MIAMI-DADE COUNTY

Miami student drove race car with only his thoughts — revolutionizing tech for the disabled

BY DEVOUN CETOUTE

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Falci Adaptive Motorsports and the University of Miami's Miami Project to Cure Paralysis showcased their new tech that allowed quadripalegic Miami-Dade student German Aldana Zuniga to drive a race car with his mind. BY FALCI ADAPTIVE MOTORSPORTS

Miami Dade College student German Aldana Zuniga sped around a Colorado track in a NASCAR race car. But the Honduran native wasn't using his hands or feet to control the 850 horsepower car.

His thoughts propelled him.

A feat seen in comic books was achieved by a brave quadriplegic and advanced technology.

"I felt very excited, I felt the adrenaline rush," said Zuniga, who lives in Miami. "It felt amazing."

Zuniga raced around the Pike's Peak International Raceway from Monday to Wednesday, doing about 20 laps while showcasing the revolutionary technology created by Falci Adaptive Motorsports and the Miami Project to Cure Paralysis, which is part of the University of Miami.

The tech crossed a NASCAR race car and a brain implant to allow Zuniga to drive with his mind.

This implant not only allowed him to drive a car, but offered a glimpse of hope into how others who are disabled or paralyzed can control different technologies with their minds.

Zuniga suffered a spinal cord injury in a car crash in 2013 when he was 16. The crash left him without the ability to use his limbs. He was diagnosed as a quadriplegic before he even learned how to drive.

The crash resurfaced and made him apprehensive about driving the high-powered race car. He began to work with the Miami Project, where he helped researchers with advanced technology that would help the disabled do everyday tasks.

There he found a love in technology and is studying computer programming at Miami Dade College.

"After being a part of this, I found a lot of love for it," Zuniga said of advancing technology for the disabled. "I see the amazing stuff they can do, so this is where I would like to work."

BREAKS NEW GROUND BY USING HIS MIND

When approached with the opportunity to drive for the first time in his life, Zuniga was nervous.

“When I imagined doing it I was excited, but at the same time I was nervous because of my accident,” he detailed. “I tried to remain positive and calm myself down...I have faith in them and they have faith in me.”

Aside from Zuniga’s thoughts controlling the throttle, he used a device called “sip and puff” to slow down the race car and another person was inside to maintain Zuniga’s safety in case something went awry.

Channeling all the courage needed to drive such a powerful vehicle, Zuniga said being a beacon for others was a pivotal driving force.

“I wanted to do this not only for myself, but for all the people that don’t know they could do something like that or are afraid or don’t have the will,” he said. “I want to keep them confident and to have hope and not lose it. To go out there and try all the stuff...that they don’t know about.”

Scott Roy, director of communications for the Miami Project, said Zuniga had been training for months prior to the demonstration.

Dr. Scott Falci, a neurosurgeon and founder of the Falci Institute for Spinal Cord Injuries, helped design the race car. He described the entire project as “very cool and exciting,” and added that seeing Zuniga excel at driving it was fantastic.

He also was amazed at how Zuniga handled the stress of multitasking by driving with his mind in addition to enduring the vehicle’s sweltering conditions.

“What a tremendous kid,” he said. “Look what we asked him to do. He never learned to drive and we bring him out here in a car that doesn’t know how to go slow.”

HOW CAN A THOUGHT PROPEL A RACE CAR?

One of the keys to allowing the mind to control the race car was a brain machine interface, or BMI.

The BMI is an implanted sensor that goes on the surface of the brain, in this case Zuniga’s, David McMillan said, an assistant professor at UM’s Department of

Neurological Surgery and the director of education and outreach for the Miami Project.

When Zuniga thinks about a specific task, a specific part of his brain activates and the sensor picks up that signal.

“Originally, we were going to use the signal to do essentially one task but we knew that if you could make the signal do that task, you could then make it do other things,” McMillan said.

One of the first tasks Zuniga and researchers collaborated on was using the BMI to control a pair of gloves that worked to help him with hand functions. Zuniga again used the implant to control walking robotics, McMillan said.

Using his thoughts to control the movement of walking is a colossal feat, but transitioning the BMI to allow him to control a car was no easy task.

The implant allowed Zuniga to control the throttle of the race car, but as McMillan put it “you can’t just tell the engine to go full throttle on, whereas with certain devices you could just say on and off.”

“Grading the throttle response was the primary engineering challenge there,” he noted.

Through simulations and near a year’s worth of work, Kevin Davis, a biomedical engineering student at UM, and other engineers were able to achieve the task of allowing Zuniga’s thought to gradually affect the throttle of the car.

In Zuniga’s mind, the way he thinks did not differ much from other projects the team has worked on.

McMillan said he pictures himself moving his hand in a certain way and then the software turns that image into different commands. So when he imagines grasping a certain way, the throttle increases.

This action is quite similar to how motorcyclists squeeze down on the throttle to go and then release their grasp to slow down.

“This is one of the most important talking points of this project,” McMillan said.

A RIPPLE EFFECT TO MAJOR TECH ADVANCES

This was a first step to a plethora of possibilities that involve the brain controlling many different technologies.

“There are really very practical applications of this, not everyone’s gonna be driving a race car,” Scott Roy said. “But if you can do this, then you could potentially turn on lights with your thoughts or controlling your computer cursor.”

For people with severe disabilities, Roy said this could make daily living better.

McMillan called it a “real paradigm shift.”

“Especially from the standpoint of the way that we interact and impact our immediate physical world, it always starts with a thought and intention,” he said.

He proceeded to note that people will soon fundamentally rethink how their thoughts are being translated on the world around them. One day, the technology could be translated to fully controlling vehicles with the mind or exoskeletons.

Wherever this technology advances, Zuniga will be along for the ride helping the Miami Project identify new ways to better the lives of those with disabilities.

To others who may be disabled or looking to him as an inspiration after conquering a large technological feat, Zuniga emphasized that the key is to “hold on to hope.”

“Don’t worry about all the stuff you are going through because there are people going through worse,” he said. “And now with technology, the level you can reach is so high. We have to help the researchers and these projects so they can advance more and hopefully one day everyone with a disability can walk again.”

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DEVOUN CETOUTE

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Miami Herald Real Time Reporter Devoun Cetoute covers breaking news, Florida’s coronavirus pandemic and general assignment. He’s a graduate of the University of Florida and grew up in Miami. Theme parks, movies and cars are on his mind in and out of the office.

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