THE 34th INTERNATIONAL SEATING SYMPOSIUM
Consumers Informing Practice

presymposium: tuesday, march 6, 2018
THE WESTIN BAYSHORE, VANCOUVER BC

handout:

PS2

Power Wheelchair Alternative Driving Methods

Michelle Lange

Oak

THE UNIVERSITY OF BRITISH COLUMBIA
Interprofessional Continuing Education

POWER WHEELCHAIR ALTERNATIVE DRIVING METHODS

Michelle L. Lange, OTR/L, ABDA, ATP/SMS

What we will be covering:

- Power Wheelchair Driving Methods
  - Old driving methods, new features
  - New driving methods
  - Decision Making Hierarchy
  - Hands-on Time!

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

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

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

Joystick placement

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

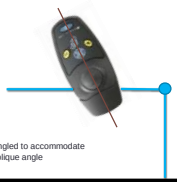
Swing away joystick mounts

- Allows more midline placement

Stealth Products

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

- If a midline mount is required, does the client need to independently move this out of the way?
  - Yes
    - Explore power mounting
  - No
    - Caregiver can move mount out of way for transfers

Power Options

- Motion Concepts Power joystick mount

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

Mushroom Joystick

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

Stealth

Joystick Handles

- Goal post style designed for poor grasp

Bodypoint

Clinical Decision Making

- Does the client have excessive force which could break a standard joystick?
  - Yes – Explore heavy duty joystick
  - No – Explore standard joystick

Tough Joystick

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

Switch It

Heavy Duty Joystick

- Mo-Vis
- All-round Heavy Duty Joystick
- For clients who use excessive force
  - Enlarged throw and force (650 grams)
- 2 switch jacks
  - Power and Mode
- Mini USB port for programming
- Retrofit a standard joystick to accommodate excessive force
  - R-Net
  - Curtis

Mo-Vis

- Mo-Vis is in Belgium
- Distributed by Stealth Products
- Great line of alternative driving methods
- Unique programming software

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

- Dual Switch version
  - Two switches on top of joystick send signals thru 2 switch jacks

ASL

Compact Joystick

- Mo-Vis All Round Joystick Light (120 grams)
- All Round Joystick (250 grams)
- Mini USB port for programming
- 2 switch jacks
  - Power and Mode
  - Mounts on sides for 1-2 twister switches
- Variety of mounting options
  - Hand
  - Chin

Clinical Decision Making

- Does the client have the ability to grade the force and distance of movement, as well as have adequate movement and motor control, but not at the hand?
  - Yes, at the foot
    - Explore proportional foot control
  - Yes, at the forearm
    - Explore proportional arm control
  - No – explore Digital Driving Methods

Foot Control

- Proportional foot control
- Attaches to compact joystick
- Some clients will have better control with the foot “free”

Switch It

ASL

HMC/Permobil

Arm Control

- Switch It proportional arm control
- Attaches to compact joystick
- Appropriate for clients with limited grasp and/or wrist control, who have good control at the shoulder and elbow

Clinical Decision Making

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

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

Clinical Decision Making

- Will the client use the mini joystick by the chin?
  - Yes
  - Mini proportional joysticks require less force than a standard or compact joystick, reducing RSI risk
  - Minis requiring approximately 50 grams of force work best at the chin

Mo-Vis Mini Proportional Joysticks

- Mo-Vis
- Mo-Vis Multi Joystick
  - 50 grams
  - 2 switch jacks on joystick and on interface box
  - Mini USB on configuration box for programming
  - Various mounting options

Switch It Mini Proportional Joysticks

- 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

Clinical Decision Making

- Will the client use the mini joystick by the chin?
  - Yes
  - Are Secretions an issue?
    - Yes
      - Use a sealed mini proportional joystick

ASL Mini Proportional Joystick

- Extremity Control
  - 120 grams
  - sealed

Stealth Mini Proportional Joysticks

- Precision Mini Proportional Joystick (PMP)
  - Sealed
- i-Drive version
  - 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

Clinical Decision Making

- Will the client use the mini joystick by the finger or thumb?
  - Yes
  - Minis with approximately 10 grams of force work well in this area
    - Less leverage by finger or thumb than by chin

ASL Mini Proportional Joysticks

- MEC
  - 18 grams
- Micro Mini
  - Isometric joystick

Ring Mount

Mini Proportional Joysticks

- HMC
  - Permobil
  - 13 grams

Mo-Vis Mini Proportional Joysticks

- Mo-Vis
- Mo-Vis Micro Joystick
  - 10 grams
  - 2 handles
  - 2 switch jacks on interface box
  - Mini USB on configuration box for programming
  - Various mounting options

Mo-Vis Configurator Software

- Many parameters can be adjusted separate and in addition to the power wheelchair programming parameters
- Road Compensation
  - The wheelchair automatically slows when encountering uneven terrain
  - Prevents reduced control with sensitive joysticks mounted at the hand or chin

ROAD
COMPENSATION

Switch It Mini Proportional Joysticks

- MicroPilot
  - Isometric joystick
  - Requires very little throw
  - Relies on force instead, approximately 10 -50 grams
  - Adjustable force
  - Can mount parallel to floor
- Micro Guide
  - Non-Isometric
  - 25 grams

Clinical Decision Making

- Does the client have difficulty using a joystick by the hand during cold conditions?
  - Yes
  - Try a hand warmer

Other New Items!

- Mo-Vis
- Hand Warmer
  - Hard to drive when hands are cold
    - MS
    - Duchenne
  - Recycles air from in front of warmer to reduce energy consumption
  - Programmable
    - Temperature, fan speed
  - Optional Hand Hood

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

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

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 - Head

- Harness and bib
- Some clients need the joystick mounted at the chin
- Some mounting options mount to the client
- This keeps the joystick in better alignment with the client, though does not readily move out of the way

Mounting - Head

- New Option
- i-Drive Control Harness

Head - Power Options

- Power swing away
  - Joysticks
  - Sip 'n Puff
  - Any control by mouth
  - Hydration
  - Lightweight devices

Mo-Vis Multi Swing

Clinical Decision Making

- Choose a mount by the hand.
  - Ensure that the forearm, wrist and hand are well supported
    - Armtrough or tray
  - Ensure the joystick is mounted in the optimal position
    - Hand pad
    - Midline and/or swing away mount, as needed

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

Digital Driving Methods

- Non-Proportional
- Switch

Clinical Decision Making

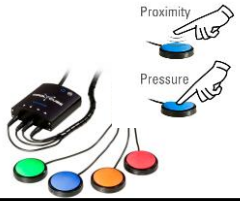
- Client cannot use any type of joystick
  - Joystick control requires the ability to grade the force and distance of movement
  - The client must also have adequate movement and motor control to use a joystick
    - No – explore Digital Driving Methods

Clinical Decision Making

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

What's New?

- Switch It Cool Cube with Pro Spot Proportional Proximity Switches
- Only the top surface will activate
  - Proportional – but mounts on top of tray
- Proportional speed
  - Proximity to switch = 40% speed
  - Continued pressure ramps up to 100%
- Auditory feedback
  - Different tone for each direction
- Various colors



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 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

Proximity Switch Arrays

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

ASL

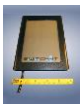
Switch-It!

Mo-Vis Configurator Software

- Mo-Vis proximity switches
- Debounce time = activation delay
  - May allow a client time to move over other proximity switches to reach desired direction
- Sensitivity = activation distance
  - Sets distance to activate proximity sensor

Clinical Decision Making

- Client has good fine motor control, but limited activation travel and force
- Common DXs: ALS, SMA, MD
  - Touch Pad (proportional)
  - VIC Touchless finger joystick (proportional)
    - No longer available in the USA
  - Fiberoptic switches



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

Switch-It!

Stealth Products Fiberoptic Arrays

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

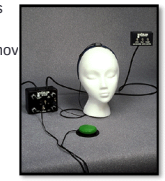
Clinical Decision Making

- Client has good head control, but little extremity control
- Common DXs: SCI, ALS, CP, MS
  - Magitek (proportional)
  - Proportional Head Control (RIM) (Proportional)

Switch It

Magitek Drive Control

- Older driving method with some new features
- Sensor mounted at top of head
- Translates head movement into wheelchair mov
- Requires very good head control
- Stop: enter Neutral Zone



Magitek Drive Control

- New Features
- 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

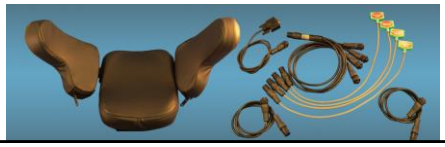
Clinical Decision Making

- 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!



ASL and Switch It original Head Arrays

- Older driving method
- Tri-pad Head Array

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 (user switch)
- Hold user switch for a programmable amount of time (long beep) and then use directional switch to send a wireless switch signal to another AT device (i.e. SGD, Computer, tablet)
  - No Interfacing component required
- Can change reset double tap to longer hold (R-net, Q-Logic)
- 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 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
- Works with wide variety of head supports

Switch It Dual Pro

- Programming can be done on back pad
- 3 control options:
- Proximities only
- Mechanical only
  - Increased force on switch increases speed
- Proximities and Mechanical
  - Proximities respond immediately
  - Increased force increases speed

- Increased force and lead to increase tone, difficulty stopping, and increased fatigue

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

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
  - Stage 1
- Traditional control
  - Stage 2

Sip 'n Puff programming

- 2 pressure
  - Q-Logic
  - 2 puffs = Forward, 1 puff = Right
  - 2 sips = Reverse, 1 sip = Left
  - Sampling Delay
  - Between time

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

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

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

Switch Interfaces

- Stealth Products iDrive
- Any combination of mechanical and electrical switches

Switch Interfaces

- Magitek iZip II & iZip III
- 1 – 5 Proximity and mechanical switches
  - 1 switch: OneSwitch option

Switch Interfaces

- Switch-It Cool Cube
- Interfaces with any combination of mechanical and electrical switches

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

Faith

Driving with the New Chair!

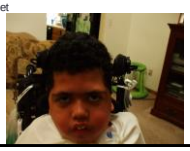
Combining Mechanical and Electronic Switches

- Julian
- SMA, type I

Microlite, right medial knee, Right

Fiberoptic, left thumb, Forward

Proximities at either side of head for Left and Reset



Julian

- As his needs changed, so have his switch locations and types
- Proximities by either side of his head

Julian

- Fiberoptics by each hand
- Fingers flexed to improve movement

Left middle finger

Right index finger

Julian

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

Clinical Decision Making

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

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
- New: Stealth i-Drive

ASL

Stealth

2 Switch Control

- Newer Option
- 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
  - This has been around for a little bit, but many folks have not heard of this yet
  - 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

Clinical Decision Making

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

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

Hands-on Time!

- Split into 4 groups!
- Hop in!
- Drive!
- Ask questions!
- Come back in here by 12:00pm to complete Course Evaluations and wrap up!

Take Home Message:

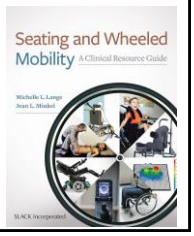
- There are many ways to drive a power wheelchair!
- Positioning, Drive Wheel Configuration, Tracking Technologies, Programming, and Training optimizes driving for an individual

Resources:

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

One More Resource…

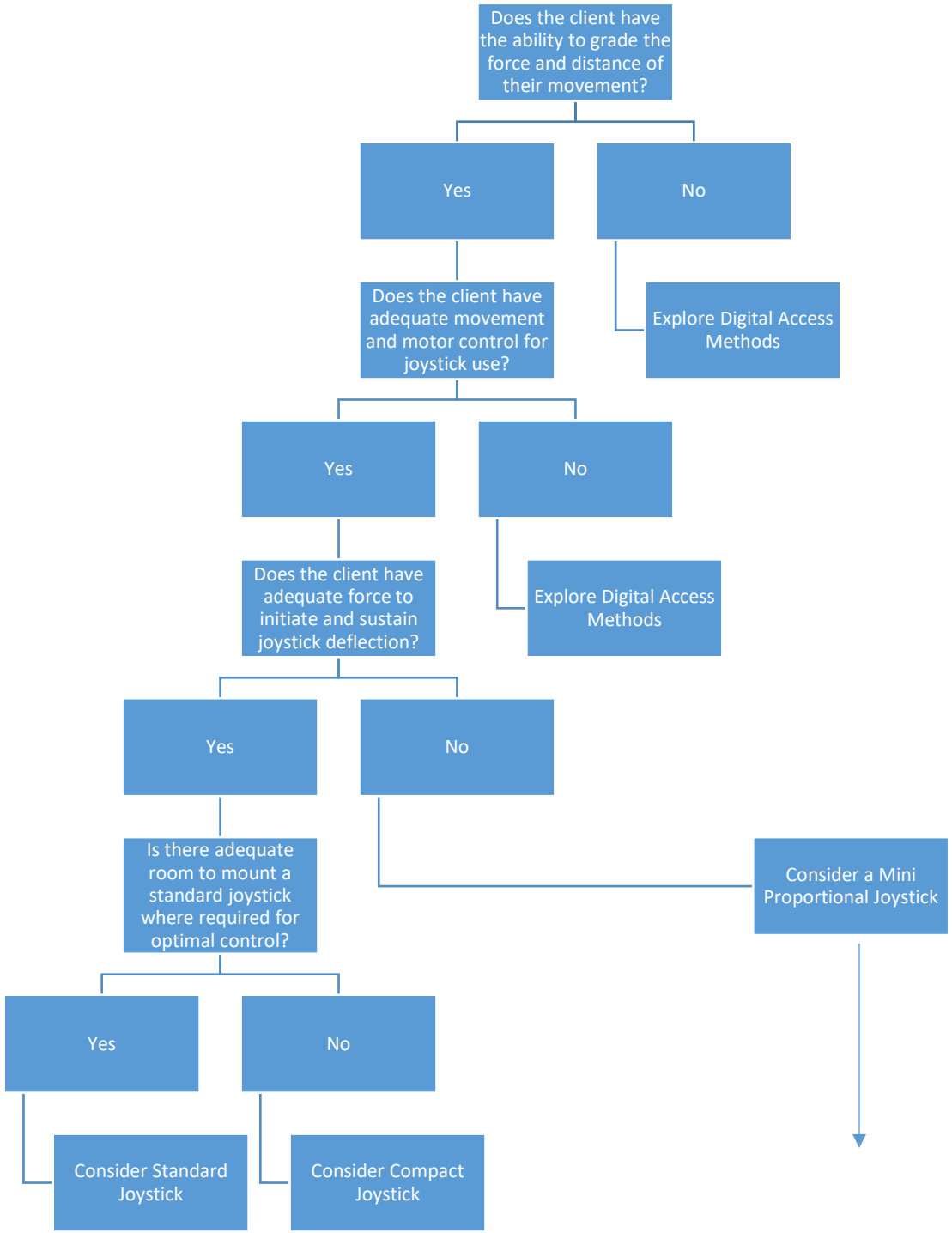
- Seating and Wheeled Mobility: a Clinical Resource Guide
- Edited by Michelle L. Lange, OTR/L, ABDA, ATP/SMS and Jean L. Minkel, PT, ATP
- Available from SLACK, Inc.



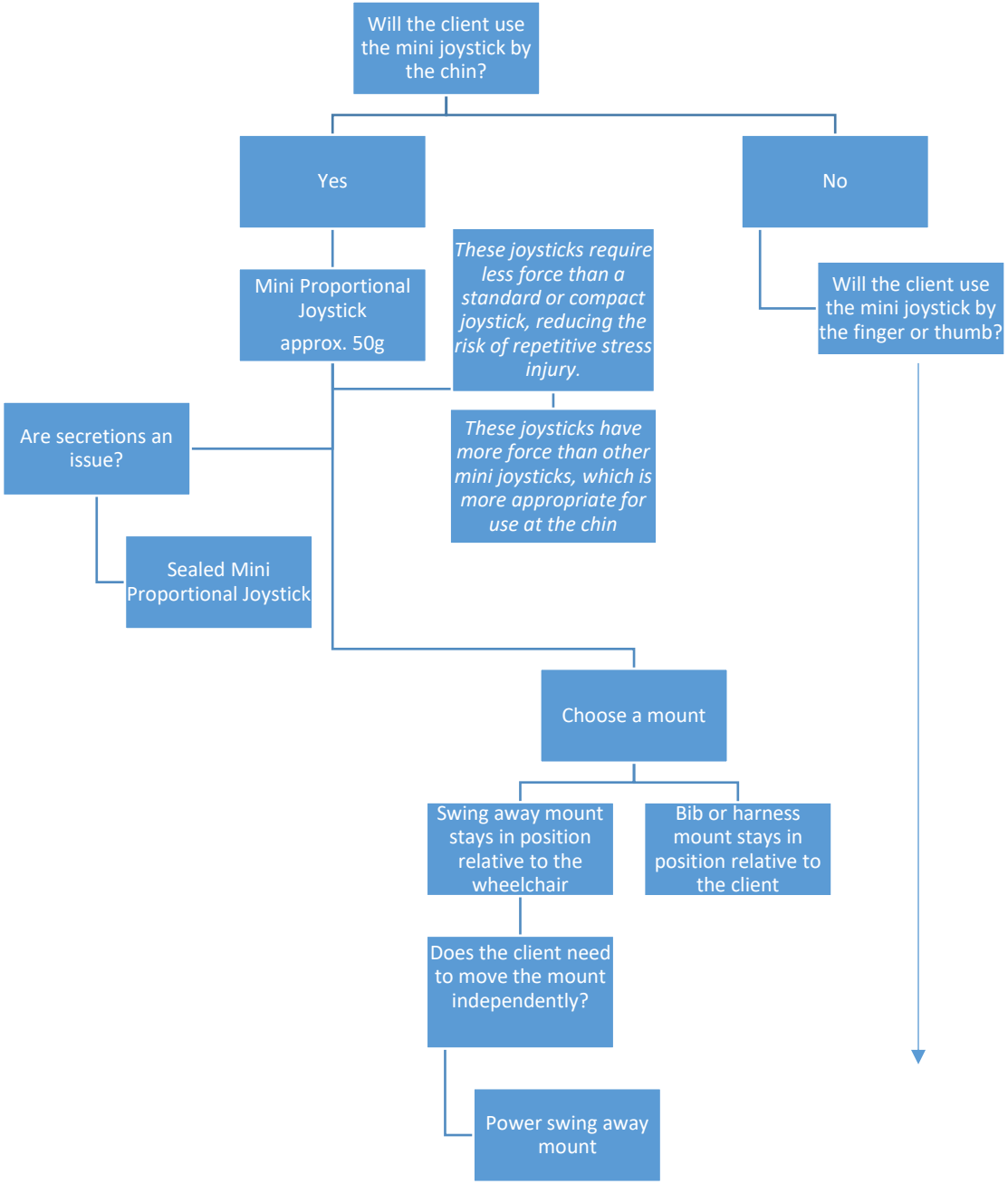
Contact Information:

- Michelle L. Lange, OTR/L, ABDA, ATP/SMS
- MichelleLange1@outlook.com
- www.atilange.com

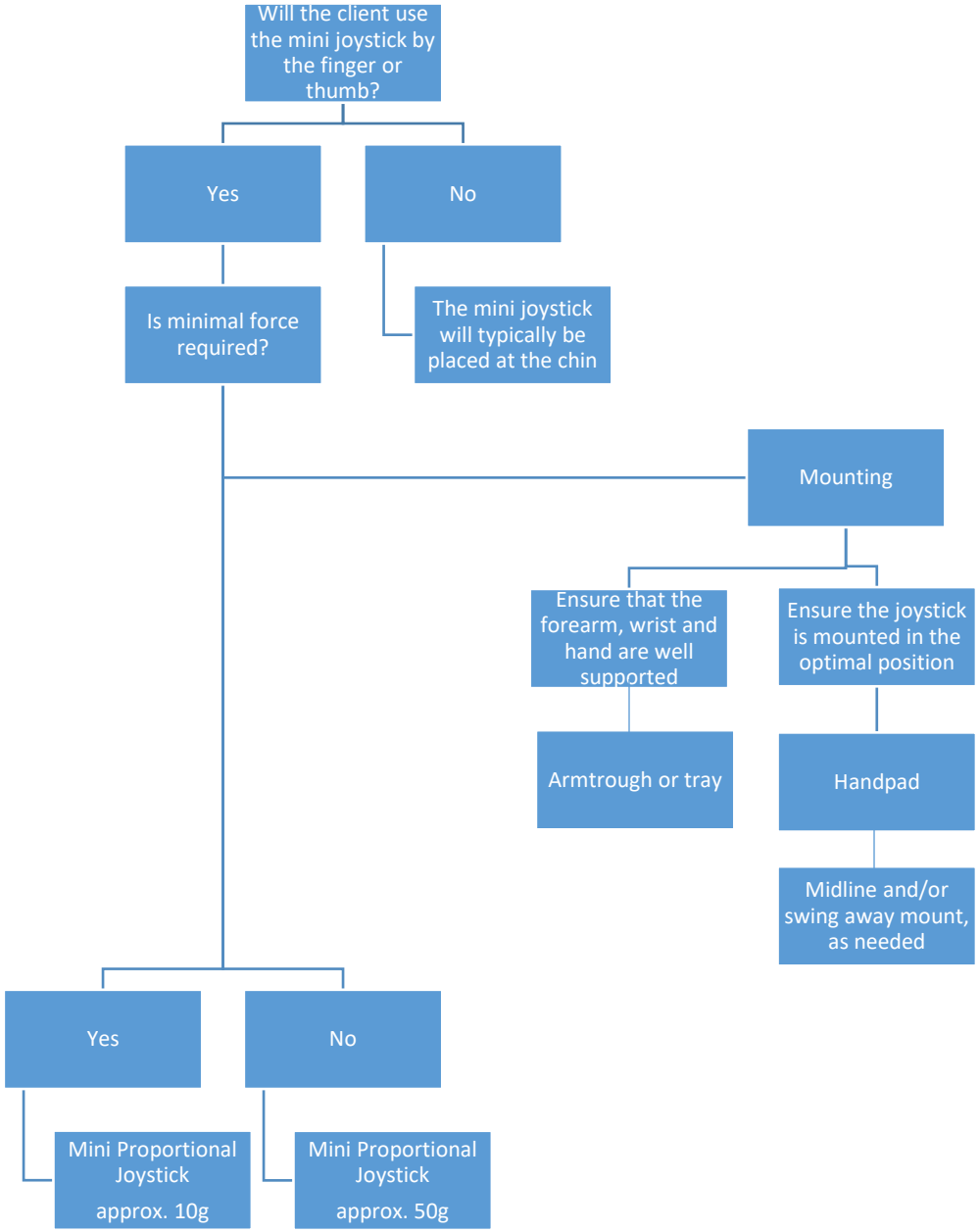
Power Wheelchair Joystick Decision Making Tree



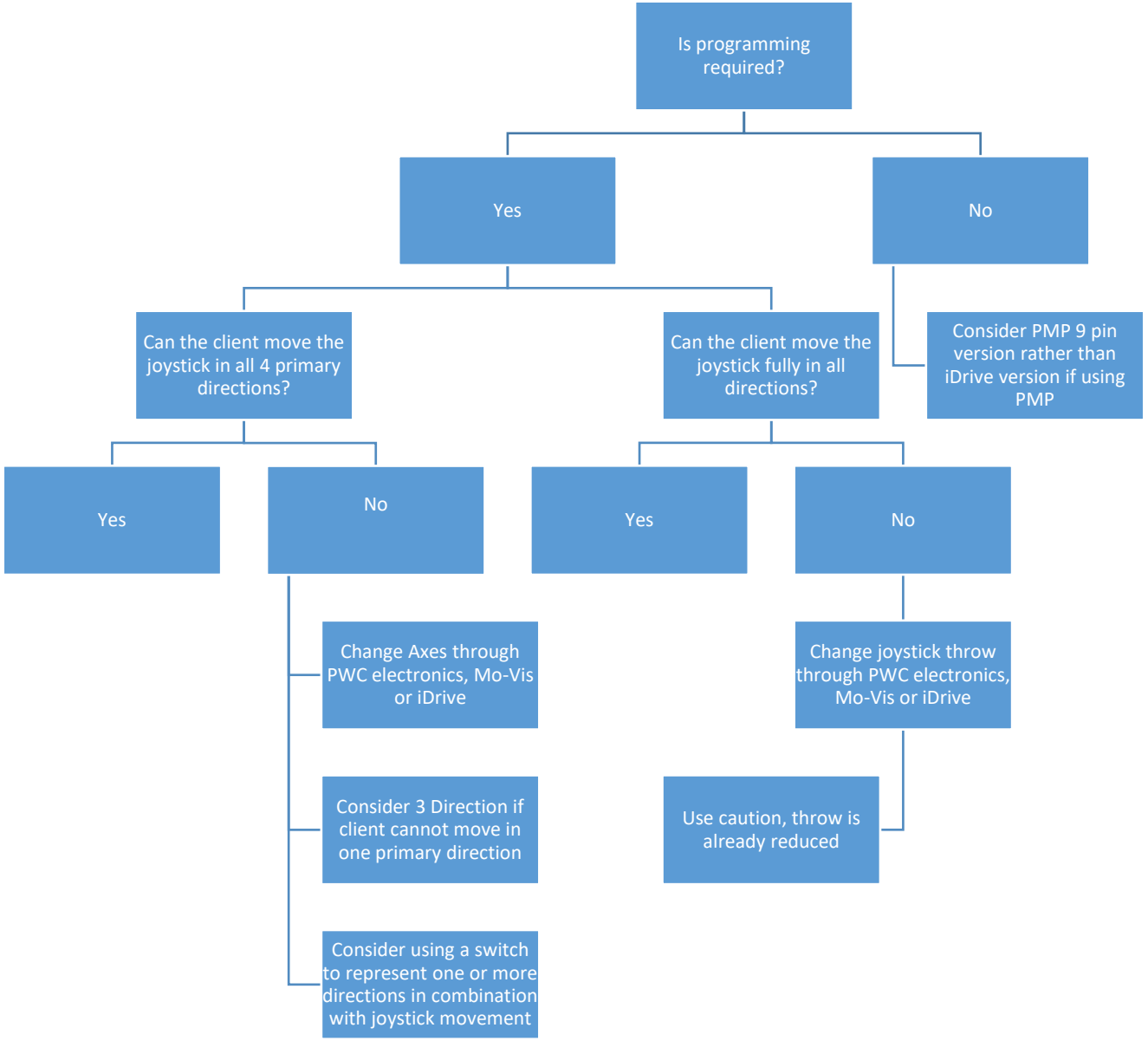
Power Wheelchair Joystick Decision Making Tree



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 Mini Proportional Joystick Comparison Chart

Joystick Name	Photo	Manufacturer	Force	Travel	Isometric	Switch Ports	Electronic Packages	Programmable	Sealed/ Moisture resistant
Micro Extremity Control (MEC)		Adaptive Switch Labs (ASL)	18 grams	13 mm	No	Push down on handle for Reset	Mk6i Q-Logic R-net	Can make Reverse act as Reset	No
Extremity Control Joystick		ASL	120 grams	6 mm	No	None	Mk6i Q-Logic R-net	Can make Reverse act as Reset	Yes
Micro Mini		ASL	Not measured by ASL	minimal	Yes	None	Mk6i Q-Logic R-net	No	No
Mini Joystick		HMC/ Permobil	13 grams	3 mm	No	1 jack on interface box for Reset	Mk6i Q-Logic R-net	No	No
Compact Joystick - Lite		HMC/ Permobil	50 grams	17 mm	No	2 jacks on joystick, Power and Reset	Mk6i Q-Logic R-net	No	No

Michelle L. Lange, OTR/L, ABDA, ATP/SMS. MichelleLange1@outlook.com. 11.2017.

Joystick Name	Photo	Manufacturer	Force	Travel	Isometric	Switch Ports	Electronic Packages	Programmable	Sealed/ Moisture resistant
Multi Joystick		Stealth/ Mo-Vis	50 grams	8 mm	No	2 jacks on joystick and interface box, Power and Reset	Q-Logic R-net	Yes	No
Micro joystick		Stealth/ Mo-Vis	10 grams	3.3 mm	No	2 jacks on interface box, Power and Reset	Q-Logic R-net	Yes	No
Precision Mini Proportional (PMP) joystick		Stealth iDrive	43 grams	7 mm	No	On IDrive CPU (optional)	Mk6i Q-Logic R-net	Yes (also non-programmable version)	Yes
MicroPilot		Switch-it/ Sunrise	10-50 grams adjustable	0 mm	Yes	None	Mk6i Q-Logic R-net	No	No
MicroGuide		Switch-it/ Sunrise	25 grams	6 mm	No	None	Mk6i Q-Logic R-net	No	No

Comparison information: Standard Joystick Force 250 grams, Standard Joystick Throw 28 mm

Michelle L. Lange, OTR/L, ABDA, ATP/SMS. MichelleLange1@outlook.com. 11.2017.

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.

Michelle L. Lange, OTR/L, ABDA, ATP/SMS. MichelleLange1@outlook.com. 11.2017.

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 tripad 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)

Michelle L. Lange, OTR/L, ABDA, ATP/SMS. MichelleLange1@outlook.com. 11.2017.