

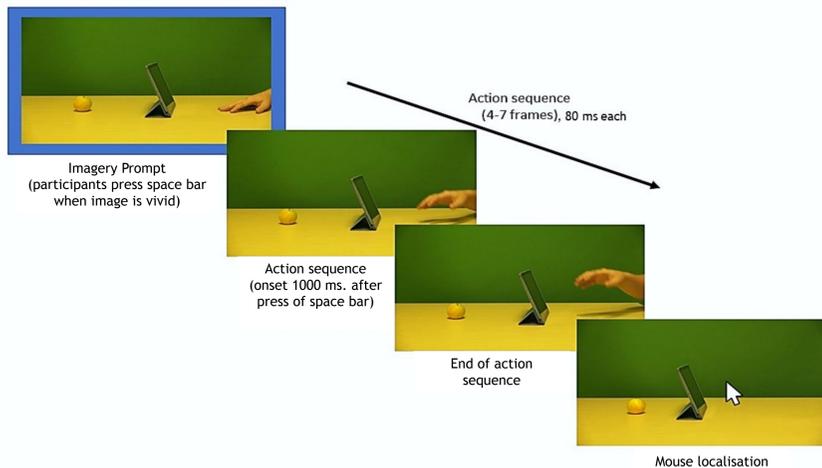
Imagery as predicted perception: imagery predictively biases observed action kinematics

Eleonora Parrotta, Patric Bach, Katrina L. McDonough

University of Aberdeen, patric.bach@abdn.ac.uk, actionprediction.org

Recent approaches (Moulton & Kosslyn, 2009; Dijkstra et al., 2019) conceptualize mental imagery as a simulatory mode of perception, which relies on the voluntary engagement of the same top-down prediction processes that shape our perceptual experience. We tested this proposal in two preregistered online experiments. Using an established paradigm, we tested whether prior imagery suffices to induce similar biases as those that govern the observation of goal-directed action, subtly distorting towards the behaviour expected of an intentional agent.

Task and design



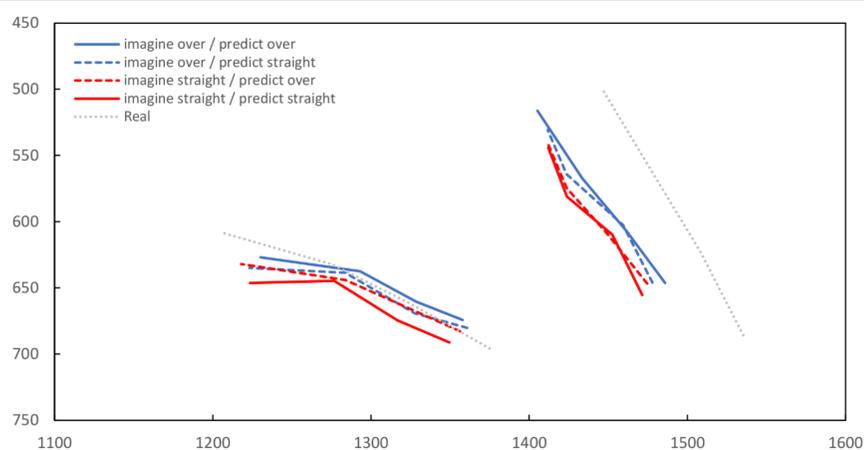
Participants watched short clips of reaches for a goal object, with either a low straight trajectory or a high arched trajectory, until the hand suddenly disappeared (96 trials pp).

We varied whether there was an obstacle in the path towards the goal (and an arched reach was expected) or whether the path was clear (suggesting a straight reach).

Participants report, using their mouse, the subjective location of the hand's disappearance point. In prior studies, these judgments were robustly biased towards the expected trajectories (Hudson et al., 2018; McDonough et al., 2019).

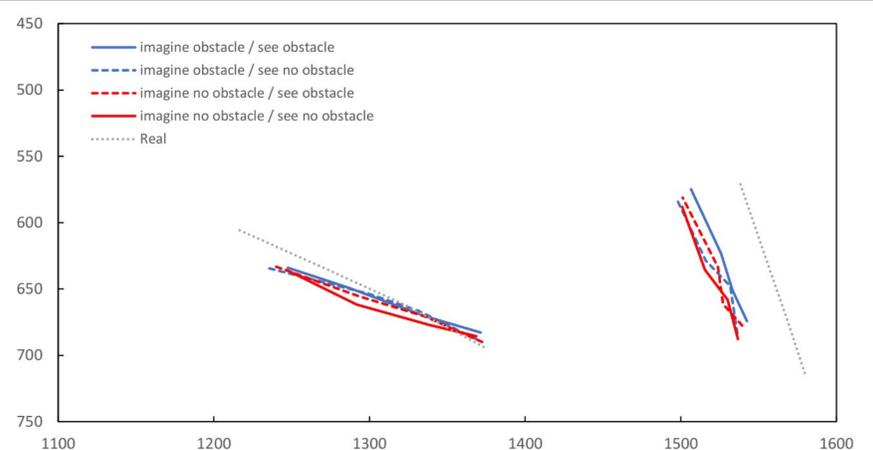
We tested whether imagery induced similar biases towards the *imagined* trajectory, by asking participants, before each action to imagine either a straight or arched reach (Experiment 1) or the presence of an obstacle or a clear path (Experiment 2), which would merely *predict* these two types of reach.

Reported locations - Experiment 1 (n=29)



- Judgments were biased towards the expected path: upwards in the presence of obstacles, downwards when the path is clear ($F=7.11$, $p=.009$)
- Judgments are also biased towards the imagined path: upwards for imagined reaches, downwards for imagined withdrawals ($F=7.11$, $p=.013$)
- Both contributions are independent.

Reported locations - Experiment 2 (n=35)



- Judgments are biased towards the expected path: upwards in the presence of obstacles, downwards when the path is clear ($F=12.4$, $p=.001$)
- Judgments are biased towards the path around the imagined obstacle: upwards for obstacles, downwards for clear paths ($F=14.9$, $p<.001$)
- Both contributions are independent.

Conclusions

Both experiments show that imagery induces similar perceptual expectations as other prediction processes that are known to bias perceptual judgments. The data therefore support the proposal that imagery reflects the voluntary control of predictive pathways that shape an event's perceptual representation. Importantly, the data also show that imagery can drive prediction processes, by inducing expectations about events likely to occur in the imagined (not observed) realities. Together, the results indicate shared pathways through which imagery and prediction can play a role in mental simulation and counterfactual reasoning.