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WHEELCHAIR SEATING FOR KIDS: what's different?

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

Stealth Products linear seating system

Access to Independence

Learning Objectives

1. Participants will be able to list 3 specific wheelchair seating factors.
2. Participants will be able to list three possible interventions to address each of these seating factors.
3. Participants will be able to describe common changes seen in pediatric seating needs over time.

CONTINUED™

What We Will Be Covering:

- Pediatric Seating
  - Dependent upon mobility base
  - Size range
  - Growth
  - Accommodating changes to medical condition
  - Seating categories
  - General seating principles
    - Increased muscle tone
    - Muscle weakness/paralysis
  - Case Studies throughout

Quickie Zippie TS

Pediatric Seating

- So what is the difference between wheelchair seating in kids vs. adults?
- In general:
  - Kids are smaller
  - Kids grow
  - Kids change
  - Kids are more likely to be in a dependent mobility base
  - Kids don't sit in a wheelchair seating system for long periods of time
    - More likely to use a variety of positions
  - Kids are less likely to develop pressure injuries

Pediatric Seating – Unique Considerations

- The seating system is dependent upon the mobility base
- The size range of the seating system and mobility base
- Accommodating growth
- Accommodating changes to the child's medical condition

Poll Time

- Are you involved in Pediatric Seating Evaluations?
  - Yes, I am on the evaluation team
  - No, I am able to provide input for the evaluation
  - No, I work with children in their recommended equipment
  - No, but I want to!

Seating is Dependent on the Mobility Base

Seating is Dependent on the Mobility Base

- Adaptive Strollers
- Manual Wheelchairs, Dependent
- Manual Wheelchairs, Independent (self propulsion)
- Power Wheelchairs

Jay ConfigureFit

Adaptive Strollers

- Pros:
  - Size range starts at infant
  - Families often accept this more easily than a wheelchair
  - Often lightweight and easy to fold
  - Tilt and recline options
  - Options to support medical equipment
  - Hi Low base options
  - Tandem options

Convaid Cuddle Bug

Adaptive Strollers

- Cons:
  - Often minimal seating options
    - Lack of support and stability
  - Often fixed posterior tilt
    - Not a functional position
  - Dependent mobility
    - Small wheels, too far back

Kid Kart Mighty Lite

Adaptive Strollers

- Cons, cont.:
  - Hard to mount SGD to frame
    - Tube size and strength
  - Some have little growth
    - Replacement sooner
  - Some have little frame adjustment
    - Less ability to meet complex seating angles
    - Less accommodating of change

Convaid Cruiser

Case Study

- Riley
- Age 3
- Rare genetic disorder
- Currently in stroller with standard seating
- Chest straps attach to pelvic belt
  - This reduces the effectiveness of each
- Lateral trunk curvature
- Pelvis: posterior tilt, oblique, rotated

Case Study

- Riley
- Evaluated for molded seating system
- Why?
  - Significant need for postural support due to very low tone
  - Developing scoliosis already – needs intimate support to limit this

ATNR influencing posture, lateral trunk flexion

Case Study

- Riley

Postural collapse due to low tone

Significant support needed to achieve neutral pelvis and trunk extension

Riley in demo molded seat (Aspen Seating Orthosis or ASO)

Case Study

- Riley received new ASO and pediatric dependent MWC
- She will be evaluated for power mobility in the near future

Quickie Zippie IRIS

Manual Wheelchairs

- Dependent
- Independent

MWCs - Dependent

- Seating implications
  - Size range
  - Growth
  - Seat to back angle adjustments
    - Influences posture
  - Seat to floor height
    - Transfers
    - Access to work surfaces
      - Kids have a wide variety of surface height needs

MWCs - Dependent

- Seating Implications: Dynamic Seating
  - Dynamic backs
  - Dynamic footrest hangers
  - Dynamic headrests
  - *Video

Seating Dynamics

MWCs - Dependent

- Seating Implications: Dynamic Seating
- Dynamic Seating is typically used on Dependent MWCs or PWCs due to weight and the clients who tend to use this technology
- Goals:
  - Absorb and diffuse forces
    - Protects client and wheelchair/seat from damage
    - Reduces extension
  - Provide movement
    - Vestibular input
    - Calming, increased alertness

Kid Rock

MWCs - Dependent

- Seating implications
  - Tilt
  - Adds weight and wheel placement makes self-propulsion difficult
  - Much more common than Recline in the pediatric population
    - Postural management
      - Trunk and head control
    - Fatigue management
    - Medical management
      - i.e. post seizure
    - Functional tasks
      - Feeding, vision

Ki Mobility Focus CR

MWCs - Dependent

- Seating implications
  - Support of medical equipment
    - Oxygen
    - Vent tray
  - Folding
    - for transport
  - Crash tested
    - for transport, i.e. school bus
  - Stroller handles
    - For caregiver propulsion

Case Study

- Lily
- Cerebral Palsy
- 6 years old
- Tilt in space MWC
- Linear Seating System
- Hensinger collar

Case Study

- Lily
- Sitting with good alignment
- Functional position for her
- Wheelchair frame and LSS will accommodate future growth
- Not currently a PWC candidate due to significant visual limitations
- Using a SGD well through auditory scanning

MWCs - Independent

- Pros:
  - Many options available:
    - Frame adjustment
    - Growth
    - Seating options
    - Tilt, recline, elevating leg rests, standing
      - Not on lightweight versions
    - Some are crash tested

Invacare MVP Jr.

MWCs - Independent

- Cons:
  - Some are not crash tested
  - Ultra Lightweight chairs are harder to fund
  - Caster/footplate interference issues
  - Repetitive stress injuries
  - Can be fatiguing and time consuming for long distances, varied terrain

Ti Twist

MWCs - Independent

- Seating: So what's different vs. Dependent MWCs?
  - Seating angles may change for a self-propeller, as this is a different task, to optimize mobility and stability
    - Dump, increased knee flexion
    - Generally a more closed seat to back angle than dependent base

Zippie X'cape

MWCs - Independent

- Seating: So what's different?
  - Back height may be lower to allow more upper extremity, including scapular, movement

Invacare Crossfire

MWCs - Independent

- Seating: So what's different?
  - In linear seating, an I or T back may be used to get lateral chest pad hardware a little more out of the way
  - This allows for improved self-propulsion, keeping arms close to trunk

Linear back

I back

T back

Stealth Products

MWCs - Independent

- Seating: So what's different?
  - If the frames is very lightweight, the seat needs to be lightweight, too (or you may as well get a heavier, less expensive chair!)

MWCs - Independent

- Growth
  - Frames vary tremendously in growth
  - Most kids need more linear growth than width
  - Little chairs have low seat to floor height for transfers, but less growth

Quickie Kidz – very low seat to floor height

Freedom 2 Kids

Case Study

- Alexis
- Cerebral Palsy
- Age 9
- Currently in dependent mobility base

Case Study

- Alexis
- Unable to self-propel due to:
  - Current wheels are too far back and too small
  - Base is heavy
  - Seat is heavy

Case Study

- Alexis
- He was able to self-propel an appropriately configured ultra lightweight MWC with a lighter weight seating system
- Recommended an off the shelf cushion and back which met his needs
- Seating goal: facilitate self-propulsion and provide adequate support and pressure relief in as light a seating system as possible

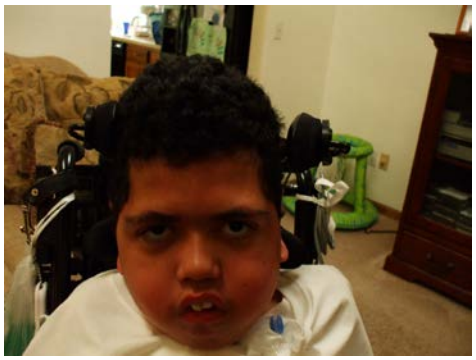
Power Wheelchairs

- Seating
  - Sling seating generally not accommodated
  - Cushions, LSS and molded
  - Seat to back angle usually adjustable
  - Power tilt and recline typically available
  - Weight of the seating system is not an issue

Otto Bock Skippi

Case Study

- Julian
- Age 12
- SMA, type 1
- Using a PWC since age 3



Case Study

- Julian
- Due to profound muscle weakness
  - He requires significant postural support
  - His trunk has experienced postural collapse and asymmetries
  - He cannot shift his weight and needs another means to do so
- Due to ventilator use, his trunk is “barrel” shaped

Case Study

- Julian
- Seating: molded
- Mobility: power wheelchair with a combination of proximity and fiberoptic switches to capture small movements with no force

Questions?

Size Range

- Size of the seating system and the mobility base
  - Very small through adult size
  - Children out of the NICU
    - Thru…
  - Teens who are as tall and heavy as the average adult

Poll Time

- What age children are you working with? (mark all that apply)
  - Birth through 3
  - 3 – 5 years
  - 5 – 10 years
  - 10 – 18 years

Accommodating Growth

- Available growth
  - In seating system
    - Before replacement is required
    - Typically 1-3 years
  - In mobility base
    - Before frame is grown
    - Before replacement is required
    - Typically 3-7 years

Changes to Medical Condition

Accommodating Changes to the Child's Medical Condition

- Progressive conditions
- Orthopedic surgeries
- G-Tubes
- Tone management
- Orthopedic changes

Changes: Progressive Conditions

- Progressive conditions
  - Most common: spinal muscular atrophy
  - Metabolic conditions can worsen, as well
  - Increasing need for postural support
  - Increasing need to accommodate changes in body shape secondary to postural collaspe

Case Study

- Farrid
- Age 12
- SMA type 1
- Spends most of his time in bed as he does not have adequate support in his wheelchair seating system

Case Study

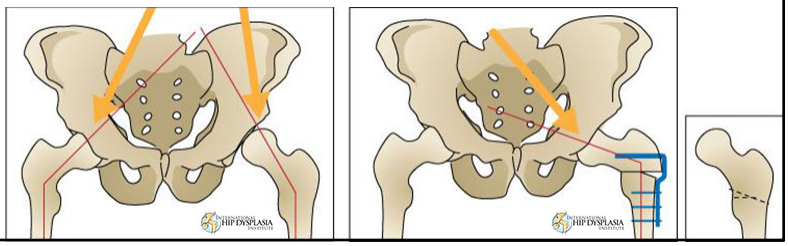
- Farrid
- Goals:
  - Significant postural support
  - Postural alignment and support to minimize future asymmetries
  - Provide weight shift
  - Accommodate changing needs

Case Study

- Farrid
- Solution:
  - Molded seating system which can modified and grown for a reasonable amount of time
  - Aspen Seating Orthosis (ASO)
    - 3 year warranty

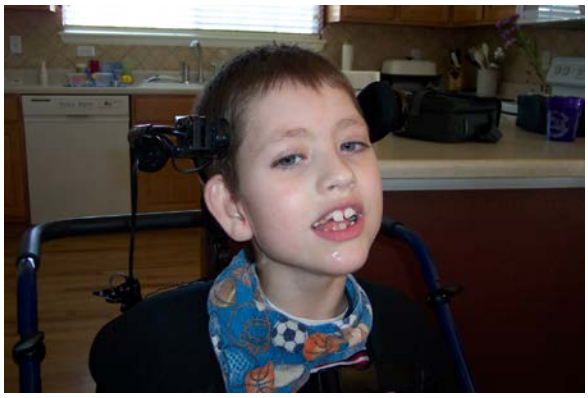
Changes: Orthopedic Surgeries

- Orthopedic Surgeries
  - Orthopedic:
    - Tendon releases
      - affects ROM
    - Hip osteotomies
      - Can change hip width (i.e. hardware)
      - Can change available range
    - Spinal fusion
      - change in height and shape of trunk



Case Study

- Brady
- Age 16
- Cerebral Palsy
- Spinal Fusion



Case Study

- Brady developed a spinal curvature at a young age, around 7
- Molded seating was recommended to limit progression of the curve
- He underwent surgery for an adjustable growing rod to limit further curvature and post-pone the need for spinal fusion
- In his mid-teens, the spine was fused

Case Study

- Brady
- With his spine now fused
  - He did not require as much postural support
  - The seating system did not need to limit his spinal curvature
- He was able to use a linear back and off the shelf cushion

Changes: G-Tube

- G-tubes
  - Sudden weight gain and, often, growth
  - This weight gain may be a significant percentage of the child's weight

Case Study

- Taylor
- Age 8
- Cerebral Palsy
- 28 lbs
- Very thin

Case Study

- Taylor received a G-tube
- He gained about 10 lbs over 3 months time
- His seating system had to be modified to accommodate the change in width
- He subsequently experienced a growth spurt, also requiring growth to the seating system and wheelchair frame

Changes: Tone Management

- Tone management
  - Oral medications
  - Baclofen pump
  - Dorsal Rhizotomy
  - Can change tone, ROM, strength and support required

Baclofen Pump

Changes: Tone Management

- How much is too much?
- If a child has received too much tone medication, you may note the following changes:
  - Decreased head control
  - Decreased trunk control
  - Increased difficulty managing secretions

Case Study

- Brian
- Age 10
- Cerebral Palsy
- Baclofen Pump
  - Recent dose increase
  - Decreased trunk and head control, as a result

Neck hyperextended and "propped"

Or hanging forward…

Brian – seat to back angle

- Head support adjusted
- Seat to back angle opened to accommodate lack of hip flexion
  - Reduced posterior pelvic tilt
- Call to medical team re: dose

Changes: Orthopedic Changes

- Orthopedic changes
  - Spinal curvature development due to:
    - Sudden growth spurts
    - Muscle imbalance
    - Muscle weakness
  - Lack of weight bearing and muscle imbalances can lead to hip subluxation, dislocation

Case Study

- Truett
- Age 3
- Spinal Cord Injury
- Developing scoliosis

Case Study

- Despite his young age and growth potential, a molded seating system was recommended to provide adequate postural support, pressure distribution and **to limit the progression of his spinal curvature**
- He also uses a stander to provide some weightbearing

Poll Time

- What changes do you find impact seating the most?
  - Progressive conditions
  - Orthopedic surgeries
  - G-Tubes
  - Tone management
  - Orthopedic changes

Other Changes

- As kids grow and mature, their environments change
  - Home based use
  - Day care and Preschool
  - Elementary and beyond
  - Community needs
- How does this impact seating?
  - Seat to Floor height
    - Transfers
    - Work surfaces
    - Dependent on mobility base and seating

Other Changes

- As kids grow and mature, their needs and functional tasks change
- The seat now must provide the necessary stability for tasks and not limit required movement

Questions?

Seating Categories

Seating Categories

- Sling
- “Off the Shelf” cushions and backs
- Linear seating systems
- Molded seating systems

Seating Category: Slings

- Sling seating
  - Not often used in Pediatrics
  - Poor support
  - No growth
  - Sling seats lead to:
    - Hip adduction, internal rotation
    - Posterior pelvic tilt
  - Sling backs lead to:
    - Posterior pelvic tilt
    - Kyphotic posture

Seating Category: off the shelf

- Off the Shelf Cushions and Backs
  - Off the shelf – not customized the user except to match dimensions
  - Designed for positioning, pressure relief or both
  - Various materials and covers
  - Typically generic contours
  - Not a lot of growth

Sunrise Jay Off the shelf cushion and back

Case Study

- Brady
- Age 16
- Cerebral Palsy
- With his spine now fused
  - He did not require as much postural support
  - The seating system did not need to limit his spinal curvature
- He was able to use a linear back and off the shelf cushion

Seating Category: Linear

- Linear Seating Systems (LSS)
  - Flat or generically contoured primary and secondary support surfaces
  - Typically foam
  - Option with the most growth
    - More common in pediatrics

linear

Seating Category: Linear

- Linear Seating Systems (LSS)
  - Customization
    - Dimensions
    - Angles
  - Adjustment
    - Can position secondary supports where needed
    - Angles
    - Growth

Case Study

- Wyatt
- Age 11
- Cerebral Palsy
- Linear Seating System
- This is adequate to support his postural and alignment needs
- Also accommodates growth and other changes

Seating Category: Molded

- Molded seating
  - Molded to the client for maximum pressure distribution, postural support and stability
  - Least amount of growth
  - Costly
  - May restrict movement

Invacare molded Contour U

Case Study

- Emilia
- 6 years old
- Cerebral palsy, Greig Syndrome
- 43 degree spinal curvature
- Requires intimate contact to limit the progression of her curvature
  - 24 hour postural care

Questions?

General Pediatric Seating Guidelines

General Pediatric Seating Guidelines

- Many children requiring a mobility base have
  - abnormal muscle tone,
  - muscle weakness, or
  - paralysis

Seating Guidelines

- Abnormal Tone
  - Decreased
  - Increased
  - Mixed
    - Low tone trunk
- Goals:
  - Postural support
  - Postural alignment
    - Orthopedic change risk
  - Identifying posture that limits tonal patterns
    - i.e. extension

Seating Guidelines

- Muscle Weakness
  - Postural support
    - Support against gravity
    - Limit orthopedic changes
  - Accommodating any asymmetries
  - Pressure distribution and relief
    - Due to lack of movement

Seating Guidelines

- Paralysis
  - Postural support
    - Support against gravity
    - Limit orthopedic changes
  - Accommodating any asymmetries
  - Pressure distribution and relief
    - Due to lack of movement and sensation
  - Accommodating medical equipment
    - Mobility base

Questions?

Case Study

- Brady
- Age: now 14 years old
- Diagnoses:
  - Cerebral palsy
  - Movement disorder
  - CVI
  - Medically fragile
  - Scoliosis

Referral

- Brady was being seen by a speech language pathologist at The Children's Hospital in Denver
- She referred Brady for an access evaluation, as he was having difficulty progressing due to little to no access
- Brady was 7 years old and in 1st grade.
- He was receiving OT and PT
- He had been evaluated by the Augmentative Communication Team at age 4 and more recently by the school AT team

Current Positioning

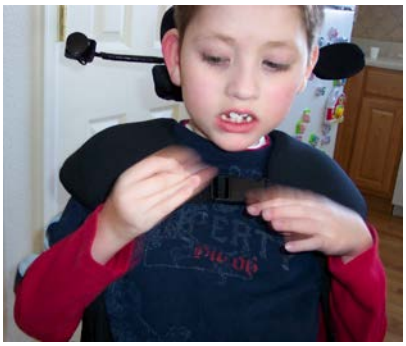
- Brady was seated in a custom molded seating system (Aspen Seating Orthosis) set on top of a Snug Seat Panda seating system. He was positioned well, though his neck was hyperextended.
- He had a dependent mobility base, a Snug Seat Tiger, and a hi-low base.

Evaluation: Positioning

- Identified problems:
  - Lack of stability at the head
  - Scapular protraction and shoulder rounding, pulling the head forward
  - Elbow flexion pattern, leading to ROM loss
  - No support at feet for stability

Current Access

- Brady was using a Big Mack with his right hand. He required assistance to reach and press this switch surface. His movement patterns pull his hands up to his face.



Evaluation: Access

- Brady did not display adequate motor control for direct access
- Brady's vision was quite impaired, so he required auditory scanning which works best using a single switch
- With increased stability at the head and feet, as well as a bit more upper trunk retraction and extension, Brady could use a switch by either side of his head.

Access Recommendations

- Brady demonstrated his best control at the right side of his head, so an AbleNet Spec switch was placed on the headrest in this location. It can be swung away when the SGD is not being used.
- A speaker was placed on the left side for private listening of auditory cues and to provide a lateral “template”

Positioning Recommendations

- Stealth headrest with occipital pad, suboccipital pad, left lateral spot pad with imbedded speaker (for SGD auditory scanning) and right lateral switch (for SGD access).

Positioning Recommendations

- Shoulder pads to retract scapulas and extend upper trunk to improve head position for access.

Positioning Recommendations

- Ankle Huggers to increase overall stability and reduce tremoring

Application Recommendations

- Recommended return to TCH AAC program for another evaluation with new positioning and access.
- Eventually, a new SGD was recommended to meet his communication needs.

Changes over the years…

- Communication:
  - Brady moved from a PRC SpringBoard to an ECO
  - He is spelling
  - He generates unique sentences
  - He can use the SGD to control the TV and DVD player
  - He is beginning to send messages to a word processing program on the computer

Changes over the years…

- Positioning:
  - Moved to MWC which was more stable and has more growth
  - Ankle huggers to shoeholders
  - Shoulder pads to shoulder straps

Changes over the years…

- Positioning:
  - Brady had a spinal fusion
  - He no longer required a molded seating system and a linear back and off the shelf cushion were recommended
  - Brady had persistent redness over one IT on the new cushion
  - Several others were trialed with similar results
  - Finally, he was molded for a unique off the shelf cushion

Jay 3

Ride Custom Cushion

- A unique cushion of Brock foam, customized to client
- Pros:
  - Moderate to Maximum pressure relief
  - Stabile
  - Lightweight
  - Washable
  - Custom fit

Ride Custom Cushion

- Cons:
  - Expensive
  - Have to work with someone who is trained

Ride Cushion Molding Process

- Simulator ships in a box in the desired size and is placed in client's wheelchair

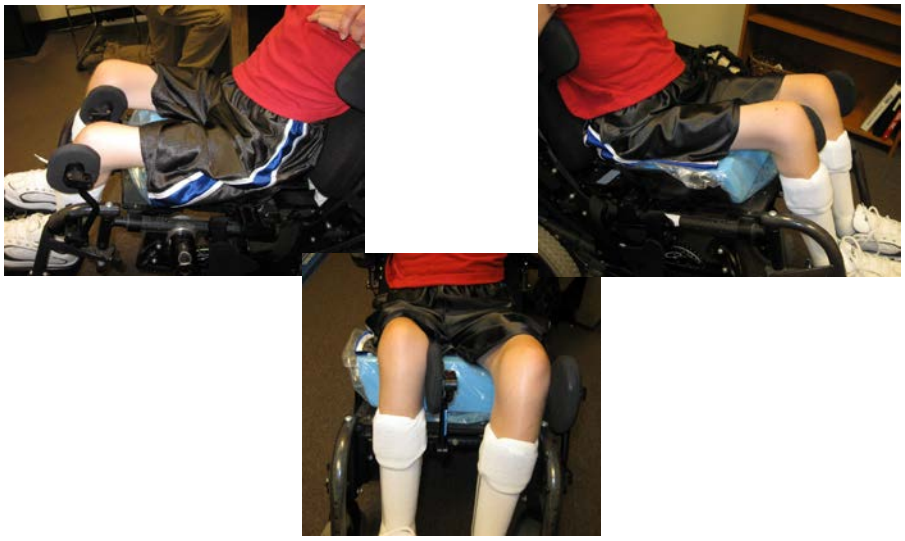
Ride Cushion Molding Process

- The client is placed very carefully into the desired position
- The client is then "pressed" down into the molding foam

Ride Cushion Molding Process

- Video

Ride Cushion Molding Process



Ride Cushion Molding Process

Ride Custom Cushion

- Ship it back
- Wait for delivery

Final results

- Brady is very stable on the new cushion and the redness has resolved
- Lesson learned: pediatric seating is always a moving target! Kids change!

Questions?

Take Home Message:

- Pediatric Seating has unique challenges, primarily change:
  - Physical growth
  - Developmental changes
  - Medical changes
  - Environmental need
- Pediatric seating is very dependent upon the mobility base, as well

Thanks!

Contact Information:

- Michelle Lange
- www.atilange.com
- MichelleLange@msn.com