

POWER WHEELCHAIR DRIVING METHODS

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Disclosures

- Potential Conflicts of Interest
 - I present educational courses for Steath Products which include power wheelchair alternative driving methods. I frequently present on this topic in-person and through webinars and receive an honorarium to do so.

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Learning Outcomes

1. The participant will be able to list clinical indicators for mini proportional joysticks.
2. The participant will be able to describe clinical indicators for various joystick placement locations.
3. The participant will be able to list 5 different digital driving methods and clinical indicators for each.
4. The participant will be able to compare and contrast newly available head arrays.

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What we will be covering:

- Wheelchair Driving Methods
 - Proportional or Analog
 - Non-Proportional or Digital

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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



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Joystick placement


- Sometimes the problem is location...
- Most joysticks are mounted at the end of the armrest to one side of the wheelchair
- Placement can be more midline
- Joystick can be angled to match angle of client movement



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Swing away joystick mounts

- Allows more midline placement



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Power Options

- Power joystick mount
- Motion Concepts
 - video

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Compact Joystick

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



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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



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Compact Joystick


- Mo-Vis
- 2 switch jacks
- Mounts on sides for 1-2 twister switches



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Tough Joystick


- Switched joystick
- 4 or 8 directions
- Heavy Duty to withstand significant forces
 - Significant force may mean decreased control



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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




Switch M Touch Drive 2

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Touch Pad

- TD 2 mounting option





Active Controls

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Proportional Mini Joystick

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

HMC Permobal

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HMC Joystick: Mounting





Stealth Hand Pad

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Mini Proportional Joystick

- ASL Micro Extremity Control (MEC)
- Slide switch makes Reverse Reset
- Pushing down also acts as Reset
- 17 grams of force





MEC

Slide Switch

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MEC Joystick - Mounting

Stealth Hand Pad

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Micro Joystick

- Mo-Vis
- 10 grams
- Various mounting options



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Extremity Control Joystick

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



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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



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MicroPilot - Mounting



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MicroPilot - Mounting

- Mounted with fiberoptic reset
- Mounted parallel to floor



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MicroGuide


- Switch-It
- Non-isometric
- 25g force



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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



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Stealth Mini Proportional


- Various nubs/handles
- sealed



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Stealth Mini Proportional


- i-Drive mounts under the handpad or elsewhere



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Power Options


- Power swing away (video)
- Joystick
- Sip 'n Puff
- Any control by mount
- hydration



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Mini Proportional Joystick

- ASL Micro Mini Joystick
- Isometric joystick



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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)

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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



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Chin Joystick – Mounting


- Aluminum collar
- Harness or Bib
- Swing away bar



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ASL or Switch It! Game Control Drive Control

- No joke!
- Controls power wheelchair, seat functions and mode changes
- Client can hold close in to body
- Light touch buttons
- Built-in mini joysticks
- Durable!
- Cannot assign buttons in the field
- Great for clients with Duchennes
- 40-50 grams on joysticks



Switch-It! Drive Station

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Mushroom Joystick

- Designed for clients who cannot grasp a joystick handle
- Stiff
- Alternative:
 - Bodypoint dome handle
 - Textured



Stoath

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Foot Control

- Proportional foot control
- Attaches to compact joystick



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Switch It!

HMC/Permobil

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Arm Control

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



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Proportional Head Control

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



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Switch-h1



Permcobil

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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?



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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



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Joystick Handles

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



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Handle with Switch

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



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Digital Driving Methods

- Non-Proportional
- Switch

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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
- Eye Gaze

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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



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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



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Single Switch Programming

- 4 or 8 direction
- Scan pattern
- Scanning "Mode"
- External scanner or on display

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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



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2 Switch Control


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



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2 Switch Control

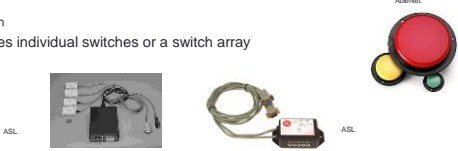
- Stealth i-Drive: Link
- Can program 2 switches to act like 3
- Activate both switches for Forward, left switch for Left and right switch for Right
 - Come off switches to toggle Forward and Reverse
- Reset
 - Double left activation
 - If client can use a 3rd switch, this can be Reset
- Can use with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



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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
 - ASL
 - Stealth
- Requires individual switches or a switch array



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Do you like Case Studies?

- Case Studies Rock!!!

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3 Switch Driving – movie time!

- Landon


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An Interesting Combination


- 3 Switch Driving



Forward Jellybean behind left upper arm



Right Turns AbleNet Jellybean left medial knee



Left Turns AbleNet Spec on strap base

Faim

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Driving with the New Chair!

- video

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Switch Arrays

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

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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



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Sip 'n Puff programming

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



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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



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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

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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



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Switch-It

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Head Array (proximity switches)


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



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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)
 - Can change reset double tap to longer hold (Rnet, Qlogic)
 - Can turn on auditory feedback when a directional switch is activated



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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



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Stealth Head Array


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



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Stealth Products i-Drive

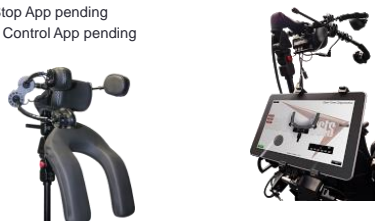
- Can combine proximity and mechanical switches
 - Mechanical switches require short adaptor cable
- Can assign each switch using a Tablet
- Reverse:
 - Double tap or Mode switch to Toggle



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i-Drive


- Separate programming from the power wheelchair electronics
- Remote Stop App pending
- Attendant Control App pending



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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



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Head Array – another movie

- Taylor

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Proximity switch arrays


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



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Proximity Array

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



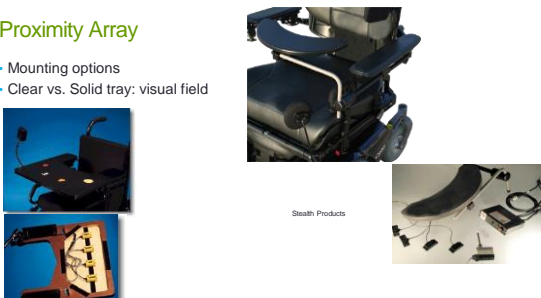
Mark

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

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Proximity Array


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



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Proximity Array at legs


- Magitek proximity array
 - Lateral and medial knees




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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



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Switch-It!

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4 Switch Fiberoptic Array in Tray

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





Stealth

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2 switch fiberoptic array

- 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



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Stealth

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Stealth Products Fiberoptic Arrays

- 2, 3, 4 switch arrays
- Handpad mount option with mini goosenecks
- tuning






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Combining Electronic Switches

- Farid, age 8
- SMA, type I
- 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


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Proximities: Right and Reset



Fiberoptic: Left



Fiberoptic: Forward

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Combination Systems

- Analog Digital Drive
- Sip 'n Puff Head Array

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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?




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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?



Stealth




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Combining Mechanical and Electronic Switches

- Julian
- SMA, type I


Fiberoptic, left thumb, Forward



Microrite, right medial knee, Right




Proximities at either side of head for Left and Reset



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Combining Mechanical and Electronic Switches



- Invacare and ASL
- Julian can control Driving, Reverse, Tilt and Speed



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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

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Thanks!

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