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The impact of 'motor distance' on action understanding: how motor similarities guide our comprehension of others

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Research on movement kinematics has demonstrated that observers can understand actions' outcome only by looking at the reach-to-grasp phase of a movement directed to an object. However, it remains unclear the extent to which the kinematic similarity between the observer and the agent affects the ability of reading the action and how such similarity reflects on neural signals. We combined motion capture technologies with video recording to acquire a dataset of reach-to-grasp actions, directed to objects with different weights (light/heavy), executed by 90 different participants. We used the Procrustes transformation to compute the motor distance between movements and agents. In two subsequent behavioral and electrophysiological (EEG) action-observation tasks, we presented observers, who had previously performed the action execution task, with 240 videoclips, and manipulated the motor distance between their movement kinematics and those presented in the videos. Observers were asked to carefully watch the reach-to-grasp phase of the action and to classify the target objects' weight. The ANOVA confirmed that observers were more accurate ($F(1,19) = 4.976$; $p < 0.05$) and faster ($F(1,19) = 22.883$; $p < 0.001$) in understanding actions characterized by a smaller motor distance (i.e., with a more similar movement kinematics) from them. This result is suggesting that the ability to comprehend the outcome of observed actions depends on motor similarities between observers and agents. We will also present results from the EEG analysis, which has been carried out with the purpose of investigating the relationship between motor distance and desynchronizations in the beta band.

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