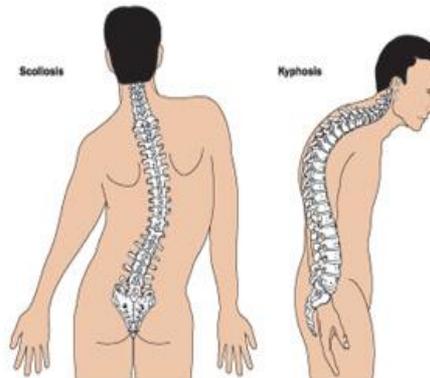


BIOMECHANICS OF SEATING AND POSITIONING



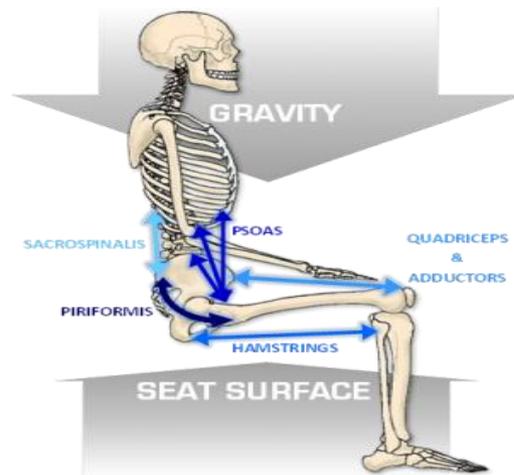
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CP of NYS Annual Conference.
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OBJECTIVES

- ❑ Become aware of biomechanics and its role in seated posture
- ❑ Determine relationship between seated posture and..
 - ❑ Function
 - ❑ Comfort
 - ❑ Prevention of deformities and pressure injuries
- ❑ Review of mat assessment used in seating evaluation

BIOMECHANICS

- bi·o·me·chan·ics; bīō-mī-măñ'iks)n.
- 1. *(used with a sing. verb)* The study of the mechanics of a living body, especially of the forces exerted by muscles and gravity on the skeletal structure.



EVALUATION

- ◉ Evaluation begins as client enters the room
 - Look at positioning in current set up
 - Active propeller?
 - Power?
 - Dependent
 - Caregivers needs
- ❖ Be holistic in your assessment-if it doesn't work for client AND caregivers, it wont be used

EVALUATION

- Medical background inclusive of all diagnoses
 - Progressive/degenerative
- Vitals-
 - Is respiration or heart rate effected by a change in positioning
- Height and weight
 - Is weight stable
 - Medications that may effect weight

EVALUATION

- **Skin integrity**
 - History of pressure injuries/flap surgery
 - Braden Score- lower the score the higher the concern
- **Overall strength and conditioning**
 - How active is the client when in the chair
 - Do they fall asleep in the chair
- **Transfer status**

EVALUATION

- ⦿ Cognitive status
 - Is client aware of her/his own positioning
 - Does client perform own MRADL's
- ⦿ Orthopedic status
 - TONE!!
 - Contractures.....where?
 - Past surgeries
 - Scheduled surgeries
 - Any fixations
- ⦿ All environments

SEATING EVALUATION

○ FUNCTION

- What are clients and caregivers goals and expectations?
 - If mobility does not meet goals for client and/or caregivers it WILL NOT be used
 - Does chair need to fold for transport in car?
 - Entrance to home- ramp/stairs/ level
 - Accessibility inside home
 - Be sure that the client and caregivers understand the benefits and limitations of the recommended equipment

MAT ASSESSMENT

- Get client out of the chair
- How did they transfer
 - How do caregivers transfer client
- What is tone like
 - can they sit without support
 - Balance-static/dynamic
 - How much support do they need

MAT ASSESSMENT

- Start in supine- why?
- Best position to see what is flexible and what is fixed



<http://www.leckey.com/case-histories/sean/>

MAT ASSESSMENT

- Start at pelvis
 - Fixed or flexible
- Trunk
 - Scoliosis/Kyphosis
 - fixed or flexible
- Alignment of head
 - How much support
- Visual field
- Alignment of legs
- History of pressure sores
 - Ability to independently weight shift

MAT ASSESSMENT

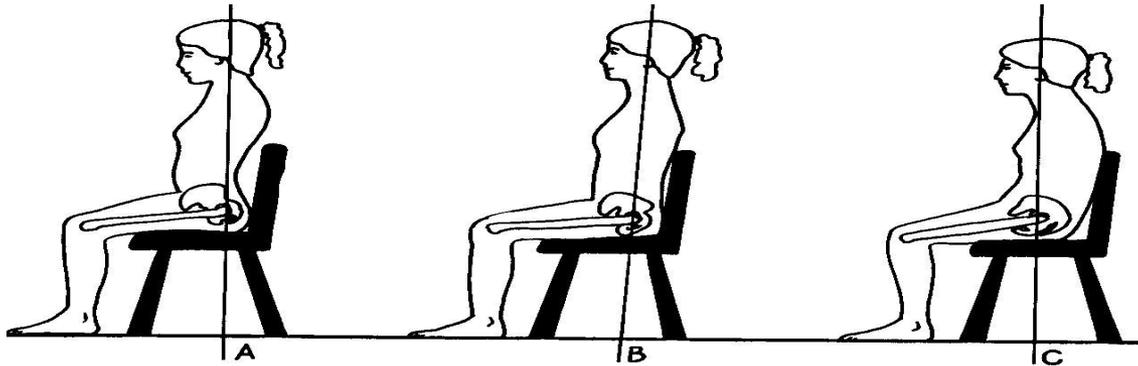
- ⦿ Fixed deformity;
 - Seating must accommodate
- ⦿ Flexible
 - Seating can provide correction
 - How much force is required for the correction
 - Be mindful of pressure- where it needs to be applied and clients skin integrity

MAT ASSESSMENT

- Sit client over the edge of the mat
 - 90-90-90
 - Good or bad??
- What happens when they are upright against gravity?

GRAVITY

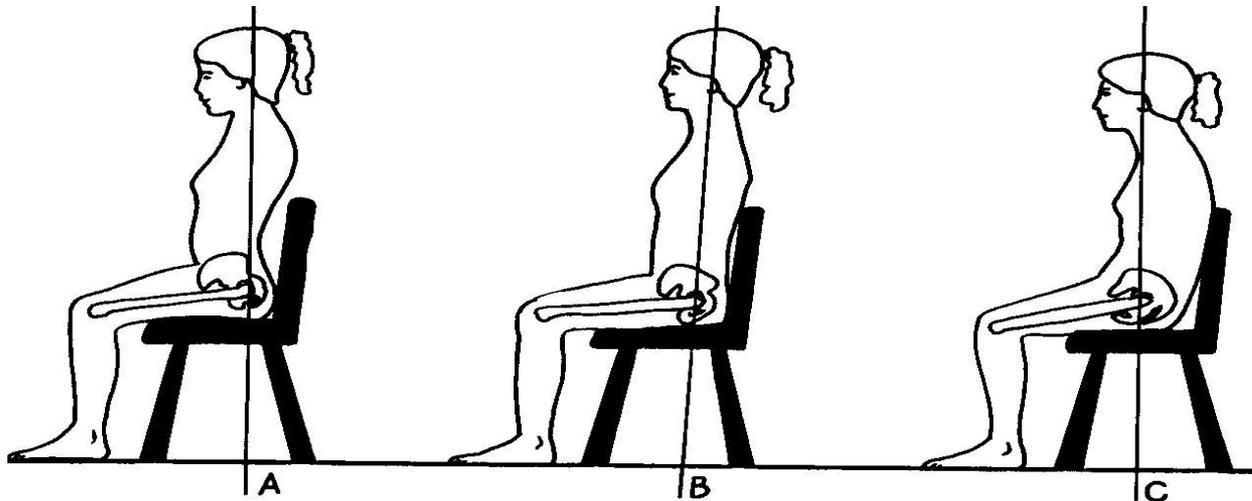
- Friend or foe??
- We are always fighting against gravity
- How does gravity effect our clients
- what happens when we seat client at 90?



- <http://www.bestofeverythingafter50.com/wp-content/uploads/2015/11/posture-.jpg>

GRAVITY

- Where does client fall when upright (90) against gravity?
- Is weight bearing on the pelvis even?
- What happens when you close/open the hip angle?



GRAVITY

○ QUESTIONS

- How much support do they need to stay upright?
- How much support do they need to stay in neutral?
 - Where is that support needed?
 - Always keep in mind fixed or flexible

TONE

○ Spasticity

- Extensor / flexion pattern
 - Do they fall back
 - Are hips pulled into extension/flexion/adduction
 - Are lower legs pulled into extension or flexion



TONE

- Hypotonic
- Where does client end up?
- Where is their breaking point
 - Where they flex
 - Must support above this point and at the counter point



SPINE

○ Scoliosis

■ Fixed or flexible

- Flexible

- How much force to hold it upright

- Fixed

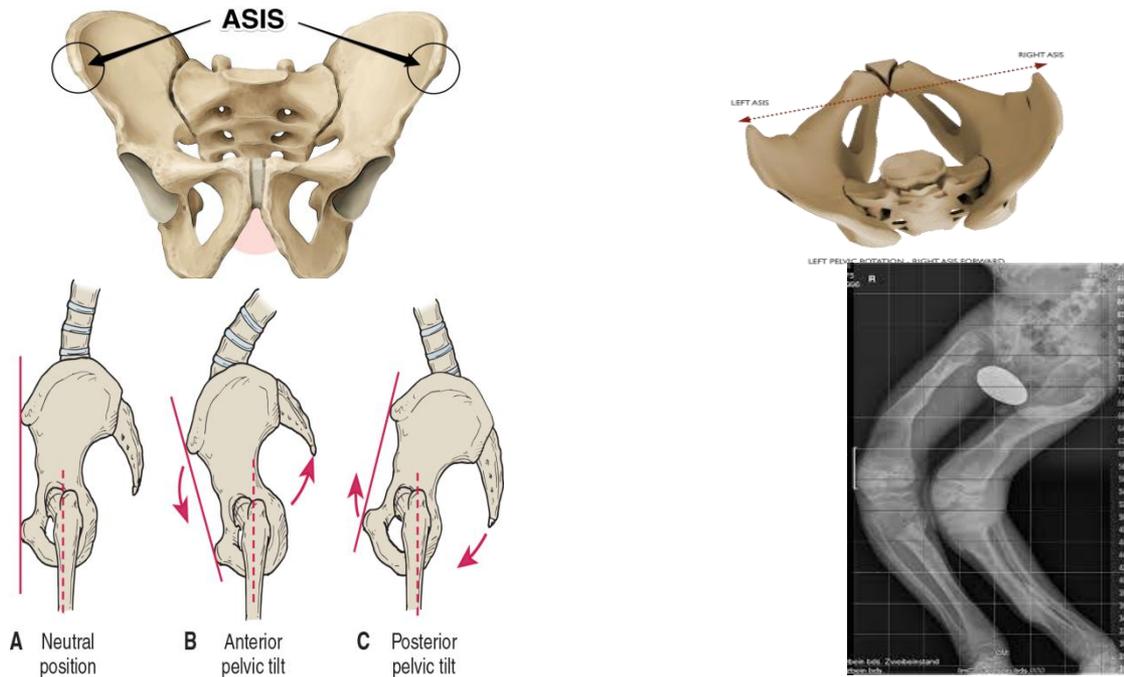
- How is this effecting the pelvis?



PELVIS

- What position does the pelvis rest in when upright against gravity
 - Oblique
 - Rotated
 - Posterior
 - Anterior
 - Windswept
- Fixed- where is the ASIS positioned?
- Flexible- can ASIS be brought to neutral
 - How much force is required to hold it in the most neutral position attainable

PELVIS



- ◉ http://seatingmatters.com/wp-content/uploads/2016/01/Pelvic_Obliquity_CMYK-300x272.png
- ◉ <http://www.jouefct.com/wp-content/uploads/2015/12/how-to-check-your-pelvis-asis-anatomy-posterior-s>
- ◉ http://fadavispt.mhmedical.com/data/books/1883/kisnerthera_ch20_f003.png
- ◉ https://www.google.com/search?q=pelvic+windswept+deformity&source=lnms&tbm=isch&sa=X&ved=0ahUKWwjx8oTMz_PWAhXl1MKHQwuC8oQ_AUICigB&biw=1366&bih=662#imgrc=dctE-zKn68HpVM:

PELVIS

- When the pelvis is in neutral...
 - Where does everything else fall
 - Head
 - Trunk
 - LE's
 - Where does the pelvis need to be to keep the head and trunk in neutral

HAMSTRINGS

- ◉ Nemesis of proper seated posture



- ◉ 3 muscles
 - Bicep femoris
 - Semimembranosus
 - Semitendinosus

- ◉ [posturehttps://www.t-nation.com/system/publishing/articles/10004209/original/One-Exercise-Isn%27t-Enough-for-Hamstrings.jpg?1482435448](https://www.t-nation.com/system/publishing/articles/10004209/original/One-Exercise-Isn%27t-Enough-for-Hamstrings.jpg?1482435448)

HAMSTRINGS

⊙ Biceps femoris

- Origin: Ischial tuberosity
- Insertion: lateral condyle of the tibia and the head of the fibula

⊙ Semimembranosus

- Origin: ischial tuberosity
- Insertion: posterior medial condyle of the tibia

⊙ Semitendinosus

- Origin: Ischial tuberosity
- Insertion: proximal medial tibia

HAMSTRINGS

- ◉ What does all this mean
- ◉ most of our clients have hamstring contractures
- ◉ Contractures and tone will significantly impact where the pelvis ends up
 - ◉ THINK....
 - If I decrease the pull of the hamstrings, where will the pelvis end up
 - When I get the pelvis in neutral where does everything else end up
 - If the pelvis is in neutral and the trunk and spine are not.....NOW WHAT???

PELVIS & HAMSTRINGS

◉ Questions to ask

- Where does the pelvis need to be to keep everything else in neutral
- How much flexion/extension do the hamstrings need to be in for optimal pelvic positioning
 - 70°(standard), 90° (contracture hangers)
 - more or less than either of these
 - Be aware of vision, swallowing, breathing and how overall positioning effect everything



HEAD AND TRUNK

- GOAL- get the head and trunk in the most neutral position attainable
 - WHY?
 - Breathing-
 - vision
 - Swallowing
- Pelvis and hamstrings may not be in neutral
 - That's OK!!!

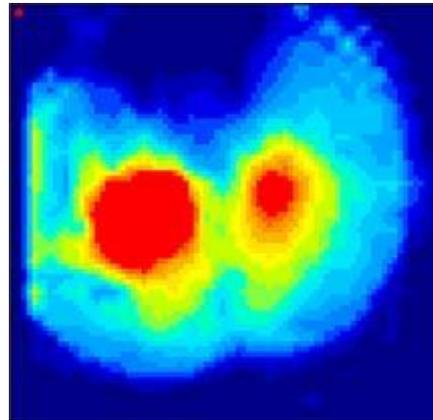


BREATHING

- Observation of breathing pattern
 - Where is client breathing from
 - Diaphragm/ , upper chest
 - What muscles are they using to inhale
 - Careful of blocking these muscles
 - Are they barrel chested?
 - What happens if you support them laterally at the rib cage
 - Do they still have an efficient inhale/exhale or does lateral support decrease this....

PRESSURE

- Keep in mind that all the support you give may cause pressure- can the client/skin handle that pressure
- Pressure mapping



PUT IT TOGETHER

- Gravity
- Tone
- Orthopedic deformities
 - Fixed/flexible
- Contractures
- Pressure
- NOW YOU ARE READY TO SELECT A SEATING SYSTEM...GOOD LUCK

SEATING EVALUATION

○ MANUAL

○ Propulsion

- Upper extremities
- Lower extremities
- Unilaterally
- Bilaterally
- Endurance
- -is it enough to be functional
- Dependent

○ Power

○ Cognitive status

- Safety
- Reflexes
- How will they operate controls
 - Hand/head/elbow
 - Knee/foot

SEATING EVALUATION

◎ BACKS

- Off the shelf
 - Minimal support needed
- Planar
 - lateral supports-flexible deformities
- Custom molded
 - fixed deformities

◎ CUSHIONS

- Off the shelf
- Pressure relieving
 - Air filled
 - Gel components
 - Foam components
- Custom molded
 - Fixed deformities

SEATING EVALUATION

◎ HEADRESTS

- Fixed
- Adjustable
- Curved
- Tri-piece
- custom

◎ ARM RESTS

- Fixed height
- Adjustable height
- Full arm pad
- Desk arm pad
- custom

SEATING EVALUATION

○ LEG RESTS

- Fixed
- Swing-away
- Lift off
- ELR- Really??

○ Foot plates

- Lift up
- Angle adjustable
 - Foot straps
 - Foot sandals
 - Rigid
 - flexible

○ Lateral trunk and hip supports

○ Medial knee supports

○ Lateral knees supports

○ Chest and pelvic straps

DOCUMENTATION

- As the clinician you must use a **MEDICAL** justification for each piece of equipment you are recommending
 - Why is this piece the best for:
 - postural support,
 - prevention of further deformity,
 - function

SAMPLES



REMEMBER

- ⦿ Tone and Gravity will dominate
 - Work with it
- ⦿ Head and spine in neutral
 - Let the pelvis fall where it needs to
- ⦿ Hamstrings-Keep them on slack
 - be wary of recommendation of ELR
- ⦿ Clinical midline may not be your clients midline
 - Use 90-90-90 only as a starting point

THE END

THANK
YOU

-Sharon