The Clear Talker mask is the latest invention from the Central Virginia VA Health Care System (CVHCS) meant to aid in communication between patients and staff. The device, a product of the hospital’s Assistive Technology (AT) team, could revolutionize this key piece of peoples’ everyday lives.

When masks became a requirement at all federal health care facilities, AT realized how much current surgical masks hindered communication.

“I noticed after wearing a mask all day that I would come home and my eyes were tired,” said Melissa Oliver, occupational therapist and program coordinator of the AT team. “I had to rely on just my eyes to physically express my greeting.”

John Miller, Brian Burkhardt and Seth Hills are rehabilitation engineers who work with Oliver. Their expertise ranges from vacuum forming, injection molding, laser cutting, electronics, 3D printing and a whole range of other valuable skills used to help Veterans return to a sense of normalcy.

“[The Clear Talker mask] may not make the cover of a fashion magazine,” said Seth Hills who has developed several adaptive sports tools, custom mounting solutions and a novel wheelchair interface while with AT. “The fact that you can see each other’s faces and catch those social cues is invaluable.”

The Clear Talker meets FDA’s requirements for surgical masks under the emergency use authorization for single-use surgical masks during the COVID-19 pandemic, says Burkhardt. When the pandemic is over, the Clear Talker will be submitted for approval to become the new surgical mask standard.

The Inspiration Behind the Mask

John Miller from the AT team was the inspiration behind the Clear Talker mask. He was born with progressive hearing loss in both ears.

“As a person with hearing loss, I do have hearing aids that allow me to hear sound,” Miller said. “But I also rely on lip reading to fill in the blanks that I miss with my hearing. After the pandemic started, I was grateful everyone was wearing masks, but it made my day-to-day life harder.”

Miller’s personal experience inspired him to pursue an engineering degree that would allow him to directly help people with disabilities.

The Design

“The first time the three of us had these masks on, I almost felt like a weight came off of my shoulders,” said Burkhardt. “I felt lighter knowing the burden of understanding was diminished with the ease of seeing the whole face.”

The clear masks on the market today have filters located directly in front of the mouth, which obstruct visibility of the mouth.

“The idea behind the Clear Talker was to create a product with the fewest manufactured parts, while still being able to read lips,” Burkhardt added, (cont. page 5).
Mr. Danny Coburn is a 63 year old veteran who served in the Army for 3 years. He worked for 29 years as a maintenance supervisor for the Virginia Department of Corrections and volunteered as a youth coach for 20 years. Mr. Coburn has multiple medical problems including but not limited to chronic ischemic heart disease, chronic obstructive lung disease, neuropathy, peripheral vascular disease, left below knee amputation. He uses a manual wheelchair inside his house as well as in the community when coming to the VA and going to the grocery store.

Mr. Coburn reports that he used to be non-stop always on the go but he had complications after his surgery resulting in an 8 month wait prior to receiving residual limb. He feels that he has had time to reflect and now appreciates the little things more and more. He wonders why he used to get so worked up and now is so grateful to have the V6 power wheelchair has enabled him to work on his property, spend time with his family at their campground, access the playing fields and a renewed opportunity to coach youth sports.

Mr. Coburn shares more about his experience with AT below:

Tell us about your experience with the Assistive Technology Program (Speech, driving rehab, OT/PT/RT).

Veteran was referred to wheeled mobility clinic by a physical therapist working with veteran on the amputee rehab program. Veteran had reported a goal of getting a wheelchair with tires that would allow him to increase independence outdoors. Wheeled Mobility Specialist sort of leapfrogged over custom manual wheelchair and referred veteran to adaptive sports clinic for evaluation for all terrain power wheelchair. Veteran then participated in multiple equipment trials ruling out manual wheelchair options which were non functional secondary to COPD and neuropathy. Veteran then trialed the Extreme X8 4 wheel drive and the Frontier V6 midwheel drive all terrain manual wheelchair, Veteran preferred the maneuverability of the Frontier V6.

Case then presented to VACO and veteran was approved. Veteran also has worked with AT through Driver’s Rehab to acquire a boom lift that sits in the bed of his truck to transport the V6. Has prosthetic limb and is able to use a walker for short distances (approximately 60’ and this enables him to move from back of vehicle to front independently).

What challenges were you having that had you referred to the program?

Extremely limited in mobility related activities of daily living…Below knee amputation on 8/14/2019….took over 8 months to heal due to complications post surgery….Neuropathy and COPD limit his functional ability to propel a manual wheelchair….PLOF was ambulating independently….post op….using standard manual wheelchair….was not able to get outside and do yard work, coached sports for over 20 years (football, baseball and basketball youths age 8-17. Cabin in Fredericksburg at the Wilderness resort in Spotsylvania, family has time share and has used it for over 25 years, with V6 was able to fish from every spot on the bank that he used to prior to amputation…..(photo of veteran with grandson at campground)

Who did you see?

I worked with OT, RT and PT on my wheelchair and with KT for my wheelchair lift.

What device/program did you get?

Frontier V6 All terrain Power Wheelchair, Interior boom lift

How has the device changed your life or impacted your life?

Increase quality of time with family, increase safety and independence in home improvement projects, access to dynamic outdoor environments, access to fishing holes, It enabled me to get out and enjoy life some I had felt trapped inside especially since it took 8 months for my leg to heal.

What activities (things) are you doing now that you were not able to do before?

Fish, work on my house, go to family campground, able to coach again once the pandemic lifts and be able to go to ball games again

Would you say your quality of life has improved?

Definitely it has much improved

Is there anything we have not covered that you would like to include?

I would like to tell people that you need to feel you own way, you can either accept it or really live with it, there is a difference between being truly alive and just living….this chair enables me to go out and do things and therefore there is no excuse to not do as much stuff as you can….doing stuff makes YOU feel good.
The REAL Immersive System is a portable rehabilitation tool that you can easily bring to the patient at the bedside, in the gym, or mobile health location. It was designed for adults and is intended to be used seated in a clinical environment and prescribed and supervised by a medical professional trained in rehabilitation therapy. REAL utilizes body sensors to generate an accurate representation of the user’s body and allows the system to record progress throughout their therapy sessions. Hand strength is not necessary for avatar generation. Sensors are strapped to the body and don’t require active muscle contraction to operate.

The REAL system starts the user out in a virtual environment called Happy Valley. The user will see a visual representation of themselves, an avatar, that can be customized by the therapist. In Happy Valley, the user is greeted by the Penguin Mayor who offers different challenges (chuckle ball, nest the birdies, find the penguin, etc.) to the user. As the user meets the challenges and succeeds, they build out a village in Happy Valley and unlock other activities. The user can use head, trunk, arm, and wrist movements to manipulate their avatar in the virtual environment. This allows the user to separate themselves from their challenges and focus on therapy and recovery in a non-threatening virtual world.

The therapist can view what the user is seeing via a wireless connection to a tablet. Through the clinician interface, they can control difficulty, body morphology, and enable features such as mirroring. Mirroring can be used in phantom limb treatment, and in re-enabling neural pathways to spinal cord and brain injured populations.

The system lasts 1–2 hours on a full charge—which may be a problem for back to back sessions. Real VR recommends using the system for one hour and charging for a full hour in between sessions.

The system is leased on a monthly or yearly basis: $1,340/month or $16,080 for the year. This includes the REAL System hardware, software, functionality upgrades, training, technical support, unlimited users, and HIPAA compliant policies. Additional bands cost $80 per set.

Overall, the REAL system worked pretty seamlessly once the wifi network was setup and the tablet and headset were paired properly. The sensors do have to be used in a room without too much metal, otherwise, the metal will cause interference. The virtual environment utilizes clean and simple graphics, and the system matches physical body movement to the virtual avatar in real time. While a bit cartoonish, the games are well developed, engaging, and can be adjusted to the user’s abilities and treatment goals. A key advantage to this system are the body sensors which make it possible to track joint movement and do not rely on hand strength to hold.

NeuroRehab VR
Neurorehabvr.com
Virtual Reality, cont.

The NeuroRehab VR system is intended for neuro impaired patient populations that include TBI, SCI, stroke, and M.S. Neuro Rehab VR recommends the system be used in clinical settings with clinician supervision and guidance.

The virtual environments developed by NeuroRehabVR include Retail Therapy (a virtual grocery shopping experience), Haven (a non-threatening virtual landscape), Leg Day (kick volleyballs into wooden targets in the distance), LokoSprint (a running path ala TempleRun that can be paired with LokoMat therapy), and more. These environments benefit physical, occupational, and cognitive therapies as well as overall physical and mental wellness.

By comparison, several of the Neuro Rehab VR virtual environments appear more functional than aesthetic in design. While they are designed for therapeutic goals, it’s easier to imagine you are in a therapy session or a research project rather than in another world doing therapy without knowing it. The system does not render an entire avatar—normally just the hands are rendered. Points for functionality, but the system may not be as good at distracting the user from the mechanics of therapy. Hand function is required for upper extremity avatar control and generation, but the system can be used in standing/walking exercises (LokoSprint, Leg Day), whereas Real VR cannot.

Cost:
Hardware Bundle: $4000 (one-time cost)
Plan Options:
- Intro (free forever)
- Retail Therapy, Fowl Play, Leg Day
- Essential $349/month ($4188/yr.)
- Intro plan plus:
  - LokoSprint, Explore, Range of Motion, Lunchtime Adventure, Haven
  - Monthly updates + Service & Support
- Pro $599/month ($7,188/yr.)
  - Essential plan plus:
    - Data Analytics Portal

The clinician can observe and control the stimulus and the cognitive load that the user experiences, and tailor settings to the patient’s specific needs. The ability to create customized and targeted therapy plans with quantifiable progress and real time data feedback improve the efficiency and healing effects of VR therapy.
Virtual Reality, cont.

Content summarized from recent in-services by REAL and NeurorehabVR staff as well as information available at www.realsystem.com, neurorehabvr.com, and https://immosis.com/portfolio/leg-day/.

Figure 3Clinician observing Patient shaking ketchup onto a plate (Lunchtime Adventure).

Figure 4Retail Therapy picking a can off a store shelf.

Figure 5Leg Day

Figure 6Therapists guiding therapy. Patient leaning against box that is represented virtually as a table.

New VA invention, cont.

AT held focus groups to test the design to ensure it helped people read body language, facial expressions and improve the overall connection.

Oliver said she hopes to have all testing completed within a few weeks to begin distributing the masks to staff at the hospital.

To learn more about this highly specialized team, visit (Hyperlink) https://www.richmond.va.gov/services/Assistive_Technology_at_McGuire_VA_Medical_Center.asp

Process: vacuum forming

Mask Development
controlled with the movement of a finger. 3D printed parts, laser-cut spacers, and old-fashioned machined parts all made the mounting possible. A phone mount was built into the tray for quick access. The drive tray benefits the Veteran by supporting his hands, locating the joystick in a comfortable spot to reach, and enabling him to see in front of his feet for potential obstructions. In addition, the Veteran can use the tray for meals. Seth Hills also contributed to this design.

Figure 2. A tray custom-built to make driving this Veteran's power wheelchair easy and smooth

John Miller worked with SCI OT Kate Kapus and a Veteran to develop a custom driving tray for a Veteran to drive his power wheelchair. The tray was custom sized using a laser cutter and outfitted with a low-profile joystick using the same Multi Jet Fusion printer as Brian. Seth used the printer’s color feature to apply “winter camo” to the part surfaces. The evolutions of old designs highlight the newfound capabilities of our program to deliver quality functional parts with great aesthetics.

Figure 3. A pair of Intimate Rider clamps, 3D printed in winter camo

Seth Hills has recently devoted much of his time to the ClearTalker Mask design (as reported in the main story of this newsletter), but he continues to innovate for patients. He revisited a clamping design he had made several years ago for securing an Intimate Rider product for Veterans with SCI. He added new gripping features to make them easier to use, then printed them using the same Multi Jet Fusion printer as Brian. Seth used the printer’s color feature to apply “winter camo” to the part surfaces. The evolutions of old designs highlight the newfound capabilities of our program to deliver quality functional parts with great aesthetics.