

復康袖 - 智感肌電混合上肢復康訓練系統 Rehabilitation Sleeve - An FES-Robot Hybrid System

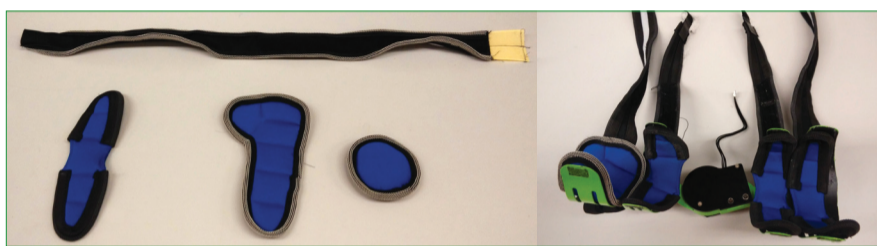
由自主意識控制的穿戴式智感肌電混合上肢復康訓練系統

A functional electrical stimulation (FES)-robot hybrid system for upper limb rehabilitation driven by voluntary intention

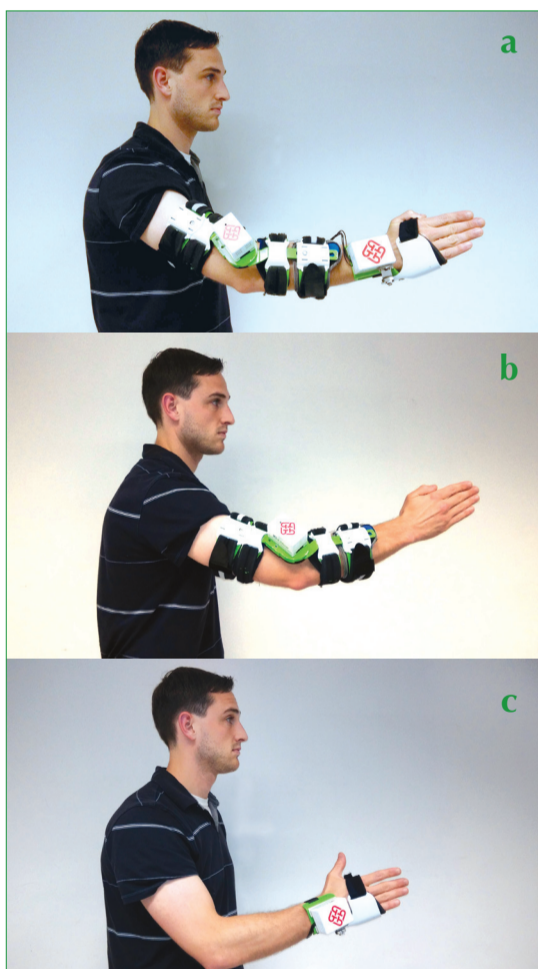
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傳統復康訓練是一個漫長而枯燥的過程。復康袖為中風人士提供一種有效而新穎的自主意識控制系統，能夠改善肌肉控制及協調能力。它集成了電刺激與機械自動化系統的優點，將兩種技術整合一體，適用於上肢多關節的訓練方面。系統採用可調節壓力和濕度的綁帶系統，能提高穿戴舒適度，適用於長時間的康復練習治療。

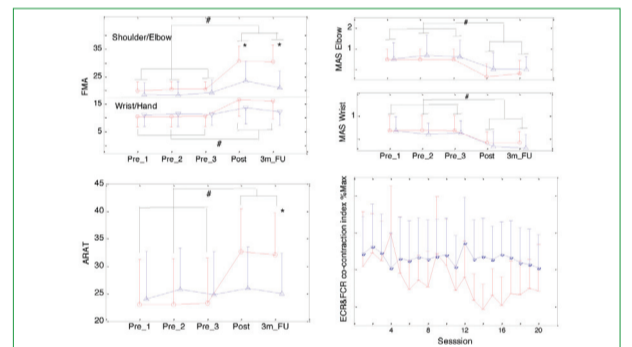
復康袖更可將使用者的動作轉換為電腦滑鼠指令，配合不同的電腦應用程式操作，可令復康訓練更多元化，並能增加訓練的樂趣，提升訓練的效果。



復康袖的綁帶系統
The bracing system



互動訓練模式：圖中的病人正在透過屈伸腕指代替發出滑鼠指令來玩電腦遊戲。病人也可把瀏覽互聯網及操作其他電腦程式納入復康訓練中。The interactive training programme: The subject is playing a computer game by extending and flexing his wrist/hand, where such movements are interpreted as mouse inputs. Subjects also surf the web and perform other computer operations as part of the training.



在中風後腕關節復康訓練中，復康袖（即電刺激機械自動化整合系統）比單純機械系統無電刺激的訓練方式更有效，主要表現為更快的康復進程。紅線和藍線分別代表復康袖及純機械系統取得的康復進程。Training effectiveness of the FES-robot on the upper limb, in comparison with training assisted by robot only. Faster recovery can be observed in FES-robot assisted training (The FES-robot training is indicated by the red lines, and the robot-only training is indicated by the blue lines).

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Special Features and Advantages

- **Faster recovery:** FES-robot hybrid training system assists the elbow and wrist joints to move using motors. Meanwhile, it also enhances neuroplasticity recovery by inducing additional muscular practice at the elbow, wrist and hand/fingers through electrical stimulation.
- **Voluntary EMG-driven:** The system driven by EMG signals of user effectively improves coordination of muscle movement
- **Comfortable:** The bracing system manages the pressure and moisture levels of the skin to minimize any uncomfortable feelings caused.
- **Interesting training programme:** The training system can act as a computer input device, enabling the combination of training tasks with computer games and applications.

Applications

- The device provides a novel training method for paralyzed persons to improve their upper limb functions
- The device can be used in hospitals, clinics, health centres and at home

Awards

- Gold Medal - 43rd International Exhibition of Inventions of Geneva, Switzerland (April 2015)
- Special Merit Award from Institute of Health and Beauty by Doctor Mukhina® (April 2015)

An electromyography (EMG)-driven electromechanical robot system integrated with neuromuscular electrical stimulation (NMES) was developed for multi-joint upper limb rehabilitation after stroke. This hybrid system successfully combines the advantages of EMG-driven robot and NMES and can achieve much more prominent recovery than using either technology alone in pilot clinical trials. The training device is equipped with a novel bracing system with moisture and pressure management function to improve the wearing comfort, especially for long-term usage. The device can also render user's motions into mouse commands. When coupled with various computer applications, it diversifies rehabilitation training programmes, making patients more interested in the process and thus yielding better results.

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