

A NEW WAY TO DRIVE

Changing Power Wheelchair Access Methods for Independent Mobility

A wide variety of power wheelchair driving methods are available, opening up possibilities for people with significant limitations to be independently mobile. However, with a host of options comes the need for careful assessment to determine the optimal access method, as well as optimal seating, wheelchair base, power seating and more.

background

Faith is a 12-year-old girl with the diagnosis of cerebral palsy. She has a power wheelchair with two access methods already on it – a head array and a standard joystick. She can drive with either access method, but not with very good control. She was referred for a mobility evaluation to determine if a new access method was warranted and if so, which one. Faith's current power wheelchair is more than four years old and she is outgrowing it.

When I first met Faith, we began with some basic questions about her current equipment and medical status, her goals, what was working and what was not. She has a Baclofen pump, which reportedly has reduced her spasticity and the amount of her extraneous movement. She does still demonstrate athetosis. She did not have any orthopedic asymmetries reported or other medical issues. Faith is non-verbal.

Faith currently uses a pediatric power wheelchair with a linear seating system and a manual tilt. She is positioned fairly well in the seating system, despite outgrowing it. Her seating was adequate to evaluate her access to the power wheelchair. She also uses a Prentke Romich ECO2 speech generating device (SGD) with ECOPoint eye gaze. Her eye gaze access is extremely efficient.

Faith was observed driving with the head array, which is a head support that incorporates three proximity switches (a switch in rear pad for forward directional control, a switch in left pad for left and a switch in right pad for right). She is able to move the power wheelchair, but with very poor control and significant effort and overflow. She appears to be dynamically stabilizing with her head and this affects her driving. She also has a joystick by her left hand that she uses at times. She can move the wheelchair around with this, but not with any precision.

assessment

Switches were tried in a variety of locations in an attempt to find four switch locations where Faith had isolated and accurate control. After trying various combinations, Faith was able to drive with the following configuration. Left: specs switch in left hand (*Figure 1*); right: jellybean switch by left medial knee (*Figure 2*); and forward: jellybean switch behind left elbow (*Figure 3*). A reset switch will eventually be placed by her left hand. This will

allow her to access reverse, speeds and a power tilt in the future. Faith drove with very good isolated control. She has no difficulty with mobility concepts.

So, how in the world did we come up with those switch locations? Just like real estate, switch access is all about location. People with athetosis generally need stability in one area to allow for isolated control somewhere else – and those spots can be unusual. I asked Faith where she needed to stabilize (or, in the terms of a 12 year old, what I needed to hold down so she could use her body). She needs to stabilize at her head and her feet. By removing her access method from around the head (the head array), she was free to press against the head support to provide stability, rather than drive. She has ankle huggers, but never used them. By using these during the assessment, Faith found her control over other parts of her body increased.

After finding her stability, we began trying switches in various locations. Faith offered up a few suggestions herself. Generally, the strongest switch site is used for forward as it is typically accessed most frequently. The weakest switch site can be used for reset, as this is not time dependent and does not require sustained contact. Faith has more control over the left side of her body. Although she could move a joystick with her left hand, her control was poor. She could, however, pull her arm back against a switch behind her elbow with good control and could squeeze a switch in her left palm. The advantage of placing the switch in her palm was that she could access this for left directional control despite the position of her arm. She even demonstrated sufficient control



FIGURE 1 - LEFT DIRECTIONAL SWITCH IN LEFT HAND



FIGURE 2 - RIGHT DIRECTIONAL SWITCH



FIGURE 3 - FORWARD DIRECTIONAL SWITCH

An informal study demonstrated that tracking technology reduced the amount of switch hits to get through an obstacle course by 57 percent when driving with three switches and reduced the time required by 38 percent.

to activate the switch behind her elbow and in her palm separately (for discreet directional control) and together (to provide diagonal control). Faith had adequate control of left hip adduction to activate a switch her for right directional control. She did not have good control of hip abduction and her right lower extremity control was inadequate.

recommendations

Faith would benefit from a new power wheelchair. The current power wheelchair is a pediatric version, and she is outgrowing this. Also, the current power wheelchair has a manual tilt that she cannot operate independently. A new power wheelchair can be ordered with a power tilt to allow her to independently change her position in space for functional tasks and pressure relief as she is spending longer and longer periods of time in the wheelchair and is unable to otherwise shift her weight independently. The new power wheelchair will also include tracking technologies to increase driving efficiency. An informal study demonstrated that tracking technology reduced the amount of switch hits to get through an obstacle course by 57 percent when driving with three switches and reduced the time required by 38 percent. Finally, the new midwheel drive base will increase maneuverability, reduce turning radius and allow her knees to be placed at 90 degrees despite continued growth (her hamstrings are on the tight side). A power seat elevator was not recommended as this would not increase Faith's function. We do not need to interface the speech generating device as she is using eye gaze access. She uses this device very well to control devices in the environment through IR transmission and to access the computer, so she will not be using those features on the power wheelchair.

A new power wheelchair and seating system were recommended. This includes a display to support alternative access, a power tilt, tracking technology, a five to one switch box, three AbleNet Jellybean switches (forward, right, reverse for caregiver access in the rear), two AbleNet Spec switches (for left and reset),

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and a remote stop switch. Once this is delivered, the power wheelchair will be programmed to meet Faith's needs, and she will require some training to learn how to use the new power wheelchair and access method. After some initial training, we will mount the reset switch and train Faith how to use this to access other wheelchair functions.

access to SGD

Faith accesses her Prentke Romich ECO2 speech generating device using ECOPoint for eye gaze with amazing speed and accuracy.

She has a mount for this on her manual wheelchair. The current power wheelchair has a frame clamp for this same mount, however it does not end up in the same position between wheelchair frames in relation to her face. This impacts her accuracy. Also, the ideal position for eye gaze places the device directly in front of her face which impedes her visual field for driving. A power mounting system is available (Motion Concepts) that would allow Faith to move the speech generating device out of the way for driving and back into a precise position for eye gaze access. The speech generating device can be moved from the current mount on the manual wheelchair to the power mount on the new power wheelchair.

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