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Researcher Trips Amputees In Effort To Develop Improved Prosthetic Legs

ScienceDaily (Sep. 16, 2009) — Again and again, 71-year-old Marjorie Brasier walked on the treadmill using an instrumented prosthetic leg, and again and again she tripped or slipped. Sometimes she recovered on her own and kept walking, while at other times the harness she wore was all that kept her from tumbling to the floor.

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Brasier's trips and slips occurred by design as part of a University of Rhode Island research study that seeks to improve the safety of prosthetic legs by developing a reliable and responsive stumble detection system.

One of six clients of Nunnery Orthotic & Prosthetic Technologies to participate in the study, Brasier was hooked up to dozens of electrodes, wore shoes containing 99 pressure sensors, and 40 light-reflective markers on her body were tracked by eight cameras surrounding the room to collect the data necessary for the research.

"When we become unbalanced, our neural system reacts quickly and sends a signal to help us recover," said He (Helen) Huang, assistant professor of biomedical engineering at URI. "Our challenge is to see if we can detect these neural reactions fast enough to activate a mechanism in a patient's prosthetic leg to stabilize them before they fall."

During the experimental phase of the study, Huang is collecting data from able-bodied individuals and those using prosthetic legs to determine what kind of physiological signals can be detected for use in developing a stumble detection system. Once she has analyzed the data, she hopes to develop an algorithm that can be used in computer-controlled artificial limbs to provide active stumble recovery.

"If we can detect the stumble reaction fast enough, then there may be time to react to it," said Huang, who is collaborating on the project with Brown University Assistant Professor Susan D'Andrea. "Hopefully we can develop a system that can mimic the normal human reaction to stumbling."



Research test subject Marjorie Brasier prepares to walk on a treadmill as Michael Nunnery of Nunnery Orthotic and Prosthetic Technologies and URI Assistant Professor Helen Huang look on. (Credit: URI Department of Communications & Marketing, photo by Michael Salerno Photography)

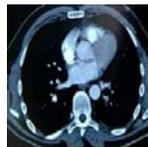
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According to the URI researcher, the population of lower-limb amputees in the United States is large and growing, especially so during this time of war, and she believes that the design of a high performing prosthetic leg is critical to reducing the burden of this disability.

"We need to give a lot of credit to the patients involved in this study as they are allowing us the opportunity to collect unprecedented data related to stumble and recovery reactions in amputees," said Michael Nunnery, owner of Nunnery Orthotic and Prosthetic Technologies, Inc., another partner in the research project. "We hope to utilize this data to have an innovative impact on the future of above knee amputee prosthetics needs."

Brasier lost her leg when a teenage drunk driver struck her car in Florida in 2001, an accident that took the life of her husband. Despite the long day of testing on the treadmill in late August, she was upbeat about participating in the study.

"I didn't really know what I was getting myself into," said the retired schoolteacher from Warwick, "but I'm always game for adventure. And if I can help veterans in any way, I'm glad to do it. It's an honor."

Added Huang: "All of the patients we've tested have been happy to participate because they know that it might help themselves later."

The project was funded in part by the Rhode Island Science and Technology Advisory Council, which believes that a successful prototype could quickly lead to a commercially available component that will enhance the safety of prosthetic limbs.

Adapted from materials provided by [University of Rhode Island](#).

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