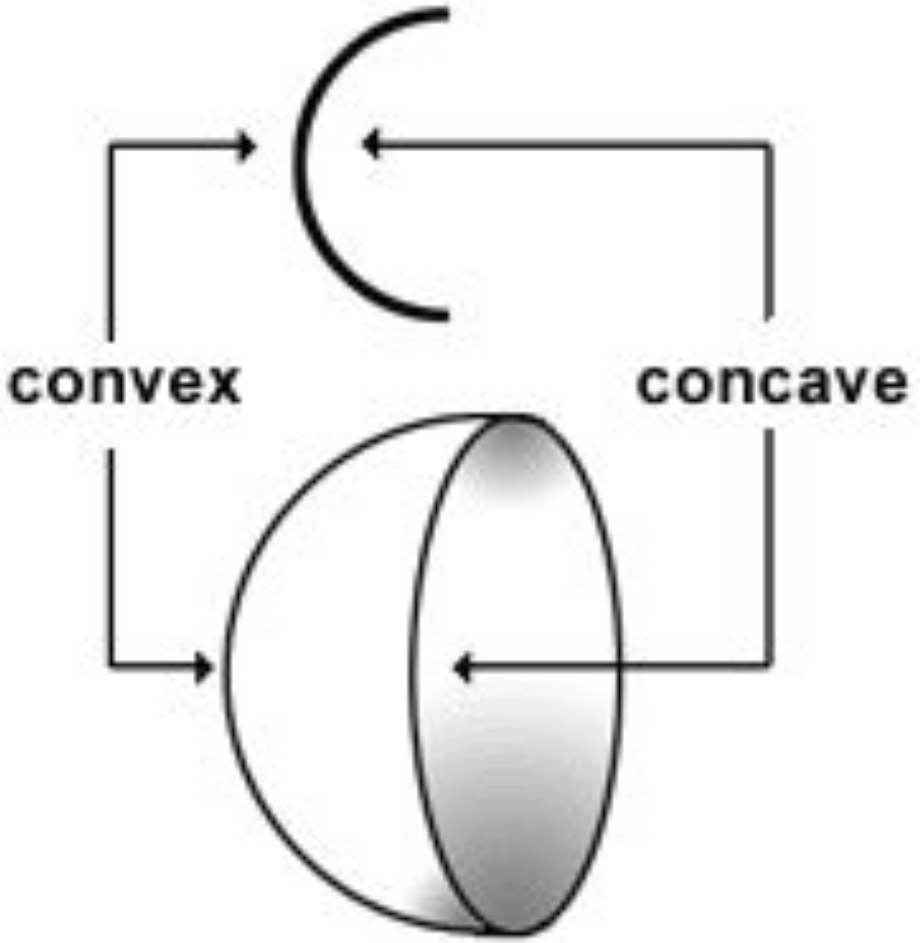
TERMINOLOGY

Concave – hollowed or rounded inward

- "Female" surface
- Slide occurs in SAME direction as the bone during joint movement

Convex – curved or rounded outward

- "Male" surface
- Slide occurs in the OPPOSITE direction as the bone during joint movement


convex
concave

RELATIONSHIP BETWEEN PHYSIOLOGICAL & ACCESSORY MOTION

Biomechanics of joint motion:

a) Physiological motion

- Result of concentric or eccentric active muscle contractions
- Bones moving about an axis or through flexion, extension, abduction, adduction or rotation

b) Accessory Motion

- Motion of articular surfaces relative to one another
- Generally associated with physiological movement
- Necessary for full range of physiological motion to occur
- Ligament & joint capsule involvement in motion

JOINT SHAPES & ARTHROKINEMATICS

Ovoid: one surface is convex the other surface is concave

Sellar (saddle): one surface is concave in one direction & convex in the other, with the opposing surface convex & concave respectively

ARTHROKINEMATICS

- There are five types of joint arthrokinematics: Roll, Spin, Slide, Compression, and Distraction:

1) Roll:

- A series of points on one articulating surface come into contact with a series of points on another surface
- Rocking chair analogy; ball rolling on ground
- Example: Femoral condyles rolling on tibial plateau
- Roll occurs in direction of movement
- Occurs on incongruent (unequal) surfaces
- Usually occurs in combination with sliding or spinning

ARTHROKINEMATICS

2) Spin:

- Occurs when one bone rotates around a stationary longitudinal mechanical axis
- Same point on the moving surface creates an arc of a circle as the bone spins
- Example: Radial head at the humeroradial joint during pronation/supination; shoulder flexion/extension; hip flexion/extension
- Spin does not occur by itself during normal joint motion

ARTHROKINEMATICS

3) Slide:

- Specific point on one surface comes into contact with a series of points on another surface.
- Surfaces are congruent. When a passive mobilization technique is applied to produce a slide in the joint it is referred to as a GLIDE.
- Combined rolling-sliding in a joint
- The more congruent the surfaces are, the more sliding there is
- The more incongruent the joint surfaces are, the more rolling there is

ARTHROKINEMATICS

4) Compression:

- Decrease in space between two joint surfaces
- Adds stability to a joint
- Normal reaction of a joint to muscle contraction

ARTHROKINEMATICS

5) Distraction:

- Two surfaces are pulled apart
- Often used in combination with joint mobilizations to increase stretch of capsule.
- https://www.youtube.com/watch?v=dfFGaUQ6P_Y

CONCAVE-CONVEX RULE

- One joint surface is MOBILE & one is STABLE

1) Concave-convex rule: concave joint surfaces slide in the **SAME** direction as the bone movement (convex is STABLE)

- If concave joint is moving on stationary convex surface – glide occurs in SAME direction as roll

2) Convex-concave rule: Convex joint surface slides in the **OPPOSITE** direction as the bone movement (concave surface is STABLE)

- If convex joint is moving on a stationary concave surface – glide occurs in the OPPOSITE direction as the roll

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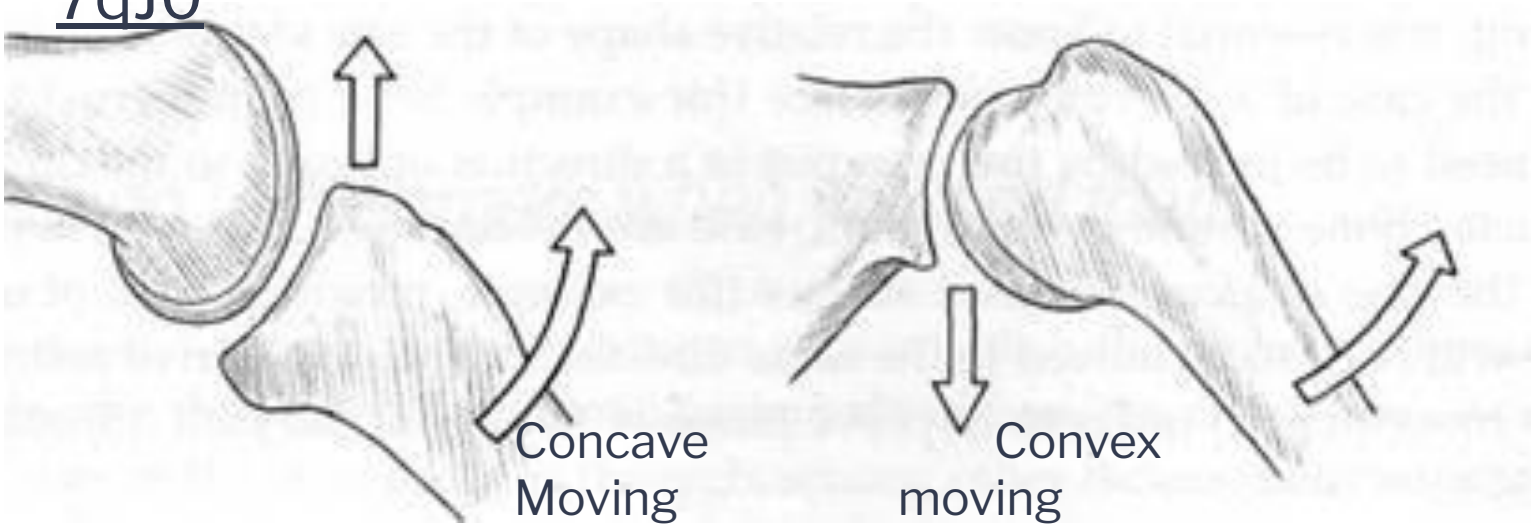
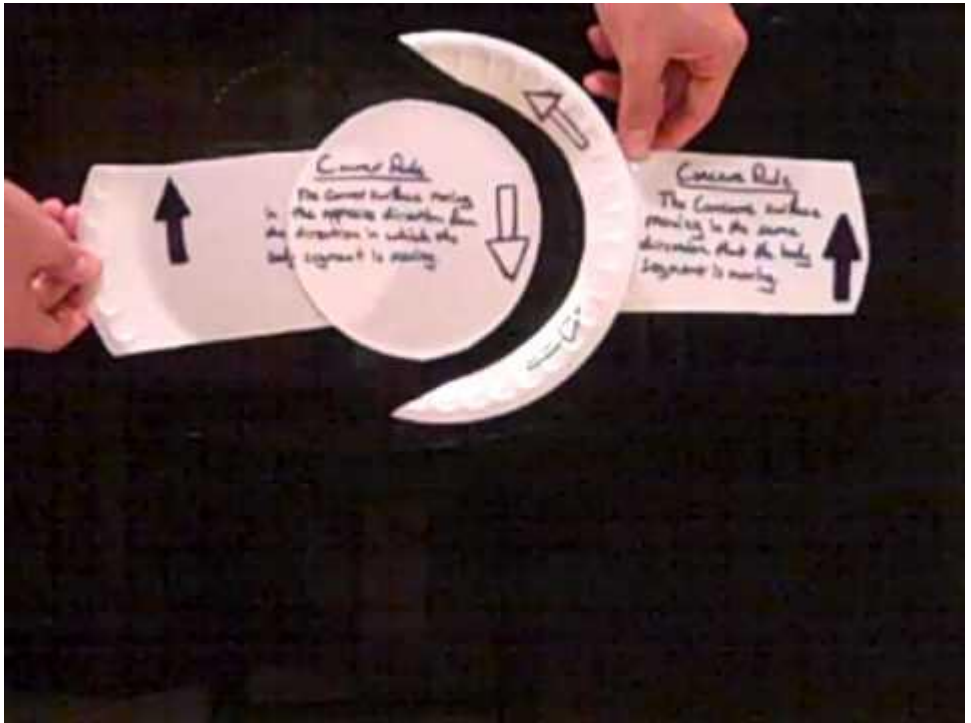




EFFECTS OF JOINT PLAY

Neurophysiological effects

- Stimulates mechanoreceptors to □ pain
- Affect muscle spasm & muscle guarding – nociceptive stimulation
- Increase in awareness of position & motion because of afferent nerve impulses

Nutritional effects

- Distraction or small gliding movements – cause synovial fluid movement
- Movement can improve nutrient exchange due to joint swelling & immobilization

Mechanical effects

- Improve mobility of hypomobile joints (adhesions & thickened CT from immobilization – loosens)
- Maintains extensibility & tensile strength of articular tissues

Cracking noise may sometimes occur

CONTRAINDICATIONS

- Inflammatory arthritis
- Malignancy
- Tuberculosis
- Osteoporosis
- Ligamentous rupture
- Herniated disks with nerve compression
- Bone disease
- Neurological involvement
- Bone fracture
- Congenital bone deformities
- Vascular disorders
- Joint effusion

(It may be possible to utilize Grades I & II mobilizations to relieve pain)

PRECAUTIONS

- Osteoarthritis
- Pregnancy
- Flu
- Total joint replacement
- Severe scoliosis
- Poor general health
- Patient’s inability to relax

MAITLAND JOINT PLAY GRADING SCALE

- Grading is based on amplitude of movement, and where within the available ROM the force is applied

Grade I

- Small amplitude rhythmic oscillating movement at the **beginning** of range of movement
- Used to manage pain and spasm

Grade II

- Large amplitude rhythmic oscillating movement within **midrange** of movement
- Used to manage pain and spasm

MAITLAND JOINT PLAY GRADING SCALE

Grade III

- Large amplitude rhythmic oscillating movement **up to point of limitation** (PL) in range of movement
- Used to gain motion within the joint
- Stretches capsule & CT structures

Grade IV

- Small amplitude rhythmic oscillating movement at very **end** range of movement
- Used to gain motion within the joint
- Used when resistance limits movement in absence of pain

Grade V – (thrust technique) - Manipulation

- Small amplitude, quick thrust at end of range
- Accompanied by popping sound (manipulation)
- Velocity vs. force
- Requires additional training

JOINT PLAY INDICATIONS

- Grades I and II primarily used for pain
- Pain must be treated prior to stiffness
- Small amplitude oscillations stimulate mechanoreceptors - limit pain perception
- Grades III and IV - primarily used to increase motion
- Stiff or hypomobile joints should be treated 3-4 times per week – alternate with active motion exercises
- ALWAYS Examine PRIOR to Treatment
- If limited or painful ROM, examine & decide which tissues or joints are limiting function
- Determine whether treatment will be directed primarily toward **relieving pain** or **stretching a joint or soft tissue limitation**
- Quality of pain when testing ROM helps determine stage of recovery & dosage of techniques

JOINT PLAY INDICATIONS

1) If pain is experienced **BEFORE** tissue limitation, gentle pain-inhibiting joint techniques may be used

- **Stretching under these circumstances is contraindicated**

2) If pain is experienced **CONCURRENTLY** with tissue limitation (e.g. pain & limitation that occur when damaged tissue begins to heal) the limitation is treated cautiously – gentle stretching techniques used

3) If pain is experienced **AFTER** tissue limitation is met because of stretching of tight capsular tissue, the joint can be stretched aggressively

JOINT POSITIONS

- Resting position/ loose packed position: maximum joint play - position in which joint capsule and ligaments are most relaxed, articulating surfaces are maximally separated
- Evaluation and treatment position utilized with hypomobile joints
- Joint will exhibit greatest amount of joint play
- Position used for both traction and joint mobilization
- Close-packed position: Joint surfaces are in maximal contact to each other
- General rule: Extremes of joint motion are close-packed, & midrange positions are loose-packed

JOINT MOBILIZATION APPLICATION

1. All joint mobilizations follow the convex-concave rule
2. Patient should be relaxed
3. Explain purpose of treatment & sensations to expect to patient
4. Evaluate BEFORE & AFTER treatment
5. Stop the treatment if it is too painful for the patient
6. Use proper body mechanics
7. Use gravity to assist the mobilization technique if possible
8. Begin & end treatments with Grade I or II oscillations

JOINT POSITIONING AND STABILIZATION

- Patient & extremity should be positioned so that the patient can RELAX
- Initial mobilization is performed in a loose-packed position
- In some cases, the position to use is the one in which the joint is least painful
- Firmly & comfortably stabilize one joint segment, usually the proximal bone
- Hand, belt, assistant
- Prevents unwanted stress & makes the stretch force more specific & effective

TREATMENT FORCE & DIRECTION OF MOVEMENT

1. Treatment force is applied as close to the opposing joint surface as possible

- The larger the contact surface is, the more comfortable the procedure will be (use flat surface of hand vs. thumb)

2. Direction of movement during treatment is either PARALLEL or PERENDICULAR to the treatment plane

3. Treatment Direction

- Treatment plane lies on the concave articulating surface, perpendicular to a line from the center of the convex articulating surface (Kisner & Colby, p. 226 Fig. 6-11)
- Joint traction techniques are applied perpendicular to the treatment plane
- Entire bone is moved so that the joint surfaces are separated

TREATMENT FORCE & DIRECTION OF MOVEMENT

3. Continued…

- Gliding techniques are applied parallel to the treatment plane
- Glide in the direction in which the slide would normally occur for the desired motion
- Direction of sliding is easily determined by using the convex-concave rule
- The entire bone is moved so that there is gliding of one joint surface on the other
- When using grade III gliding techniques, a grade I distraction should be used
- If gliding in the restricted direction is too painful, begin gliding mobilizations in the painless direction then progress to gliding in restricted direction when not as painful

TREATMENT FORCE & DIRECTION OF MOVEMENT

4. Reevaluate the joint response the next day or have the patient report at the next visit

- If increased pain, reduce amplitude of oscillations
- If joint is the same or better, perform either of the following:
- Repeat the same maneuver if goal is to maintain joint play
- Progress to sustained grade III traction or glides if the goal is to increase joint play

PATIENT RESPONSE

- May cause soreness
- Perform joint mobilizations on alternate days to allow soreness to decrease & tissue healing to occur
- Patient should perform ROM techniques
- Patient’s joint & ROM should be reassessed after treatment, & again before the next treatment
- Pain is always the guide

JOINT TRACTION TECHNIQUES

- Technique involving pulling one articulating surface away from another – creating separation
- Performed perpendicular to treatment plane
- Used to decrease pain or reduce joint hypomobility
- Kaltenborn classification system
- Combines traction and mobilization
- Joint looseness = slack

KALTENBORN TRACTION GRADING

Grade I (loosen)

- Neutralizes pressure in joint without actual surface separation
- Produce pain relief by reducing compressive forces

Grade II (tighten or take up slack)

- Separates articulating surfaces, taking up slack or eliminating play within joint capsule
- Used initially to determine joint sensitivity

Grade III (stretch)

- Involves stretching of soft tissue surrounding joint
- Increase mobility in hypomobile joint
- Grade I traction should be used initially to reduce chance of painful reaction
- 10 second intermittent grade I & II traction can be used
- Distracting joint surface up to a grade III & releasing allows for return to resting position
- Grade III traction should be used in conjunction with mobilization glides for hypomobile joints

ASSESSMENT REVIEW

GAIT

- Stance phase
- Swing phase
- Common abnormal gaits

POSTURAL ASSESSMENT

- A bilateral comparison to check levels of distance from the PLUMB-LINE.
- Used to detect any possible health problems and gain a better understanding of a client's predisposition to injury or overuse.

****Normal Posture:** Is maintained by balance, strong and flexible muscle, intact ligaments, properly functioning joints. As well as a balanced line of gravity and good postural habits.

****Change in Posture:** may be secondary to structural imbalances, joint degeneration, a change in centre of gravity, poor postural habits or pain

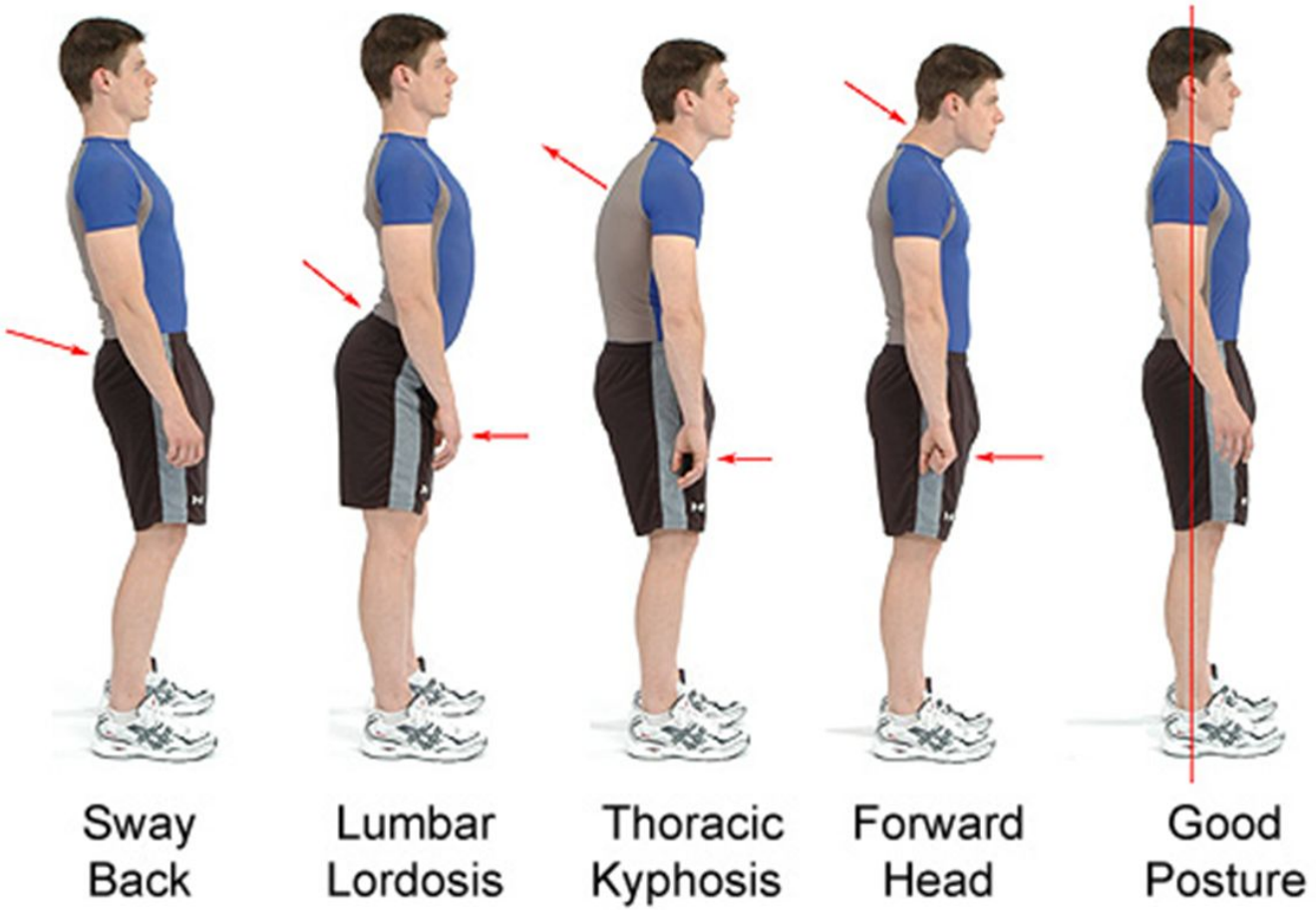
****Faulty Alignment:** Creates unnecessary stress and strain on the body, elongating muscle and adaptive shortening of muscle, creates a decrease in efficiency for the body.

CONTINUED

Ask yourself the following questions…

- What is “normal” body alignment?
- Is there an obvious deformity?
- Are the bony contours of the body “normal” and symmetric, or is there an obvious deviation?
- Are soft tissue contours (muscle, skin, fat) normal and symmetrical?
- Are the limb positions equal and symmetric?
- Are the colours and textures of skin normal?
- Are there any scars that indicate recent/past injury or surgery?
- Is there any crepitis, snapping or abnormal sound in the joints when the client moves them?
- Is there any swelling or redness in the area being observed?
- What attitude does the client appear to have towards the condition?
- What are the client’s facial expressions?
- What is the client’s willingness to move

ABNORMAL POSTURES



FACTORS AFFECTING POSTURE

- Functional (positional)Factors
  - Habitual poor posture, eg. Tall people that slouch
  - Seen in individuals that stand or sit for long periods of time (CREEP)
  - Maintenance of appropriate posture requires muscles to be strong, flexible and easily adaptable to environmental changes
  - Muscle imbalances can be common in adolescences, may create long term problems
  - Pain could be a contributing factor to a postural dysfunction
  - Respiratory conditions can cause weakness, weight gain, altered posture and painful musculoskeletal structures
  - Many postural faults are correctable after identification and rehabilitation
  - General treatment protocols involve strengthening of weak muscles along with stretching shortened structure. This is combined with postural education for the client
- Structural (skeletal) Factors
  - A result of congenital anomalies, developmental problems, trauma, or disease
  - Frequently involves changes in bone development and therefore not easily correctable
  - Bony Contours
  - Laxity of ligaments
  - Fascial and musculotendinous tightness
  - Muscle tone
  - Pelvic angle
  - Joint position and mobility

COMMON SPINAL DEFORMITIES

- Lordosis
  - Lordosis is an anterior curvature of the spine
  - Hyperlordosis is an exaggeration of the normal curves in the cervical and lumbar spine
- Kyphosis
  - Kyphosis is the posterior curvature of the spine
  - Hyperkyphosis is an exaggeration of the normal curvature of the thoracic spine
- Scoliosis
  - Scoliosis is a lateral curvature of he spine
  - Usually the most visible spinal deformity
  - can be Functional (non-structural) Scoliosis, or Structural (skeletal) Scoliosis

PALPATION

- Skin – 4T's: Temperature, Tenderness, Texture, Tone
  - moisture, mobility
- Subcutaneous Soft Tissue
  - tendon, muscle, ligament, connective tissue
- Arteries, Veins, Nerves, Lymph nodes
- Bones and Joints
  - contours, positional relationships, effusion, spurs, heat, tenderness
- Wendy Nickel's Scale

MOVEMENT

- Active, Passive, and Resisted Ranges of Motion- always testing the painful movement last
- Used to determine the range or lack of range of motion of a joint(s)
- Helps to confirm/rule out suspected diagnosis
- Keep in mind that “normal” varies for each individual

ACTIVE RANGE OF MOTION

- A.K.A: PHYSIOLOGICAL or ANATOMICAL movements, ends at a physiological barrier
- Performed actively by the client using his/her muscles voluntarily
- Tests amount of ROM, control, power and willingness
- Tissues it is testing : CONTRACTILE,NERVOUS, JOINT, NONCONTRACTILE
- **Things to Note when Examining Active Movements:**
  - When and where the pain begins
  - Does the movement increase the intensity or quality of pain
  - Client's reaction to pain
  - Amount of available ROM
  - Any limitation and it's nature
  - Pattern of movement
  - Rhythm and quality of movement
  - Movement of associated joints
  - Willingness

CONTINUED

- PROM quality is determined not only by degree of movement, but also by end feel
- Joints are put through their range of motion by the therapist with the patient relaxed
- Tests – Inert Structures (Joint) as Well as Anatagonist lengthening
- Things to Note when Examining Passive Movements:
  - When and where does the pain begin
  - Does movement increase the intensity or quality of pain
  - Pattern of limitation of movement
  - Movement of associated joints
  - Amount of available ROM
  - Any limitations and its nature
  - END FEEL of the movement

RESISTED RANGE OF MOTION

- Tested LAST during an assessment
- tests CONTRACTILE & NERVOUS tissue
- Joint must be in a NEUTRAL position so that any problems discovered are more likely to be the result of contractile tissue
- Weakness not associated with pain or disuse is a positive neurological sign (i.e. Nerve root, peripheral nerve, of upper motor neuron lesions)
- “don’t let me move you”
- You create a maximal but isometric contraction

- **Things to note when examining Resisted Movements:**
  - if contraction causes pain, note what the quality and intensity is
  - strength of the contraction
  - type of contraction that causes pain/weakness:

*Concentric – creating tension while shortening muscle (bicep curl up)
*Eccentric – creating tension while lengthening muscle (bicep curl back down)
***Isometric – creating tension with no movement of muscle. No change in length (pushing wall)**

PRINCIPLES AND CONCEPT OF THE PALPATION/MOVEMENT PORTION OF ASSESSMENT

- The palpation/movement portion of the assessment requires the therapist to make physical contact with the client, therefore the therapist must obtain informed consent before beginning
- Palpation/movement may cause the client discomfort or worsen their symptoms
- Palpation/movement is used to support or rule out suspected condition(s) (based on history and observation)
- The examination must be performed symmetrically, therapist is looking for consistent pattern of signs and symptoms (Bilateral, unaffected before affected)
- Special care must be taken if the condition is acute, in spasm, or if the client complains of pain

CONTINUED

- At the end of the assessment the therapist must warn the client that there might be an exacerbation of their symptoms
    - **Why does this occur?**
        - The assessment needs to provoke the clients symptoms in order to accurately diagnose client, this may temporarily aggravate the injury/pain
- Therapist must now compare the findings of the palpation/movement examination to the history and observation assessment and conclude if there are any changes that need to be made
- Therapist should not hesitate to refer client to another health care professional if they feel it necessary

CONTINUED

- Unless bilateral simultaneous movement is required, the unaffected side is tested first
- The client does active movements before the therapist applies passive movement
- Any movements that are painful are done at the end of assessment
- If AROM is **NOT** full, return client to starting position and begin PROM with caution, clear communication, and in a position where the client's facial expression can be observed
- If AROM **IS** full and non-symptomatic, passive overpressure can be applied to determine the end feel of the joint
- Each active, passive and resisted movement can be repeated several time or held for a certain amount of time to see if symptoms/strength increases or decreases – Using A/P/R as Treatment

CONTINUED

- Resisted isometric movements are done with the joint in neutral (resting) position
- For PROM/ligamentous test it is not only the amount (degree) of movement, but also the quality (end feel)of movement that is important
- When the therapist is examining the ligaments, the appropriate stress is applied gently and repeated several time
- When testing myotomes, each contraction is held for a minimum of 5 sec to see whether weakness becomes evident

JOINT PLAY

- ACCESSORY movements
- Small ROM that can only be obtained passively by the examiner
- Involuntary movements
- Necessary for full voluntary, painless function of a joint & for full ROM
- **Hypermobile:** more susceptible to ligament sprains, joint effusion, chronic pain, recurrent injury, early OA, and paratenonitis, resulting from lack of control
- **Hypomobile:** more susceptible to muscle strains, pinched nerve syndromes and paratenonitis from overstress

- **Mennell's Rules for Joint play Testing (8)**
  - Client should be relaxed & fully supported
  - Examiner must also be completely relaxed but using a firm comfortable grip
  - Examine one joint at a time
  - Examine one movement at a time
  - Unaffected side first
  - One force is stabilizing, the other is mobilizing (grip of hands)
  - Movements should be normal and NOT forced
  - Movements should not cause undue discomfort

****Remember: joint should be in a neutral position**

****Joint play can be used to assess or treat a condition**

NEUROLOGICAL ASSESSMENT

- Dermatomes- tests nerve root
- Myotomes- tests nerve root
- Reflexes- tests nerve root
- Major motor-sensory nerves in region- tests peripheral nerves
- Sensation testing when appropriate- tests peripheral nerves

REFERRED PAIN

- What is referred pain?
  - “Pain that is felt at a site other than the injured tissue, because the same or adjacent neural segment supplies the referred site”
  - “steady, deep and achy, felt deep, boundaries are indistinct, radiates segmentally without crossing the mid-line” (Magee)
- Causes of referred pain:
  - Trigger Point – Localized area of hyper irritability within tissues. They are tender to compression, accompanied by tight bands of tissues, often if sufficient it may give rise to “referred pain”
  - Spinal Dysfunction, Nerve Root Impingement
  - Sclerotomic Origin (deep soft tissue)
  - Joints

SPECIAL TESTS

- Help determine a particular type of disease, condition or injury present
- Specific to the region
- Uses of special tests:
  - Confirm a tentative diagnosis
  - Make a differential diagnosis
  - Differentiate between structures
  - Understand unusual signs
  - Unravel difficult signs and symptoms

****Clients tolerance may limit use of special tests****