POWER WHEELCHAIR DRIVING METHODS
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Introductions
• Hello!
• Introductions all around!
  • Name
  • Favorite Starbucks drink
  • Goals for today
• Disclosure:
  • while I do teach educational courses for Stealth Products, I am in Private Practice, I use a variety of equipment and will attempt to present this information in a non-biased way

Learning Outcomes
The participant will be able to:
1. Describe the difference between proportional and digital wheelchair control
2. List 3 power wheelchair alternative proportional driving methods with clinical indicators for each
3. List 3 power wheelchair alternative digital driving methods with clinical indicators for each
4. List 3 programming parameters which can be changed to increase responsiveness of the power wheelchair for someone with muscle weakness

What we will be covering:
• Mobility Assessment
• Power Wheelchair Driving Methods
  • Proportional
  • Digital
  • Programming

MOBILITY ASSESSMENT
Mobility Assessment

- Mobility Category
  - Augmented mobility
  - Adapted stroller
  - Manual wheelchair
    - Dependent
    - Self-propulsion
  - Power mobility
    - Power Assist wheels
    - Power operated vehicle/scooter
    - Power wheelchair
      - Consumer level
      - Complex rehab level

General Assessment considerations

- Current mobility
- Simulation
- Equipment trials
- Environmental requirements
- Accessibility

Poll time

Do you:
- Evaluate clients for power mobility?
- Work with clients using power mobility?
- Neither, but I want to!

Power Wheelchair Basics

- Components of a Power Wheelchair:
  - The wheelchair frame
  - Growth
  - Frame adjustments
  - Suspension

Power Wheelchair Basics

- Components of a Power Wheelchair:
  - Drive Wheel Configuration
    - Front
    - Rear
    - Mid or Center
  - Affects driving performance
  - Some configurations are better for alternative access
  - Some configurations are better for varied terrain
Rear wheel drive

- Pros:
  - Stability on all terrains
  - Will handle downhill speeds with better control
  - Wide range of choices
  - Good for heavy outdoor use
  - Fastest speeds
  - Greatest suspension available

- Cons:
  - Largest turning radius of the three configurations available
  - Due to front caster placement, many front rigging options are limited (i.e. center mount)

Front Wheel Drive

- Pros:
  - Drive wheels pull the weight instead of push
  - Improved obstacle climb capability
  - With no front casters, can pull footplates closer to the body
  - Small front turning radius

- Cons:
  - Less stable downhill
  - Tendency to “fishtail” at faster speeds (downhill)
  - Forward tippy when client climbs on footrests
  - Limited speeds unless compensated for in electronics
  - Limited suspension

Center wheel drive

- Pros:
  - Smallest possible footprint and turning radius
  - Considered to be the most “intuitive” driving platform to some
  - Very stable

- Cons:
  - May have challenges traversing through aggressive outdoor terrain
So which is best for efficiency?

- For many less efficient joystick drivers and for nearly all switch drivers, mid or center wheel drive is generally more efficient
  - Less compensatory movements required to compensate for the casters
  - Casters tend to be skewed after a turn and pull the wheelchair off course

Power Wheelchair Basics

Components of a Power Wheelchair:

- Suspension
  - To reduce vibration and jarring
  - Also dependent on seating
  - Lack of suspension can increase muscle tone and fatigue

Suspension

- Components of a Power Wheelchair:
  - Suspension
    - To reduce vibration and jarring
    - Also dependent on seating
    - Lack of suspension can increase muscle tone and fatigue

- Components of a Power Wheelchair:
  - Tracking
    - Reduces joystick movement and switch activations required to get from Point A to Point B
    - Increases driving efficiency
    - Particularly important for alternative access

A word about Tracking…

- Informal tracking study comparing midwheel drive PWC with and without tracking enabled:
  - 3 switches on a tray
    - 57% less switch hits
    - 38% less time
  - Head Array
    - 69% less switch hits
    - 47% less time
  - Summary of study available at www.atilange.com under Resources
Assessment

- Goals
- Current mobility skills
- Related factors
- Medical issues
- Cognitive issues
- Future Needs
- Age
- Mobility Training
- Justification and Funding issues

Goals

- Clinician Goals:
  - To determine if the client is an appropriate candidate for a power mobility base
  - Potential vs. Mastery
  - Measurements
  - Objective vs. Subjective

Goals

- Clinician Goals:
  - To determine the most appropriate:
    - Power wheelchair and components
    - Drive Wheel Configuration
    - Power Seating
    - Driving method

Goals

- Clinician Goals:
  - To justify the recommended equipment adequately to obtain funding
    - Varies with funding source(s)
    - Moving target
    - No rule book
    - Time limitations

Funding
Goals

- Clinician Goals:
  - To provide adequate support/training for a successful outcome
  - Training client and caregivers in proper use of chair
  - Basic troubleshooting
  - Mobility training
  - Work as a team

- Client goals
  - i.e. “I want a fast wheelchair”

- Caregiver goals
  - i.e. “I don’t want any more holes in my walls”
  - Consensus building!

Current mobility skills

- Ambulation with or without assistance
  - Client should have mobility concepts

- Manual wheelchair
  - If propelling a MWC, this is often inefficient, necessitating a PWC
  - If one handed, client may rely on “reverse” or pulling back on rear wheels to correct course. This can result on depending on pulling back on the joystick.

Current mobility skills

- Any prior power mobility experience
  - May not have been positive
  - Ensure client and caregivers that you are on the same team

Related factors

- Transfers
  - seat to floor height

- Accessibility
  - Home, school
  - Vehicle, school bus
Related factors

• Seating
  • To optimize access to driving method
• Need for power seating functions
• Need to interface other assistive technology
  • i.e. communication device

Medical Issues

• Motor control
• Muscle tone
• Muscle strength
• Extraneous movement
• Reflexes
• Seizures
• Alertness level
• Vision and visual perception
• Hearing
• Progressive disorders

Medical Issues

• Motor Control
  • Volitional, isolated, controlled and repeatable movements
  • Utilize as small a movement as possible
  • Proportional control requires grading of force and distance of movement

Medical Issues

• Muscle Tone
  • Low tone may mean limited active range of motion and decreased strength
  • Increased tone often limits midline and midrange control
  • Fluctuating tone often results in fluctuating performance!

Medical Issues

• Muscle Strength
  • For active range of motion
  • For activation
  • For sustained activation
  • Limit active range and force required

Medical Issues

• Extraneous Movement
  • Athetosis or fluctuating tone: often control is best away from midline and at end ranges, stabilize adequately to allow isolated control
  • Tremoring: decrease sensitivity if using proportional control
Medical Issues

• Reflexes
  - Try not to place an access method in the path of a reflexive movement for activation or release
  - I.e. ATNR, Rooting

Medical Issues

• Seizures
  - If a client has high seizure activity, a power wheelchair may not be appropriate
  - Make sure the access method is released during a seizure
  - Make sure the client can drive safely after a seizure
  - Supervision

Medical Issues

• Alertness Level
  - Is the client alert during driving?
  - Persons with head injuries often have periods of agitation and subaroused states

Medical Issues

• Vision and Visual Perception
  - Persons with low vision can often drive functionally, particularly indoors
  - Blind drivers: canes, echolocation, sensors and programming
  - Field cuts and left sided neglect
  - Perception: depth perception often doesn’t develop fully until a person moves independently

Medical Issues

• Hearing
  - Limited hearing is usually not a limiting factor in driving
  - Client will need to compensate with vision and judgment

Medical Issues

• Progressive Disorders
  - Access method may change as condition progresses
  - ASL/Switch-IT! lease programs for people with ALS
Wake Up Time!

• Tell the person next to you what city you were born in

Cognitive Issues

• See Criteria Handout www.atilange.com
• Cause and effect
• Stop and go concepts
• Directional concepts
• Judgment
• Problem solving
• Following directions
• and … Motivation

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

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.

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.

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
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

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

Motivation

• Motivation is important, too

Future Needs

• Progressive disorders
• Growing bodies
  • Growth of wheelchair frame
• Children: growing minds
• Mobility needs change with age
  • Environments, distance, independence
• Work requirements
• Need for weight shifts

Power Seat Functions

• Tilt
• Recline
• ELRs
• Elevators
• Standers
• Why important?
• RESNA Position Papers

Age

• How young is too young?
• Research has demonstrated that children can drive a power wheelchair as young as 8 months!
  • Pediatric Power Position Paper
• It is cognitively easier to drive with 3 switches (using hands) than a joystick at a young age
• Borrow a kid and get a baseline!
Mobility Training

- As part of the evaluation process
- After wheelchair delivery to optimize skills

Remote stop switch

- Great for training new drivers
- ASL and Switch-it!
- iDrive App pending!

Justification and Funding Issues

- The evaluation report
- Justifications - what works
- Justifications - what doesn’t work
- Ask your supplier

Take home message:

- Assessment is critical to:
  - Determine if a client is ready for a power wheelchair
  - Match client to product
  - Secure funding
  - Achieve successful outcomes

Questions?

Take A Break!
THE DRIVING METHODS

Driving Methods: Proportional

- Also called Analog
- Joysticks
  - hand
  - chin
  - head
  - forearm
  - foot
  - handle types

Joystick - hand

- Proportional joystick control requires grading of force and distance of movement
- Grading requires co-contraction of the flexors and extensors
- Difficult for clients with abnormal muscle tone

Joystick placement

- Sometimes the problem is location…
- Most joysticks are mounted at the end of the armrest to one side of the wheelchair

Swing away joystick mounts

- Allows more midline placement

Power Options

- Power joystick mount
- Motion Concepts
Poll Time!

• Which Alternative Proportional Joysticks have you used?

Compact Joystick

• Compact Joystick Single Switch
• Textured for easier grasp
• Top is non-removable
• One switch on top of joystick acts as a Reset

Compact Joystick

• Compact Joystick Dual Switch
• Two switches on top of joystick send signals thru 2 switch jacks
  • Reset
  • Tilt
  • Power
  • Mouse clicks
  • 1-2 switch SGD access

Compact Joysticks

• Who would you use these with?

Tough Joystick

• Switched joystick
• 4 or 8 directions
• Heavy Duty to withstand significant forces
  • Significant force may mean decreased control
**Touch Pad**

- Cellphone touchscreen technology
- **Absolute Mode**
  - Start in the center
- **Relative Mode**
  - Center is wherever you start
- Built-in mode switch on screen
- On logo
- Can enable or disable mode option

**Proportional Mini Joystick**

- 14g force
- **Standard Joystick**
  - 180 – 220 grams

**Mini Proportional Joystick**

- Micro Extremity Control (MEC)
- Slide switch makes Reverse Reset
- Pushing down also acts as Reset
- 17 grams of force
- New version has shorter throw and a lighter spring

**HMC Joystick: Mounting**

**MEC Joystick - Mounting**
MEC Joystick Video

Extremity Control Joystick
- ASL
- Resistance is 1/3 of standard joystick
- Can choose to make Reverse act as Reset
- Moisture resistant

Micro Joystick
- Mo-Vis
- 10 grams
- Various mounting options

Mini Proportional Joystick
- Switch It! MicroPilot
- Isometric joystick
- Requires very little throw
- Relies on force instead, approximately 10 - 50 grams
  - Adjustable force
- May result in less extraneous movement by the chin
- Can mount parallel to floor

MicroPilot - Mounting
- Mounted with fiberoptic reset
- Mounted parallel to floor
MicroGuide
- Switch-It
- Non-isometric
- 25g force

i-Drive Mini Proportional Joystick
- A line of alternative access methods that work on any PWC electronics package and can be programmed through the PWC programmer or separately through i-Drive software on a computer or tablet
- Stealth Products

Stealth Mini Proportional
- Various nubs/handles
- sealed

Stealth Mini Proportional
- i-Drive mounts under the handpad or elsewhere

Stealth Mini Proportional
- Various mounting options

Power Options
- Power swing away
- Joystick
- Sip 'n Puff
- Any control by mount
- hydration
Mini Proportional Joystick

- ASL Micro Mini Joystick
- Isometric joystick

Mini Proportional Joystick

- Mounting options

Mini Proportional Joysticks

- Clinical Indicators:
  - Requires small travel distance
  - Requires minimal force to move and sustain joystick
  - Can be fragile
  - MEC includes reset (push downward)

Who would you use these with?

Chin Joystick

- Can be mounted on a swing away arm or bib
- Can lead to repetitive stress injuries of the jaw or cervical area
- Can be difficult to use if surface isn't smooth
- May use compact or mini proportional joystick

Chin Joystick – Mounting

- Aluminum collar
Chin Joystick – Mounting
• Collar mount or bib

ASL or Switch It! Game Control Drive Control
• No joke!
• Controls power wheelchair, seat functions and mode changes

Game Control Video

Mushroom Joystick
• Designed for clients who cannot grasp a joystick handle
• Stiff
• Alternative:
  • Bodypoint dome handle
  • Textured

Game Control Drive Control
• Client can hold close to body
• Light touch buttons
• Built-in mini joysticks
• Durable!
• Cannot assign buttons in the field
• Great for clients with Duchenne
• 40-50 grams on joysticks
Foot Control
- Proportional foot control
- Attaches to compact joystick

Arm Control
- Switch It! proportional arm control
- Attaches to compact joystick

Arm or Foot Controlled Joysticks
- Who would you use these with?

Proportional Head Control
- Pushing back moves wheelchair forward
- Sustained pressure required to continue movement
  - Can lead to increased muscle tone and difficulty stopping

Magitek Drive Control
- Sensor mounted at top of head
- Translates head movement into wheelchair movement
- Requires very good head control
- Stop: enter Neutral Zone
- Who would you use this with?

Magitek Drive Control
- Emergency Stop Switch Port
- Over rate
  - Shuts down system with sudden movement (i.e. sensor falls off head)
- Over range
  - If the client moves too far from center and stays there, the PWC stops
Joystick Handles

- Larger handles may reduce muscle tone
- Goal post style designed for poor grasp

Handle with Switch

- Joystick Extension Fifth switch
- Switch built-in
  - Can operate reset, mouse click, tilt, etc.
  - Mono jack

Questions?

PROGRAMMING

General and Proportional

Programming

- Driving Parameters
- Proportional specific parameters

Why is this Important?

- Cathy
**Why is this Important?**

- Not programming a PWC for an individual is like not customizing an Ultralightweight MWC for optimal self-propulsion

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**Whose Job is This?**

- Takes a team…

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**Got Chocolate?**

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**Programming Driving Parameters**

- Driving parameters affect the speed and responsiveness of the PWC and are not access method specific
  - Can increase driving efficiency
  - Can customize to an individual’s environmental needs
  - Can make a PWC downright dangerous!

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**Poll Time!**

- Are you currently programming PWCs?
  - Yes
  - No
  - I want to!

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**Programming Driving Parameters**

- Programming can often be done by changing overall parameters (typically speed and responsiveness) or individual parameters
  - Overall programming automatically changes a number of specific driving parameters in proportional to one another
Programming Driving Parameters

- Programming choices
  - Simple
  - Speed and responsiveness
  - Advanced
    - Parameter by parameter
    - Invacare MK6i
    - Overall Speed and Performance

Some Electronics packages offer preset programs to choose from
- You can customize from there
- Saves time and reduces chance of error

Driving Parameters

- Programming choices
  - Invacare MK6i
    - Standard Programs
      - i.e. “very slow learner”
    - Q-Logic
      - Program for each device type
      - More on web
      - Make your own!
      - Did a program turn out really well? Save it to use with similar clients!

- Speed
  - Acceleration
  - Deceleration
  - Torque
- Remember, these parameters may look different using different access methods or drive wheelchair configurations

Speed

- Maximum speed in a specific direction
  - Usually listed as a % of the full speed
- Forward
- Turns
  - Much lower than Forward
- Reverse
  - Lower than Forward
  - Drivers have less control rearward and may reverse farther than necessary if this is too high
Speed
• Proportional access methods provide speed control
• Non-proportional access methods offer one speed only
• Drives or Profiles can be set up with different parameters
  • Allows different speeds for different circumstances

Speed
• Generally slower for inside
• Faster for outside
  • Crossing the street before the light is red
  • Keep up with companions walking
    • Around 2 mph
  • Getting to class on time
  • Keeping up with peers on the playground
    • Around 200 mph!

Acceleration
• How quickly the wheelchair achieves full speed in response to access method activation
• Too fast: chair may be jerky and throw the client rearward
  • Can lead to startle, anxiety
• Too slow: chair may be unresponsive

Deceleration
• How quickly the wheelchair comes to a full stop in response to access method release
• Too fast: chair may jerk to a stop, pitching client forward, possibly rocking chair forward
• Too slow: chair will roll to a slow stop and may inadvertently run into walls, etc.

Torque
• Like driving in low gear
• Increases power without increasing speed to drive on carpet, over thresholds, etc.
• Intuitive Torque
  • Increases torque at lower speeds automatically
• Q-Logic

Torque
• Turn down torque to prevent the following:
  • Chair climbing the wall
  • Chair moving the furniture
  • Chair punching holes in wall
Proportional Specific Parameters

- Sensitivity
- Short throw
- Deadband
- Changing axes
- 3 direction
- Switch Joystick

Sensitivity

- How quickly the PWC responds to joystick movement
- Sometimes referred to as Tremor Dampening
- Too High: PWC drives too perky
- Too Low: PWC is unresponsive
- Switching to a mini proportional joystick?
  - Sensitivity may have to be reduced

A Sensitive Video

Thanks Maz!

Short Throw

- Shorter distance is required to achieve full speed
- If a client with muscle weakness is struggling with a standard joystick, increasing sensitivity and enabling short throw can help
  - May consider mini proportional joystick
  - Use with caution with mini joysticks

Deadband

- Draws an imaginary line around the joystick
  - Driver must move past this boundary to initiate movement of the chair
- Designed for goalpost handles
- Available on Q-Logic and R-net

Changing Axes

- Choose which joystick movement results in which directional movement
  - i.e. Forward can be swapped with Reverse
3 Direction

- 3 directions can emulate 4
- i.e. pulling back on the joystick can be Forward. Press Reset, now pulling back on the joystick controls Reverse.
  - MK6i: RIM mode
  - R-net: Training mode inhibits one drive
  - Q-Logic: 3-Direction Profile

Switch Joystick

- Change a proportional joystick to a switch or non-proportional joystick
  - 4 directions
  - Why?
    - May help a client who tends to veer
    - New drivers
  - MK6i: in Latched only
  - R-net: in step latched drive only
  - Q-Logic: past 50% joystick deflection only

i-Drive proportional programming

- On the i-Drive software, you can program features of the mini proportional joystick
  - Throw
  - Assign directions
  - Combine with switches
  - 3 direction
  - Switch joystick (in Latch)

Questions?

Hands-on Time!

- Proportional Driving Methods
- Go to a station
- Hop in!
- Drive!
- Program!

LUNCH TIME!

Lunch!
Be back here by 1:00pm!
THE DRIVING METHODS

digital

Digital Driving Methods

- Single switch scanning
- 2, 3, 4 or 5 switch combination
- Sip 'n puff
- Head Array (proximity)
- 4 switch proximity array
- 2 or 4 switch fiberoptic array
- Sip 'n puff head array
- Roll Talk
- Tongue Drive

Poll Time!

- What Alternative Digital Driving Methods have you used?

Switch Driving

- 1 switch: scanning
- 2 switch: Forward, Left, Right and Reverse and Reset
- 3 switch: Forward, Left, Right
- 4 switch: Forward, Left, Right and Reverse or Reset
- 5 switch: Forward, Left, Right, Reverse and Reset

Got Chocolate?
Single Switch Scanning
• Clinical Indicators:
  • only 1-2 switch sites can be found
  • Client can see and monitor display
  • ASL options:
    • Auditory feedback
    • Communication modification
    • Jumbo LED modification

Single Switch Programming
• 4 or 8 direction
• Scan pattern
• Scanning "Mode"
• External scanner or on display

2 Switch Control
• ASL Single Switch Scanner with Dual Switch Step Scan
• Requires 2 switches
  • First switch moves through directions
  • Second switch selects and moves if sustained contact

2 Switch Control
• Q-Logic
  • Switch 1:
    • 2 activations = Forward, 1 activation = Left, double click = mode
  • Switch 2:
    • 2 activations = Reverse, 1 activation = Right

2 Switch Control
• Stealth i-Drive: Link
• Can program 2 switches to act like 3
• Activate both switches for Forward, left switch for Left and right switch for Right
• Come off switches to toggle Forward and Reverse
• Reset
  • Double left activation
  • If client can use a 3rd switch, this can be Reset
• Can use with mechanical and/or electrical switches

Any 2, 3, 4 or 5 switch combination
• Clinical Indicators:
  • Ideally, 3 switch sites provides Forward, Left and Right directional control
  • If a 4th switch can be identified, Reset provides the most function
• Requires a switch
  • Interface box and switches
  • ASL
  • Stealth

Any 2, 3, 4 or 5 switch combination
• Clinical Indicators:
  • Ideally, 3 switch sites provides Forward, Left and Right directional control
  • If a 4th switch can be identified, Reset provides the most function
• Requires a switch
  • Interface box and switches
  • ASL
  • Stealth
Any 2, 3, 4 or 5 switch combination
• Any combination of individual switches
• or
• Switch array

Do you like Case Studies?
• Case Studies Rock!!!

3 Switch Driving – movie time!

An Interesting Combination
• 3 Switch Driving

Driving with the New Chair!
And one more…

- Alexi, TBI, hypersensitive hands
- Isolated control at lateral knees

Switch Mounting

- If you are using several switch types in several locations, these need to be mounted

Switch Mounting

- Lateral Knee
  - Replace lateral pads with mechanical switch(es) if this works best for the client

Switch Mounting - Head

Replacing lateral pad with switch
Maintaining left lateral support for stability

Switch Arrays

- Sip 'n Puff
- Proximity arrays
- Fiberoptic arrays
- Combination arrays
Sip 'n Puff

- Clinical Indicators:
  - Little control of head or extremity movement
  - Good oral motor control, lip closure, intact palate
  - Full directional control and speed control

Sip 'n Puff

- Mounting options:

Sip 'n Puff programming

- 4 pressure
  - Forward: hard puff
  - Right: soft puff
  - Reverse (or stop): hard sip
  - Left: soft sip
  - Latch
  - Speeds

iDrive Sip 'n Puff

- 4 pneumatic commands
- Pressures programmed on iDrive software
- Can hold on tablet in front of client for better feedback
- Proportional speed
  - i.e. creeping up to table

Sip 'n Puff programming

- 2 or 4 pressure
- 2 pressure on QLogic
- Command Time/Sampling Delay
- 2 pressure
  - Between time
  - 2 puffs = Forward, 1 puff = Right
  - 2 sips = Reverse, 1 sip = Left
Sip 'n Puff stop switch

- Stops the wheelchair if the straw moves out of reach
- Can also be used as a reset switch
- Travis and Jessica

Wake up Time!

- Tell the person next to you what pets you have

Head Array (proximity switches)

- 3-5 proximity switches in a tri-pad headrest
- Clinical Indicators:
  - Fair to good head control
  - Little extremity control

Head Array with Beam Switch

ASL ATOM Head Array

- Electronics are attached to the head pad
- New features
  - Client can turn the head array on and off by pressing an external switch
  - Hold one directional switch for a programmable amount of time and then send a wireless switch signal to another AT device (i.e. SGD, Computer, tablet)

ASL ATOM Head Array (cont.)

- New features, cont.
  - Can change reset double tap to longer hold (Rnet, Qlogic)
  - Can turn on auditory feedback when a directional switch is activated
Permobil Head Array
- Total Control Head Array System
  - Can combine electrical and mechanical switches
  - 2 Proximities in rear pad to facilitate diagonals
  - 6 input jacks on back (1/8")
    - Mechanical mono
    - Electrical stereo

Stealth Head Array
- Suboccipital pad can increase stability of the head
- Can be added to many types of head arrays

Stealth Products i-Drive
- Can combine proximity and mechanical switches
  - Mechanical switches require short adaptor cable
- Can assign each switch and activation distance using a Tablet
- Reverse:
  - Double tap or Mode switch to Toggle

i-Drive
- Separate programming from the power wheelchair electronics
- Remote Stop App
- Attendant Control App
Switch It Dual Pro

- Switch It Dual Pro Head Array
- Programming can be done on back pad
- Switch control, proportional control or both
  - Proportional responds to amount of force

Head Array – movie time!

Head Array – another movie

Head Array - iDrive

Proximity switch arrays

- Typically placed under a tray
- Consider tactile cue above (i.e. loop Velcro)
- Consider pigtail cable
- ASL, Switch-It!, Stealth

Active Controls Tray Mount

- Sandwiches switches between two trays
Proximity Array

- Clinical Indicators:
  - Fair upper extremity control
  - Accommodates larger movement
  - Eliminates a plane of movement

Jellybean by left cheek is for SGD. Cuff is to keep left hand off of proximity switches and to provide stability. Right hand accesses proximities.

Proximity Array

- Mounting options
- Clear vs. Solid tray: visual field

Proximity Array

- Mounting options

Proximity Array in Tray

- Stealth iDrive in Eclipse Tray

Stealth Products

Proximity Array

- Magitek proximity array
Fiberoptic Switch Arrays

- Small targets
- Accommodates very small movements with no force
- Typically placed by finger or thumb
- Cables are fragile
- ASL, Switch-It!, Stealth

4 Switch Fiberoptic Array in Tray

- Can mount in tray on superior surface or side
- Can mount in armtrough, as well

Fiberoptics Video 1

- Cover both beams for forward
- Cover left for left directional control
- Cover right for right directional control
- 3rd switch can be used as reset
- Proportional version
- ASL
- Stealth i-Drive

Stealth iDrive Fiberoptics in tray

Stealth Products Fiberoptic Arrays

- 2, 3, 4 switch arrays
- Handpad mount option with mini goosenecks
- Tuning
**Fiberoptic Mounting Options**

- Good location to capture tongue extension or cheek puff
- Good site for Reset

**Combining Electronic Switches**

- Farid, age 8
- SMA, type 1
- Driving with:
  - Forward: 1 fiberoptic switch under right index finger
  - Left: 1 fiberoptic switch under left index finger
  - Right: 1 proximity switch by left medial knee
  - Reset: 1 proximity switch by right medial knee
- Invacare MK6i, ASL
### Combination Systems
- Analog Digital Drive
- Sip ‘n Puff Head Array

### Analog Digital Drive System
- Left and Right pads active on the head array
- Forward and Reverse active on the joystick
- Why would you choose this?

### Sip ‘n Puff Head Array
- Left and Right pads active on the head array
- Any puff is Forward
- Any sip is Reverse
- Who would you choose this for?

### Sip n puff head array
- Stealth iDrive

### Combining Mechanical and Electronic Switches
- Julian
- SMA, type I
  - Microlite, right medial knee, Right
  - Fiberoptic, left thumb, Forward
  - Proximities at either side of head for Left and Reset

### Combining Mechanical and Electronic Switches
- Invacare and ASL
  - Julian can control Driving, Reverse, Tilt and Speed
Eye Gaze

- Roll Talk
  - Allows driving with eye gaze
  - A single switch hit is still required to “wake up” system
  - Controls many other functions including communication and EADL functions
  - Primarily designed for clients with ALS
  - Abilia, Sweden
  - Distributed by ASL

Eye Gaze

- Rolltalk NOVA

Tongue Control

- Only a bunch of college students would volunteer to pierce their tongue…
- Still in research at Georgia Institute of Technology
- Movement of tongue is translated into movement of the chair

Questions?

Break Time!

Hands-on Time!

- Digital Driving Methods
- Go to a station
- Hop in!
- Drive!
- Program!
Questions?

PROGRAMMING

Digital

The cookie survey!

Non-Proportional Specific Parameters

• Driving parameters effect performance differently with different driving methods

Single Switch Scanning

• Speed of scan
• Scanning mode
• Scan pattern
• 4 or 8 directions
**Single Switch Scanning**

- **MK6i**
  - requires external scanner
- **R-net**
  - 4 directions on display
  - Scans chair functions
- **Q-Logic**
  - 12 scanner options
  - Can disable mode option
  - If using with SGD

**Switch Driving Programming**

- **Q-Logic**
  - 2 switch option
  - 3 switch option
  - Can program double hit on Left to access actuators
  - May avoid need for Reset switch

**Sip n Puff**

- **4 pressure**
  - Calibrate Hard and Soft pneumatic commands
  - Ramping
  - R-net: ramp up, ramp down
  - Q-Logic: Sampling Delay
  - Allows client time to build pressure
  - i.e. Frank

**Head Array**

- **Poll time**
  - Who does the programming on your team?
  - Manufacturer
  - Supplier
  - Clinician
  - No one

- **How to access Reverse**
  - Using a Reset or Mode switch to toggle Forward and Reverse
Head Array

- How to access Reverse
  - Standby
  - Choose Forward or Reverse
    - Invacare
      - Left command = Reverse
      - Forward command = Forward

- Right Pad (R-net, Q-Logic)
  - First activation toggles Forward/Reverse
  - Second activation drives

Head array

- i-Drive
- Reverse options
- Activation distance for each switch
- Assign function of each switch

Other Useful Programming

- Sleep Mode
  - All functions are disabled until Mode switch is activated
  - Allows a client to rest (i.e. on Head Array) without any unexpected results

Changing Drives

- Invacare Drive Select
- Allows the client to change drives (speeds) through the drive method. Requires Reset to go from Drive Mode to Drive Select
- Left and Right change Drive
- Movietime!

Other Useful Programming

- No Driving Mode (MK6i)
  - Disables driving in a specific mode while all other functions are available
  - Why?
    - Mark and the big screen TV
Other Useful Programming

- Power Seating Functions
  - Acceleration
  - Deceleration
  - Speed
  - Distance
  - Combinations of movement

Control of power seating through Drive Method

- Change from Drive Mode to Power Seating
- Various strategies, dependent on electronics package
- Movietime!

Other Useful Programming

- Pressure relief reminder
  - MK6i
  - Q-Logic
  - Falcon Rehab offers a reminder with recorded voice cues

Questions?

Take Home Message:

- There are many ways to drive a power wheelchair!
- Programming optimizes driving for an individual

Next steps:

- Work with your supplier and manufacturers for further inservices, product and client evaluation!
- Contact your local reps to try out some of this awesome technology!
- Drive!
- Identify potential clients and evaluate and/or refer!
Resources:

- www.atilange.com
- Under Resources:
  - Indoor Power Mobility Criteria
  - Pre-Mobility Training Guidelines
  - Mobility Training Guidelines
  - Complex Rehab Power Wheelchair Electronics Comparison Chart

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Thank You!