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KINEMATIC AND NEUROPHYSIOLOGICAL MEASURES OF MOTOR REPRESENTATIONS IN JOINT ACTIONS

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Background: When people act together, how can their actions be coordinated around a collective goal? An answer to this question may be easily extracted from accounts of 'shared' or 'collective' intentionality. Alternatively, when people act together with a purpose, the collective goals of their actions may be sometimes represented motorically.

Aims: The main aim of the project is to explore the motor representation of collective goals at behavioural and neurophysiological level. Our conjecture is that motor representations may enable joint action and provide interpersonal coordination around goals.

Method: Paradigm 1 - Behavioral: We tested the modulation of grip aperture in a reach to grasp task performed jointly or in parallel but merely individually. Moreover, as a control we have collected the same measure in a bimanual version of the same task. Overall, 54 participants took part in the study.

Paradigm 2 - Neurophysiological: In a registered report, we measured the excitability of motor cortex through transcranial magnetic stimulation (TMS) when actions are performed jointly, in parallel and in competition. Couples of participants were seated side by side and are asked to sequentially move a ball displayed on a screen in front of them by pushing or lifting their hand on a pressure sensor.

We expect that participants represent the collective goal of the task at the level of primary motor cortex in the joint-cooperative condition, as if they covertly performed the task of the confederate. This cooperative-effect should be decreased or completely abolished in the other two conditions.

Preliminary results: Data of the first paradigm confirm our findings from a previous behavioral study that joint actions are based on the motor representation of a collective goal. The main finding is that when acting jointly, participants showed a coupling effect in their maximum grip aperture similar to that they exhibited when acting bimanually.

In the second paradigm, planned analyses showed no neurophysiological evidence for shared motor representation when acting jointly. Explorative analyses suggest possible optimization of the experimental design for future experiments. Our investigation took benefit of the Registered Report format to improve quality and methodological rigor. Overall, results showed behavioral evidence but not neurophysiological evidence of motor representation of collective goals and give indications to further exploration in future studies.

Keywords: Joint actions, Kinematics, Transcranial magnetic stimulation, Motor System

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