Learning Objectives:

- Discuss 2 anatomical differences that must be considered when seating a child compared to an adult.
- Identify the impact of early mobility experience in relationship to cognitive, visual, perceptual, and social development.
- Compare and contrast the pros and cons of using manual mobility or powered mobility in young children.

Ergonomic Seating: A True Challenge

“The human body is a dynamic, plastic organism, which changes, develops and maintains its functions via correct and constant physical stimulation.”

Bengt Engstrom

What We Should Know About Pediatrics...

- Developmental differences
  - Neurological
  - Anatomical
  - Muscular
- Different learning patterns
- Altering clinical expectations
  - Propulsion characteristics
  - Reciprocating motion
  - Duration of activity

Neurological Development: The Ability to Sit

- Sitting is a functional position developed with a dynamic interaction of all systems and the environment
- Typically developing infants do not sit and function from this position until 6-12 months
  - Must consider “abnormal” development as a limiting factor to trunk control and UE movement
  - Set appropriate goals based on current stage of development
Not Just “Little Adults”

- Pelvic Development
  - The pelvis is composed of 3 bony areas:
    - Ischium
    - Pubis
    - Illium
  - Fusion does not occur until teen years
  - Abnormal growth/development impacts shape and depth of acetabulum

Seating Implications

- Children sit with more external rotation and abduction
- Pelvis is susceptible to high forces which may result in permanent bony changes as the child grows/develops (don't over position)
- Forcing into adduction (legs together) may result in hip dislocation

Spinal Curves

- Newborn – Physiological Flexion
  - Limited ROM
  - Soft tissue and capsular inflexibility
  - Short iliopsoas/hamstring
Newborn – Physiological Flexion

Cervical Lordosis:
- 3-6 months of age
- Based on positional changes and ability to lift head in prone
- Ligaments/muscular structures can become overstretched
- Bony orientations may change

Secondary Spinal Curves

Lumbar Lordosis:
- 8-18 months
- Onset of weight bearing and walking
- Younger children: don’t expect a lumbar curve
- Functional anatomy: lumbar lordosis in standing, not seated!

What Should We See?

True 24 Hour Positioning

- Provide position options:
  - Prone/Supine
  - Standing
  - Sitting
- Challenge the sensory and motor systems
  - Unstable surfaces
  - Exploring the environment
  - Play activities

Not Just “Little Adults”

- Muscle strength and endurance
- Motor control
- Fine motor vs. Gross motor skills
- Learning potential
  - Age
  - Ability to follow directions
  - Play as “therapy”
What if I were to tell you...

That there is a treatment option out there that has the potential to improve the cognitive, motor, social, and language skills of a child with a mobility impairment?

The Importance of Independent Mobility

- Function
- Cognitive Development
- Visual Development
- Perceptual Development
- Social Interaction
- Confidence
- Enhances Learning

Let Kids Interact With Peers

AGE APPROPRIATE MOVEMENT...

- Crawling Baby: 20% hr, +500 steps, +150 ft
- Walking Baby: 33% hr, +1000 steps, +1/4 mile
- Toddler: +10,000 steps, 1-2 miles

Is this too young?
Age Appropriate?
Let’s look at typical development

- 4-5 months: Rolling
- 8-10 months: Crawling
- 12-15 months: Walking
- 18-20 months: Running
- 2 years: Jumping
- 3 years: Riding a tricycle
- 4 years: Galloping
- 5 years: Skipping

Why do we promote power mobility for such young children?

Evidence Based Practice:

- Reducing the risk of learned helplessness
- Promoting self confidence
- Increasing learning/development
- Allowing visual development

Evidence Based Practice

POWERED MOBILITY AS A THERAPEUTIC INTERVENTION

Problem:
3-5 year wait for Power Mobility

Solution:
Tech + Training at 6 months

Power mobility advances cognitive, language, crawling/walking

www.udel.edu/gobabygo
### Early Power

- Advance Cognitive, Language?

### Andrew (Spina Bifida) – Trial #1


### Andrew – 7 months old

### Safety with Mobility

The very skills that are required to be “safe” develop through independent mobility. (Age) Appropriate Supervision

### Is One Better?

Guiding our Decision

- Body Structures and Function
  - Long Term prognosis
  - Endurance/Motor Control
  - Motivation/learning style
- Activities and Participation
  - Functional abilities
  - Age appropriate interaction
- Environment
  - Transportation
  - Accessibility
  - Parental acceptance (expectations)

Environmental & Support Barriers

What drives our decision?

- Society: Walking is best!
- Parents: Not ready to accept that their child is “different”
  - Unrealistic functional expectations
  - Unstable medical conditions
  - Feelings of guilt/fear
- Medical Model of Disability
  - Functional Mobility vs. Exercise
- Funding Policies

Least Costly Alternative

- Recommend the least costly option that is **functional, safe** and **equally effective**.
  - Ambulation (w/ or w/out device)
  - Manual Wheelchair that is **optimally configured**
  - Manual Wheelchair w/ power assist wheels
  - Scooter/POV (no postural support; tiller operated)
  - Power Wheelchair w/ standard joystick
  - Power Wheelchair w/ specialty input device (SID)

Let’s Talk About Propulsion

- Setting Realistic Expectations
  - Our arms are not designed to be our primary means of mobility
  - Shoulder preservation … Prevention is KEY!
    - Repetitive Strain Injuries impact ALL areas of function … not just mobility.
- Guidelines based on adult population
  - Kids are not going to push optimally, but we can teach them how as they grow/develop.
Important Configuration Considerations

- Access to the wheels
  - Appropriate seat width
  - Seat height
  - Camber
  - Armrests
- Wheel size relative to frame size!
- Wheel lock function – push vs. pull to lock
- Transport requirements

A Paradigm Shift

- Move away from "walking at all costs"
- Avoid over positioning
  - Allows exploration of the environment
  - Development of postural control
  - Facilitates movement patterns
  - Improves social interaction/acceptance
- Weigh your options
  - Understand the costs and benefits of early independent mobility
- Work within the system
  - Become an advocate
  - Encourage caregiver advocacy

Consider Power Assist?

Pushrim Activated Power Assist

- Compensates for poor muscle strength and development
  - Caution: Asymmetrical Strength
- Allows for instruction of proper push technique
- May transition to full manual mobility as indicated….or on to full power mobility….
- New options for power assist available; look at all the options

Some Keys To Success - Manual:

- Understand developmental differences
  - Anatomical/neurological
  - Physical capacity
- Sit the child IN the chair not ON the chair
  - Appropriate seat height
- Ensure proper access to wheels
  - Frame Width, Camber, Rear Seat Height
- Set realistic expectations
  - Development, Age, Diagnosis
- Don’t over accessorize!

STEPS TO PEDIATRIC MOBILITY

1. Gain confidence in elaborating WHY independent mobility is vital for development
2. Educate caregivers and address common concerns
3. Equipment trialing and training with the child

Interact . . . Not CRASH!
...that’s OK! Development is a series of repetitive actions done with slight variations!

Practical Strategies for Training:
- Therapy Balls/Bolsters
- Bubble Wrap
- Dim lighting
- Use of lights/colors
- Not reward based
- Going to something – have a purpose!
  * Motivation is key
  * Parent/Sibling/Peer Motivation

Some Keys To Success - Power:
- Drive Wheel Configuration: Understand the differences
- Input Device Selection: Don’t force joystick use!
- Power Seat Functions: Gravity assisted positioning, Peer interactions
  - Consider other pieces of equipment the child will be using daily.
- Any amount of independence is independence!
- Set realistic expectations
  - Development, Age, Diagnosis

Summary
- Pediatric therapy programs must focus on increasing independent mobility experiences.
- Mobility devices should be kid-friendly and maximize age appropriate activities and participation.
- Proper postural supports should be utilized but not overdone!
- Multiple positions (sitting, standing, prone, etc.) are recommended.
- Mobility has a direct impact on brain development, learning, visual/spatial awareness, and socialization.
- Independent mobility options should be initiated as early as possible (Ideally birth – 3 years old)

References:

ANY QUESTIONS?
THANK YOU!
References (cont.):


References (cont.):