



# AAC ON THE MOVE: A CASE STUDY ON POWER WHEELCHAIR INTEGRATION

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## MEET ANGIE

It is never too late to learn a new skill. This fact could not resonate more than with our friend, Angie, who began her journey at the Perlman Center at 41 years old. She arrived with the team from her residential facility, who saw her enormous potential and turned to the assistive technology resources from the Perlman Center for support. Angie was dependent on a manual wheelchair and caregivers for mobility and did not have a communication device. Angie was very social and understood so much, but her independence to communicate and navigate her environment was limited. However, Angie's smile, drive to communicate and incredible determination to be more independent and engaged in her environment was obvious.

## FINDING HER VOICE

Angie was using low-tech eye gaze to look at what she wanted; then a guessing game ensued, using "yes" or "no" facial expressions to confirm her communication intent. She also had been introduced to augmentative and alternative communication (AAC) through trials of static picture symbols and early auditory scanning on an iPad with her speech therapist. Our assistive technology team began evaluating potential AAC access methods. Angie required custom seating due to significant contractures and postural deficits. Direct access was not practical due to significant limitations in Angie's range of motion and control for reaching. We trialed eye gaze access with Angie, however, functionality was inconsistent and sustaining an upright and still head posture proved frustrating. After an initial learning curve and some fine tuning through speech generating device (SGD) programming, Angie took off with auditory switch scanning access. This access method was accurate, efficient and intuitive to Angie. She was able to activate a single switch behind her left elbow accurately and quickly. After activating the switch, Angie could hear an auditory cue for each selection as it was scanned. These auditory cues supported her ability to learn the language and navigate on this new AAC system. After comparing several SGDs, Angie and the whole team decided on the Accent 1400 from Prentke Romich Company (PRC), with a 45-button language program, an AbleNet Big Red switch mounted behind her left elbow, and single switch scanning access using a row column scan pattern and 1.3 second scan speed (see Figure 1). Over the next five years, Angie found her voice, and touched many lives. The video "Angie's New Voice" shows her incredible journey (watch Video 1 via the QR code at the end of the article).



**FIGURE 1** Angie using her first communication device, via single switch scanning access, and a switch behind her left elbow.

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## A NEW WAY TO MOVE

Seeing the progress with her new SGD and finding independence in communication, the residential facility team continued pursuing greater independence for Angie. With an established switch site at her elbow and an excellent understanding of scanning access using her communication device, Angie began power mobility trials. Her team practiced using her existing switch to learn how to drive a power wheelchair. Through evaluation and trials, they recommended a Quantum Q700 power wheelchair, with custom molded seating system and familiar access using single switch scanning drive control. Angie uses her Big Red switch mounted behind her left elbow to start the scan, then watches on the display in front of her as each directional choice is scanned/highlighted. She then activates her switch when the direction she wants to go is highlighted. She must sustain pressure on the switch for the duration of movement required in that direction. Due to difficulty sustaining pressure on the switch, the power wheelchair was programmed to latch forward

drive. When forward was scanned, Angie could select and continue movement in this direction with a momentary switch activation. To stop, Angie would activate the switch a second time. A third switch activation would resume the scan. Her team has an emergency stop switch to use, as needed, for safety. Angie can also turn to either side after initially selecting that direction and then completes multiple subsequent switch hits to turn incrementally as sustained switch activation is still difficult. Angie enjoys greater independence with her mobility and loves driving around the halls of her residential facility. Currently, she does her best driving in wide-open spaces, and staff continue to work with Angie to refine driving skills for safe navigation of tighter spaces at home.

## TIME TO UPGRADE

In 2021, due to the age of her SGD, her skill development, desire for a smaller screen and eligibility for new SGD funding, it was time for Angie to explore AAC and access options that would better meet her current needs and capabilities. Angie preferred sticking with the familiar Accent devices from PRC but was interested in trialing eye gaze again. This new access method initially appeared promising; however, the accuracy of eye gaze proved to be inconsistent and less efficient than switch scanning. Angie was an excellent scanner with great potential to increase her access speed, so alternate scan options were considered. She continued using her elbow switch but advanced to a more efficient scanning method using quarter row/column scan pattern and the fastest scan speed available on her SGD! With this increased speed and Angie's accuracy and consistency using her current communication device and access method, she decided to stick with these familiar options. By continuing with scanning and decreasing SGD size, Angie was no longer hidden behind a bulky computer, and her big smile would bring more communication partners to her side!

## TO INTEGRATE OR NOT TO INTEGRATE?

During her AAC evaluation, Angie and the team considered the possibility of integrating her power wheelchair with her AAC device. Angie's team had been plugging and unplugging her switch to change between using her power wheelchair and SGD (as she used the same switch to access each device), which limited Angie's independence in both areas. To make this more seamless and give Angie greater independence to change between driving and using her AAC device, we hoped to set-up Bluetooth integration. Working with her local complex rehab supplier, we found this was not something that could be achieved through programming on Angie's existing drive control. Although her power wheelchair had

## CONSIDERING ANGIE'S INCREASED EXPERIENCE LEVEL, HER RECENT IMPROVEMENTS IN AAC ACCESS, AND ONGOING LIMITATIONS WITH DRIVING HER PWC, WE DECIDED THAT FURTHER TRIALS TO EVALUATE ALL DRIVE CONTROL AND INTEGRATION OPTIONS WERE WARRANTED.

Bluetooth capability in the expandable electronics, the output from her power wheelchair was recognized as a mouse control for mouse emulation on her current Accent 1000 SGD. After troubleshooting with representatives from PRC, we determined it was not possible to program the SGD to recognize any of the mouse emulation directional inputs from her power wheelchair as a switch input for scanning. It would take programming an auxiliary mode and the addition of a new input/output module and cable to connect her power wheelchair with her SGD.

Further collaboration with Angie's complex rehab supplier and various manufacturers occurred to review options for cabled versus Bluetooth connection to her SGD. The output module box and output cable connection appeared to be the least expensive option presented and the quickest to receive. Once installed, and the necessary programming of an auxiliary mode on her expandable electronics was completed, Angie would need to learn to scan, not only through directional selections but also Mode. Once Mode was selected, she would choose between driving, seat functions or auxiliary mode on the display. After choosing auxiliary mode, this new module would send the switch signal to her SGD for scanning access. However, we learned with this integration option, Angie would not be able to use her switch through the auxiliary mode for AAC access if her power wheelchair was in attendant control. This was

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a concern, as Angie requires frequent use of her attendant control for safety and navigating tighter spaces. The Uno Single Switch Scanner with Bluetooth from Adaptive Switch Labs (ASL) eliminated that concern and allowed seamless integration and use even when in attendant control. However, this option was far more expensive, and this new drive control would need to be funded through insurance, rather than out of pocket. While pursuing funding was possible and justifiable, this gave us reason to more thoroughly evaluate this option before moving ahead. If we pursued this new drive control, would this meet Angie's needs for the next several years? Considering Angie's increased experience level, her recent improvements in AAC access, and ongoing limitations with driving her power wheelchair, we decided that further trials to evaluate all drive control and integration options were warranted.

Through collaboration with ASL, we were able to obtain their Uno Single Switch Scanner with Bluetooth to trial with Angie. During trials, several pros and cons were uncovered. This drive control would allow for veering (by providing more scanned directions), remove the need for caregivers to plug or unplug cords, and allow Angie to use her switch for AAC access even in attendant control mode. However, the module itself was smaller than anticipated and could possibly be difficult for Angie to see and effectively use. Furthermore, there were still challenges Angie experienced using single switch scanning for her drive control, which impacted her safety and independence. While she certainly understood the drive control and how to operate it correctly, Angie struggled to sustain switch activation and required latch to sustain forward driving. If Angie's timing was a little off when navigating tighter spaces while using latch, collisions were more likely. Additionally, turning required several switch hits, which was difficult to coordinate and inefficient.

Keeping in mind concerns with use of her existing drive control, we proceeded with evaluating other potential switch access sites. If we could establish additional switch sites, the use of a multiple switch array, rather than scanning, would greatly increase control and efficiency. The team discussed the possibility of adding switches near Angie's current switch behind her left elbow. However, we were concerned about available space for multiple switches, stable mounting and whether Angie could dissociate movements to use multiple switches at this site. We also considered switch access at Angie's head but determined this did not seem reasonable due to her long-established head posture and available movements. Though she was able to briefly lift her head and access a switch on the back of her headrest, Angie was unable to sustain switch contact. Angie's



**FIGURE 2** Angie testing out a new drive control - a proximity switch array on a tray.

ability to lift her right arm was limited, so when trialing switches at this site, a tray would be necessary to provide support.

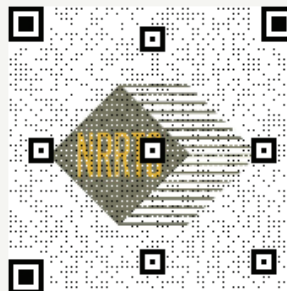
Through collaboration with Angie and her team, we were able to setup and test a proximity switch array on a tray (see Figure 2) (watch Video 2 via the QR code at the end of the article). This was the aha! moment we had hoped for! Angie was a whiz at using the array of proximity switches on the tray by sliding her right arm slightly in each direction to access switches for forward, left and right. She was even able to access an additional mode switch to the right side of the tray with her right arm. Angie and the team were thrilled to go from one switch to five!

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## NEXT STEPS- PLANNING FOR THE FUTURE

After seeing Angie's ability to access a proximity switch array on a tray, we prepared to setup an extended trial of this drive control. In recent sessions, Angie and her multidisciplinary team worked together to determine the best placement of switches under the tray surface, completed the programming necessary to set-up this drive profile on her power wheelchair, and assisted in initial training on use of this drive control (watch Video 3 via the QR code at the end of the article). Now Angie and her team will get to take this system for a spin at home to practice! If they feel this is a better and easier setup, we will move forward with identifying needed components and pursuing funding. We plan to trial options that allow Bluetooth integration of this switch array to her AAC device, so she can use any combination of her new switches and/or her existing switch for scanning on her SGD. Programming will be key during setup to optimize driving and safety. Programming speed, deciding how she will access modes and driving profiles, and possibly using standby mode will all be considered. Although we anticipate Angie will choose familiar scanning access of her SGD, further trials will be needed to assess if mouse emulation or use of multiple switches (two switch scanning) may speed up Angie's communication. If Angie decides to continue with single switch scanning, she will have options. We could integrate to allow use of one of the new proximity switches in her tray, or Angie could choose to use her existing switch site with a smaller AbleNet Jelly Bean switch behind her left elbow exclusively for AAC access.

The simplicity of using separate switches for driving and AAC access may be easier and more efficient. However, integration could simplify the system and reduce the need for additional hardware. Regardless of what she decides, Angie now has options to truly allow her to communicate on the go!



To watch videos of Angie, please scan the QR code.

Video 1: Angie's New Voice

Video 2: Angie's Access Trials – Summary of Tray Array Trial

Video 3: Angie's First Drive

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