

# Impaired grip strength is related to altered modulation of intermuscular coupling in post-stroke subjects: a pilot study

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## Introduction



Stroke

### → Modification of cortical activity

(Pichiorri et al., 2018 ; Ray et al., 2017 ;  
Rossiter et al., 2014)

### → Impairment of voluntary motor function

Force production capacity  
(Andrew & Bohannon, 2000)

Intermuscular coordination / coupling disorder ?

## Methods

### • Participants

- 4 **chronic stroke** patients
- 10 **healthy subjects** (Charissou et al., 2017)

### • Electromyography:

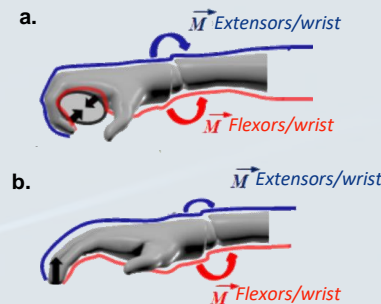
- Extensor carpi radialis
- Flexor carpi radialis

### • Net fingers force

### • Intermuscular coherence (IMC):

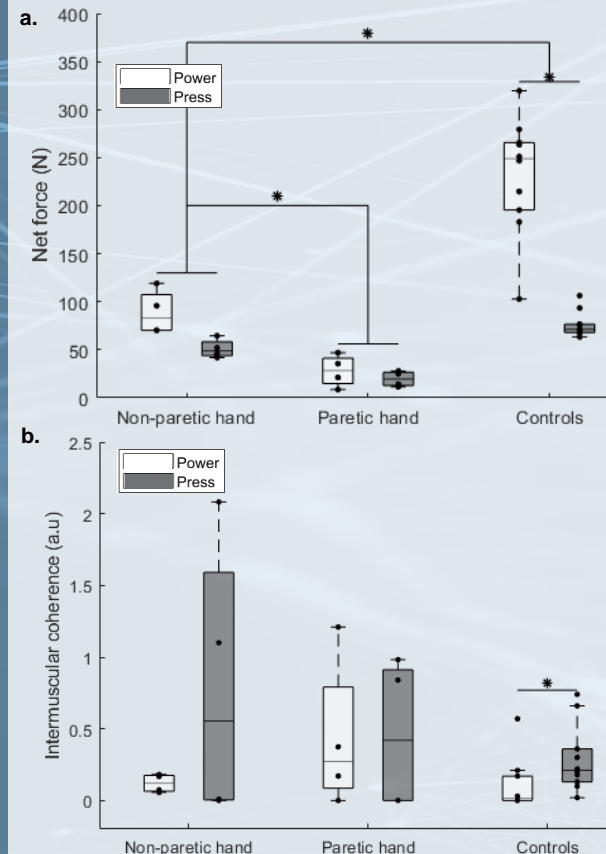
- Time-Frequency analysis
- Beta frequency-band [13-35 Hz]

**Task: maximal fingers flexion in two kinematic configurations: Power and Press** (Charissou et al., 2017)



**Fig 1:** Isometric flexion task of the fingers. With **a.** gripping (Power) and **b.** pressing the fingers on a flat surface (Press).  $M_{Extensors/wrist}$  et  $M_{Flexors/wrist}$  are the moments of force produced around the wrist joint.

## Results



**Fig 2:** **a.** Net force production and **b.** intermuscular coherence **b.** in power (white) and press (gray) configuration for the non-paretic and paretic hand of stroke patients and for dominant hand of control subjects.

## Discussion



Stroke

**Lower net fingers force** in stroke patients

+  
Absence of **modulation of IMC** and **net force**  
according to kinematic configurations

↓  
Disruption of **common neural inputs** to agonist  
and antagonistic muscles (De Luca & Erim, 2002)

↓  
Impaired **muscle selectivity** in stroke patients  
(Dewald et al., 1995)

↓  
Contribution to **impaired grip strength**



Alteration of **motor control** of upper  
limb function in **both hemi-bodies**  
(Arya, 2014)



## Stroke Conclusion

→ Loss of ability to modulate **intermuscular coordination + net force production** → Contribution to **impaired motor function** → **Therapies** should promote **modifications** of IMC

**Perspectives:** Concomitant study of **intermuscular** and **corticomuscular** interactions to better characterizing the central motor control mechanisms altered by stroke.