Electronic Driving Coach

An assistive technology device under development at Shepherd Center and Georgia Tech could aid drivers with brain injuries and other cognitive deficits.

BY JANE M. SANDERS

After sustaining a severe brain injury in a motorcycle accident, Freddie Alexander underwent rehabilitation and eventually returned to driving a car. But he had a series of minor accidents and received traffic citations that made his car insurance skyrocket. His wife feared for his safety, and his doctor advised him to undergo a driving evaluation at Shepherd Center.

Driver rehabilitation specialist Michele Luther-Krug observed that Freddie's driving habits improved when she gave him regular prompts, but without them, he became inattentive and even dangerous. She planned to tell Freddie he should not drive independently.

But Luther-Krug collaborated with John Anschutz, the director of Shepherd's Assistive Technology Center, and an idea began to hatch. Knowing how effective Luther-Krug's prompts were in helping Freddie's driving improve, Anschutz used off-the-shelf components and wrote a software program to create an automated driving coach system that mimics Luther-Krug's feedback. After a training program that included supervised driving by Freddie's wife, Freddie has been driving independently for almost a year now with no incidents.

"Sometimes, I forget to do things while I'm driving, and this system helps remind me of what I should do," Freddie says. "It's like someone sitting beside me. This system has made a big difference for me, and I commend Shepherd Center for helping me out."

The prototype system Freddie is using works like this: It plugs into the car's cigarette lighter for power. The driver gets intermittent verbal reminders to check mirrors, speed, and distance from other vehicles and objects. When the driver completes a task, such as checking the mirrors, the driver presses a button positioned on the car seat's armrest and then gets a brief verbal message of encouragement. If the system reminds a driver to complete a task and does not receive a response within three minutes, the system's prompts increase in frequency.

"You have to want to be a safe driver for this system to work," Anschutz says. "And the driver must recognize that he

or she has a deficit. To Freddie, it was important to be able to drive independently, so he was motivated to use the system."

Anschutz and Luther-Krug – along with vice president of technology Mike Jones, Ph.D., and director of brain injury research, Ron Seel, Ph.D. – have applied for a patent for the automated driving coach. While they await its approval, the system continues to be refined and improved in collaboration with researchers at the Georgia Institute of Technology and an Atlanta-based startup company called Centrafuse™, which designs automotive software.

At Georgia Tech, researchers led by Bruce Walker, an associate professor of psychology and interactive computing, are conducting research to determine what speech and non-speech sounds and cues would be least intrusive and most helpful to users of the automated driving coach. To that end, Walker's graduate students have been gathering feedback from Shepherd Center patients who have used the automated driving coach.

"My lab has experience in creating both effective and user-acceptable auditory interfaces," Walker says. "It's very important to have a combination of cues that are not intrusive. We don't want people to turn them off. We want to help them be better drivers."

In addition to refining the auditory interfaces, Anschutz and Walker are consulting with Centrafuse™ on how to give the automated driving coach more functionality in a vehicle using the company's software platform, which can run on a touch-screen dashboard computer.

"The system has a lot of possibilities we've not explored yet," Anschutz says. "It could be a good fit to go into a car's PC. If it was integrated with the car, the system could do a lot more."

The automated driving coach differs from anything on the market from carmakers, such as an alarm system that notifies drivers when they've veered out of their lane. "The automated driving coach gets at the problem before this point," he explains. "It is meant to keep the driver engaged and active."

Eventually, the researchers plan to conduct a more objective evaluation of the automated driving coach with potential users in both a simulator, as well as a real vehicle.

In addition to helping people with brain injuries, the system could help new drivers, people with attention deficits and/or anxiety, and senior adults, researchers say. The system could be customized to address the various skills these groups need for safe driving.

Facing Page: Former brain injury patient Freddie Alexander of Smyrna, Ga., uses an electronic driving coach under development by Shepherd Center and Georgia Tech.

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Shepherd Center Helps Restore Independence Through Assistive Technology

Giving independence to people with disabilities through assistive technology – from the acute-care stage to rehabilitation to the return to home – is the goal that drives Shepherd Center's Assistive Technology Center.

Shepherd Center has developed numerous assistive technology devices for patients with paralysis and other physical and cognitive impairments. People often use these devices while at Shepherd and sometimes at home, as well.

One recent example is an integrated sip-and-puff control system that allows high-level quadriplegics to use a single device to adjust lights, control a television's power and channels, make phone calls and summon for help. "It gives the person control of their environment, which is empowering and like food for the soul," says John Anschutz, director of Shepherd's Assistive Technology Center.

As donor funds become available, the goal is to get this system into the hospital rooms of all Shepherd patients who need it, and then into patients' homes – perhaps making it work via an iPod.

In another recent effort, rehabilitation engineering technologist Kevin Grogg devised a sip-and-puff infrared remote control dubbed a "Weemote." With a sip, a user can power a TV on or off. With a puff, the Weemote scans through a user's pre-programmed 10 favorite TV channels. The device may become available through the Shepherd Center Apothecary for $200 to $300.

"We try not to make things from scratch," Anschutz says. "We look for commercially available options first because they have better technical support for these products than we can provide for something we develop."

Shepherd is always looking for commercial partners to collaborate with on the development and manufacture of assistive technology devices. Also, staff members in the Assistive Technology Center can evaluate acute-care facilities to see if Shepherd's sip-and-puff control system, or something similar, could be feasible for nurse call systems in those settings.

Below: Shepherd Center's Assistive Technology Center created a sip-and-puff interface so patients with limited movement can operate an iPod music player.

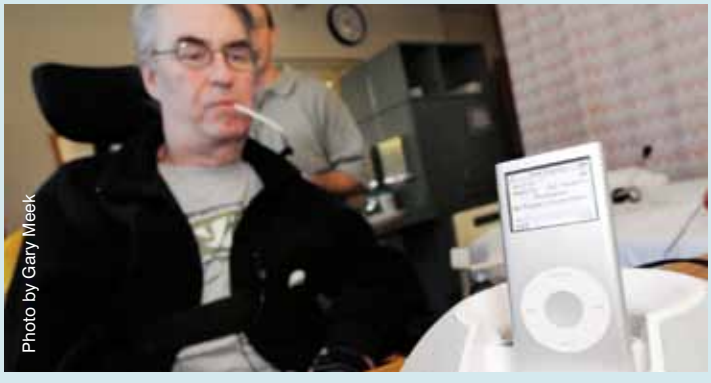

Photo by Gary Meek