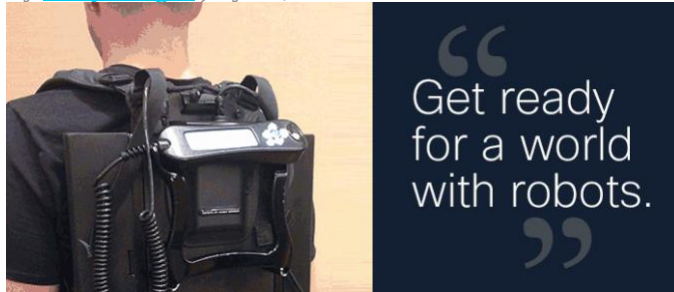


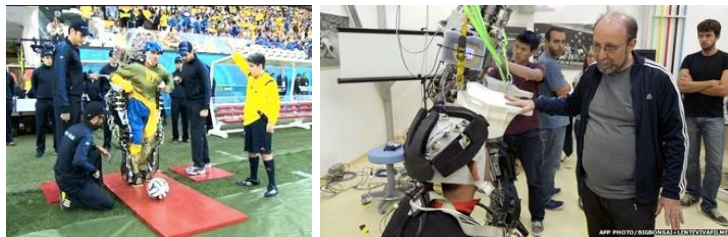
# Wearable Robotics Technology Steps Forward

By [Mary Gorges](#) July 16, 2014



From the World Cup to the movies, we get a look at what's possible.

The final showdown in the World Cup on Sunday shattered viewing records with one *billion* people from across the globe tuning in. History was also made at the very beginning of these games a month ago when a 29-year-old paraplegic kicked out the first ball.



*Paraplegic Pinto at World Cup Head cap that sends brain signals*

Juliano Pinto's lower body is completely paralyzed. But in front of a packed stadium in Brazil last month, he was able to stand, walk, and kick by wearing an exoskeleton (also called a wearable robot) and gave us a glimpse into how the worlds of technology and medicine are rapidly intersecting. Pinto's suit was mind-controlled, meaning brain signals were translated into digital commands that told the robotic legs to move.

Shane Mosko, of Connecticut, was a soccer player in college before he was paralyzed from the waist down in a car accident a year and a half ago. At a recent conference of the National Neurotrauma Society in San Francisco, the 22-year-old used an exoskeleton with the aid of crutches to 'walk'.



This particular suit is made by [Ekso Bionics](#) in Richmond, Calif., one of only three companies in the world that make exoskeletons. The suit is powered by battery-operated motors in the knee and hip joints and has some 30 sensors that work collaboratively and in real time. As Shane moves his upper body, the sensors throughout the suit communicate with the motors. If they sense a change in the center of gravity or if the weight of his body shifts, the motors receive the message to move the robotic legs to restore balance. This idea isn't too far from how a Segway operates – it uses similar motion-sensing technology so the scooter moves whenever its driver leans forward or backward.

The suit's sensors also provide continuous real-time data or feedback to a computer hardware unit on the back of the exoskeleton that tells a therapist when to make adjustments. A handheld control unit attached to the system displays readings that reveal how much – or how little – physical effort the patient is exerting. The higher the numbers, the more work the robot is doing.



Michael Glover, one of Shane's rehab therapists from Ekso Bionics, says he can program the suits so the patient uses their own physical power as much as possible, and says most of these systems are designed to prevent the patient from being totally passive as that's when they can become even weaker. "In the software, we have variable assistance technology that can make it a real therapeutic session for Shane, and draw down the amount of assistance of the robot and make him work. That's when he really increases his strength and ultimately, regains some of his walking," says Glover.

The technology and design for exoskeletons is rapidly changing ...going from earlier versions we saw years ago of something called the Lokomat where paraplegics walked in place while suspended in suits over a treadmill ...to Hollywood's vision far into the future. In the movie ["Edge of Tomorrow"](#), Tom Cruise plays a soldier wearing an exoskeleton that gives him almost super-human power to fight in battle.



*The Lokomat*

*"Edge of Tomorrow"*

Neuroscientists like Dr. Keith Tansey, of Emory University, say while exoskeletons can have a tremendous impact on medical restorative function, it's far more exciting to think about their other uses.



"We think about robots bringing us from less than normal to up to normal. So far, they've been devised to assist as needed. But think of a robot going from assisting you to resisting you – making you go faster, longer and achieving more endurance," says Dr. Tansey. He adds that someday, exoskeletons may be worn by fire firefighters to help carry people or heavy hoses, by soldiers who carry heavy loads day after day, and by people who work with their hands above their heads for extended periods. Taking it into a different realm, Dr. Tansey says exoskeletons that have no one in them could possibly be used for such things as walking on the moon or for bomb detonating.

Already today, wearable robots are quickly moving from what we used to see only in the movies (think Transformers and Terminator) to the soccer field and beyond. As the input that goes into them becomes more sophisticated, so will the output and real-time information we get from them. Get ready for a world with robots.