

Visual illusion affects object size estimates for prospective action judgements

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INTRODUCTION. How does the eye guide the hand in an ever-changing world? Actions such as grasping imply to calibrate the amplitude of the reaching movement precisely and shape the handgrip adequately to object size. To account for these demands, the two visual system model assumes that visually-guided actions rely on processes that compute the absolute metrics of an object, independently of the visual context. Accordingly, actions should be immune to visual illusions arising from a size contrast between a target object and contextual elements. Until now, experimental studies have failed to provide a definitive answer to this question. One problem lies in the proprioceptive and visual feedback of the acting hand, which can be exploited to correct the illusory effect during movement. To overcome this issue, we investigated the effect of a visual illusion in which the relative size of a circle varies according to the size of surrounding circles (i.e., The Ebbinghaus illusion) on prospective action judgements. This task has the advantage to involve the covert activation of motor programs without requiring movement execution.

HYPOTHESIS. If the motor system does not take into account the visual context, prospective judgements about one's ability to grasp objects should not be influenced by the illusion. In contrast, a concurrent motor task involving the hand was expected to bias prospective action judgements because the current state of the motor system influences the ability to imagine oneself grasping an object.

METHODS. In Experiment 1, participants had to decide whether they felt able to grasp the central circle of an Ebbinghaus figure between their index finger and thumb, without moving their hands. As a control, we asked other participants to make non-motor perceptual judgements that require deciding whether the central circle was smaller or larger than another circle. In Experiment 2, participants had, moreover, to squeeze a ball between finger and thumb while making the judgements.

RESULTS. The results provided strong evidence that the illusion affects perception and action similarly. Moreover, the effect of the visual illusion on prospective action judgements was modulated by the concurrent motor task, which suggests that visual information from the context and motor information from the body are integrated when judging whether an object is graspable or not.

TAKE HOME MESSAGE. The motor system exploits the visual context when computing object size, indicating that perception and action are not entirely dissociated but rather interact.