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Representational Momentum reveals the joint contribution of context and kinematics to action representation

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Recent studies have shown that observed kinematic information drives action understanding, even in the presence of misleading contextual priors. Moreover, at the perceptual level, prior beliefs about observed actions'goal has a top-down influence on perception, biasing it in the direction of predicted future course. This results in a perceptual shift known as Representational Momentum (RM). In this study, we investigated how contextual priors and movement kinematics jointly shape both action understanding and perceptual shifts. We presented 16 participants with videos of hands reaching for objects of different weights (heavy/light), which suddenly stopped halfway. We manipulated both the participants' prior expectations about the objects' weight (correct/incorrect) and the amount of kinematic information in the presented movements (high/low). Participants performed a sequential dual task: (I) a Representational Momentum task, in which they had to click on the last point reached by the hand before it disappeared; (II) an Action Observation task, in which they had to classify the object's weight. ANOVA on the RM effect revealed a significant interaction between prior and kinematic informativity ($F(1,15)=17.452$; $p<0.001$), with a greater positive perceptual shift observed when prior was correct and kinematic informativity was high. ANOVA on action understanding sensitivity (d') revealed main effects for both prior ($F(1,15)=17.641$; $p<0.001$) and kinematic informativity ($F(1,15)=5.229$; $p=0.037$), with higher values for correct priors and highly informative movements. These findings demonstrate that both top-down (priors) and bottom-up (kinematics) information influence action understanding and, interestingly, that they contribute to a forward bias in the perceptual representation of observed actions.

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