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# The Importance of Early Mobility

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## Learning Outcomes:

The participant will be able to

1. The participant will be able to explain current research linking early power mobility to overall development.
2. The participant will be able to describe the concept of augmented mobility.
3. The participant will be able to describe 4 categories of children who may benefit from power mobility.

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## What we will be covering:

- The Importance of Early Mobility
  - What does the research say?
  - Developmental benefits

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## Importance of Early Mobility

- Power Mobility is often not recommended for very young children due to:
  - **Concerns for motor development**
  - **Concerns that the child will not understand or be unsafe**
  - **Concerns about funding**

### Barriers

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## Importance of Early Mobility

- Early mobility has been linked through research to key developmental milestones
- Despite this, power wheelchairs are often not explored or approved for young children
- Education is key



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## Under Utilization

- 145,000 children under the age of 18 use some form of a mobility device
  - (Kaye, Kang, & LaPlante, 2000)
- However, power mobility continues to be underutilized
  - Rodby-Bousquet, E., & H€agglund, G.(2010).Use of manual and powered wheelchair in children with cerebral palsy: A cross-sectional study. *BMC Pediatr*, 10: 59.

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## Importance of Early Mobility

- RESNA Pediatric Power Mobility Position Paper
  - Compilation of expert opinion and summary of related research
  - Intended for education, reimbursement and to direct research
  - Available at [resna.org](http://resna.org)
  - Just revised



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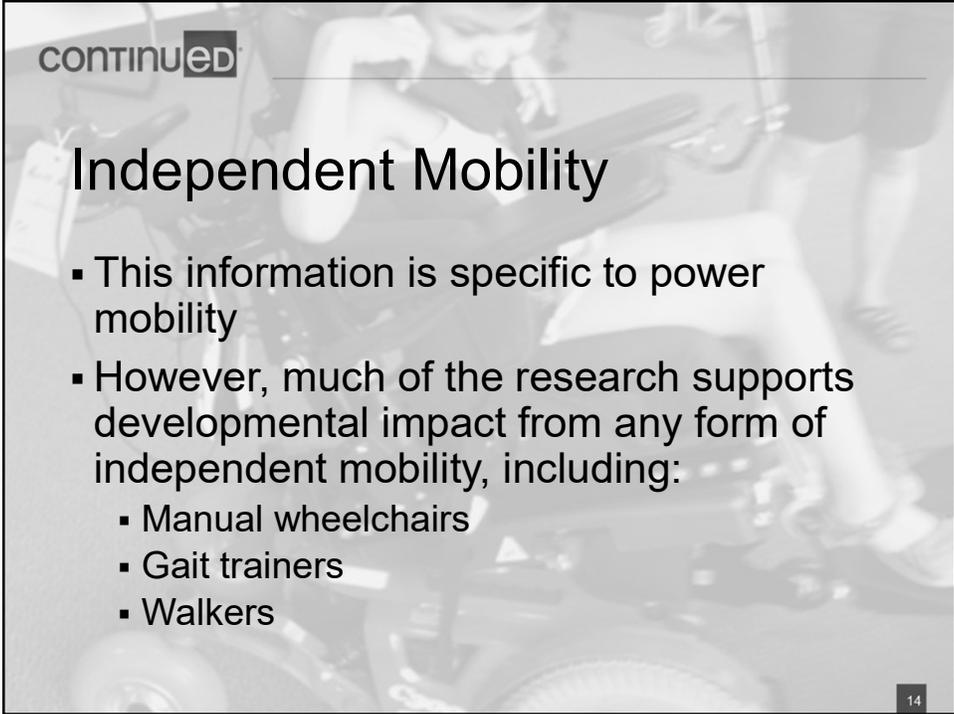
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## Another Great Resource:

- “Practice considerations for the Introduction and use of Power Mobility for Children” by Roslyn Livingstone and Ginny Paleg in *Developmental Medicine and Child Neurology*, June 2013.
  - Literature Review
  - Delphi consensus
  - Clinical practice considerations

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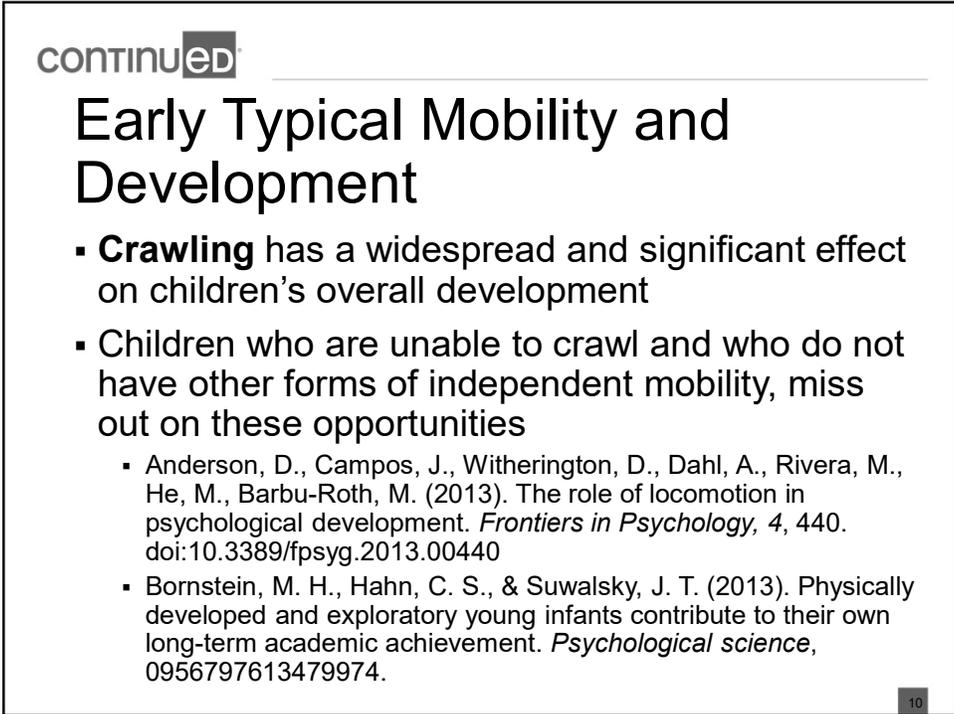
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## Independent Mobility

- This information is specific to power mobility
- However, much of the research supports developmental impact from any form of independent mobility, including:
  - Manual wheelchairs
  - Gait trainers
  - Walkers

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## Early Typical Mobility and Development

- **Crawling** has a widespread and significant effect on children's overall development
- Children who are unable to crawl and who do not have other forms of independent mobility, miss out on these opportunities
  - Anderson, D., Campos, J., Witherington, D., Dahl, A., Rivera, M., He, M., Barbu-Roth, M. (2013). The role of locomotion in psychological development. *Frontiers in Psychology*, 4, 440. doi:10.3389/fpsyg.2013.00440
  - Bornstein, M. H., Hahn, C. S., & Suwalsky, J. T. (2013). Physically developed and exploratory young infants contribute to their own long-term academic achievement. *Psychological science*, 0956797613479974.

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## Self-Initiated Behavior and Learning

- Mobility experience in a power mobility device may support development of self-initiated behavior and learning
  - McGarry, S., Moir, L., & Girdler, S. (2012). The smart wheelchair: is it an appropriate mobility training tool for children with physical disabilities? *Disabil Rehabil Assist Technol*, 7: 372–80.
  - Nilsson, L., Eklund, M., Nyberg, P., & Thulesius, H. (2011). Driving to learn in a powered wheelchair: The process of learning joystick use in people with profound cognitive disabilities. *Am J Occup Ther*, 65: 652–60. Qualitative and case study.

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## Self-Initiated Behavior and Learning

- Kids who use power wheelchairs at a young age develop foundational skills for better learning in the future

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## Emotional and Visual Perceptual Development

- Use of a power mobility device triggers emotional and visual perceptual development
  - Uchiyama, I., Anderson, D.I., Campos, J.J., et al. (2008). Locomotor experience affects self and emotion. *Dev Psychol*, 44: 1225–31.

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## Immobility and Learned Helplessness

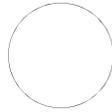
- Lack of purposeful movement and limited ability to affect environment can result in passive, dependent behavior
  - Guerette, P., Furumasu, J., & Tefft, D. (2013). The positive effects of early powered mobility on children's psychosocial and play skills. *Assistive Technology*, 25(1), 39-48.



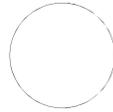
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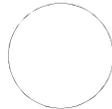
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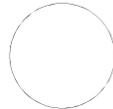
Children with little or no movement



Children with inefficient movement



Children with medical conditions limiting mobility



Children with severe intellectual and/or sensory impairments

## Who Can Benefit from Early Mobility?

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## Children with Little or No Movement

- Minimal mobility experience: none to very limited movement, such as squirming on the floor
- Bottom Line:  
Kids who use power wheelchairs at a young age are more independent, participate more, engage more, and view themselves as more capable.

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## Children with Little or No Movement

- For children with minimal mobility experience, a power mobility device can promote overall development as well as functional mobility
  - Lobo, M., Harbourne, R., Dusing, S., et al. (2013). Grounding early intervention: Physical therapy cannot just be about motor skills any more. *Phys Ther*, 93: 94–103.
  - Jones, M.A., McEwen, I.R., Neas, B.R. (2012). Effects of power wheelchairs on the development and function of young children with severe motor impairments. *Ped Phys Ther*, 24: 131–40.
  - Tefft, D., Guerette, P., Furumasu, J. (2011). The impact of early powered mobility on parental stress, negative emotions, and family social interactions. *Phys Occup Ther Pediatr*, 31: 4–15.

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## Children with Little or No Movement

- For children with minimal mobility experience, a power mobility device can promote overall development as well as functional mobility (cont.)
  - Guerette, P., Furumasu, J., & Tefft, D. (2013). The positive effects of early powered mobility on children's psychosocial and play skills. *Assist Technol*, 25: 39–48.
  - McGarry, S., Moir, L., & Girdler, S. The smart wheelchair: Is it an appropriate mobility training tool for children with physical disabilities? *Disabil Rehabil Assist Technol*, 7: 372–80.

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## Case Study

- Case Study – AJ video

Some children are able to ambulate or propel a manual wheelchair, but inefficiently



Significant benefit can still be obtained through power wheelchair usage in participation and independence

Children with Inefficient Mobility

## Children with Inefficient Mobility

- For children with inefficient mobility, power mobility may enhance independence and participation in family, school, and community life.
  - Evans, S., Neophytou, C., De Souza, L., & Frank, A.O. (2007). Young people's experiences using electric powered indoor – outdoor wheelchairs (EPIOCs): Potential for enhancing users' development? *Disabil Rehabil*, 29: 1281–94.

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## Will my Child Walk in the Future?

- For children with inefficient mobility, team members may be worried that use of power mobility will inhibit future walking

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Will my  
Child Walk  
in the  
Future?

- There is no evidence that using power mobility at a young age impedes development of ambulation or other motor skills
  - Jones, M.A., McEwen, I.R., & Neas, B.R. (2012). Effects of power wheelchairs on the development and function of young children with severe motor impairments. *Ped Phys Ther*, 24: 131–40.
- Kids who use power wheelchairs at a young age are not less likely to walk or become lazy.
- **More likely to try any form of mobility**

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## Diagnosis Specific Mobility Needs

- Some conditions are known to offer little potential future mobility and so early intervention is particularly important
  - **SMA**

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## Diagnosis Specific Mobility Needs

- Children with conditions that limit early functional mobility may benefit from power mobility to promote independence and support overall development
  - Lynch, A., Ryu, J-C, Agrawal, S., & Galloway, J.C. (2009). Power mobility training for a 7-month-old infant with spina bifida. *Pediatr Phys Ther*, 21: 362–8. (level V)

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## Case Study

- Case Study – Farid video

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## Conditions Limiting Early Mobility

- Even in conditions where future ambulation may develop, developmental benefits of early mobility still indicate use while working on gross motor skills.

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## Children with Severe Intellectual and/or Sensory Impairments

- Many children, even those with significant and multiple impairments, can use a power wheelchair with appropriate training, support, and supervision
  - Developmental benefits may outweigh functional and completely independent mobility

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CONTINUED

## Children with Severe Intellectual and/or Sensory Impairments

- Many children with severe intellectual and/or sensory impairments can learn to use a power mobility device competently with appropriate practice and environmental support
  - McGarry, S., Moir, L., & Girdler, S. (2012). The smart wheelchair: Is it an appropriate mobility training tool for children with physical disabilities? *Disabil Rehabil Assist Technol*, 7: 372–80.
  - Nilsson, L., Eklund, M., Nyberg, P., & Thulesius, H. (2011). Driving to learn in a powered wheelchair: The process of learning joystick use in people with profound cognitive disabilities. *Am J Occup Ther*, 65: 652–60.

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Brett

- Significant physical, cognitive and visual limitations
- Age 3
- Initial 'screening' for power mobility
- Using a switch and current mobility base
- Demonstrating Cause and Effect
- Not yet demonstrating Stop and Go concepts
- Delayed processing
- \*Video

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## Driver's Training

- Remember teaching your teen to drive?
- Typical State requirements for a teen
- Typical expectations of a power wheelchair candidate



Labeled for reuse

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## Mobility Training

- Successful learning of power mobility skills may depend at least as much on practice time and quality of learning support within the child's environment as the child's motor, cognitive, or sensory abilities
  - Nilsson, L., Nyberg, P., & Eklund, M. (2010). Training characteristics important for growing consciousness of joystick-use in people with profound cognitive disabilities. *Int J Ther Rehabil*, 17: 588–95.

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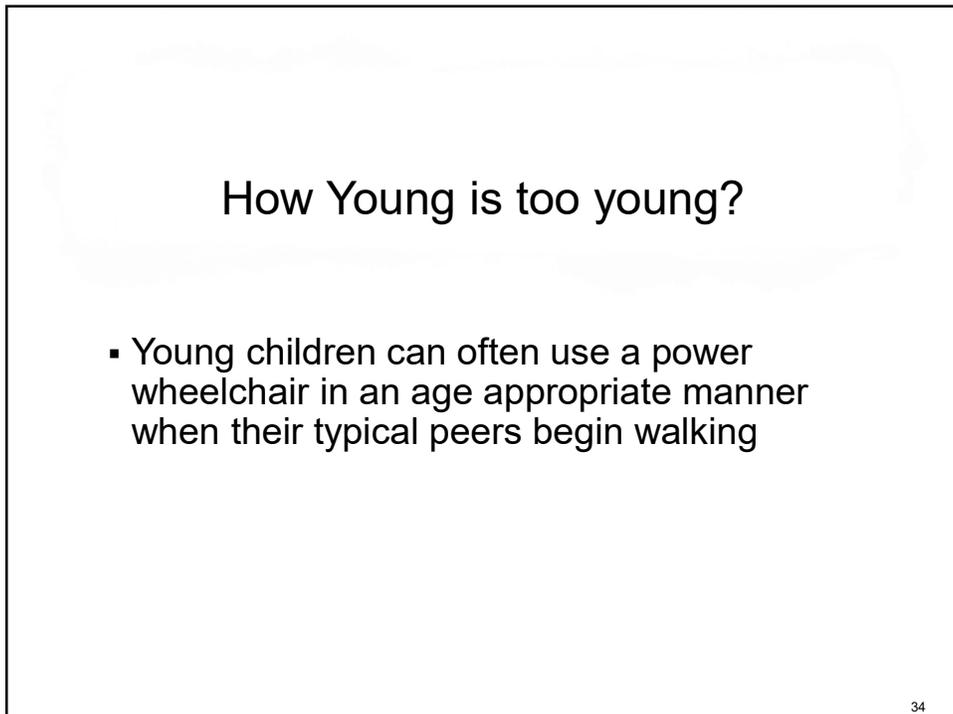


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## Mobility Training

- Wow, listen to that again!
- The quantity and quality of mobility training matter as much as what the child's skill set is!

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## How Young is too young?

- Young children can often use a power wheelchair in an age appropriate manner when their typical peers begin walking

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## Augmented Mobility

- Augmented mobility is an attempt to bring power mobility to children at an age when peers are just getting mobile
- More and more research is demonstrating the efficacy of this approach

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## Typical Development

- Children typically crawl around 9 months
- Children typically take independent steps and explore environment by 12–15 months
  - Sharma, A., & Cockerill, H. (2014). *Mary Sheridan's from birth to five years: Children's developmental progress*. Routledge.

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## Babies Driving?



- This new concept augments mobility of children as young as 8 months for the significant developmental benefits supported in the research.
- A very young child isn't going to use a mobility device the same way an older child or adult will.
- Typical toddlers move all the time, though not with what appears to be purpose.
  - Exploration
  - Moving for the sake of moving
  - Spurs development

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## Augmented Mobility

- With access to a specialized power mobility device, it is possible for infants with disabilities to have augmented mobility experiences as early as 8 months of age.
  - Galloway, J.C., Ryu, J-C., & Agrawal, S.K. (2008). Babies driving robots: Self-generated mobility in very young infants. *Intel Serv Robot, 1*: 123–34.
  - Lynch, A., Ryu, J-C., Agrawal, S., Galloway, J.C. (2009). Power mobility training for a 7-month-old infant with spina bifida. *Pediatr Phys Ther, 21*: 362–8.

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## Augmented Mobility

- Children can begin learning to maneuver a power mobility device below 14 months of age and those able to use a joystick have demonstrated competent control as young as 18 to 24 months.
  - Jones, M.A., McEwen, I.R., & Neas, B.R. (2012). Effects of power wheelchairs on the development and function of young children with severe motor impairments. *Ped Phys Ther*, 24: 131–40.

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## Augmented Mobility



- Very young children sometimes understand driving with 3 switches before understanding joystick control as joystick use is more abstract.

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## What are the options?

- Adaptive ride-on cars
- Pediatric Power Wheelchairs



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## Pediatric Power Wheelchairs

- Some manufacturers make a pediatric power wheelchair from the ground up
- Others offer pediatric seating on their adult power wheelchair base



Permobil Koala

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## Pediatric Power Wheelchairs

- Pediatric power wheelchairs require a comprehensive evaluation by a qualified team

Invacare Tiger Cub



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## Adaptive Ride-on cars

- Pros:
  - Often families are more receptive to this option
  - More peer relevant
  - Less costly, as funding continues to be a challenge for very young children
  - Environmental and Transportation accessibility

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## Adaptive Ride-on cars

- Cons:
  - Family must purchase this option
  - Family must find someone to help with adaptations or be very handy
  - Positioning limited
  - Access limited

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## Adaptive Ride-on cars

- Specific Options:
  - Go Baby Go workshops
    - Parents and other team members attend and adapt a ride on car on the spot
    - Based at University of Delaware
    - More info: <https://sites.udel.edu/gobabygo/>

Power Wheels Ride-on Car



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## Adaptive Ride-on cars

- Specific Options:
  - Wild Thing
    - Stealth Products
    - Undergoing clinical trials and coding approval
    - Consumer purchase option soon
    - Based on Fisher Price product
    - More seating options (Deigo pediatric seating)
    - More access options (iDrive)
    - \*Video

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## Take Home Message:

- Our traditional view of early power mobility is changing based on more current research
- Even our very young and/or very impaired clients can benefit from augmented mobility experiences
- Identify potential drivers and try a power wheelchair out
  - Or refer to a clinic near you!

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## Questions?

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## References:

- RESNA Pediatric Power Mobility Position Paper, 2018 update.
- Practice considerations for the Introduction and use of Power Mobility for Children by Roslyn Livingstone and Ginny Paleg in *Developmental Medicine and Child Neurology*, June 2013.

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