MAINTAINING POSTURE BY PROVIDING MOVEMENT

Michelle L. Lange, OTR/L, ATP/SMS


Combination Dynamic Footrest, Rocker Back, and Headrest

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Learning Outcomes:

The participant will be able to:

1. Identify 3 factors which lead to loss of position within a wheelchair seating system.
2. Describe how dynamic seating can successfully return a client to their optimal seated posture, despite large and forceful movement.
3. List 3 specific dynamic seating product features that help maintain client posture.

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What we are covering today:

1. What causes loss of position within a wheelchair seating system?
2. How can optimal client position be maintained through movement?
3. Matching client need to specific product features.

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Question 1:
What Causes Loss of Position Within a Wheelchair Seating System?

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What causes loss of position within a wheelchair seating system?

- Lack of appropriate postural support
- A client moving away from a position of discomfort
- A client seeking a position of stability
- A client seeking a position of function
- **Extension**
  - **Hips**
  - **Lower extremities**
  - **Neck**
- **Large, forceful movements**

- **Any other ideas?**

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Hip Extension

- When a client extends at the hips in a static seating system, this force is not diffused and so results in movement of the client in relation to the support surfaces.
  - **The client extends their hips, lifts the pelvis off of the seat surface and, once active extension ceases, the pelvis falls back to the seat in a posterior pelvic tilt.**
  - or…
  - **The client extends their hips, pushes their trunk against the back of the seating system, and their pelvis pushes forward into a posterior pelvic tilt. There is nowhere else for the pelvis to go.**
- Most likely, the client is unable to correct the position of their pelvis independently and will need repositioning.

All. Day. Long.

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Let's Take a Look!

This client is extending his hips against the **static back** of his seating system and lifting (elevating) his pelvis off of the seat cushion, despite an appropriate pelvic belt and angle of attachment.

When he stops actively extending, he lands on the cushion in a significant posterior pelvic tilt, far forward on the cushion.

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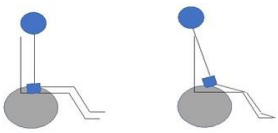
Let's give it a try!

- Sit up straight
- Extend at your hips
- Did your pelvis move forward?



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Lower Extremity Extension

- Lower extremity extension and hip extension are often seen together
- **The client may leverage off of the footplates, elevating the pelvis, and leading to collapse into posterior pelvic tilt upon ceasing active extension.**
- or…
- **If the feet are not secured, the client may extend at the knees, also leading to the pelvis moving forward.**

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Let's Take a Look

Carl has quite a bit of extension in his hips and lower extremities

As a result, he is basically 'standing' in his wheelchair when actively extending

When active extension ceases, he collapses with loss of position

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Let's Take a Look!

Alex has so much movement in her legs that it is difficult to keep her pelvis in position

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Let's give it a try!

- Sit up straight
- If your feet reach the floor, extend your leg against the floor
- How has this impacted your posture?
- Don't tip over!

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Neck Extension

- When a client extends and/or rotates at the neck against a static head support, the client may move into neck hyperextension, further neck rotation, or their head may simply fall forward from lack of contact.

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Let's Take a Look

- Jonathan
- Jonathan has strong hip, knee, and neck extension
- He pivoted off of the head pad into neck hyperextension

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Let's Try it!

- Pair up with another person for this activity
- One sitting, one standing behind
- If standing:
  - hold the back of the head of the person in front of you
  - Don't move, you are a static head support!
- If sitting:
  - Extend against your partner's hands
    - What impact does this have on your overall posture?
  - Rotate against your partner's hands
    - What impact does this have on your overall posture?

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Large and Forceful Movements

- Large and forceful movements, such as seen in dystonia, create movement in more than one plane, including rotation. Maintaining alignment with the seating system support surfaces is very challenging.

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Let's take a look!

Colton has intermittent increased extensor tone, dystonia, and a strong ATNR

He was readily moving out of alignment with his seating support surfaces and unable to return independently

This video of Colton on the floor demonstrates his large and forceful movements

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Let's try it!

- Sit up tall … be brave …
- Now, rather than simply extending at the hips, go ahead are rotate and extend at the hips with force
- How has this impacted your position?
- How is this different than just extension?

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Summary

- What Causes Loss of Position Within a Wheelchair Seating System?
  - Unrelieved forces leading to movement of the body in relation to the seating support surfaces
  - Collapse into a suboptimal position after this movement
  - Leverage of the body against static seating support surfaces
  - This can lead to a sudden and significant loss of position
  - This may be seen as a slow, nearly imperceptible change in position

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Question 2:
How can Optimal Client Position be Maintained Through Movement?

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Traditional Approach

- A **traditional approach** to maintaining posture in clients with active extension and/or forceful movements is to **block movement**
- This often involves Force and Counterforce
- An example: Posterior Pelvic Tilt
  - Block anterior movement through appropriately angled pelvic positioning belt and possibly block forward migration of the ITs through an antithrust contour (pre-ischial shelf)
  - Block posterior movement through posterior pelvic contact of the cushion and/or back

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Providing Movement

- Traditionally, providing movement within the seating system has raised concern for the following reasons:
  - Loss of position as a result of movement
  - Increase in active extension as a result of movement
- However, **movement can be provided within a seating system in such as way as to actually better maintain postural alignment than through static seating**
  - And active extension is typically decreased…

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How can optimal client position be maintained through movement?

Hip Extension:

- By allowing the hips to extend through movement of the back, extension forces are **diffused**
- In addition, movement accommodates hip extension, removing **leverage** which can result in forward movement of the pelvis

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We can see this on the Mat Exam

- You are sitting behind a client on the mat table
- The client extends at the hips
- What do you do?
- If you lean into the client and try to block this extension, you will lose!
- Instead, you allow hip extension, wait for active extension to subside, and assist the client back to upright

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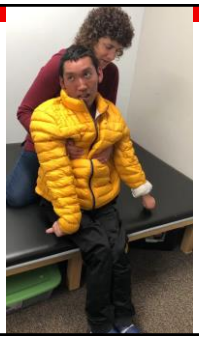
Let's Take a Look!



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An Example

- Remember Carl?
- Let's take another look at him before receiving a dynamic back
- And after…

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How can optimal client position be maintained through movement?

Lower Extremity Extension:

- By allowing the legs to extend through movement of the footrests, extension forces are **diffused**
- In addition, movement accommodates knee extension, removing **leverage** against the footplates which can result in pelvic elevation and posterior pelvic tilt
- The client may better tolerate **staying in contact with the footplates**, rather than simply extending away from this weightbearing surface

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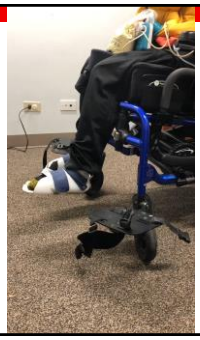
We can see this by …

- Swing away the static footrest hangers and observe
- Here, Jonathan is extending at his knees, showing the force that typically leverages off the footplate



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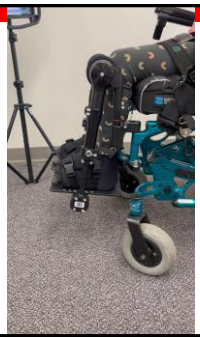
An Example

- Remember Alex?
  - Dynamic Footrests provide movement at the lower extremities, helping her to tolerate having her feet strapped to the footplates, diffusing force, and helping to keep her pelvis in position, in conjunction with a dynamic back.

Before



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An Example

- In this video, Dynamic Footrests are capturing and diffusing large forceful leg movements.
- Without Dynamic Footrests, Joe would not tolerate his feet being strapped to the footplates and his large, uncontrolled movements led to injury to himself and others.
- The Dynamic Footrests also help to keep his pelvis in position.

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How can optimal client position be maintained through movement?

Neck Extension:

- By allowing the neck to extend through movement of the head support hardware, extension forces are **diffused**
- In addition, movement accommodates neck extension and rotation, removing **leverage** against the head pads which can result in neck hyperextension and forward trunk movement

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We can see this by …

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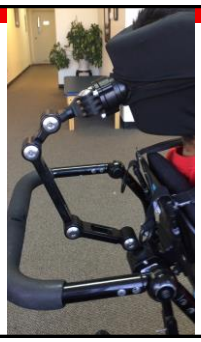
Let's Take a Look!

- Remember Jonathan?
- In this video, Dynamic Head Support Hardware diffuses significant forces.
- Jonathan exerts a great deal of force without losing contact with the head pad or moving into neck hyperextension.

Hyperextended Neck



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Let's Take a Look!

Neck Extension:

- Kian is leveraging off the static head support and pushing his trunk forward, as well as assuming a hyperextended neck position

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How can optimal client position be maintained through movement?

Large Forceful Movements

- By allowing the client to extend, rotate, and generally move through movement of the seating system, forces are **diffused**
- **Leverage** against various support surfaces is also reduced, helping maintain postural alignment with the seating system

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Let's Take a Look!

- Remember Colton?
- Colton has large, explosive, dystonic movements that used to pull him out of position
- The Dynamic Back absorbs his strong forces so that his pelvic position is maintained
- A Stealth i2i head support was later added which he tolerated, and which kept his trunk and neck in midline

Then he fell asleep…

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Let's take a look!

Amber has increased extensor tone and dystonia

She was readily moving out of alignment with her seating support surfaces and unable to return independently

Movement diffuses force and accommodates her movement. Even though her pelvis assumes an asymmetrical position, she returns to a neutral starting position as her forces diminish

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Summary

- How can Optimal Client Position be Maintained Through Movement?
  - Movement diffuses forces
  - Movement reduces the ability of the client to find leverage
    - "takes the wind out of their sails"

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3. Matching Client Need to Specific Product Features

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Movement at the Hips

- Movement which occurs within the seating system and/or wheelchair frame
  - Movement can occur at the hips
  - This is called a **Dynamic Back**

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So, how is movement provided?

- **Dynamic Backs**
- A Dynamic Back moves posteriorly in response to hip extension
- Energy is stored in a component such as an elastomer, hydraulic, or spring
- This energy is stored and returns the client to a starting position when active extension ceases

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Matching client need to specific product features

- What is required in Dynamic Back design to allow movement without loss of position?
  - A **pivot point** that matches the natural pivot point of the hip joint

Pivot point of Dynamic Back in line with natural pivot point of hip

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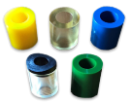
Matching client need to specific product features

- What is required in Dynamic Back design to allow movement without loss of position?
  - The **correct resistance** level
  - Too firm
    - Client cannot activate back
  - Too soft
    - Back engages during tilt or with backpack
    - Client cannot readily return to upright
    - Metal touches on either side of polymer
- Remember, elastomers need replacement due to wear and tear!



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Movement at the Legs

- Movement which occurs within the seating system and/or wheelchair frame
  - Movement can occur at the legs
  - This is called a **Dynamic Footrest**
    - Knee extension
    - Telescoping motion
    - Also, plantar /dorsi flexion and rotational footplate options

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So, how is movement provided?

- **Dynamic Footrests**
- A Dynamic Footrest moves downward and out into knee extension in response to force
  - Also into Plantar / Dorsi flexion
  - Also into Footplate Rotation
- Energy is stored in a component such as an elastomer, hydraulic, or spring
- This energy is stored and returns the client to a starting position when active extension ceases

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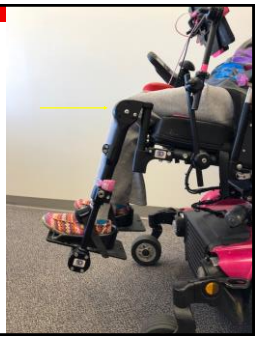
Matching client need to specific product features

- What is required in Dynamic Footrest design to allow movement without loss of position?
  - A **pivot point** that matches the natural pivot point of the knee joint



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Matching client need to specific product features

- What is required in Dynamic Footrest design to allow movement without loss of position?
  - The **correct resistance** level
  - Too firm
    - Client cannot activate footrests
  - Too soft
    - Client does not readily return to starting position
  - Remember, elastomers need replacement due to wear and tear!

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Movement at the Head

- Movement which occurs within the seating system and/or wheelchair frame
  - Movement can occur at the head
  - This is called **Dynamic Head Support Hardware**

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So, how is movement provided?

- **Dynamic Head Support Hardware**
- The Head Support moves posteriorly in response to posterior and/or rotational client forces
- Energy is stored in a component such as an elastomer, hydraulic, or spring
- This energy is stored and returns the client to a starting position when active extension ceases

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Matching client need to specific product features

- What is required in Dynamic Head Support Hardware design to allow movement without loss of position?
  - Direction and distance of movement are critical in preventing movement into neck hyperextension

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Summary

- Matching Client Need to Specific Product Features
  - Dynamic Seating pivot points need to be as close as possible to natural pivot points to provide movement readily in response to client force
  - The right resistance level provides ready movement and guides the client back to a starting position
  - In combination with appropriate seating, dynamic seating **provides movement without loss of client position** in relation to the seating support surfaces!

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Next Steps:

- Think of the clients you work with
- Do any of the clients move out of alignment with the seating support surfaces and are unable to reposition themselves? Despite appropriate seating interventions?
- Consider providing movement to maintain posture!

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Funding

Justifications:

- Focus on why Dynamic Seating is indicated
  - Safety
  - Implications if Dynamic Seating is not provided
  - Ongoing positioning – the client will require less repositioning and better maintain posture
- Seating Dynamics products are listed on some manufacturer's order forms, but are not standard and still need to be justified
  - Freedom Designs, Invacare
- More justification ideas on the Seating Dynamics website, Funding page

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Resources

- There are many resources on the Seating Dynamics website, including:
  - RESNA Position Paper on the Application of Dynamic Seating
  - Blogs
  - Case Studies
  - Literature Review
  - Clinical Guidelines
  - Funding Resources
  - On Demand Education
  - More!
- SeatingDynamics.com

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CEUs

- How will I receive my CEUs?
  - You will be sent an email following the presentation with a link to the post-test. After successfully completing the post-test, you will receive a CEU certificate via email from NRRTS.

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Contact Information

Michelle Lange
MichelleLange1@outlook.com

Seating Dynamics
www.seatingdynamics.com
303-986-9300

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