Positioning The Trunk

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Course Objectives:

The participant will be able to describe Kyphosis and seating interventions to address this concern.

The participant will be able to describe Lordosis and seating interventions to address this concern.

The participant will be able to describe lateral Scoliosis and trunk Rotation and seating interventions to address these concerns.

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What we will be Covering Today

Achieving and maintaining a neutral and upright trunk

Kyphosis

Lordosis

Rotation

Lateral Scoliosis

Combined spinal asymmetries

https://orthoinfo.aaos.org/en/diseases--conditions/fractures-of-the-thoracic-and-lumbar-spine/

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Why is this Important?

The position of the trunk, and subsequently the head, is very dependent on the position of the pelvis

Maintaining an upright trunk requires intrinsic muscle strength, balance, and stability

If a client lacks the intrinsic control, extrinsic supports are required

Gravity has a profound influence on the trunk

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Positioning Strategies

Not a cookbook approach

Can't really look at challenges in isolation

Always keep in mind the possible causes and your goals

Goals can be used as justifications for funding

Positioning Chart

- www.atilange.com under Resources
- See handouts

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A word about Assessment…

We are not going into Seating Assessment today

We are jumping into common seating challenges and interventions

But… don't forget that Mat Evaluation!

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Anatomy Review

Trunk
- Spine
  - Cervical C1-C7
  - Thoracic T1-T12
  - Lumbar L1-L5
- Rib cage
- Muscles
- Attached to the pelvis
- Attached to the skull

https://orthoinfo.aaos.org/en/diseases--conditions/fractures-of-the-thoracic-and-lumbar-spine/

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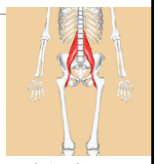
Anatomy Review

Key multi-joint muscles that impact trunk position

Hip Flexors – psoas (zo-is) major
- This muscle attaches to the femur at one end and all the lumbar and lowest thoracic vertebrae at the other
- Flexes and externally rotates the hip and stabilizes the lumbar spine with the abdominals
- If range is limited, the psoas will pull the pelvis into an anterior tilt and the spine into lordosis. External rotation may also be present.

Solution:
- Allow slight external rotation
- Stabilize pelvis
- Determine optimal seat to back angle on mat exam



Physio-pedia.com

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Positioning Strategies: Trunk

Forward Trunk Flexion - Kyphosis

Trunk Extension – Lordosis

Trunk Rotation

Lateral Trunk Flexion - Scoliosis

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The Relationship Between the Pelvis and the Trunk

Posterior Pelvic Tilt ⟶ Kyphosis

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The Relationship Between the Pelvis and the Trunk

Anterior Pelvic Tilt ⟶ Lordosis

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The Relationship Between the Pelvis and the Trunk

Pelvic Rotation ⟶ Spinal Rotation

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The Relationship Between the Pelvis and the Trunk

Pelvic Obliquity ⟹ Lateral Scoliosis

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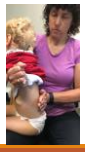
Reducible vs. Non-reducible

Spinal asymmetries may be reducible

- Client has a certain postural tendency
- This can be fully corrected to neutral by applying reasonable force and counterforce



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Partially Reducible

Many times, an asymmetry can be partially corrected toward neutral

The goal of seating is to correct as much as possible toward neutral without undue force/pressure to prevent or minimize this from worsening

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Non-Reducible

A non-reducible asymmetry cannot be reduced toward neutral

The goal of seating is to accommodate this asymmetry and maximize pressure distribution

Non-reducible asymmetries can worsen but typically will not improve short of surgical intervention

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Combined Asymmetries

These asymmetries can be seen at various levels of the spine

These asymmetries can be seen in combination with one another

i.e., lumbar lordosis, thoracic kyphosis, lateral scoliosis and rotation

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Ribcage Distortions

The ribs are attached to some of the vertebrae of the spine (T1-T12)

When the vertebrae are not aligned, this impacts the attached ribs

This can lead to distortions of the ribcage

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Kyphosis

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Forward Trunk Flexion

Kyphosis can be at various levels of the spine

May be combined with neck hyperextension

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Let's Try It!

Let's try it!

Sit up straight

Assume a kyphotic trunk position

What is your pelvis doing?

Where is your head?

Where is the pressure risk?

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Forward Trunk Flexion

Possible Causes:

- Flexion at hips
- Flexion at thoracic area
- Flexion at shoulder girdle with gravitational pull downward
- May occur from increased or floppy tone, abdominal weakness, poor trunk control, weak back extensors
- Increased tone (i.e. hamstrings) pulling pelvis back into posterior tilt
- Posterior pelvic tilt
- Habitual seating in an attempt to increase stability
- Sling back

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Forward Trunk Flexion

Interventions:

- If reducible:
  - Anterior trunk support
  - Posterior trunk support
  - Force and Counterforce

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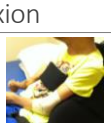
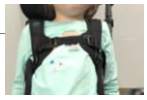
Forward Trunk Flexion

Anterior Trunk Supports

- Chest strap
- Shoulder straps
- Shoulder retractors
- Butterfly style vests
- TLSO





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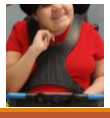

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Anterior Trunk Supports

Facilitate an upright trunk

Provide stability

Maintain client contact with the back

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Chest Straps

Provides anterior thoracic support across the chest and does not cross the shoulders

Prevents forward movement

Does not prevent trunk flexion above strap

Dynamic version allows movement forward and assist with return to upright
- Extends functional reach

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Chest Straps

Clinical Applications
- Minimal anterior support is required to prevent the client from leaning forward to the point that independent return to upright is not possible
- May be needed for transportation or uneven terrain

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Shoulder Straps

H-Harness style

Backpack style

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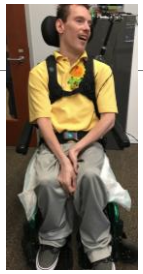
H-Harness Style

More contact

Less likely to fall off shoulders



Bodypoint

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Backpack Style

Work well for a women's figure

Less contact

Better for shoulder retraction

Can see clothes better

Bodypoint

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Shoulder Straps

Clinical Applications:
- Targeted anterior thoracic support over the clavicles
- Promotes trunk extension and scapular retraction
- More upright trunk and improved head position

Bodypoint

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Shoulder Retractors

Designed to encourage an upright trunk by "prompting" the client to extend when contacting the pad

May be useful for clients who tend to "hang" on shoulder straps

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Anterior Vest

More anterior contact than other options

Less retraction than shoulder straps

Dynamic version allows movement forward and assist with return to upright
- Extends functional reach

Various styles
- Increased contact area or
- Contoured style

Bodypoint

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Anterior Vests

Clinical Applications:
- Facilitates upright trunk
- Provides stability
- Maintains client contact with the back

Precautions:
- Make sure this isn't positioned too high, as this can lead to choking
- Use with pelvic positioning belt, or client could slide down and choke

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An Example

Ally

20 years old

Cerebral Palsy, seizures, post-hemispherectomy

Ally uses an Anterior Vest in a style that is appropriate for a woman's figure

When she sits up straight, this fits her ok

But her trunk collapses forward, and the vest is too high

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An Example

Let's take a look from the side…

What's wrong with this picture?
- The straps are attached too low
- The seating system isn't matching her seated angles

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An Example

And from above…

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An Example

So, what did we do?

- Molded seating system
- Matched her required seating angles
- Appropriate anterior support
  - Shoulder straps

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Before and After

Yeah, I know. A vest. Sigh.

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Before and After

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Combination Anterior Trunk and Pelvic Supports

Some combination supports are available

Often in Adaptive Strollers

Similar to 5 point harness in car seats

Due to the attachment between the trunk and pelvic supports, neither can really do its job

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Trunk Flexion

Alex is still hanging on his shoulder straps

What to do?

- Hint: is his head over the pelvis?
- Find point of balance
  - Determines seat to back angle

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Biangular Back

Posterior Trunk Support

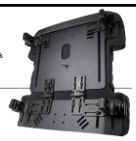
The lower portion ends at the PSIS
- Posterior superior iliac spine

The upper portion extends slightly beyond the angle of the lower portion
- Fixed – typically 7 degrees
- Adjustable angle available

Encourages trunk extension

Other backs incorporate this shape
- Tarta

Stealth Products TFB linear bi-angular back modification



Stealth Products Tarta Back

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Stealth Products Epic Back

2 piece highly adjustable back

Designed to maintain pelvis in neutral during movement

Moves at pelvis spine junction

New product

Postural Variation system

Encourages trunk extension

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Forward Trunk Flexion

Interventions:
- If non-reducible:
  - *Open seat to back angle to match pelvis angle
  - Contoured back to accommodate trunk
  - Tilt seating system to allow upright head

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Non-Reducible Kyphosis

Tilt to balance head over pelvis

Head behind pelvis to reach point of head balance

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Forward Trunk Flexion

Goals
- Prevent spinal changes and subsequent pelvic changes
- Neutral alignment of trunk over pelvis
- If reducible, anatomical alignment
- Increase head control
- Trunk extension
- Pressure distribution
- Maintain good visual field

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Kyphosis Summary

- Kyphosis and posterior pelvic tilt are typically seen together
- Kyphosis leads to forward neck flexion or hyperextension
- Strategies differ if the Kyphosis is reducible or not

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Lordosis

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Lordosis

Hyperextension of the lumbar area

Often combined with anterior pelvic tilt

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Let's Try It!

Let's try it!

Sit up straight

Assume a lordotic trunk position

What is your pelvis doing?

Where is your head?

Where is the pressure risk?

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Lordosis

Possible Causes:

- Tight hip flexors or over correction of tight hip flexors
- Increased tone pulling pelvis forward into an anterior tilt
- Habitual posturing in an attempt to lean forward for functional activities
- "Fixing" pattern to extend trunk against gravity (e.g. in conjunction with shoulder retraction)

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Lordosis

Interventions

- If reducible:
  - Provide lower back support as needed
  - Biangular back
  - May need to change seat to back angle
  - Do not over correct limited hip flexion
    - Pulls the pelvis into anterior tilt
  - May require anterior trunk support

Therafin

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Abdominal Panels

Abdominal Panel or Belly Binder

Circumferential support

Must span lower ribcage and upper pelvis

Reduces lordosis and anterior pelvic tilt

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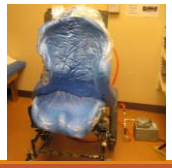
Lordosis

Interventions
- If non-reducible:
  - Molded seating system to accommodate asymmetry and distribute pressure

Aspen Seating mold



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Lordosis

Goals:
- Neutral alignment of trunk over pelvis
- Pressure distribution
- Reduce subsequent shoulder retraction and fixing to allow function
- Reduce subsequent anterior pelvic tilt

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Lordosis Summary

Lordosis is typically seen in conjunction with anterior pelvic tilt
- See the Wheelchair Positioning: the pelvis course

Lordosis tends to lead to a 'head forward of pelvis' position

Requires posterior and anterior support as well as optimal seat to back angle for an individual

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Trunk Rotation

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Trunk Rotation

Often seen in combination with lateral flexion

Often seen in combination with pelvic rotation

Possible Causes:
- Pelvic rotation
- Lateral trunk flexion causes

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Let's Try It!

Let's try it!

Sit up straight

Assume a rotated trunk position

What is your pelvis doing?

Where is your head?

Where is the pressure risk?

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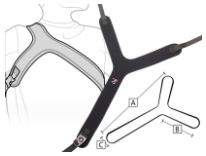
Trunk Rotation

Interventions:
- See pelvic rotation interventions
- If reducible:
  - Use anterior supports on forward side, if rotation is primarily from upper trunk
  - Y-strap, if entire trunk is involved



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Y Straps

Y Straps provide some anterior thoracic support

Primarily designed to de-rotate the trunk

Available in a dynamic version

Clinical Applications:
- Shoulder straps can often limit trunk rotation
- If shoulder straps are inadequate, a Y Strap can be used
  - Applies forces above and below the shoulder


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Trunk Rotation

Interventions:
- If non-reducible:
  - If the trunk is non-reducible and in rotation, the primary goal is to allow the client to face forward
  - This may require placing pelvis asymmetrically in seating system
  - A molded back may be required to distribute pressure behind pelvis and trunk

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Trunk Rotation

Goals:
- If reducible:
  - Neutral alignment of trunk over pelvis
  - Correct pelvic rotation
- If non-reducible:
  - Pressure distribution
  - Forward facing posture

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Trunk Rotation Summary

Spinal rotation is often seen in conjunction with pelvic rotation

Rotation is also often present in combination with other spinal asymmetries

The priority is for the client to face forward

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Lateral Scoliosis

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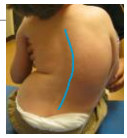
Lateral Trunk Flexion

Lateral trunk flexion is often referred to as a scoliosis

It is important to be clear, as 'scoliosis' can also be used to describe any spinal curvature

Scoliosis may be C curve, S curve, and/or rotational

Scoliosis may be reducible, partially reducible, or non-reducible



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Let's Try It!

Let's try it!

Sit up straight

Assume a laterally flexed trunk position

What is your pelvis doing?

Where is your head?

Where is the pressure risk?

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Lateral Trunk Flexion

Possible Causes:

- Increased tone on one side
- Musculature imbalance, may have pelvic involvement
- Decreased trunk strength or decreased tone, causing asymmetrical posture
- Habitual posturing for functional activity or stability

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Lateral Flexion

Often worse with effort…

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Lateral Trunk Flexion

Interventions:

- If reducible:
  - Generic contoured back
  - More targeted contoured backs often add more lateral support

Stealth Products Ultra Lightweight Pediatric Back

Stealth Products ADI Backs

With added laterals

Stealth Products TrueForming/Nucleus Backs

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Backs

There are many "off the shelf" backs which incorporate various levels of support

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Backs

Height of the back corresponds to client parameters
- Degree of trunk postural support required
- Self-propulsion needs

Stealth ADI Backs

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Backs

Stealth Tarta Back
- Modular system
- Can form to bi-angular shape
- Dynamic

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Lateral Trunk Flexion

Interventions:
- If reducible:
  - Lateral trunk supports (may need to be asymmetrically placed, one lower at the apex of lateral convexity for that force and counterforce)
  - Anterior trunk supports to correct any rotation (see forward trunk flexion interventions)

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Lateral Trunk Supports

Flat or curved pads

Swing-away

Adjustable width

Size

Angles of adjustment

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Lateral trunk supports

Lateral trunk support examples

Stealth – variety of angles

AEL curved lateral trunk support

All Season Mount

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Lateral Trunk Flexion

Interventions, continued:
- If non-reducible:
  - Refer to physician to explore medical or surgical procedures, x-rays
  - TLSO
  - Aggressively contoured or molded back to allow for non-reducible curvature of spine and/or rib cage
  - Horizontal tilt under seat to right head, if pressure distribution is good

Motion Concepts

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Lateral Trunk Flexion

Goals:
- Neutral alignment of trunk over pelvis, if reducible
- Minimize subsequent changes in pelvic and lower extremity posture
- Level head over trunk for increased vision, social interaction
- Pressure distribution

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Lateral Trunk Flexion Summary

Lateral trunk flexion is commonly seen with pelvic obliquity

Alignment balanced with pressure distribution and tolerance is critical

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Non-Reducible Spinal Asymmetries

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Non-Reducible Spinal Asymmetries

Spinal asymmetries often present in combination with one another and may be partially reducible or completely non-reducible

Curvatures of the spine directly impact the shape of the rib cage

Goals:
- Accommodate and support asymmetries
- Pressure distribution
- Minimize future progression
- Comfort
- Optimize trunk and head control and balance

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Case Study

Anderson

Age 12

Diagnosis: cerebral palsy

Lordosis, Kyphosis and Lateral Scoliosis

Lordosis

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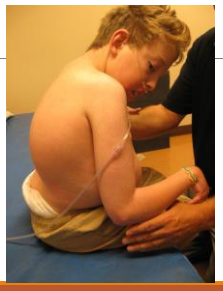
Case Study

Kyphosis



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Case Study

Lateral Scoliosis
- Note skin fold

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Case Study

Anderson required molded seating to accommodate and support his spinal curvatures and ribcage distortions

With the appropriate "shape capture" and seat to back angle, Anderson was able to align and balance his head with minimal support

Aspen Seating

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Case Study

Anderson's shape capture

Aspen Seating

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Case Study

Joshua

Age 7

Diagnosis: cerebral palsy

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Case Study

Joshua was seated in an Aspen ASO

Demonstrates strong extension, lordosis, rotation and neck hyperextension

Agitated

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Case Study

Joshua's "key point of control" was his trunk. If we could prevent the lordotic extension, then the generalized extension and rotation were minimized

We were able to control the lordotic extension with a belly binder

Aspen Seating

101

Case Study

Another key point – his head

Joshua tended to hyperextend in response to pressure on the occiput

He also tended to "hook" under his current head support

The i2i head support prevented hooking and did not contact the occiput

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Case Study

With his extension under control and his new head support, Joshua was able to use shoulder elevation to activate a switch over his right shoulder with good isolation

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Requirements To Receive Credit

A QR Code will be provided in order to "sign in" for the class. Please scan it with your phone camera. It will direct you to a website to enter your information for attendance.

Within 24-48 hours of the conclusion of the class, a link will be sent to your email.

- A **course evaluation** will need to be completed.
- Upon completion of the post-course evaluation, the CEU Certificate is immediately available to you. This will be located under your Achievements near the top of the screen.

A PDF Copy of the PowerPoint will be emailed to you in the next 24-48 hours for your reference.

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Final House Keeping

Within 1 – 2 days you will receive an email

- This email will contain a link to the quiz. The link is safe and will say Pridelearninginstitute.litmos.com. Click on the link and it will bring you to the evaluation for the course.
- This email will also have the PDF of the course and directions to complete the process below.

Click the start button to fill out the course evaluation.

Near the top left of the page, you will see the achievements tab. Click on achievements tab and find the title of the course taken. Next to the course title will be a link to download certificate. Download the certificate and print or save it on your computer.

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