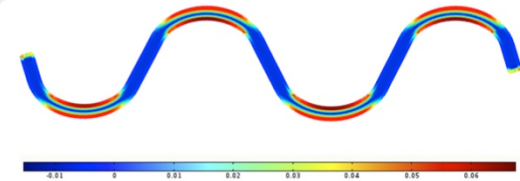
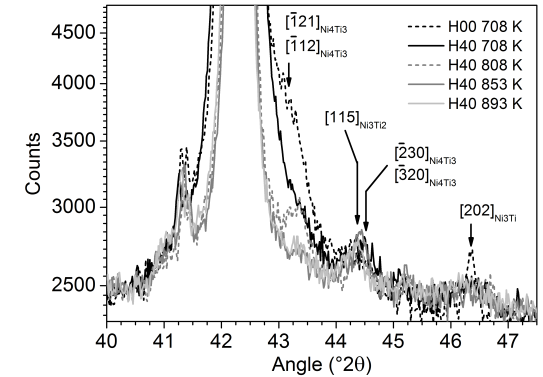
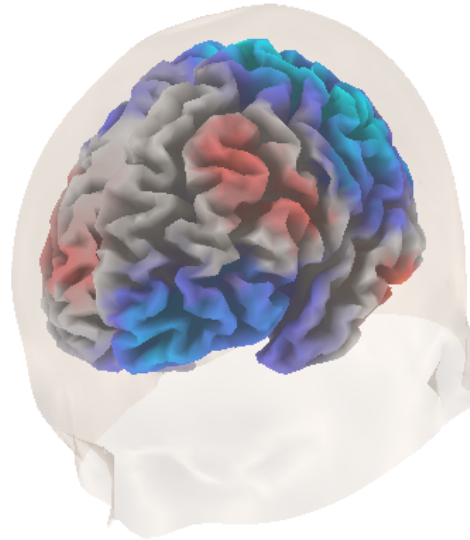


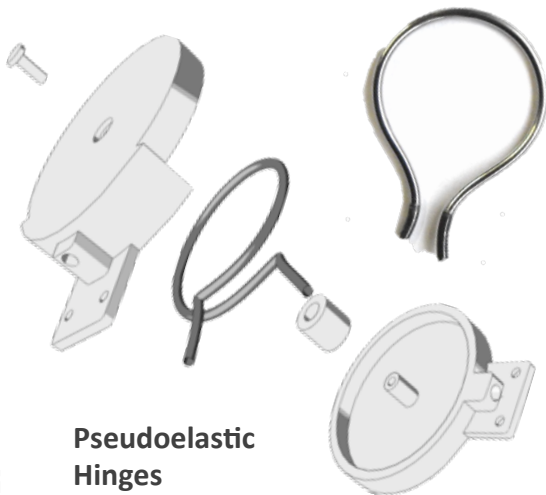
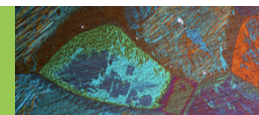
APPLICAZIONI DI MATERIALI FUNZIONALI IN TECNOLOGIE E METODI PER LA NEURORIABILITAZIONE E LE NEUROSCIENZE

Simone PITTACCIO

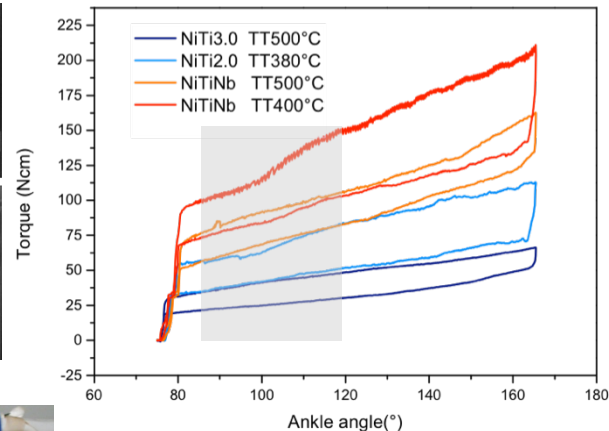
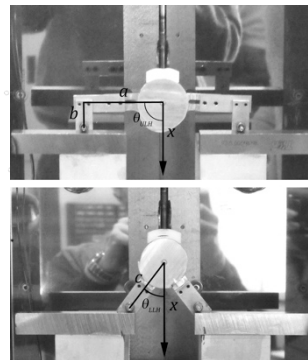
Francesca PASSARETTI
Lorenzo GARAVAGLIA
Fabio LAZZARI

s.s. Lecco





Pseudoelastic Hinges
International patent
WO/2011/137999

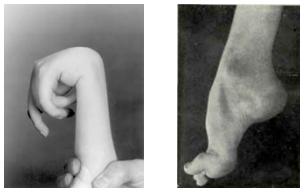


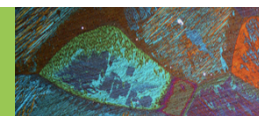
VANTAGGI DELLA NONLINEARITÀ MECCANICA:

- > Forza quasi-costante
- > Forza limitata
- > Possibilità di movimento preservata
- > Riduzione graduale della contrattura
- > Tollerabilità

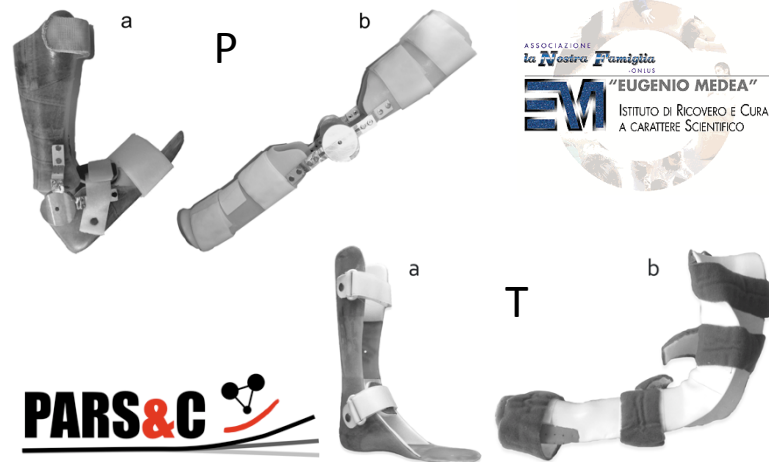
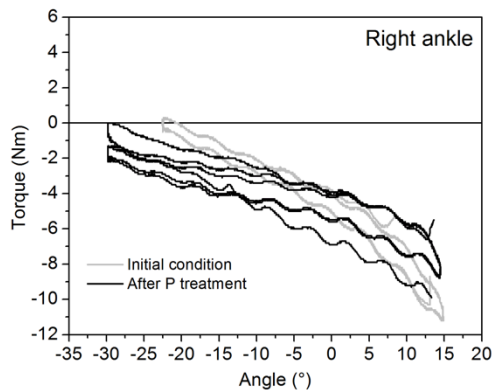
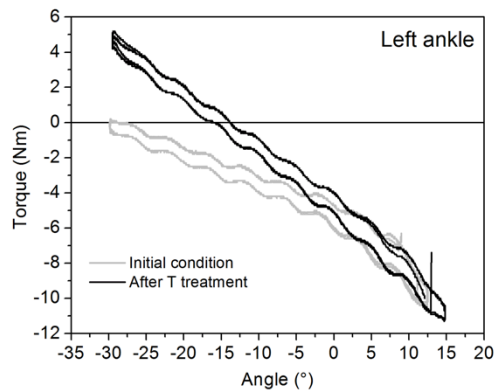
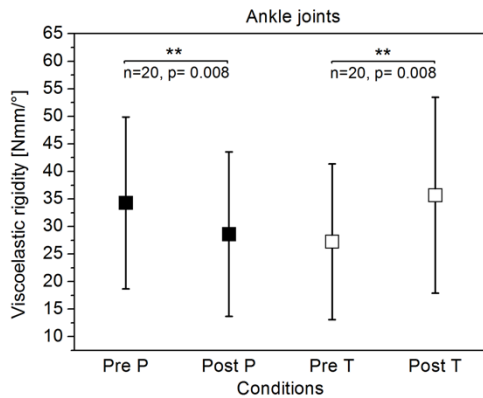
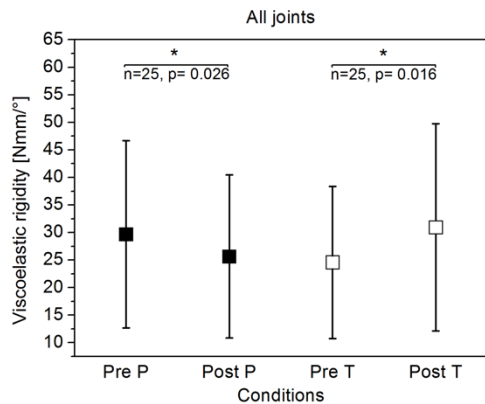
ICTUS, TRAUMI CRANICI, DANNI PERINATALI

- > Paresi
- > Rigidità articolare
- > Deformità degli arti
- > Disabilità





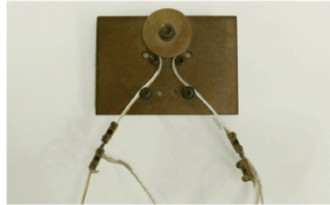
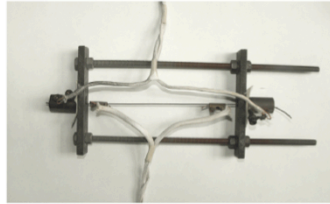
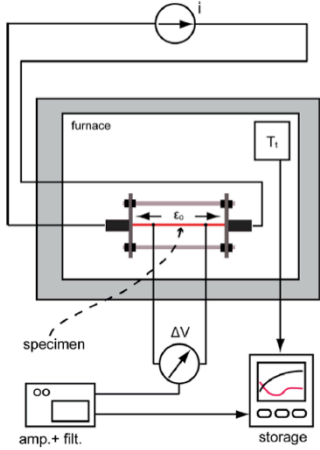
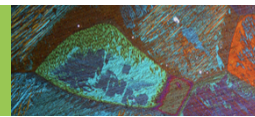
STUDIO CEREBROLESIONI ACQUISITE – BAMBINI n=25



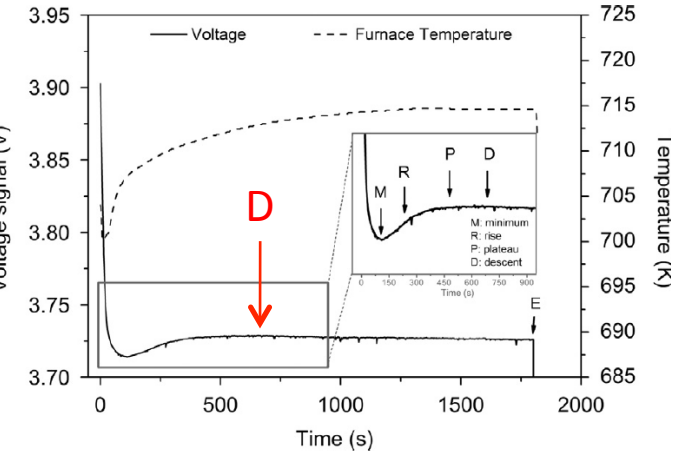
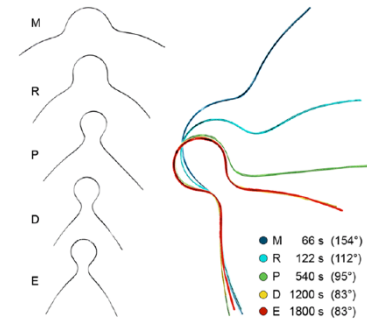
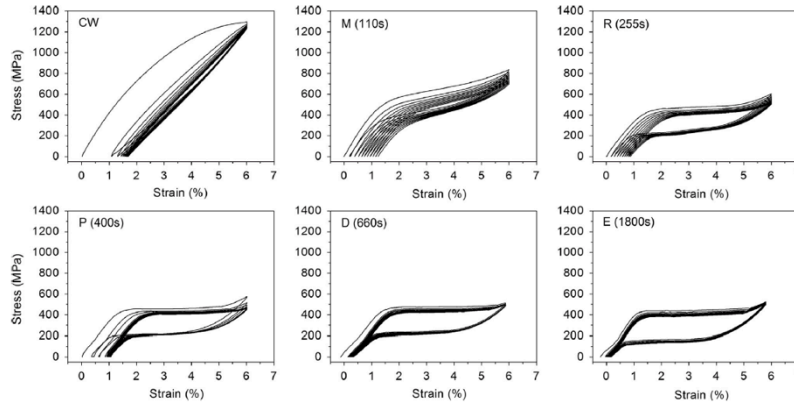
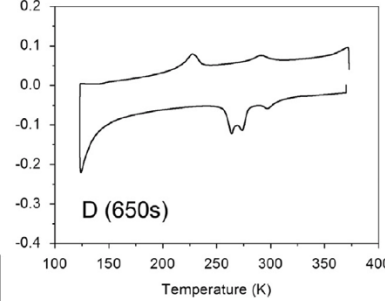
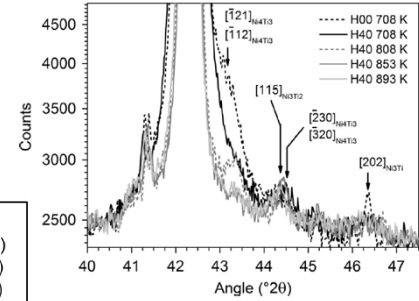
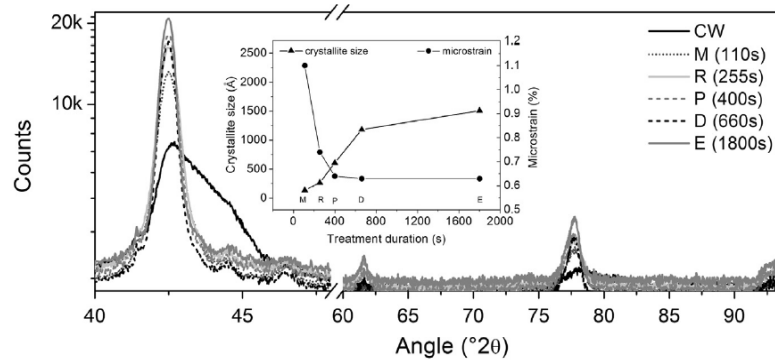
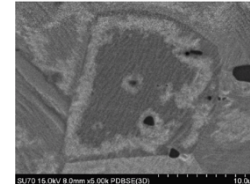
Pittaccio et al. (2013)
 Annals of Biomedical Engineering

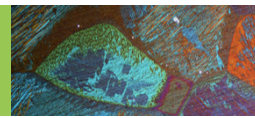
VANTAGGI DELLA PSEUDOELASTICITÀ RISPETTO A TUTORI TRADIZIONALI:

- > Stesso controllo dell'angolo articolare
- > Migliore comfort
- > Riduzione della rigidità

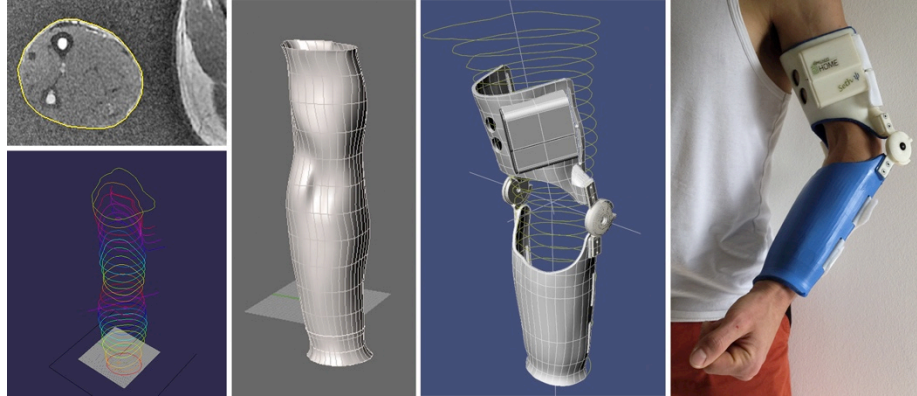


Pittaccio & Garavaglia (2014)
 Material Science and Engineering A





MODELLAZIONE CAD DA BIOIMMAGINI E STAMPA 3D

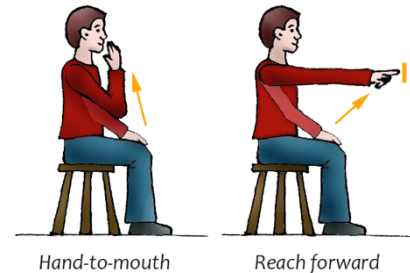
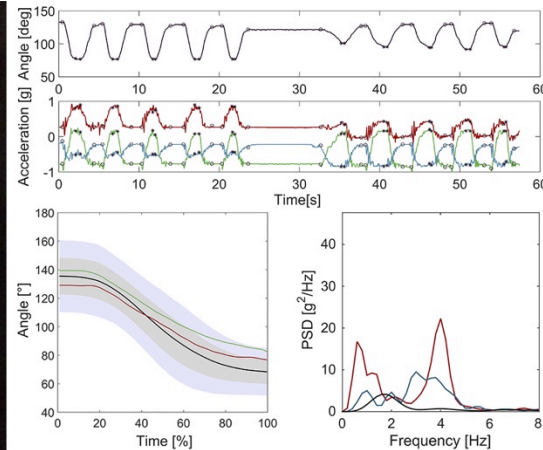
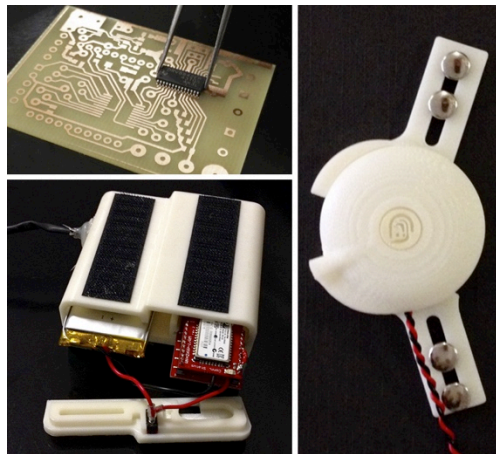


Pittaccio, Garavaglia, Ceriotti, Passaretti (2015) J Funct. Biomaterials
 Pittaccio, Garavaglia, Lazzari, Passaretti (2015) IEEE-EMBC Proceedings;
 Pittaccio, Garavaglia, Lazzari, Passaretti (2015) IFAC-online

SENSORIZZAZIONE
 DEGLI SNODI:
 CARATTERIZZAZIONE
 FUNZIONALE SUL CAMPO
 (Fabio Lazzari)

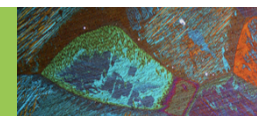


RIPRENDO
 @HOME

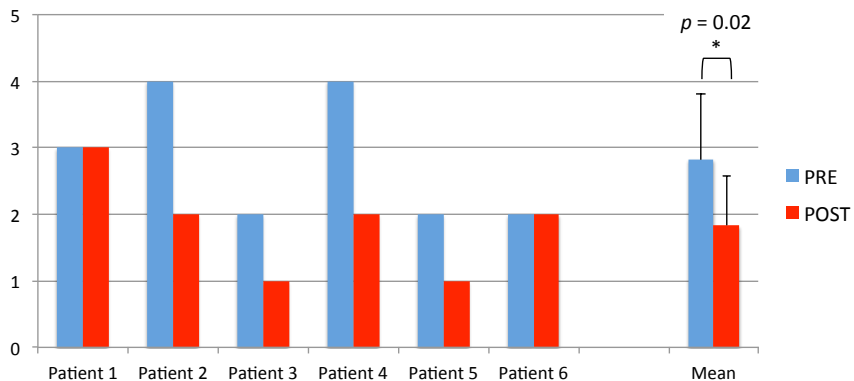


VANTAGGI DELLA
 SENSORIZZAZIONE

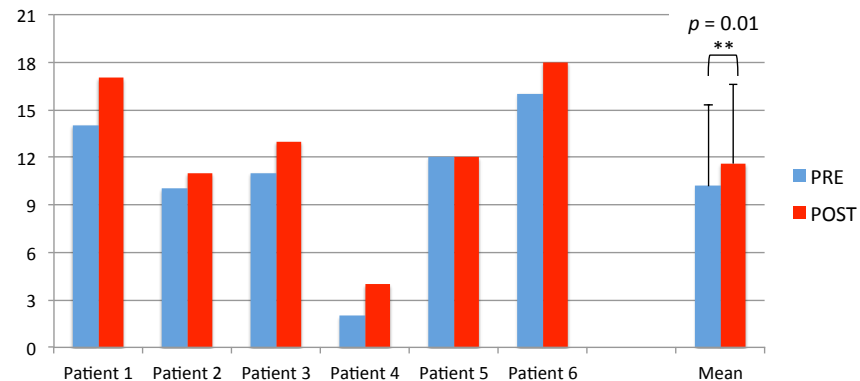
> Monitoraggio
 interazione
 uomo-dispositivo
 dinamico



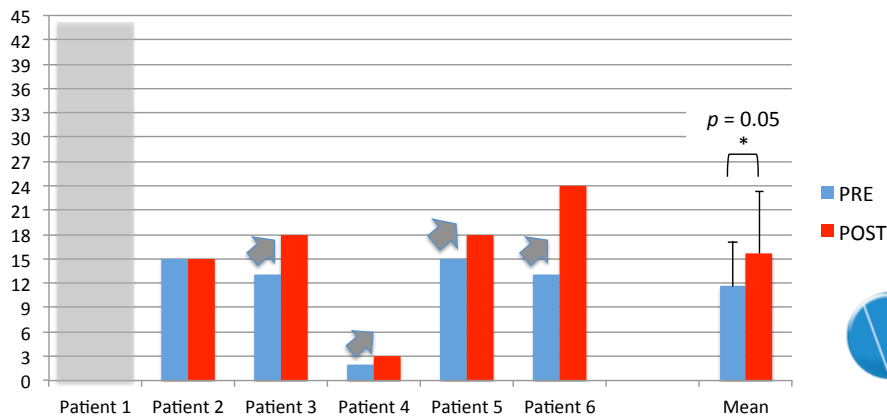
Ashworth Score (Elbow)



Fugl-Meyer (Motor function - Upper Limb)



WMFT

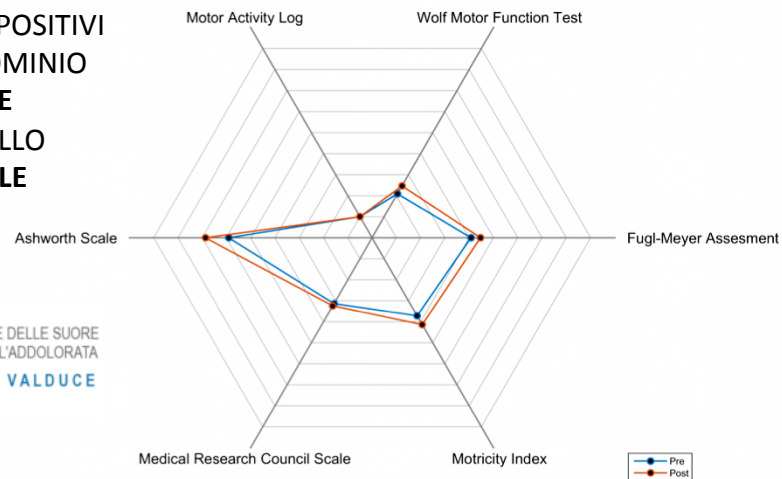


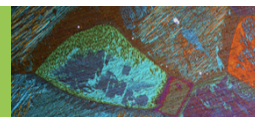
**RISULTATI POSITIVI
SIA NEL DOMINIO
POSTURALE
SIA IN QUELLO
FUNZIONALE**



CONGREGAZIONE DELLE SUORE
INFERMIERE DELL'ADDOLORATA
OSPEDALE VALDUCE

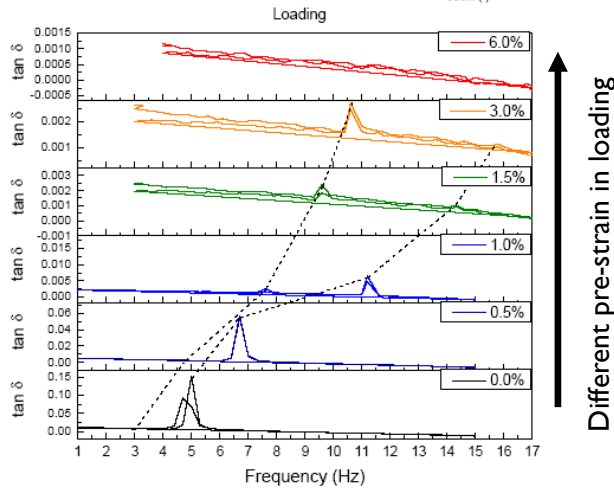
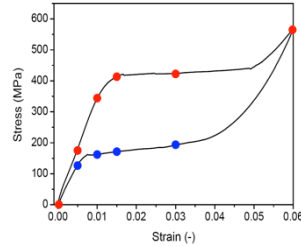
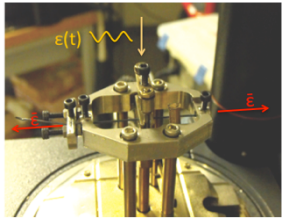
Results, Mean values





Ph.D. DI LORENZO GARAVAGLIA (Advisors: A. Aliverti Polimi, S. Pittaccio CNR-IENI)

RISPOSTA IN FREQUENZA DI NITI PSEUDOELASTICO A DIFFERENTI PRE-STRAIN SET-UP AD HOC

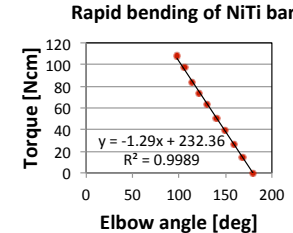
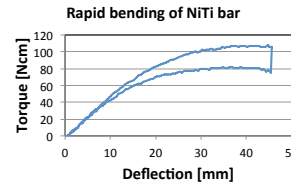
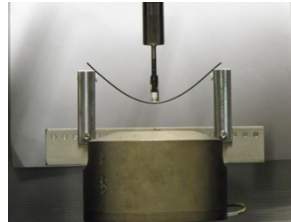


CREAZIONE DI TUTORI PERSONALIZZATI DA ANALISI MORFOLOGICA IN MOVIMENTO: PROTOCOLLO INNOVATIVO PER DISCINESIE

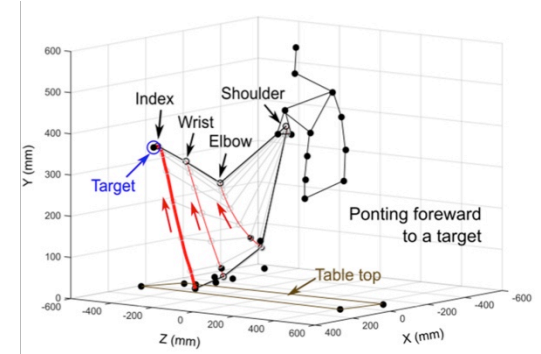
Acquisizione dinamica della anatomia superficiale dell'arto



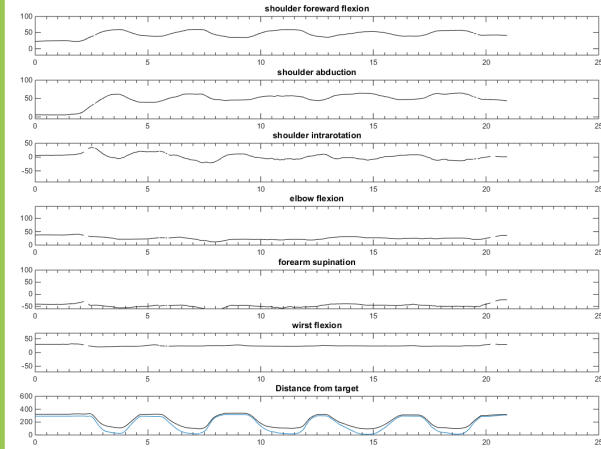
ottobock.

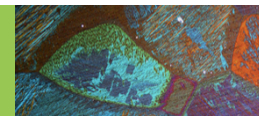


MODELLO CINEMATICO ARTO SUPERIORE



RISULTATI ANALISI DEL MOVIMENTO

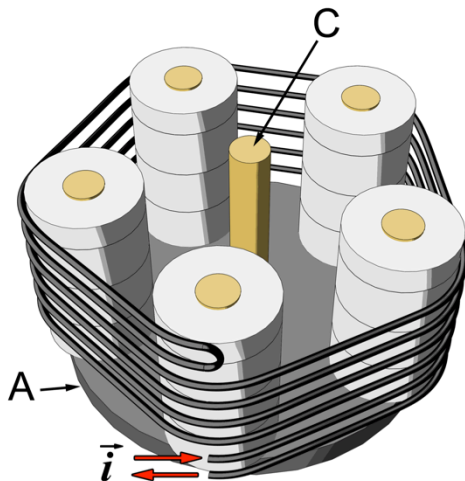




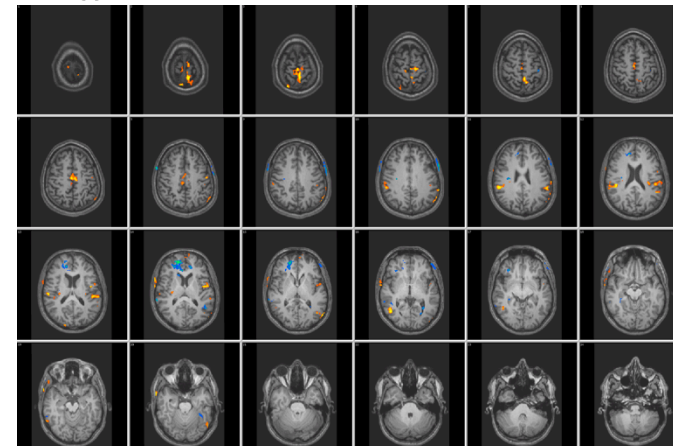
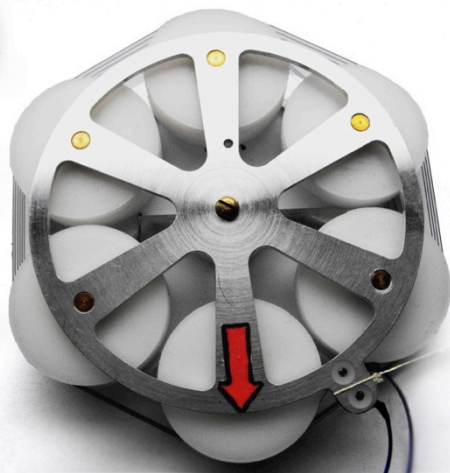
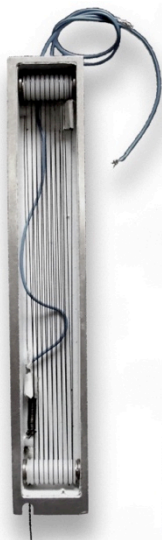
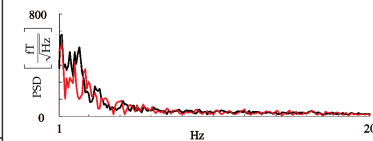
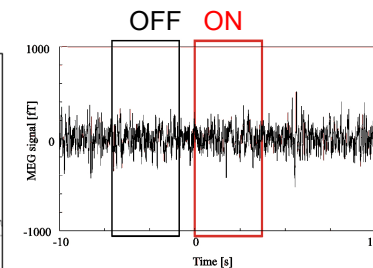
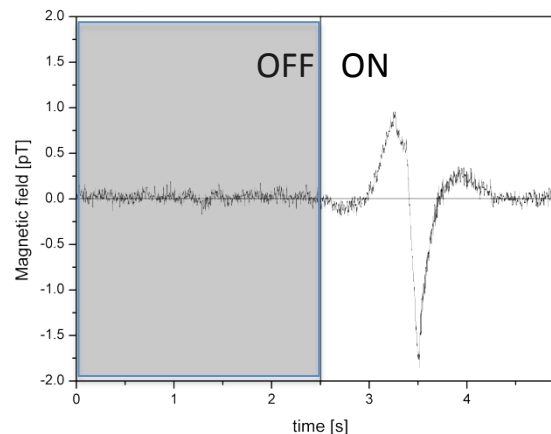
VANTAGGI DELLA
ATTUAZIONE SMA

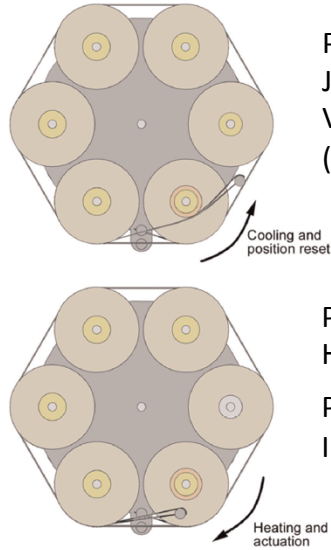
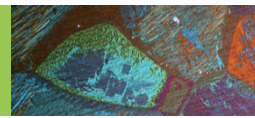
> Compatibili con
MEG e MRI

SMA rotary actuator
International patent
WO/2011/141183



MAGNETIC FIELD $\approx 1\text{pT}$ @ 1.5m



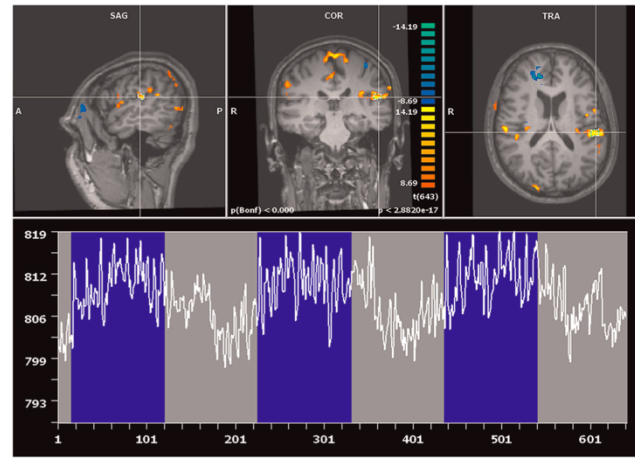
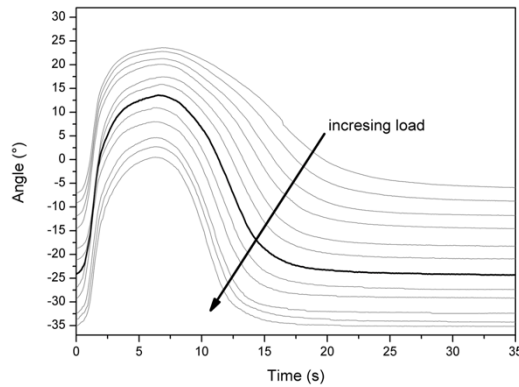
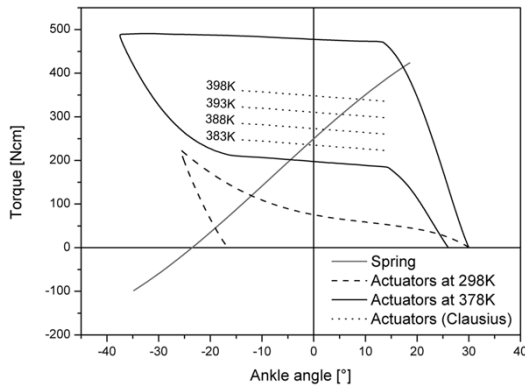
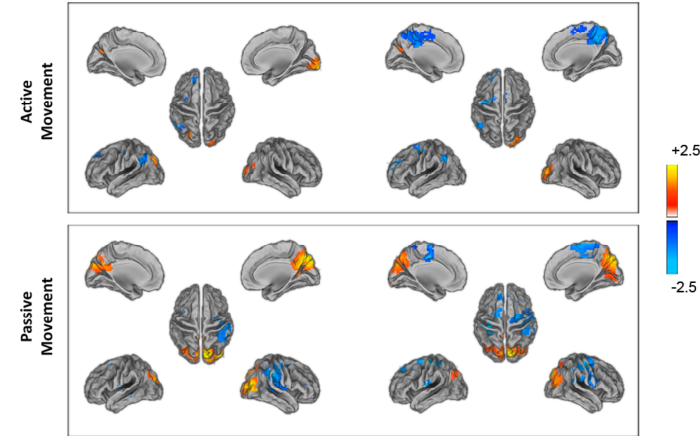


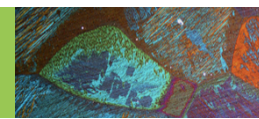
Pittaccio et al. (2011)
 JMEPEG
 Viscuso & Pittaccio.
 (2012) JIMSS

Pittaccio et al. (2011)
 Human Brain Mapping
 Pittaccio et al. (2013)
 IEEE-EMBC Proc.

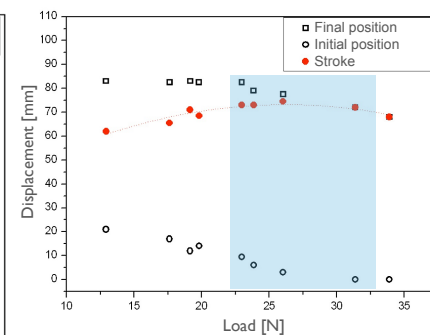
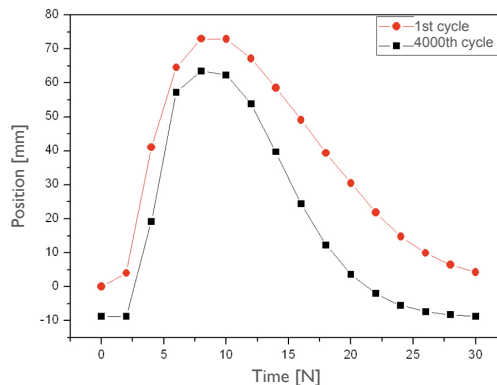
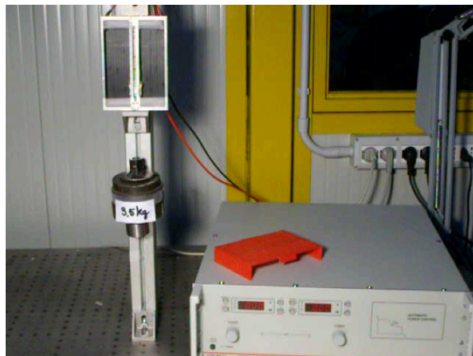
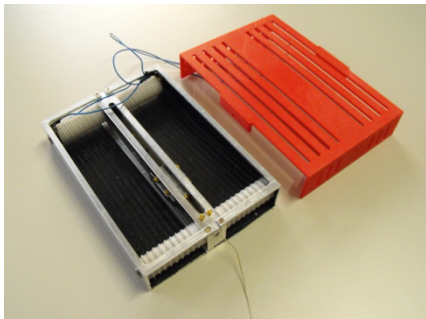
ALPHA BAND

BETA BAND

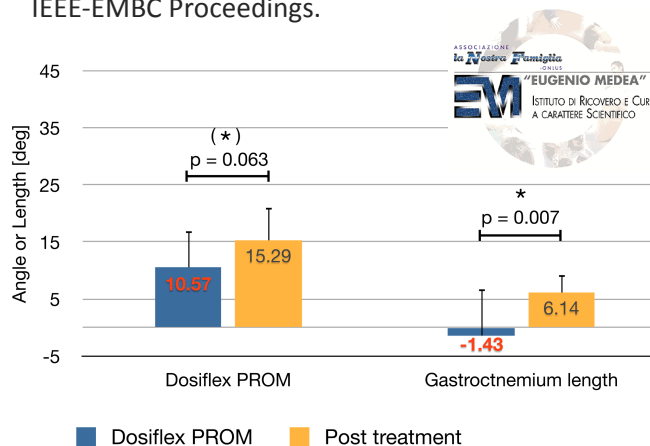




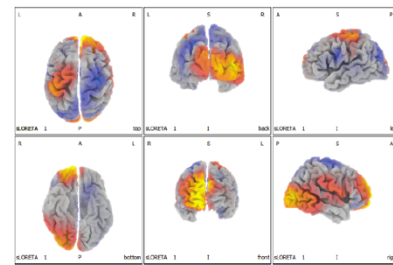
ATTUATORE SMA



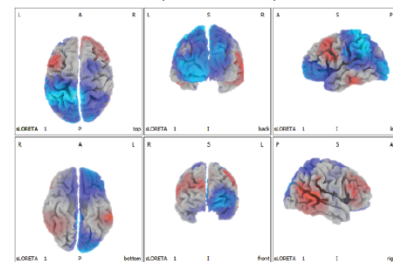
Pittaccio, et al, (2013) IEEE-EMBC Proceedings;
 Pittaccio, Garavaglia, Lazzari, Passaretti (2015) IEEE-EMBC Proceedings.

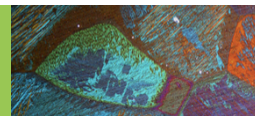


Pre-treatment EEG | Passive motion | ERD/ERS α band

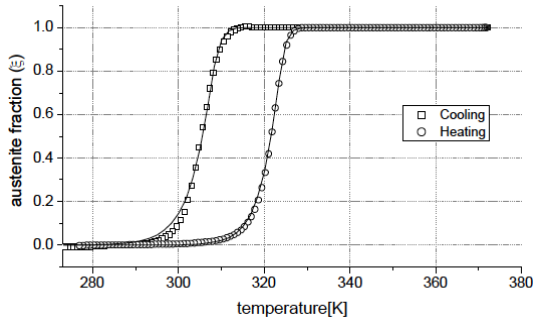


Post-treatment EEG | Passive motion | ERD/ERS α band





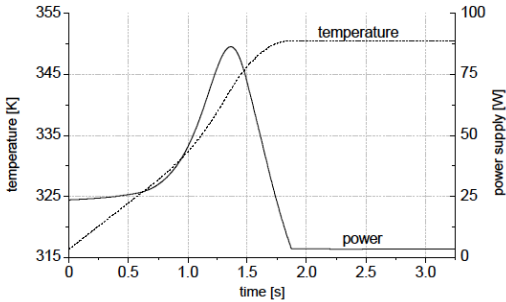
MODELLAZIONE DEL MATERIALE



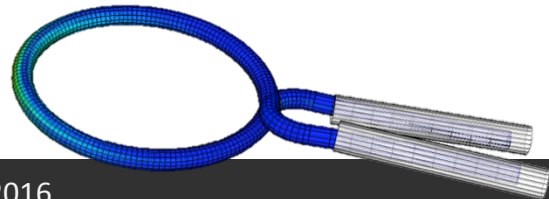
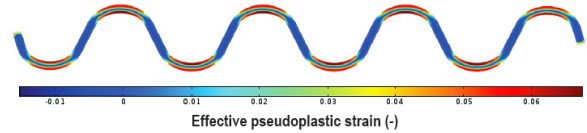
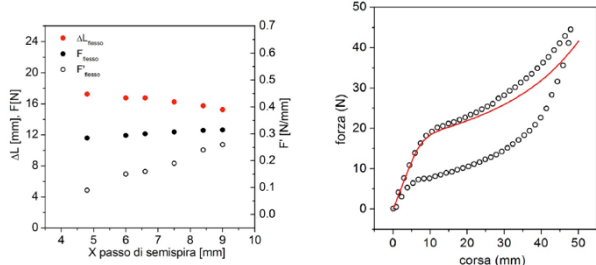
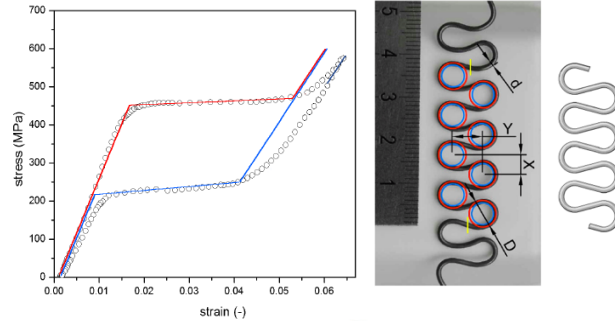
$$T(\xi) = c + d \cdot \text{arcTh}\left(\frac{\xi^4 - a}{b}\right) + \tilde{\sigma}(t) \cdot \frac{\partial \Theta}{\partial \sigma}$$

$$I^2(t) \cdot R(\xi(t)) = c_p \delta V \frac{dT}{dt} + \delta V \Delta H_h \left| \frac{d\xi}{dt} \right| +$$

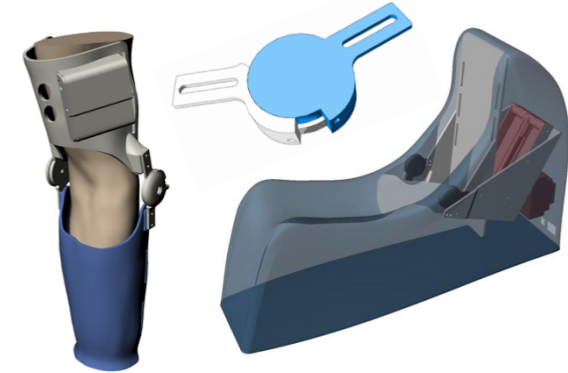
$$+ h_{tot} S(T(t) - T_\infty) + \frac{d}{dt} [F_e(t) \cdot \Delta l_e(t)]$$



MODELLAZIONE DI COMPONENTI



PROTOTIPAZIONE VIRTUALE DI DISPOSITIVI E CINEMATISMI



MODELLAZIONE DI SISTEMI NEURO-MUSCOLO-SCHELETRICI

