



An Alternate Route to Independence: Considerations for Alternate Drive Controls on Powered Wheelchairs

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Agenda:

- Considerations for Successful Power Wheelchair Mobility
- What are Alternate Drive Controls?
- Proportional vs Switch Input Controls

 What's the difference?
- Alternate Control Solutions



Today's Objectives:

Describe 3 considerations for proportional alternative drive controls Describe 3 considerations for digital/switched alternative drive controls

2

Describe at least one factor on how tilt or recline can affect access to each drive controls option



Considerations for Successful Power Wheelchair Mobility

- **Proper Seating** is Critical!!!!
- Identify the Client's Optimal Position
 - Stabilize Proximally to Promote Distal Function
 - Provide the Minimal Amount of Support Necessary that Allows Function
- Attain and maintain proper pelvic position











Once the Person is Seated Appropriately...

- 1. Identify consistent and reliable movements
- 2. Identify access locations
- 3. Do the movements have adequate **endurance**?
- 4. Progression of **Condition / Changes to System** in Future
- 5. What other technology can they benefit from?
 - Communication devices
 - Computer access







What are Alternative Drive Controls??

- Any drive control device other than a standard joystick
- This device can be altered or adjusted by programming, adjustment of mounting hardware, or variable shape of device (example: different shape of joystick handles)









Types of Alternate Controls





Proportional Controls

- Provides 360 degrees of control
- Provides Control of Speed the farther away from center the control is deflected, the faster the device will move
- Stopping is completed by returning device to center or letting go





Hierarchy of Input Devices: Proportional Control





Electronics

Non-Expandable	Expandable
 Only a standard proportional joystick (used typically by hand) can be used as the input device. May have the ability to control up to 2 power seating actuators through the drive control A standard proportional joystick (integrated or remote) is included in the basic equipment package of a power wheelchair 	 Compatible with most Input Devices: Proportional and non-Proportional Alternate Controls Operate 3 or more powered seating actuators through the drive control May also be able to operate the following: A separate display (alternate control devices) and other electronic devices (augmentative speech device , computer and/or electronic aids to daily living device through the chair's drive control)



Considerations: Proportional Controls



Strength and Endurance

Programming Joystick

Alternative Joystick Handles and Knobs

Hardware and Mount Options



Considerations: Proportional Controls

- Main Programming Parameters:
 - Joystick Throw
 - Center Deadband
 - Tremor Dampening
 - Assign Directions



Firmware Update

System









Considerations: Proportional Controls

- Utilization at various sites: Chin, foot, hand, lip etc.
- Additional options like:
 - Head rim control
 - Head array with proportional capacity
 - Proportional touch pads/switches



Stealth Products – Throw Force and Distance Chart

















Considerations for Proportional Controls: Mounting and Hardware Solutions

Case Study - Zoe

- Diagnosis: Tetra-Amelia Syndrome (Congenital Lack of All Extremities)
- Age: 17 years old
- Secondary medical conditions: Chronic Lung disease, Dyskinesia, Difficulty regulating temperature.
- Goals: To allow Zoe to be independent in as much of her daily life as possible including management of her medical conditions.





Case Study - Zoe

Technology Zoe requires for independence:

- Chin control for control over the power wheelchair.
- Power boom (chin control, mouth stick and Smart phone are mounted on boom).
- Switch on headrest to control power booms movements.
- Mouth stick for access to her phone.
- Bluetooth for access to her tablet through her chin controls for her schoolwork.
- Infrared for access to television at home.





Case Study - Zoe

Zoe driving her power wheelchair with her proportional chin control.





Digital / Switch Input

- All or nothing response- switch is "on or off"
- Each direction is controlled by a different switch
- Speed control is type of drive control and programming adjustments available





Hierarchy of Input Devices: Switch Input Controls



QUANTUM[®]

Hierarchy of Input Devices: Switch Input Controls



QUANTUM[®]

Provides the client with:

- Forward
- Left
- Right
- Reverse
- Mode For access to seating/auxiliary menus. Can also be used as Power On/Off or Both Mode and Power with double or long commands





Provides the client with:

- Forward
- Left
- Right
- Reverse or Mode
- If 4th Switch is used as Reverse then Mode changes are completed with a Double Command or Single Toggle of to the designated Switch





Provides the client with:

- Forward
- Left
- Right
- **Reverse** is accessed with a **Single Toggle** of the **Forward** Switch
- Mode is completed by Double Commands on the Right or Left Switch











Hierarchy of Input Devices: Switch Input Controls



QUANTUM[®]

Combo Sip and Puff Head Array

- These are ideal for people who have left and right head movements but find lifting their head off of the rear pad difficult.
- These systems use the head array for left and right and sip and puff for forward and reverse.
- These are also great for the person that is unable to differentiate between a soft and hard Sip or puff.
- You may consider this for users with a high Spinal Cord Injury, Multiple Sclerosis, Brain Injury, or many other diagnoses.





Utilization of Latch: Types of Latch Driving

Cruise – works like cruise control on a car. The consumer provides a forward command until they reach the forward speed they desire to drive at.

3-Step – The first forward input sets the chair driving at 33% of the set maximum forward speed, each of the following forward command will increase speed 33% until 100% of programmed forward speed is reached

1-Step – The chair will drive whatever maximum forward speed is set to.

*Latch driving can be applied to any alternative drive control



Case Study - Lindsay

- C3-7 incomplete quadriplegia.
- Used sip and puff initially after rehab but didn't like it.
- Ruled out chin control.
- Ruled out head array.
- Best luck was with head array and sip and puff combination.





Case Study - Lindsay

- Did not like the latch function with sip and puff.
- Liked the function but not the extra command to stop the wheelchair. Concern was if the straw comes out of her mouth how will she stop the chair.
- Solution: cut off the end of the sip and puff straw so it is smooth and flush, she can then seal the end of the straw once the pressure is provided which tricks the system into thinking it is latched.
 - Offers piece of mind that the wheelchair will stop if she loses contact with the straw.





Case Study - Lindsey: Sip and Puff Head Array combination

When Tilted:

- Changes mode by performing a double left command on her head array pad to get into her seat functions.
- Uses a puff/forward command to control her foot position.
- Uses Advanced Seating: The left and right head array pads control tilt and recline. She prefers this since she is always afraid especially with recline that she will lose contact with her straw.





Hierarchy of Input Devices: Switch Input Controls



QUANTUM[®]

- Forward Drive Command: Double hit and hold of the right switch
- Reverse Drive Command: Double hit and hold of the left switch
- Left Drive Command: Hit and hold of the left switch
- **Right Drive Command**: Hit and hold of the right switch
- Mode is completed by Double
 Commands on the Right or Left Switch





Hierarchy of Input Devices: Switch Input Controls



QUANTUM[®]

Single Switch Control Scanning

- Directional Options are scanned on the display
- When the desired direction is highlighted then the switch is activated and hold the switch as long as they want to go that direction
- To stop the chair the switch is released





Single Switch Scanning: Latched Driving with 8 Direction Scan



Lynn:

- Traumatic Brain Injury from GSW
- Significant upper and lower extremity contractures
- Jaw depression and eye blinks are only consistent and reproducible movements
- Cognition intact



Single Switch Control Scanning



- Quantum Edge 3 Power Wheelchair with Q-Logic 3 Electronics
- Stealth Comfort Plus Headrest with right swing away lateral head support and left mechanical egg switch on swing away mount
- Quantum back up camera
- Single Switch Scanning
 - 8 Direction Scanning with home and step functions
 - 2nd step function with reverse and reverse diagonal directions
 - Latch mode with 1.5-secondlong press for latch stop



Single Switch Control Scanning







Thank you for your time any questions?

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