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Hunova, a total body rehab platform: Clinical experience in Neuro Rehab

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In the last two years, several studies and clinical trials were run in order to evaluate and validate the use of the robotic rehabilitation system hunova® [1] in different clinical settings such as neurology, orthopedics, geriatrics and sport. In this paper, an overview of clinical experiences and the main results obtained in the field of neuro rehabilitation are presented.

Parkinson Disease: In Parkinson's disease, rehabilitation aims to improve patients' quality of life by promoting their independence, safety and well-being [2,3]. To achieve these goals, rehabilitation first aims to prevent and/or delay inactivity, fear of moving or falling and to maintain and enhance physical capacity; as the disease progresses, the goal becomes to improve transfers, posture, balance, walking and functional gestures [2].

A pilot study (ten subjects, 8M, mean age 72±6.84SD) with a clinical diagnosis of Parkinson's disease were included in this study with hunova®. The study was run in order to verify the feasibility and effectiveness of an integrated traditional-robotic rehabilitation treatment in Parkinson's disease patients.

Main results showed how the integration of traditional and robotic treatment lead, compared to traditional treatment only, to an improvement in the Timed Up and Go Test, to greater pelvis mobility and stability with an improvement in managing the load in sitting position, besides the maintenance of the improvements obtained with traditional treatments on balance, walking speed, stability limits and trunk mobility.

Results obtained highlight how the rehabilitation treatment with hunova® can offer an innovative therapeutic opportunity to be combined with traditional rehabilitation in subjects affected by Parkinson's disease.

Stroke: Stroke survivors show greater postural oscillations and altered muscular activation compared to healthy control [4,5]. This altered condition results in difficulties in walking and standing, and an increased risk of falls [6]. A proper control of the trunk is related to a stable gait and to a lower falling risk; to this extent, rehabilitative protocols are currently working on core stability through abdominal, pelvic and lumbar muscles reinforcement. The carried-out study aimed at assessing the potential of hunova® in stroke rehabilitation, with a focus on core stability and balance. Particularly, a robot-assisted program was compared with conventional rehabilitative treatment to determine whether robot-based protocols can improve the recovery of chronic stroke patients.

An open randomized clinical trial was run, with recruitment of thirty chronic stroke patients, randomly divided in two groups, either underwent a traditional rehabilitative protocol with physical therapists (control group: N=15 age mean 58.3±SD 7.6 years, 8 females, 8 left side affected), or a robot-based program with hunova® (experimental group N=15 age mean 63.3±SD 10.0 years, 5 females, 6 left side affected).

Main results showed how hunova® treatment was at least comparable with traditional treatment, leading a better improvement in stroke survivors in the experimental group in standing dynamic balance test (reactive balance, balance on an unstable base) and in proprioceptive control both in standing and sitting positions, compared to the control group. Results showed that hunova® is a promising tool for the rehabilitation of stroke patients.

Spinal Cord Injury: In complete Spinal Cord Injury trunk control is essential for daily life activities. When trunk control is impaired the development of less effective compensatory strategies is required. Impaired trunk control functional implications are most evident in neurological conditions such as spinal cord injury [7,8]. A study was carried out with the aim to investigate the use of hunova® for assessment and training of SCI subjects.

Eight subjects (5M 3F, mean time from disease 12±5.74, mean age 46±10.6 years) in chronic condition, with complete lesion (ASIA A-B) executed a 20 sessions training with hunova® focused on balance, trunk control, dual-motor-task with movements of the upper limbs, strengthening, core stability.

Main results showed that balance performance and trunk control were correlated with the level of lesion. After the training with hunova® subjects showed improvements in trunk control measured both by clinical scales and by

hunova® during active control tasks and balance tasks in seated position.

Obtained results showed how hunova® can be a useful rehabilitation tool for evaluation and training in spinal cord injury.

Conclusions: hunova® can be a useful and powerful rehabilitation tool for evaluation and training and a considerable number of clinical trials have been set up and will be completed to validate the technology. hunova® allows to measure significant parameters of static and dynamic stability and can centralize a complex progression of exercises to recover trunk control and reactive balance after traumatic injuries.

Speaker Biography

Jody Alessandro Saglia is a mechatronic engineer with 15 years of academic and industrial experience. He graduated in Mechatronics Engineering at Polytechnic of Turin in 2007 and received his PhD degree in 2010 from King's College London. He also received a Master Degree in Technology Transfer and Management of Innovation from the University of Genoa in 2014. He has been at the Italian Institute of Technology (IIT) since 2010, as a Postdoc researcher in the Department of Advanced Robotics and in 2014 contributed to the creation of the Rehab Technologies Facility and took the role of Principal Investigator, working on the design and development of rehabilitation and assistive technologies. Jody started to work on rehabilitation robotics, in particular on ankle rehabilitation in 2007 and led all the developments of the technology from a proof of concept to the CE marked product. He led a team of engineers and developers to design and build hunova, the first product of Movendo Technology. He is co-founder and Chief Technology Officer of Movendo Technology. Jody has published more than 20 peer-reviewed journal articles and conference papers about robotics applied to rehabilitation and assistive applications and is inventor of 4 patents.

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