

## **The hidden rhythm of interpersonal (sub-)movement coordination**

### **ABSTRACT:**

#### **Background**

Behind its smooth macroscopic appearance is a richer microscopic structure of movement, consisting of small ‘pulses’ engraved in the motor output every 300-500ms (2-3 Hz) – i.e., submovements. First observed in the 19th century, submovements are believed to reflect visual-based (micro)corrections resulting from intermittency in the updating of motor commands.

#### **Aims**

People’s movements may appear to be properly sequenced or synchronized with each other. However, it is unclear how perceptual and motor processes are actually interlocked among individuals. Recently, we have shown that coordination also occurs at the microscopic level, as submovements generated by partners are tightly alternated over time. This project aims to explore the neural dynamics subtending individual-level control as well as dyadic-level coordination of submovements.

#### **Method**

We recorded kinematic and dual-EEG data while participants ( $n = 40$ ) moved their right index finger either alone (solo condition) by seeing (vision) and not seeing (no vision) their hand, or together with a partner (dyadic condition) towards the same (in-phase) or opposite (anti-phase) directions.

#### **Results**

Delta-band (1-4 Hz) EEG activities on left parietal electrodes (contralateral to the effector) are phase coupled with submovements generation. Such cortico-kinematic coupling is modulated by the availability of visual feedback and by the dyadic coordination mode, being stronger in the presence of feedback and during in-phase than anti-phase coordination.

#### **Conclusions**

These results suggest that the neural machinery controlling submovements generation may be pivotal in achieving effective interpersonal coordination by synchronizing processing within the visuo-motor loop.

#### **Keywords**

Neurobehavioral coordination, Hyperscanning, Submovements, Intermittent motor control, Sensorimotor loops

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### **Published Work:**

Laroche, J., Tomassini, A., Volpe, G., Camurri, A., Fadiga, L., & D'Ausilio, A. (2022). Interpersonal sensorimotor communication shapes intrapersonal coordination in a musical ensemble. *Frontiers in Human Neuroscience*, 16: 899676. doi: 10.3389/fnhum.2022.899676

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