

POWER WHEELCHAIR ALTERNATIVE DRIVING METHODS

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Quantum
Rehab Q6 Edge

What we will be covering:

- Power Wheelchair Driving Methods
 - Driving methods
 - Decision Making Hierarchy
- Handouts



Permobil M300

Some thoughts...

- Impact on Alternative Driving Method success:
 - Optimal positioning
 - PWC assessment
 - Drive wheel configuration
 - Tracking technologies
 - Programming
 - Mobility training

Proportional Driving Methods

- Also called Analog
- Primarily Joysticks
- 360 degree directional control
- Speed control
- Vs. Digital



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



R-Net joystick

Clinical Decision Making

- Does the client have the ability to grade the force and distance of their movement?
 - Yes
 - Explore Standard Joysticks
 - No
 - Explore Digital Access Methods



Clinical Decision Making

- Does the client have adequate movement and motor control for joystick use?
 - Yes
 - Explore Standard Joystick
 - No
 - Explore Digital Access Methods



Invacare Linx

Clinical Decision Making

- Can the client optimally control a standard joystick mounted at the end of the armpad?
 - Yes
 - Explore standard mounting
 - No
 - Explore alternative placements



Permobil M300

Joystick placement

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



Invacare Arrow

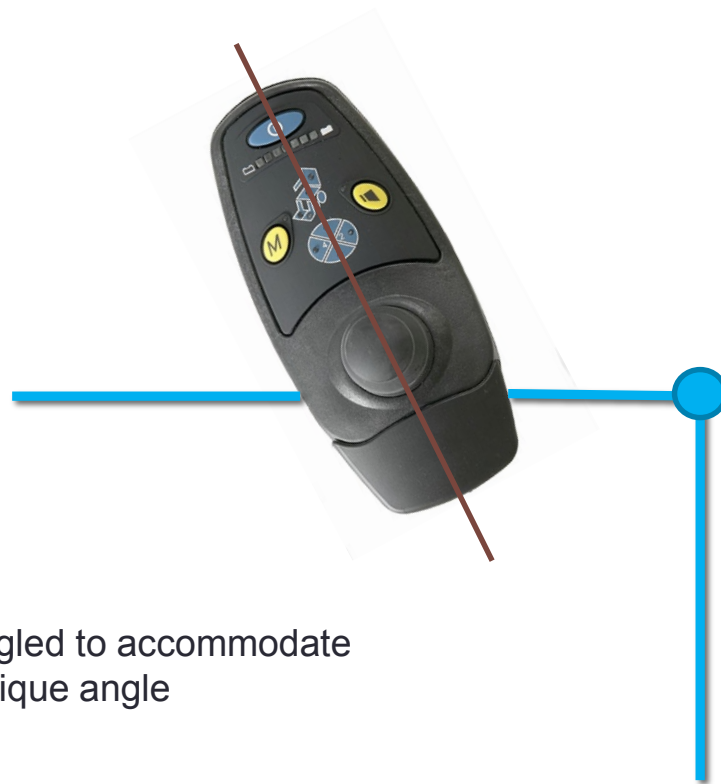
Swing away joystick mounts

- Allows more midline placement



Joystick Angles

- The angle of the joystick can also be changed to match the angle of client movement



Angled to accommodate oblique angle



Angled to accommodate pronation

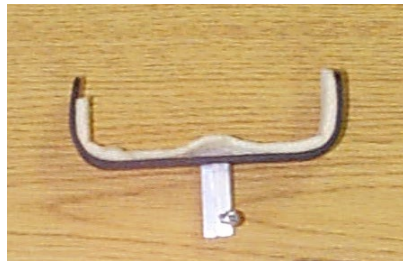
Clinical Decision Making

- Does the client have difficulty grasping a standard joystick handle?
 - Yes – Explore other style joysticks or other handles
 - No – Explore standard joystick



Joystick Handles

- Goal post style designed for poor grasp



Bodypoint



Clinical Decision Making

- Is there adequate room to mount a standard joystick where required for optimal control?
 - Yes – Use a Standard Joystick
 - No – Consider Compact Joystick

Compact Joystick

- Compact Joysticks take up less space
- Increases mounting options
- Strategy required to change modes and control power



ASL



Mo-Vis

Clinical Decision Making

- Does the client have adequate force to initiate and sustain joystick direction?
 - Yes – Explore Standard Joysticks
 - No – Explore Mini Proportional Joysticks



Mo-vis Multi

Mini Proportional Joysticks

- Mini Proportional Joysticks require less active force and travel to activate
- Standard joystick requires approximately 250 grams of force
- Many Minis require approximately 50 grams of force
 - Often appropriate for use at the chin
- Many Minis require approximately 10 grams force
 - Often appropriate for use at a finger or thumb

Switch It Micro Pilot



Clinical Decision Making

- Can the client control a mini proportional joystick by a finger or thumb and does the client wish to hold the driving method in midline and close to the body?
 - Yes – Explore Adapted Game Controller
 - No – Explore other Mini Proportional Joysticks

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

Mini Proportional Joysticks

- Mounting options
 - Hand
 - Head

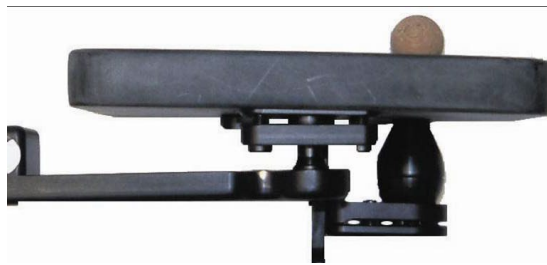
Clinical Decision Making

- Choose a mount by the chin.
 - Swing away mount stays in position relative to the wheelchair
 - Bib or harness mount stays in position relative to the client
 - Does the client need to move the mount independently?
 - Power mount



Mounting - Hand

- Many clients using a mini proportional joystick by the hand require hand and forearm support
- Mounting in a tray or hand tray provides support, protects the joystick and provides height adjustment in relation to the tray



Questions?

Digital Driving Methods

- Non-Proportional
- Switch

Clinical Decision Making

- Client cannot use any type of joystick
 - Joystick control requires the ability to grade the force and distance of movement
 - The client must also have adequate movement and motor control to use a joystick
 - No – explore Digital Driving Methods



Clinical Decision Making

- Client has fair upper extremity control
- Common DXs: CP, TBI, MS, MD
 - Individual mechanical switches on a tray surface

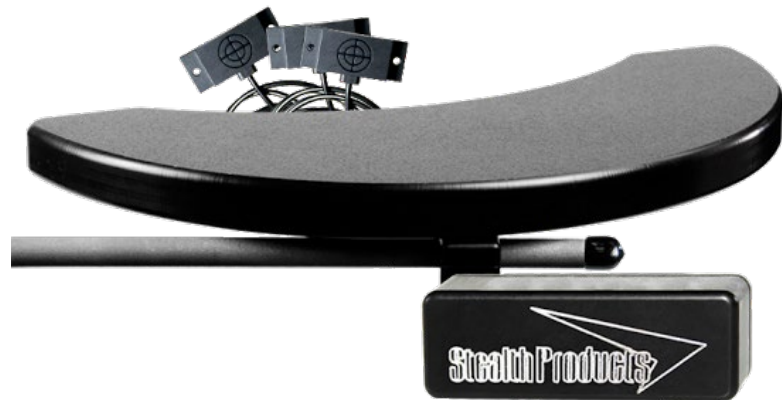


Clinical Decision Making

- Client has fair upper extremity control
- Common DXs: CP, TBI, MS, MD
 - But, client does not have controlled vertical movements
 - More difficult for clients with increased tone
 - Proximity array under tray

Proximity Array

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



Stealth Products

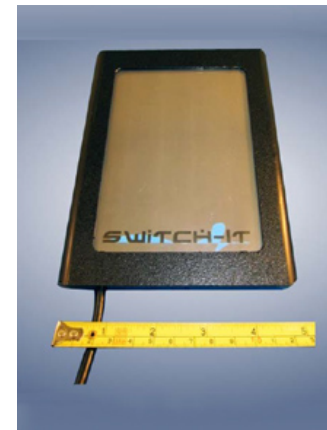
Mark



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

Clinical Decision Making

- Client has good fine motor control, but limited activation travel and force
- Common DXs: ALS, SMA, MD
 - Touch Pad (proportional)
 - Fiberoptic switches



Switch It TD2

Fiberoptic Switch Arrays

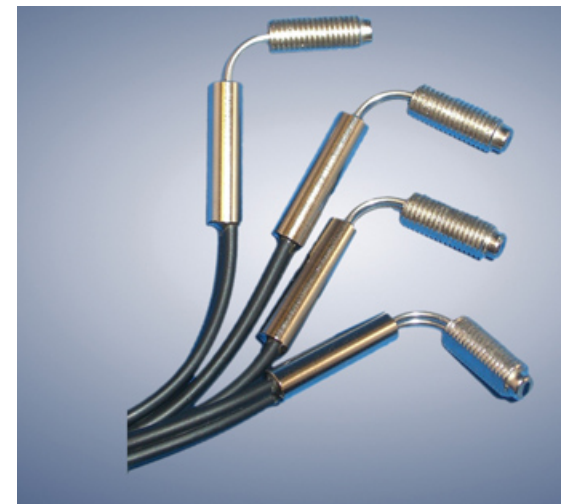
- Small targets
- Accommodates very small movements with no force
- Typically placed by finger or thumb
- Cables are fragile
- ASL, Switch-It!, Stealth

ASL



Stealth Products

Switch-It!



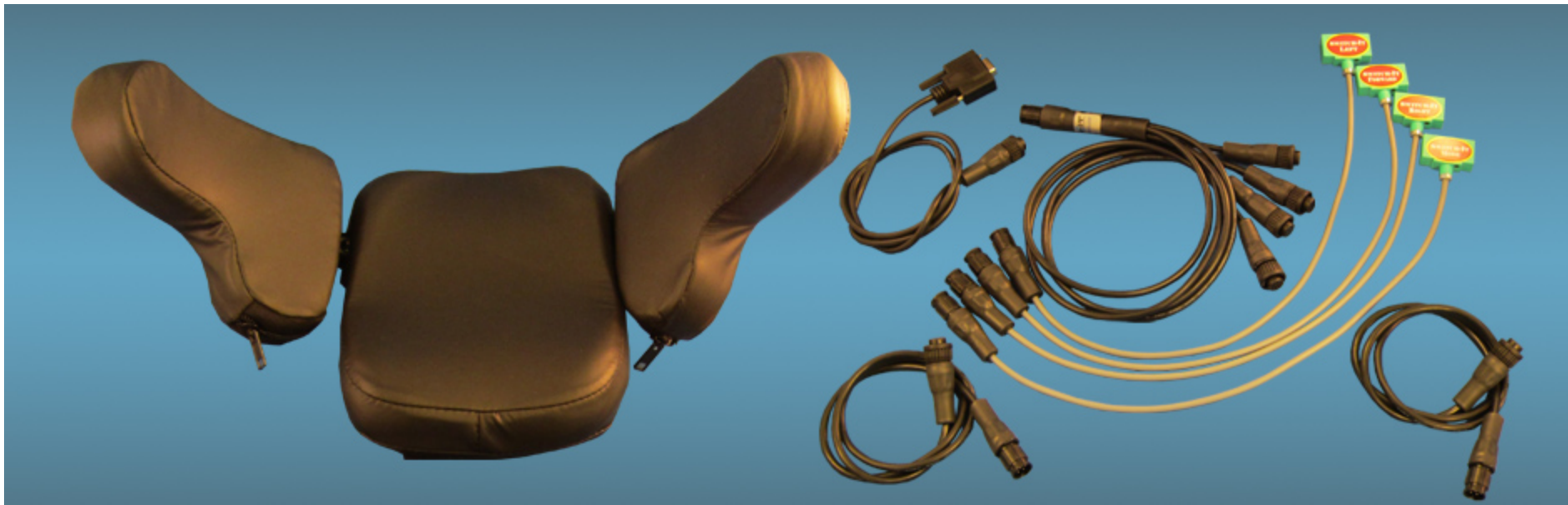
Clinical Decision Making

- Client has fair head control, but little extremity control
- Common DXs: CP, TBI, high level SCI
 - Head Array

Head Array (proximity switches)

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

Switch-It!



Head Array

- Many manufacturers, configurations and features

Permobil Total Control



ASLATOM



Switch It Dual Pro



Stealth i-Drive

Head Array - iDrive

- Jonathan

Clinical Decision Making

- Client has good oral motor control, but little head or extremity control
- Common DXs: high level SCI
 - Sip 'n Puff

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 programming

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



Clinical Decision Making

- Client has partial oral motor control and partial head control
- Common DXs: MS, TBI, SCI, CP
 - Sip 'n Puff Head Array Combo



Stealth Products

Sip 'n Puff Head Array

- Left and Right pads active on the Head Array
- Any puff is Forward
- Any sip is Reverse
- May work for clients who cannot discriminate between hard and soft pneumatic commands

Stealth Products



Clinical Decision Making

- Client has adequate motor control at 4 specific body sites
- Common DXs: CP, TBI, ALS, SMA, MD
 - 4 mechanical and/or electrical switches for Forward, Left, Right and Reverse or Reset
 - Optimal switch placement is where client has small, isolated, repeatable, and sustained ability to activate and release a switch

4 switch combination

- Clinical Indicators:
 - Ideally, 3 switch sites provides Forward, Left and Right directional control
 - Strongest switch site = Forward
 - If a 4th switch can be identified, Reset provides the most function
 - And requires the least motor control
- This isn't new, but finding the optimal switch sites and types is always a NEW challenge!



ASL

An Interesting Combination

- 3 Switch Driving

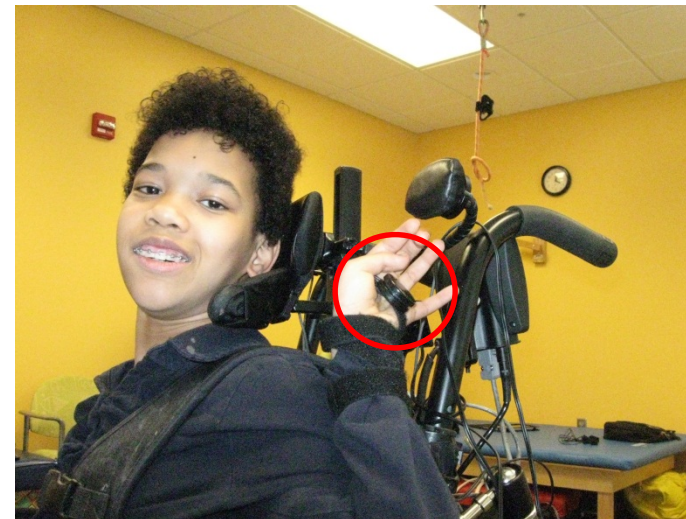


Right Turns AbleNet
Jellybean left medial knee

Left Turns AbleNet Spec
on strap base

Faith

Forward
Jellybean
behind left
upper arm



Driving with the New Chair!

- Faith

Julian

- SMA, type 1
- As his needs changed, so have his switch locations and types
- Proximities by either side of his head (Stealth i-Drive)
- *videos

Julian

- Fiberoptics by each hand (Stealth i-Drive)
- Fingers flexed to improve movement
- *videos

Julian

- Driving

Clinical Decision Making

- Client has adequate motor control at 3 specific body sites
- Common DXs: CP, TBI, ALS, SMA
 - 4 mechanical and/or electrical switches for Forward, Left, and Right
 - Reverse or Reset can be added later or consider Standby



AbleNet

Clinical Decision Making

- Client has adequate motor control at 2 specific body sites
- Common DXs: CP, TBI, ALS, SMA

2 Switch Control

- Several options
 - Adaptive Switch Labs 2 switch fiberoptic array
 - ASL Single Switch Scanner with Dual Switch Step Scan
 - Q-Logic 2 switch
 - Stealth i-Drive Link feature



Stealth Products



AbleNet



ASL

Clinical Decision Making

- Client has adequate motor control at 1 specific body site
- Common DXs: CP, TBI, ALS, SMA
 - Single Switch Scanning

Single Switch Scanning

- Clinical Indicators:
 - only 1-2 switch sites can be found
 - Client can see and monitor display
 - Newer ASL options:
 - Auditory feedback
 - Communication modification
 - *Jumbo LED modification



ASL



Take Home Message:

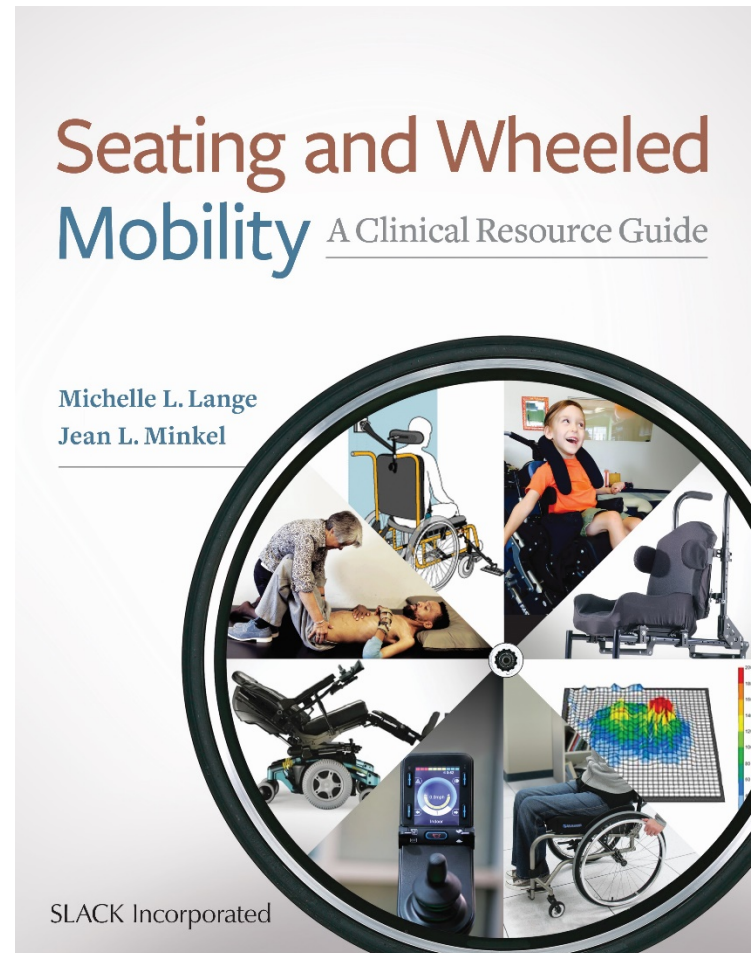
- There are many ways to drive a power wheelchair!
- Positioning, Drive Wheel Configuration, Tracking Technologies, Programming, and Training optimizes driving for an individual

Resources:

- www.atilange.com
- Under Resources:
 - Power Wheelchair Joystick Decision Making Tree
 - Power Wheelchair Non-Joystick Driving Methods Decision Making Tree
 - Indoor Power Mobility Criteria
 - Pre-Mobility Training Guidelines
 - Mobility Training Guidelines

One More Resource...

- Seating and Wheeled Mobility: a Clinical Resource Guide
- Edited by Michelle L. Lange, OTR/L, ABDA, ATP/SMS and Jean L. Minkel, PT, ATP
- Available from SLACK, Inc.



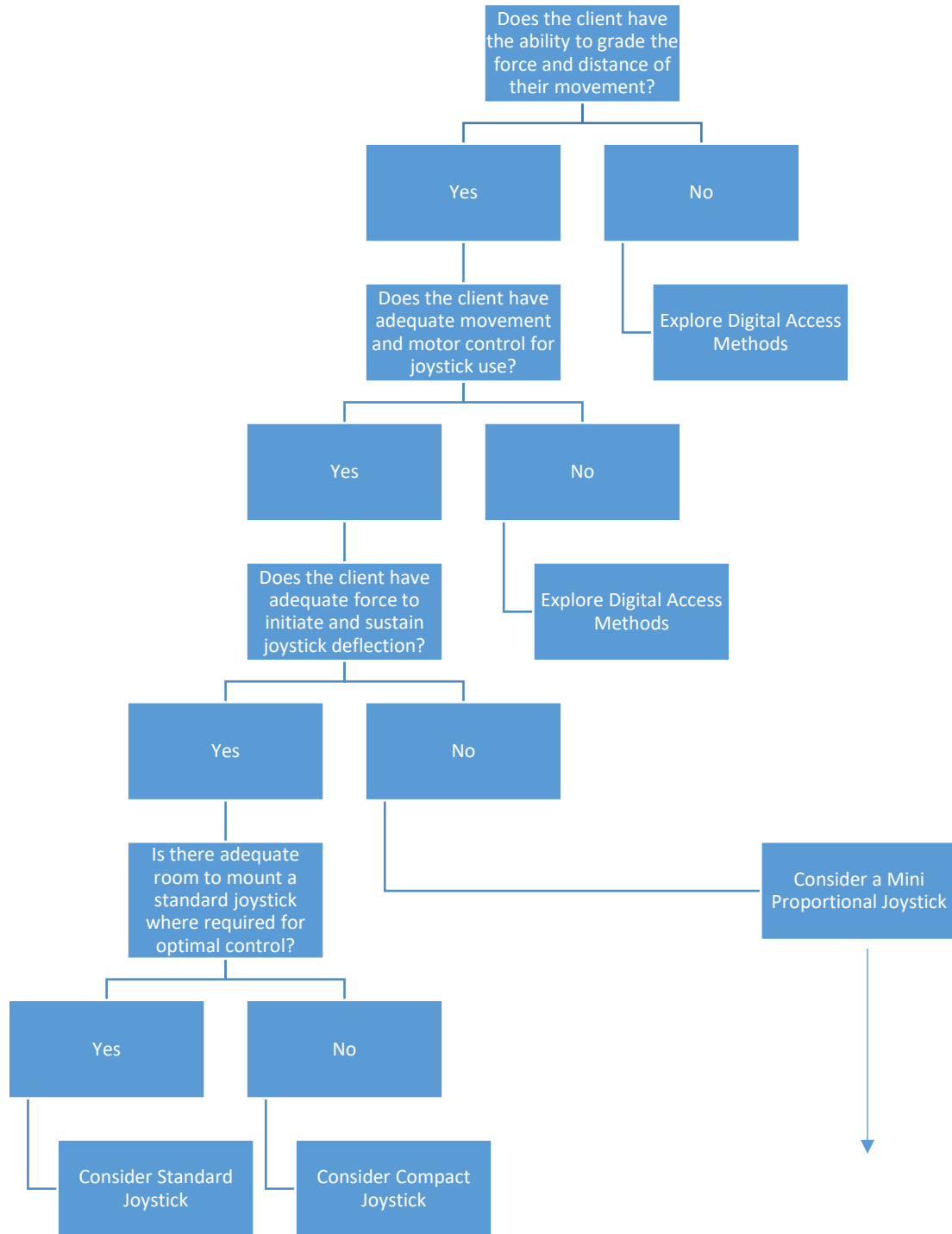
Thank You!

Contact Information:

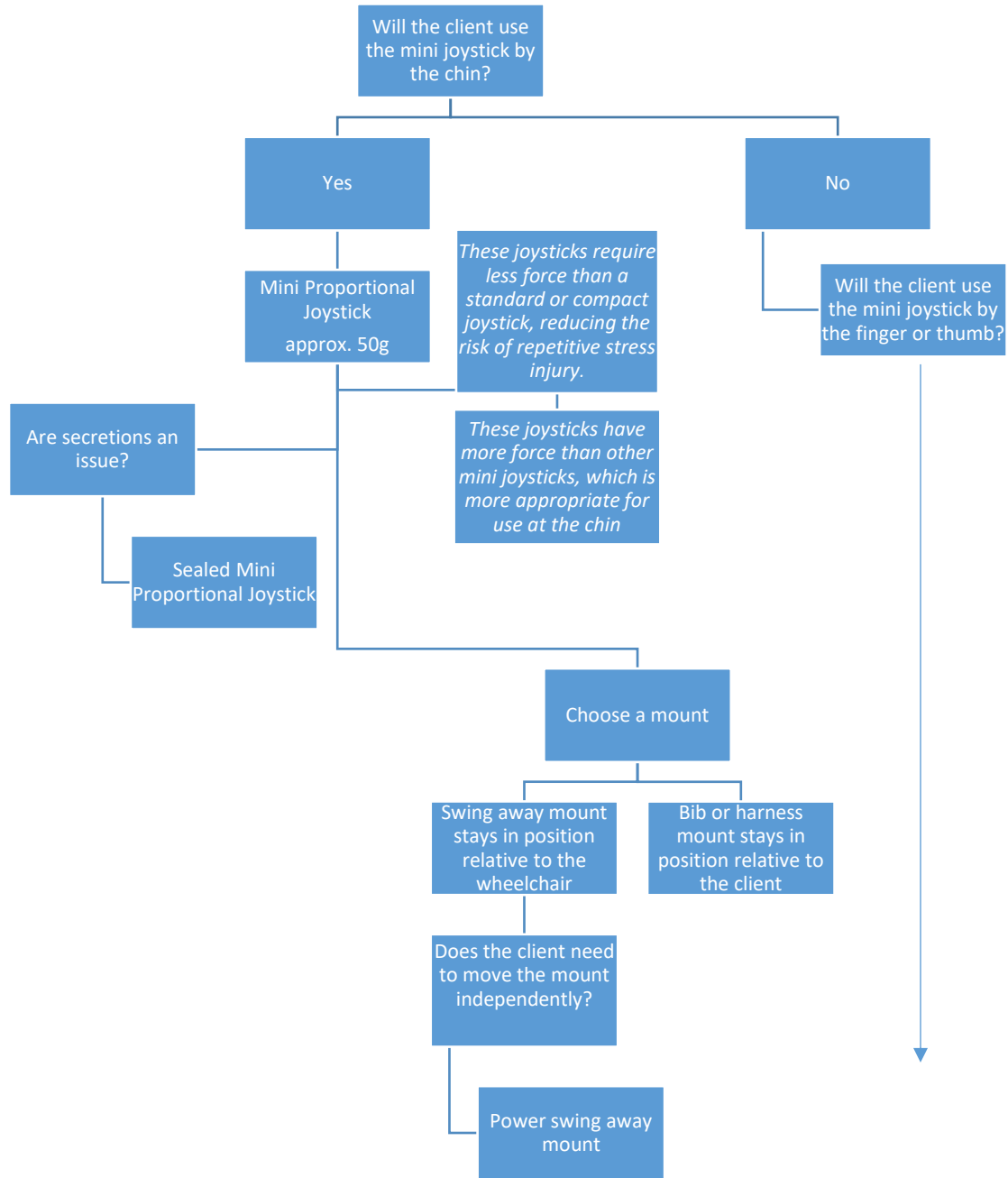
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Questions?

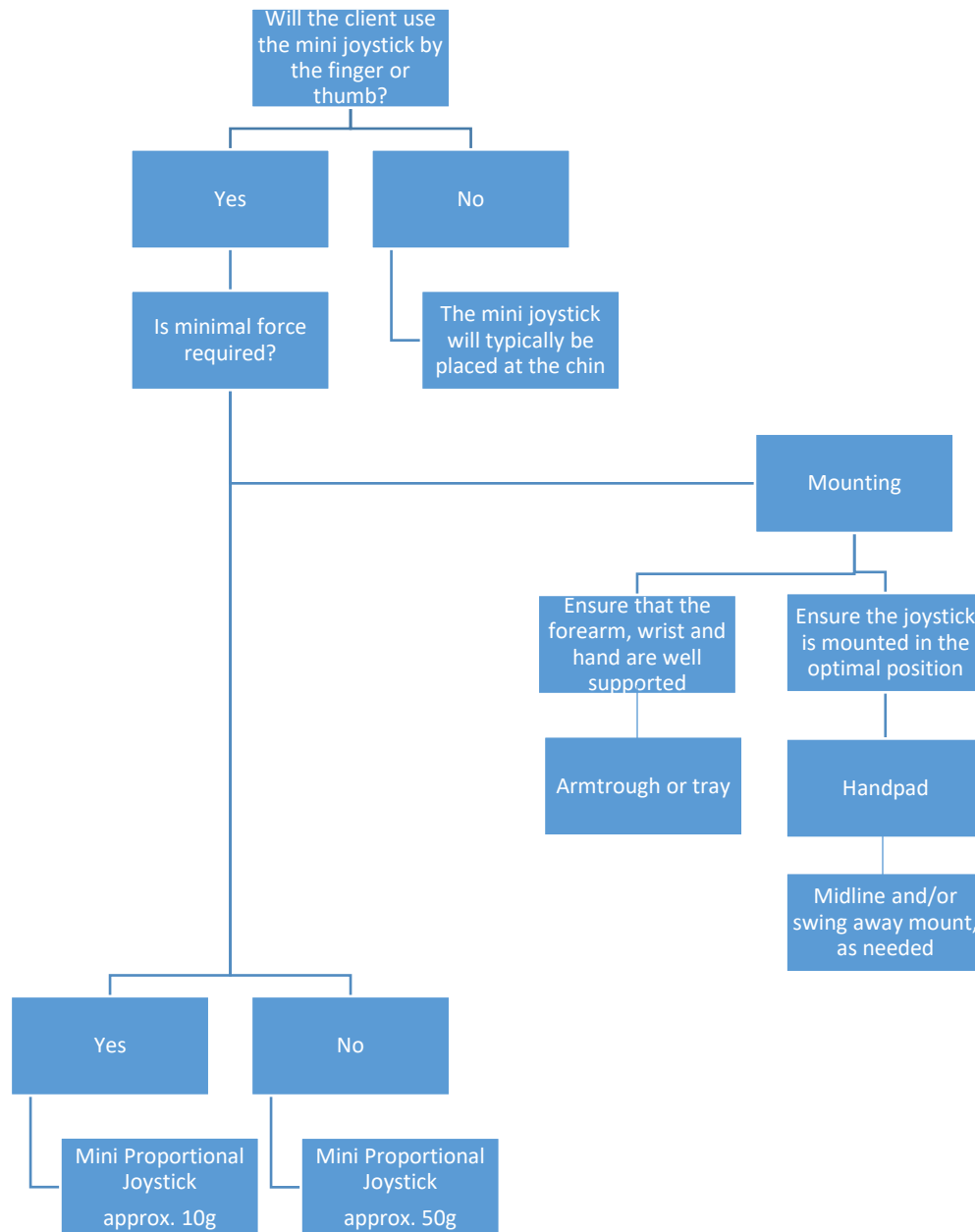
Power Wheelchair Joystick Decision Making Tree



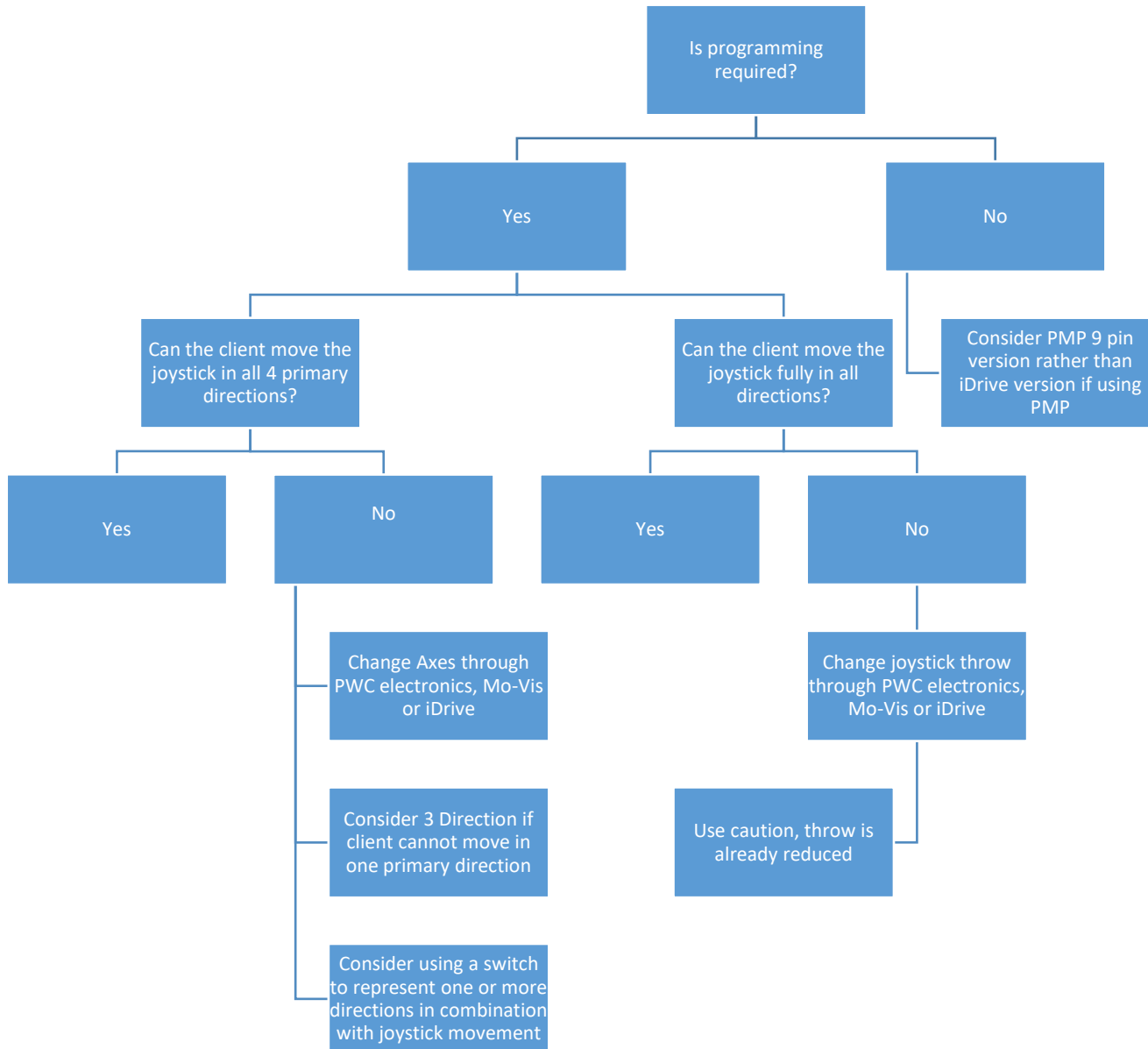
Power Wheelchair Joystick Decision Making Tree



Power Wheelchair Joystick Decision Making Tree



Power Wheelchair Joystick Decision Making Tree



Michelle L. Lange, OTR/L, ABDA, ATP/SMS,
 MichelleLange1@outlook.com. 2.2018

**Power Wheelchair
Non-Joystick Driving Methods
Decision Making Tree**

Each client functional category includes a list of diagnoses. These are diagnoses where this functional level is sometimes seen. Functional levels vary greatly within a diagnosis and these functional skills may be seen in clients with other diagnoses.

Specific Driving Methods are also labeled Proportional or Digital. Proportional typically provides 360 degrees of directional control as well as speed control by moving further from a starting point. Digital control uses switches, discreet directional control, and does not typically provide speed control via how the switch is activated.

This document is not intended to replace competent evaluation.

Client cannot use any type of joystick (see Joystick Decision Making Tree)

Joystick control requires grading of the force and distance of movement. The client must also have adequate movement and motor control to use a joystick.



Client has fair upper extremity control (CP, TBI, MS, MD)

- Individual mechanical switches on a tray surface (digital)
 - Typically 4 switches, Forward, Left, Right and Reverse or *Reset.
 - Choose the switch size and force that matches the client's abilities.
 - The client must be able to move their hands horizontally and vertically to move up and over the switch surface.

If the client does not have controlled vertical movements (more difficult for clients with increased tone):



- Proximity array under tray (digital)
 - Typically 4 switches, Forward, Left, Right and Reverse or *Reset
 - Place switches at a distance apart and in a pattern that matches the client's abilities.
 - Provide a tactile cue on the tray surface so the client knows where the activation area is located, even when looking forward to drive (i.e. Velcro).
 - Adjustment of activation area: activation distance is a "bubble" around the switch. If the activation area is too large, the switches may activate one another or be activated by the top of the client's thighs.
 - Proximity switches are capacitive switches and are activated by items which are conductive. The switch can be activated by certain items on the tray within the activation area, including beverages or a cat. The switches will not be activated by other items, such as a book. The switches must be protected from moisture.



Client has good fine motor (finger/hand) control, but limited activation travel and force (ALS, SMA, MD)

- Touch Pad (proportional), i.e. Switch It Touch Drive 2
 - The client must have adequate movement of a finger or thumb to move within a 360 circle for full available directional control.
 - The farther the finger or thumb moves from center, the faster the wheelchair moves.
 - A client with this control may be able to use a mini proportional joystick.
 - Note – a larger Touch Pad (HMC) is no longer available in the USA. This would be used by a client with fair upper extremity control.

- VIC Touchless finger joystick (proportional) is no longer available in the USA.

- Fiberoptic switches (digital)
 - Typically 4 switches; Forward, Left, Right and Reverse or *Reset.
 - Place switches at a distance apart and in a pattern that matches the client's abilities
 - Tactile cue: the client should be able to feel the tip of the fiberoptic switch or mount to determine location.
 - Adjustment of activation distance: activation distance is a straight line from the end of the switch. Match this to the client's available movement, which is typically quite small.
 - Switch placement: fiberoptics can be placed at the angle required by the client. These can be placed facing directly upwards or parallel to the floor, allowing the fingers to be moved while curled over the edge of a handpad or tray in a flexed position.
 - Switch mounting: cables are fragile and need to be well-protected. Switches can be mounted in a tray, handpad of armtrough, or in a hollow gooseneck mount.
 - UE support: to provide postural support and facilitate a very small movement, support of the forearm, wrist and hand is required.



Client has good head control, but little extremity control (high level SCI, ALS, CP, MS)

- Magitek (proportional)
 - A sensor typically mounted at the top of the head on a headset. Movement of the head is translated into movement of the power wheelchair.
 - Precautions: client must be able to consistently bring head to upright to stop movement of power wheelchair. Programming required to allow power seating control through left and right directional control only.

- Proportional Head Control (RIM) (proportional)
 - A posterior head pad is attached to a joystick behind the head. Moving the head rearward moves the power wheelchair Forward.
 - Precautions: client must sustain pressure against back pad to sustain Forward. This can lead to increased tone in some clients or require excessive muscle strength for others.

Increased tone can impact the client's ability to stop. Difficult to use with tilt or recline as posterior head pad moves. A Reverse strategy is required.

-Head Array (digital)

Despite not providing proportional control, head arrays may provide better driving control for some clients in this category. Further information below.



Client has fair head control, but little extremity control (CP, TBI, high level SCI)

-Head Array (digital)

Typically, 3 to 5 proximity switches in a tripod head rest. The pad behind the head is for Forward directional control. Various style head supports can be used.

A Reverse strategy is required. This may be accomplished through an external switch to toggle F/R, a quick hit on the rear pad, a *Reset switch or Standby. Options vary by base electronics.

-Permobil Total Control head array allows a combination of mechanical and proximity switches. This has 2 proximities in the rear pad to better capture diagonals.

-Switch It Dual Pro has 3 options: 1. Proximities only 2. Mechanical only, increased force on switch increases speed 3. Proximities and Mechanical – proximities respond immediately and mechanicals allow increased speed with increased force. Speed for each switch/direction can be changed on the rear of the head array. Precaution – increased force can lead to increased tone and difficulty stopping, as well as increased fatigue.

-ASL Atom offers a user switch which plugs into the head array. Pressing the user switch turns off the head array (double beep), allowing the client to rest on the head pads without driving, changing modes, or powering off the chair. If the user switch is held down for a longer amount of time (long beep), a directional command from the head array can now send a wireless switch signal to an AT device (no interfacing component or cable required). Can turn on auditory feedback when a directional switch is activated.

-Stealth Products i-Drive head array allows mechanical and proximity switches to be combined. Each switch is assigned using i-Drive programming, which also provides other programming options.



Client has good oral motor control, but little head or extremity control (high level SCI)

-Sip 'n Puff (digital)

Requires good intra-oral pressure control, which requires good lip closure and a competent soft palate.

Latch is used to sustain Forward movement without sustaining a hard puff. Typically turned on by a second Hard Puff and turned off with a Hard Sip. Consider a fiberoptic “kill switch” if the client will use latch.

4 pressure control: Hard Puff (forward), soft puff (right), hard sip (reverse), soft sip (left). Various strategies for changing speed which vary by base electronics.

2 pressure control (Q-Logic): 2 puffs (forward), 1 puff (right), 2 sips (reverse), 1 sip (left).

Stage control (i-Drive): Stage 1 only controls Forward and Reverse and is not latched. A softer puff moves the chair forward slowly (i.e. creeping up to a table). Stage 2 (entered via a Hard Puff) provides 4 pressure control with Latch option.



Client has partial oral motor control and partial head control (MS, TBI, SCI, CP)

-Sip n Puff Head Array combo (digital)

Any puff is Forward, any sip is Reverse, head array controls Left and Right. This may be appropriate for a client who cannot discriminate between hard and soft pneumatic commands, but has some head movement.



Client has adequate motor control at 4 specific body sites (CP, TBI, ALS, SMA, MD)

-4 mechanical and/or electrical switches for Forward, Left, Right and Reverse or *Reset (digital).

An optimal switch placement is where the client has small, isolated, repeatable and sustained ability to activate and release a switch. Switches vary in size and force requirements.

Stealth Products i-Drive and Switch It Cool Cube interfaces allow any mechanical and electrical switches to be combined.



Client has adequate motor control at 3 specific body sites (CP, TBI, ALS, SMA)

-3 mechanical and/or electrical switches for Forward, Left and Right (digital).

Reverse or *Reset can be added later or consider Standby, as needed.

Stealth Products i-Drive and Switch It Cool Cube interfaces allow any mechanical and electrical switches to be combined.



Client has adequate motor control at 2 specific body sites (CP, TBI, ALS, SMA)

-2 mechanical and/or electrical switches used to emulate 4 directions (digital).

-Q-Logic 2 switch control:

Switch #1: 2 switch activations, second sustained (Forward), 1 sustained switch activation (Left), double click (*Reset)

Switch #2: 2 switch activations, second sustained (Reverse), 1 sustained switch activation (right)

-Stealth Products i-Drive Link:

Sustained activation of both switches simultaneously (Forward)

Sustained activation of Switch #1 (Left)

Sustained activation of Switch #2 (Right)

Double click of Switch #1 (*Reset)

-ASL 2 switch Fiberoptic array (can only be used with fiberoptic switches):

Sustained activation of both switches simultaneously (Forward)

Sustained activation of Switch #1 (Left)

Sustained activation of Switch #2 (Right)

-ASL Single Switch Scanner with Dual Switch Step Scan

Switch #1: each activation moves through driving direction choices (Forward, Left, Right and Reverse)

Switch #2: sustained activation moves the power wheelchair in the selected direction



Client has adequate motor control at 1 specific body site (CP, TBI, ALS, SMA)

-Single Switch Scanning (digital)

Using an external scanner (ASL) or the base electronics display.

Options vary by base electronics.

First switch activation starts the scan and a second sustained activation moves the power wheelchair in the highlighted direction.

Directions and *Reset are scanned.

*Reset redefines what the Forward, Left and Right directional switches control by changing the mode of operation of the wheelchair, providing control of Reverse, Speeds, power seating, IR transmission, Mouse emulation, and Interfaced external AT devices.