Em-POWERment: Power Mobility Training Methods for Children and Adolescents with Multiple Severe Disabilities

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Objectives

Upon completion of this course, participants will be able to:

1. Discuss 3 potential benefits of using power mobility training interventions with children who have multiple, severe disabilities
2. Establish power mobility training regimens designed to meet the individual needs of children who have multiple, severe disabilities
3. Evaluate outcomes and expectations for the use of power mobility interventions in this unique population

Acknowledgment

Thank you to the families who have given their permission to show photographs and videos of their children, to use the children's first names, and to describe the children's condition and abilities during this presentation

The GV Power Mobility Project: Meet the Team

- Dr. Lisa Kenyon – physical therapist
- Dr. John Farris – engineer
- Dr. Samhita Rhodes – electrical engineer
- Dr. Paul Stephenson – statistician
- Dr. Naomi Aldrich – psychology
- Doctor of Physical Therapy students
- Engineering students - graduate and undergraduate
- Psychology students - undergraduate

Benefits of Power Mobility Use for Children With Mobility Limitations

Potential Benefits of Power Mobility Training in Children With Multiple, Severe Disabilities

Livingstone & Paleg 2014

Power mobility may be beneficial for children with multiple, severe disabilities even though these children may never become capable, community drivers

Benefits of Power Mobility Use

Passive mobility such as being pushed in a stroller or wheelchair does not have the same learning and developmental benefits as self-generated locomotion

Nilsson & Nyberg 2003; Nilsson et al 2011

- Power mobility may
  - Enhance alertness in individuals with severe disabilities
  - Stimulate the development of intentional, purposeful driving behaviors
  - Improve cause and effect skills (switch use)

The Grand Valley Power Mobility Project

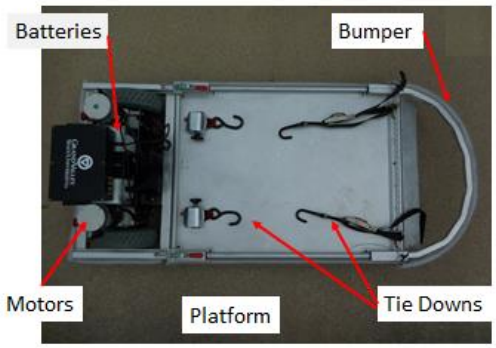
The Grand Valley Power Mobility Project

- Power mobility training program for individuals with multiple, severe disabilities
  - Ages: 9 months to 26 years
    - In Michigan, schools serve children up to 26 years
    - We think we can start younger ☺
  - Various diagnoses
    - 2 main groups of children

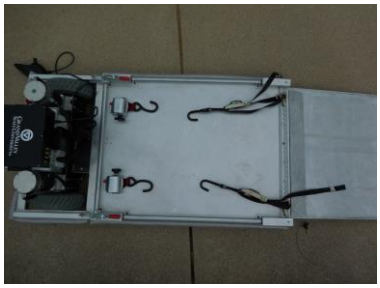
Our Power Mobility Devices

Power Wheelchair Trainer

- Rear-wheel drive configuration
- 2 brushed direct current motors
- Powered by two 12-volt batteries
- Can be used with a joystick or switch(es)
- Driving speed is set by the therapist
  - Other programmable features



Trainer with Loading Ramp Extended



Play & Mobility Device

- Mid-wheel drive configuration
- Powered by one 12-volt battery
- Uses a commercially available forward-facing car seat
  - Can be tilted back into 3 different semi-reclined positions

Play and Mobility Device

PT Interface

User Interface

Meet a Few of Our Drivers……

Driver #2

Power Mobility Training Interventions for Children with Multiple, Severe Disabilities

Power Mobility Training Methods

- Limited research available related to this specific population
- Power mobility training methods for children in general mostly based on expert opinion
  - Research detailing the best methods has yet to be conducted

Foundational Concepts

- The therapist is a responsive partner in the training process
  - Therapist doesn't teach power mobility skills
- The need to create an engaging, playful environment
  - Designed to elicit driving behaviors

Foundational Concepts

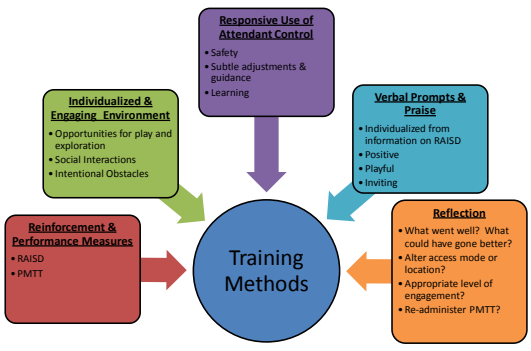
- For children who have multiple, severe disabilities, accidental activation of a joystick or switch may lead to the development of
  - Cause and effect skills
  - Intentional, purposeful driving behaviors

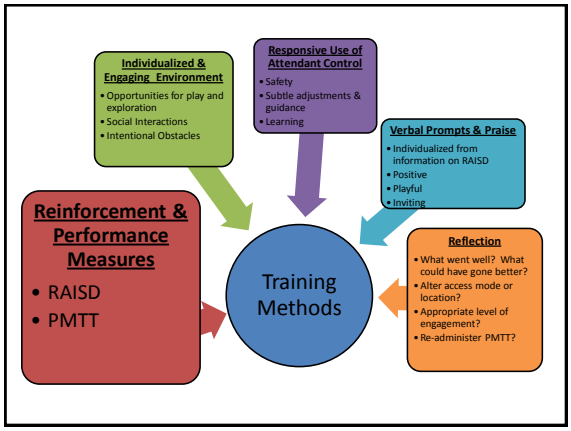
Foundational Concepts

- Contemporary theories of motor control and neural plasticity
  - Specificity of training
  - Repetition
  - Individually engaging environment
  - Individually meaningful activities

Individualizing PM Interventions

1. Identify motivational and reinforcement factors
2. Generate child-specific goals
3. Create an engaging environment
4. Responsive use of an attendant control unit
5. Individualized verbal and physical prompts





Reinforcement Assessment for Individuals with Severe Disabilities (RAISD)

- Gathers information related to potentially reinforcing stimuli and activities for each child
  - Parent/Caregiver/Teacher interview
    - Focused and brief
  - Identifies a child's likes and dislikes

Fisher WW, Piazza CC, Bowman LG, Amari A. (1996). Integrating caregiver report with a systematic choice assessment to enhance reinforcer identification. American Journal on Mental Retardation 101:15-25.

Reinforcement Assessment for Individuals with Severe Disabilities (RAISD)

- Includes 10 open-ended questions
  - "What (physical play and movement) activities do you think (your child) most enjoys?"
  - "What are the things you think (your child) most likes to listen to?"
  - "What (tactile) activities do you think (your child) most enjoys?"

Power Mobility Training Tool -PMTT

- Used to identify basic power mobility skills in children who have multiple, severe disabilities
  - Can be used with children who use switches or other alternative access methods
- Guides therapists in promoting the emergence of basic power mobility skills in children with multiple, severe disabilities

Power Mobility Training Tool -PMTT

- Not intended to determine who "qualifies" for power mobility
- Not intended to be used as an outcome measure
- Consists of
  - 12 items scored on a 5 point scale
    - 4 non-motor items and 8 motor items
  - 1 non-scored item
  - 2 items that are scored dichotomously

Scoring the PMTT

0: Does not attempt the skill or the skill is not demonstrated or not observed

1: Requires manual assistance/prompts to demonstrate the skill.

2: Without manual assistance/prompts, demonstrates the skill <50% of time.

3: Without manual assistance/prompts, demonstrates the skill 50-90% of the time.

4: Without manual assistance/prompts, demonstrates the skill >90% of the time.

Non-Motor Items on the PMTT

- Cause and effect concepts
  - Recognizes the correlation between the access method (switch or joystick)
    - Movement of the power mobility device
    - Moving the device in different directions
    - Stopping the device

Non-Motor Items on the PMTT

- Visual skills
  - Appears to notice large obstacles within 10-15 feet of the power mobility device when the power mobility device is in motion

Motor Items on the PMTT

- Activation of the access method
  - Demonstrates the motor ability to activate a switch or joystick to move the power mobility device in any direction

Motor Items on the PMTT

- Stop and go abilities
  - Demonstrates the motor ability to
    - Activate a switch or joystick to move the power mobility device in any direction
    - Sustain activation of the access method (switch or joystick) to move the power mobility device for >5 seconds.

Driving Function Items on the PMTT

- Demonstrates the ability to move the power mobility device
  - Forward at least 5 feet
  - To the right
  - To the left
  - In reverse

Driving Function Items on the PMTT

- Maneuvers the power mobility device to avoid large obstacles in the path of the device

Findings from the PMTT are used to create child-centered goals for power mobility training

Example 1

Sample Findings on the PMTT

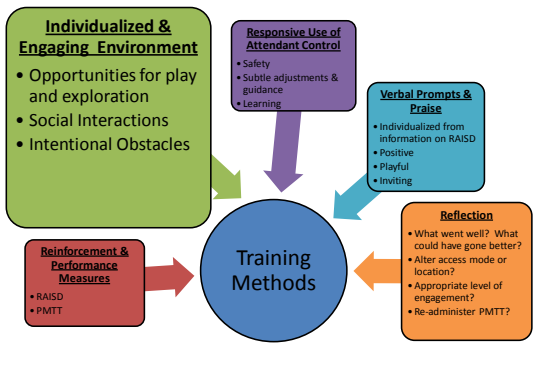
- Using only one switch
- Inconsistent switch activation
  - Does not appear to understand the connection between pressing the switch and moving the power mobility device

Sample Goal Areas

- (Child) will increase the number of switch activations demonstrated in a session by 50%.
- (Child) will drive the power mobility device 5 feet to obtain a desired object or to interact with a preferred person.

Sample Progression Goals

- (Child) will progress to using 2 switches to drive the power mobility device
- (Child) will drive the power mobility device 25 feet to obtain a desired object or to interact with a preferred person.



Create an Individualized & Engaging Environment

- Based on
  - The findings from the RAISD
  - The goals drafted from the findings of the PMTT

Example 1

Findings from the RAISD

- Enjoys music especially traditional children's songs
- Likes the feeling of ribbons on her face
- Enjoys kisses and praise from Dad
- Seems to prefer the color red

Sample Goal Areas

- (Child) will increase the number of switch activations demonstrated in a session by 50%.
- (Child) will drive the power mobility device 5 feet to obtain a desired object or to interact with a preferred person.

Create an Individualized & Engaging Environment

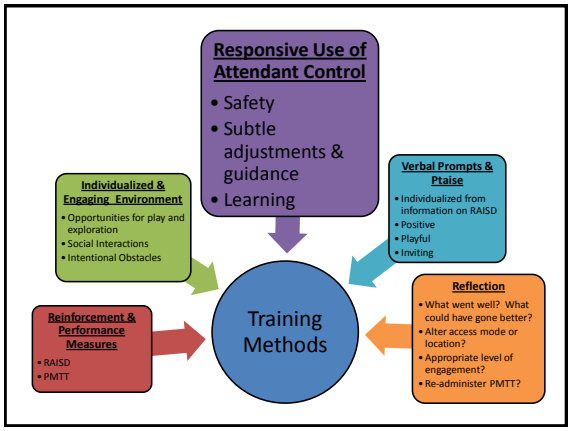
- Sample activities:
  - Singing songs
  - Use of an iPod playing children's songs: "Let's find the music"
  - Driving to Dad to get kisses and praise
  - Playing with the large red therapy ball
  - Driving through the ribbon "car wash"

Other Examples

- Other examples –
  - The zambonie
  - Dress up
  - "Dancing"
  - Dinosaur hunting
  - Twin play
  - Visiting people
  - WWE "Wrestling"
  - Driving to read a book

Logan et al 2015

- Typically developing toddlers
  - Simultaneously engage in physical activity (movement), play, and object-related behaviors



Responsive Use of Attendant Control

- Used for
  - Safety
  - Maneuvering
  - Encouraging problem solving

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- Used for
  - Safety
  - Maneuvering
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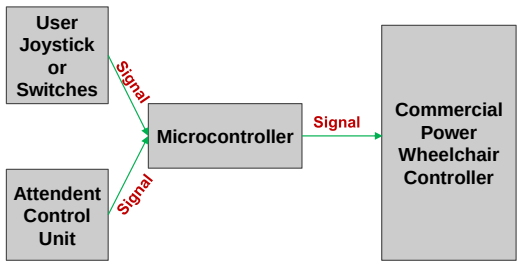
Achieved through shared control

Shared Control

The electronic capability to modify the direction and motion of the power mobility device by combining inputs from both the user and attendant control units without having to stop or interrupt the child's driving

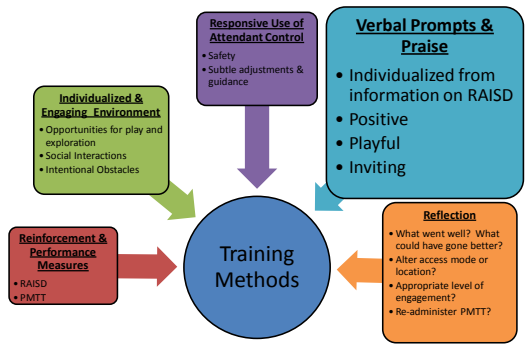


Shared Control

- Appears to be most helpful for children
  - Learning cause and effect concepts
  - Who become easily frustrated or discouraged
- Appears most helpful in the early stages of learning
- Great for minimizing safety concerns

Shared Control

- Accompanying verbiage
  - Letting the child know who is driving
    - "I stopped you"
    - "I am driving now"

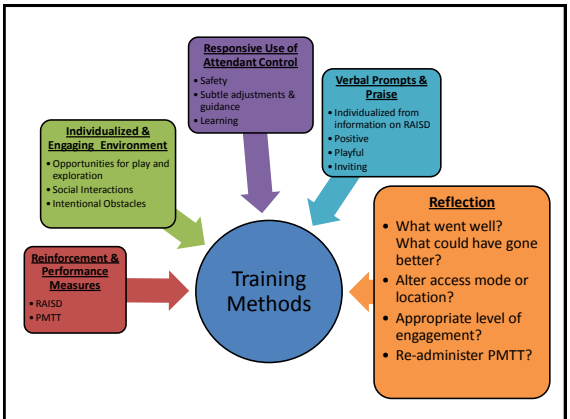


Verbal Prompts

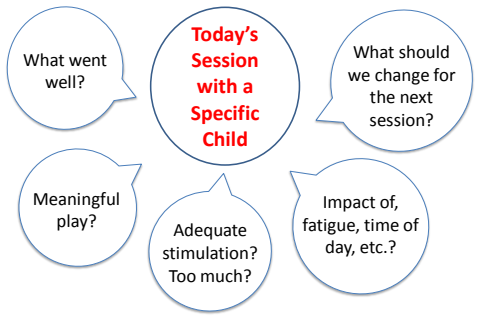
- Short and concise
  - Consistency important for each child
- Directed at an activity or task
  - "Go get a kiss from Mom"
  - "Here's your (favorite toy)"
  - "Let's find the next dinosaur picture"

Process Praise

- Always positive, never negative
- Example: child runs into a wall
  - Positive voice: "You found the wall"



Reflection



A Quick Glimpse at Some of Our Outcomes…..

Outcomes to Date

- 2 children have "qualified" for their own power wheelchairs
- 2 other children have used our switch activation data to "qualify" for a trial of an eye-gaze communication device

Review the Objectives: Any Questions?

To obtain a complete copy of the PPT, please e-mail
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