Preliminary research findings released for Ekso robotic exoskeleton in spinal cord injury

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Kessler Foundation has released preliminary research findings from its clinical study of the wearable robotic exoskeletal device, Ekso (Ekso Bionics). Gail Forrest, PhD, assistant director of Human Performance and Engineering Research, presented the Ekso research data on September 3, at the meeting of the Academy of Spinal Cord Injury Professionals at the Rio Suites in Las Vegas. Dr. Forrest directs mobility research at the Foundation, including activity-based locomotor therapy, functional electrical stimulation, and treadmill training with the LokomatPro v6, as well as Ekso. Her research focuses on new ways to improve function and restore mobility for people with disabilities and reduce their long-term risks for complications.

Ekso, has been undergoing clinical investigation in patients with spinal cord injury at Kessler since October 2011, when the research team received the second commercial unit distributed by Ekso Bionics. "Our initial research results are promising for the potential application of Ekso-assisted walking in rehabilitation, in exercise/wellness programs, in the community and for home use," said Dr. Forrest.

Dr. Forrest not only studies the mechanics of how people with paralysis stand and walk in Ekso, she looks at the impact of these activities on their muscles, hearts and lungs. Long-term studies are needed to evaluate the effects on common secondary complications such as cardiovascular disease, loss of bone and muscle, pressure ulcers, depression, chronic

pain, and loss of bladder/bowel control.

Dr. Forrest reported on data collected in 13 patients (12 with paraplegia and 1 with tetraplegia) with spinal cord injury (complete and incomplete injuries) enrolled in the Ekso study. Thus far, walking and standing with Ekso is feasible for people with a range of spinal cord disorders that cause paraplegia. Individuals with higher levels of spinal cord injury may also benefit, but require more time to learn Ekso-assisted walking.

Gait and balance data indicate positive results/progress, ie, for individuals engaging in Ekso-assisted training sessions, walking speed and distance, fluidity, gait and balance improve with training on the exoskeleton. Metabolic and cardiovascular responses were evidenced by increases in oxygen consumption, ventilation and heart rate. These increases occurred with changes from resting to standing position and increased further with changes from standing to walking. Dr. Forrest confirmed this effect by comparing the responses of a patient skilled at Ekso-assisted walking (30 sessions of training) with those of a novice walker. Oxygen consumption returned to baseline much faster in the skilled walker, indicating a training effect. "These are only preliminary data," emphasized Dr. Forrest. "The mechanisms underlying these responses need further investigation. These findings are indicative of potential benefits for the heart, lungs, and the circulation, an important finding in this high-risk population."

Another interesting finding was increased muscle firing in the lower leg muscles during Ekso-assisted walking. More detailed research is needed to evaluate the potential health benefits of this muscle activity, according to Dr. Forrest.

Advances in engineering are enabling advances in Ekso research. Auto-control for greater flexibility and maximal independence is a new feature in the upgraded device, Ekso 1.1, being tested at Kessler Foundation.

Data collection is now automated, which will aid the expansion of Ekso's capabilities in the future.

Provided by Kessler Foundation