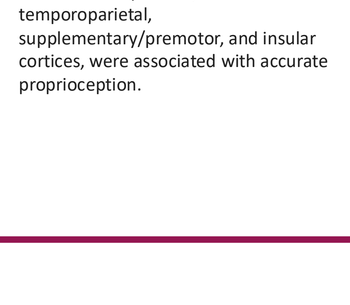
PROPRIOCEPTION TRAINING IN POST-STROKE SURVIVORS: A CHALLENGE FOR ELECTRICAL STIMULATION?

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Integration of multiple signals:
muscle spindles, Golgi tendon organs, cutaneous receptors and joint receptors

1) Why proprioception is important?

Proprioception is the awareness of the body's mechanical and spatial state

"Proprioception is not a simple passive reception of a sensory signal but rather a perception involving a complex array of information sources and central mechanisms for attention control, movement planning, and sensory processing that are shaped by memory and learning." [1]



Processed by multiple brain areas:
pure position sense-related activity in the right parietal and frontal cortices, including dorsal and ventral frontoparietal networks.
It was also reported that several brain regions beyond the primary somatosensory cortex, such as temporoparietal, supplementary/premotor, and insular cortices, were associated with accurate proprioception.

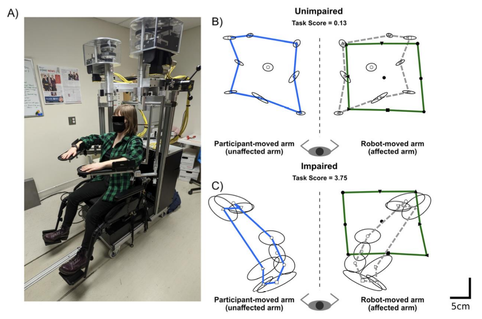
2) How neurorehab deals with Proprioceptive impairment? [2]

Traditional rehabilitation often overlooks proprioception, even if the role of proprioceptive feedback in motor learning is crucial in improving functional outcomes as demonstrated by the scientific research.

Conventional Physiotherapy Approaches

- Joint Position Matching Tasks
- Balance and Gait Training
- Mirror Therapy
- Tactile and Kinesthetic Stimulation
- Dual Task and Proprioceptive training

3) Robotics and proprioceptive training and evaluation [3,4]



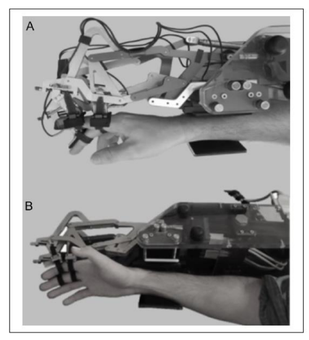
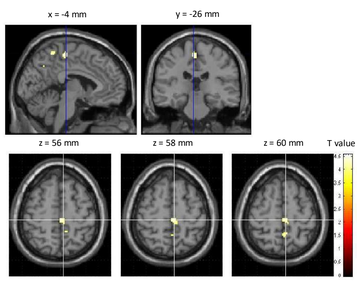
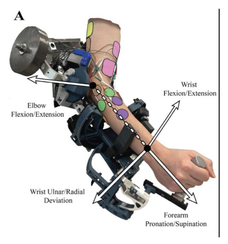


Figure 1. The FINGER robot used to perform the proprioception task, as seen from (A) lateral and (B) oblique views. The index and middle fingers attach to the robot and are guided through finger-crossing movements during the proprioception task. The robot aligns with the plane of the participant's index and middle fingers, maintaining a naturalistic gap between the fingers and eliminating any somatosensory input that might otherwise be generated on finger crossing.

4) Why FES might be a novel approach to proprioceptive training? [5,6,7,8]

- Repetitive training
- Multimodal Biofeedback
- Muscular contraction associated to movement assistance
- FES induced Brain Plasticity
- Hybrid robotics and FES training [6,7,8]







OUR GOAL: A PANEL DISCUSSION

Open Issues:

- Peripheral proprioceptive incongruence or proprioceptive augmentation?
- Which protocols?



REHABWEEK proprioception and FES

WHAT WILL FOLLOW?

We will contact all responders to the survey or any colleagues who have expressed interest in the topic and follow-up with

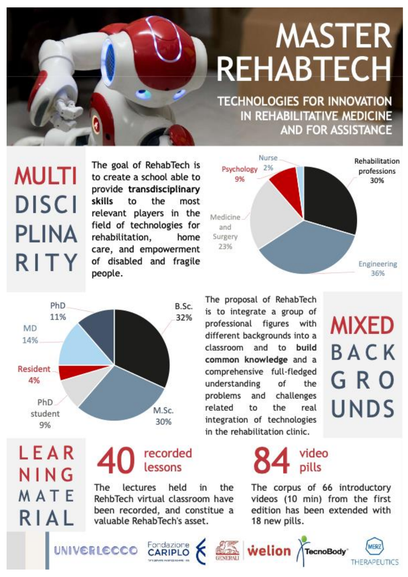
- Clinical and Scientific discussions
- Research study design
- Preliminary results collection
- Grant submission

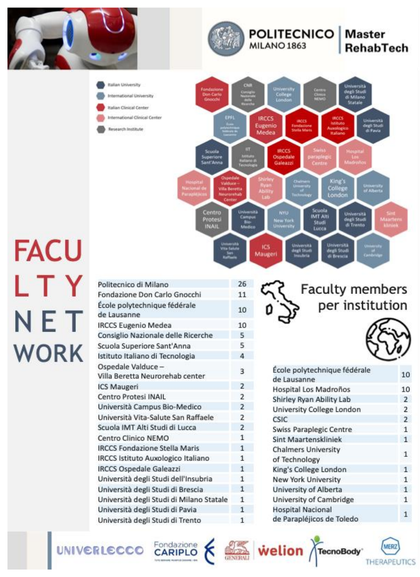
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This work was supported also by INAIL (Istituto Nazionale Assicurazione contro gli Infortuni sul Lavoro), within FeatherEXO project (PR23-RR-P1) and MUSA – Multilayered Urban Sustainability Action – project, funded by the European Union – NextGenerationEU, under the National Recovery and Resilience Plan (NRRP) Mission 4 Component 2 Investment Line 1.5: Strenghtening of research structures and creation of R&D "innovation ecosystems", set up of "territorial leaders in R&D"