




# PEDIATRIC POWER MOBILITY: LET'S GET MOVING!

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## CEUs



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## What we will be covering:

- The Importance of Early Mobility
- Determining Readiness
- Developing Readiness
- Assessment
- Mobility Training



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### Learning Objectives

1. The participant will be able to describe the importance of Early Mobility to a child's development in multiple areas.
2. The participant will be able to list 3 criteria which can be used to Determine Readiness to use a power mobility base.
3. The participant will be able to list several strategies to Develop motor and cognitive Readiness to use a power mobility base.
4. The participant will be able to list several strategies in Mobility Training to optimize power wheelchair driving.

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### The Importance of Early Mobility

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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




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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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### Pediatric Power Research



- Great updated resource!
- RESNA Position on the Application of Power Mobility Devices for Pediatric Users
  - RESNA.org
  - Atilange.com under Resources

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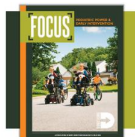
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### Research

- There is a large volume of research from the last few years
- Search Google Scholar
- Another great resource:
  - NRRTS Directions Focus on Pediatric Power & Early Intervention
    - NRRTS.org, digital version is free
    - Sign-up!




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Determining Readiness

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Cognitive Issues

- See Criteria Handout
- Cause and effect
- Stop and go concepts
- Directional concepts
- Judgment
- Problem solving
- Following directions
- and ... Motivation



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Cause and Effect Concepts

- The client realizes that activating the access method is causing movement of the power wheelchair
- Measure: verbal or non-verbal expression



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### Stop and Go Concepts

- The client realizes that activating the access method is moving the power wheelchair and that releasing the access method stops that movement
- Measure: verbal, following directions to Stop and Go or stopping for obstacles. Does not require accuracy.



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### An example

- In this video, Brett is beginning to realize that pressing a switch moves the wheelchair
- He is not showing Stop and Go yet



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### Directional Concepts

- The client realizes that the power wheelchair will move in different directions, depending on how the access method is used.
- Measure: the client responds verbally or non-verbally to different movement caused by different input or attempts to move to a location using different directional commands.



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**Judgment**

- The client demonstrates developmentally appropriate judgment
- Measures:
  - the client recognizes obstacles and attempts to avoid
  - the client is not aggressive
  - the client demonstrates caution



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**Problem Solving**

- The client demonstrates developmentally appropriate problem-solving during driving
- Measure: the client will maneuver the power wheelchair to a designated destination without cues



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**Following Directions**

- The client demonstrates the ability to follow directions while driving
- Measure: the client will follow directions such as Stop, Go and Come Here



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**Motivation**

- Motivation is important, too



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**Developing Readiness**

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**Where does Pre-mobility Training fit in?**

- The client **does not have to show mastery** of each of these mobility concepts, only potential at this point
  - Pre-assessment
- If the client is having difficulty with one or more of these concepts, Pre-mobility training can be used to develop those skills prior to an assessment
  - Increases likelihood of success in the assessment



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### Pre-mobility Training

- Motor skills
  - Access method
- Cognitive skills
  - Mobility concepts



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### Motor Skills: joystick

- Joystick Control
  - The driver must be able to grade the force and distance of movement to utilize the 360 degree available movement and proportional speed
    - Co-contraction
    - Difficult if client has abnormal tone



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### Motor Skills: joystick

- Joystick Control
  - USB Joystick Mouse
    - Computer Software
      - i.e. painting program
    - Tablet with USB mouse
      - Android, Windows
  - This doesn't translate over very well to learning how to move a power wheelchair through space, but does develop motor skills

InfoGrip  
N-ABLER Pro  
Joystick



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### Motor Skills: switch

- Sustained switch contact is required to continue movement of the power wheelchair
- Latch on a power wheelchair can be used in Forward and sometimes Reverse
  - Safety issues with children
- Quick and accurate release for stopping



Microlight switch

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### Sustained Switch Contact

- Switch Toys and other Battery Operated Devices
  - Direct connection with battery interrupter or pre-adapted device
  - The toy or other device is active only as long as the switch is depressed



Ablenet Specs Switch



Ablenet Battery Device Adaptor



Ablenet Switch Adapted Walking T-Rex

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### Sustained Switch Contact

- Direct Mode on Ablenet PowerLink 4
  - Provides practice sustaining switch contact with electrical devices



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### Switch Release

- Switch Release for accurate stopping
  - Develop activities or games to encourage the child to release the switch at a specific time
    - i.e. connect a train set to the PowerLink. Encourage the child to stop the train at a certain location.

Ablenet PowerLink 4

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### Stealth Products

- Loonz! App
- Free App that allows the client to play games through an i-Drive driving method
- Can connect iDrive 4.0 driving method to a manual wheelchair and connect to an iPad through Bluetooth
- Portable rechargeable battery pack

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### Developing Motor Skills

- Goal at this point is simply developing motor skills
- Skills do not have to be perfect to move forward
- Many clients do not require this training, but some clients will in order to eventually be functional driving a power wheelchair
  - Taking longer is ok if that is what it takes to achieve success!



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### Developing Cognitive Skills

- Cause and Effect
- Stop and Go
- Directional Concepts
- Problem Solving
- = Pre-mobility training

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### Two Methods

- Use Basic EADLs to develop specific cognitive skills
- Use dependent mobility base to "simulate" movement of a power wheelchair
- Use both to increase learning!
- No Power Wheelchair required




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### Cause and Effect

- Cause and Effect: Method #1
  - Switch Toys
  - PowerLink 4 in Direct Mode
  - Cause – press switch
  - Effect – toy/device activation




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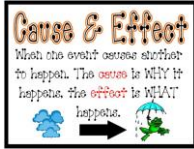
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### Cause and Effect

- If a client is struggling with Cause and Effect concepts, they will be unable to use a power wheelchair for functional mobility
- Some clients have cause and effect, but are bored and don't want to play...




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### Stop and Go

- Stop and Go: Method #1
  - Switch Toys, Direct connection
  - PowerLink in Direct Mode
  - SLAT in Latch Mode
  - PowerLink in Latch Mode
- Switch Activation = Go
- Switch Release = Stop



Adaptation LinkSwitch Switch Latch and Timer

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### Stop and Go

- Wait, that sounds like Cause and Effect?
- Cause and Effect means the client realizes they are making something happen
- Stop and Go takes this up a notch. The client realizes they can both start and stop movement.
- This incremental step requires specific training in some clients




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### Stop and Go

- Stop and Go: Method #2
- If the child is in an adaptive stroller or manual wheelchair...
  - Place a switch (or colored paper circle) where the client can access it. It is not plugged into anything.
  - When the child presses the switch, push the mobility base
  - When the child releases the switch, stop pushing



Microlight switch

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### Stop and Go

- Goal: to develop the concept of Stop and Go. The client does not need to stop accurately at this point but understand the concept.



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### Directional Concepts

- Directional Concepts: Method #1
- 3 switches, 3 devices
  - Reinforces that each switch has a different function
  - Does not yet reinforce directions



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### Directional Concepts



- Directional Concepts: Method #2
- Place 3 switches where the child can access them
  - Tell the child how this works
  - Move the chair in the corresponding direction when the child activates a switch



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### What about the Joystick?

- I think this client can use a joystick. Should I use switches in training these mobility concepts?
- Yes! The concepts are the same and it is easier to use switches on a manual mobility base
- Cognitively, using separate switches is often easier than using a more abstract joystick



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### Directional Concepts

- Directional Concepts: Method #2
  - Verbalize direction of movement while pushing the mobility base or driving the car
  - Play Follow the Leader



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### Directional Concepts

- Goal: to develop the concept that specific joystick movements or switch activations move the wheelchair in a corresponding direction. The client does not need to drive from Point A to Point B accurately at this time.



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### Problem Solving

- Problem Solving: Method #1
- SLAT
  - The first switch activates one device. The second switch activates another device.
  - Client has to determine which switch to hit and when



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### Problem Solving

- Problem Solving: Method #2
- Place 3 switches where the child can activate them
  - Tell them how this works
  - When the child activates a switch, move the mobility base in the corresponding direction
  - Encourage them to "drive" to a specific location



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### Problem Solving

- Problem Solving: Method #2
  - Allow the child time to explore
  - Play Hide and Seek



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### Problem Solving

- Goal: to develop the ability to determine the necessary combination of switch activations to get from one location to another.
  - This will transfer over to the necessary combination of joystick movements in the future
- Your client may take the "long way", but every switch activation is a learning opportunity



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### Other Options

- Augmented Mobility can be used to provide early mobility experiences to young children
- This may also help develop readiness to use a PWC
- Adapted Ride-on Cars
  - Many only allow for one direction of control



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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

- Permobil Explorer Mini



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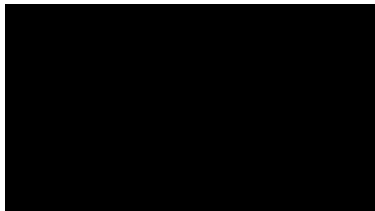
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### Virtual Reality

- VR can be used to develop readiness, for assessment and for mobility training
- Reduces space requirements
- Can use existing seating and mobility base
- Increases safety and confidence!



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Assessment

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**Assessment Considerations**

- Positioning
- Driving Method (Motor)
- Mobility Concepts (Cognitive)
- Determining optimal equipment recommendations



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**Positioning**

- Positioning is critical to optimizing function, including control of the driving method



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### Evaluation Positioning

- It is also critical to position the client adequately in an evaluation wheelchair
  - Using own seat
  - Using simulator



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### Driving Method

- Assessing the Driving Method
- There are many driving method available to match an individual's needs



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### Assessment

- I often start with a child in their current adaptive stroller or manual wheelchair
- Ensure optimal positioning
- Start with one switch. When the child presses the switch, move the chair Forward. When the child releases the switch, stop pushing
- From there, I add in more switch sites for Left and Right
- I'm in control, the child feels safe, and now I have a good idea which driving method I will try in an evaluation power wheelchair
- Let's take a look!



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**Colton**

Starting with a switch by the left cheek

Goal – giving him time to understand that when he presses the switch, I will move the chair

Cause and Effect



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**Colton**

He is showing Cause and Effect

He is starting to show Stop and Go concepts



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**Colton**

He is exploring the switch with his hand. This is great!

He is showing more ability to sustain switch contact to keep moving



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**Colton**

He is now displaying timing to start and stop

He is also displaying some caution = judgment



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**Colton**

We've added a second switch by the right side of his head for right turns

We have told him the switch by the left cheek is for Forward

However... Colton is young and he was getting tired and had a tummy ache! Mom took him out of the chair and he promptly fell asleep!

End of session today!



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**Colton**

- Colton eventually was able to access 3 switches around his head
- Evaluation with a head array on an evaluation power wheelchair was arranged
- He eventually received his own power wheelchair!



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**Mobility Concepts**

- Assessment is similar to Determining Readiness
- Potential vs. Mastery

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**Determining optimal equipment recommendations**

- Seating System
- Driving method
- Power wheelchair base
- Drive wheel configuration
- Tracking
- Power seating



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**Documentation and Funding Approval**

Typing, typing, typing...



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Mobility Training

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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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**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
  - Bottos M, Bolcati C, Sciuto L, Ruggeri C, Feliciangeli A. Powered wheelchairs and independence in young children with tetraplegia. *Dev Med Child Neurol* 2001; 43: 769–77.
  - 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* 2012; 7: 372–80.
  - Nilsson L, Eklund M, Nyberg P, Thulesius H. Driving to learn in a powered wheelchair: the process of learning joystick use in people with profound cognitive disabilities. *Am J Occup Ther* 2011; 65: 652–60.

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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
- Bottos M, Bolcati C, Sciuto L, Ruggeri C, Feliciangeli A. Powered wheelchairs and independence in young children with tetraplegia. *Dev Med Child Neurol* 2001; 43: 769-77.
- Nilsson L, Nyberg P, Eklund M. Training characteristics important for growing consciousness of joystick-use in people with profound cognitive disabilities. *Int J Ther Rehabil* 2010; 17: 588-95.

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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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### Mobility Training Goals

- Mobility training optimizes driving efficiency
- Even if the client was evaluated for a PWC and one was recommended, this does not mean further training is not required
- Mobility training completes the evaluation, possibly indicating the need for programming changes or other interventions



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### Driver's Training: motor vehicles

- Let's put this in context:
  - Teenagers have to get a permit, often practice for a full year, putting in 40-50 hours with a parent, before even taking a test to get a license
  - These teens have average motor, sensory and cognitive skills
    - For a teen...
  - These teens have ridden in cars and watched other drivers their entire lives



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### Driver's Training: PWCs

- Many PWC users have motor, sensory and/or cognitive limitations
- Many PWC users have never seen another person use a PWC
- Often, little or no training is provided



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### Mobility Concepts Training

- Some clients hop in and take off!
- Other clients require extensive and long-term training
- Many are in-between

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### Mobility Concepts Training

- Tips for training children:
  - Minimal instructions
  - Simple and consistent vocabulary
  - Allow for processing time
  - Trial and error
  - Large, quiet environments



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### Mobility Concepts Training

- What about driving in context?
- For school age children, driving in a crowded hallway is equivalent to a teen starting driver's training on the freeway!
- Start slow and move up in difficulty through other environments
  - Empty gym
  - Gym with a few kiddos
  - Empty hallway
  - Hallway with a few kiddos
  - Hallway with many students



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### Mobility Concepts Training

- Stop and Go
- Directional
- Problem Solving
- Judgment

• This is most often required with children, but the following strategies can be applied to all ages

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**Stop and Go Concepts**

- Pull Out Activities
  - In the power wheelchair, have the child Go and Stop on verbal command
  - Play games such as Red Light, Green Light
  - Goal: stopping on command quickly



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**Stop and Go Concepts**

- As a part of the school day
  - While driving from the classroom to the cafeteria (or another destination), walk next to the student
  - Encourage the student to stop and go when appropriate



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**Tip Time**

- Stay calm and the child will stay calm
- If the situation is too stressful, loud, or not safe... downshift
  - Quiet, large spaces
  - Slowly advance to other environments



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### Directional Concepts

- Pull out Activities
  - In the power wheelchair, ask the child to move in an indicated direction. This gives the child an opportunity to discriminate between directional switches or joystick movement
  - Play Follow the Leader
  - Bring in peers!



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### Directional Concepts

- As a part of the school day
  - Have the student follow the rest of the class from the classroom to the cafeteria or library



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### Tip Time

- What if the student hits the wall?
- The power wheelchair can be programmed to stop when this occurs, rather than causing damage or continuing movement
- Calmly redirect the student to choose another direction



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**Problem Solving**



- Pull out Activities
  - In the power wheelchair, have the child move to a location in the room that requires more than one directional command to reach
  - Play Follow the Leader, Hide and Seek
    - Pull in peers!
  - As the child progresses, move on to more realistic situations, such as going down hallways, through doorways, etc.

**Game Time!**

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**Problem Solving**

- As a part of the school day
  - Have the student deliver attendance to the office or other papers
  - When the class moves to a different area, have the student try the following:
    - Go through the classroom door without assistance
    - Go down the hallway




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**Tip Time**

- The average teen has "normal" cognitive, sensory and motor skills
- The average teen has had many years of "modeling" in driving a motor vehicle
- The average teen still has to put in 40-50 hours of supervised driving before even taking a test
  - It takes time

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### Judgment

- Pull Out Activities
  - Place obstacles in the child's way to see if they will stop and/or go around these.
  - Move on to real life situations to train appropriate judgment, i.e. crossing the street



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### Judgment

- As a part of the school day
  - Provide rewards for safe driving



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### Tip Time

- Many of the kids we work with do not have opportunities to develop judgment

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### Student safety

- Training in context increases risks of bumping walls and other students
- Solution:
  - Don't start in context training around a lot of other students right away
  - Like learning to drive a car
  - Reduce power and/or torque so PWC has less force



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### Train the Trainer

- The clinician may not be available for consistent training
- Funding may not support the amount of visits necessary for adequate mobility training sessions
  - Training is typically more effective using shorter and more frequent sessions
- The clinician may train others to perform Mobility Training and supervise the process



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### Take Home Message:

- Pre-Mobility Training develops readiness
- Mobility Training optimizes driving
- Training ultimately reduces the chances of equipment abandonment

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### Resource

- NRRTS Directions Focus on Pediatric Power & Early Intervention
- NRRTS.org, digital version is free
- Sign-up!



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### Contact Information:

Stealth Products  
[www.stealthproducts.com](http://www.stealthproducts.com)  
1-800-965-9229



Michelle Lange  
MichelleLange1@outlook.com  
[www.atilange.com](http://www.atilange.com)

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