

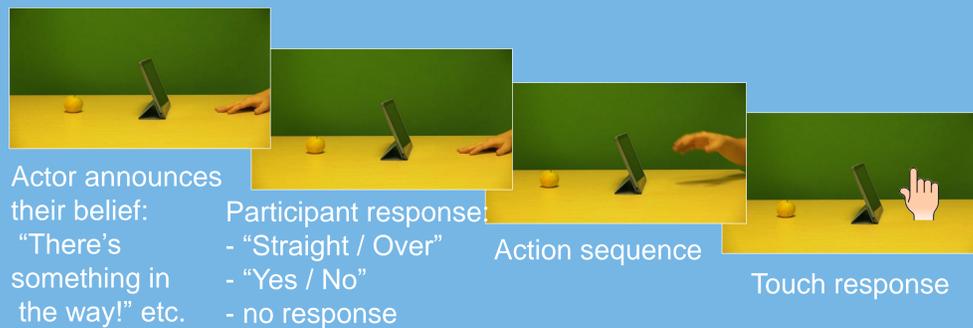
Seeing is Believing? Prior knowledge of others' beliefs biases perception of their actions.

Dr Katrina L. McDonough & Prof Patric Bach

Background

Recent accounts assume that social perception is an inferential process, based on a (Bayesian) integration of sensory input and prior expectations, see Figure 1, (Bach et al., 2014; Csibra, 2008; Kilner et al., 2007). We have developed a novel paradigm that measures the resulting perceptual bias towards expectations, which are derived from the assumption that intentional actors behave efficiently, heading straight towards goals but expend energy only to avoid obstacles (Hudson et al., 2018; McDonough et al., 2019). As a consequence, straight reaches appear higher when hands inefficiently approach an obstacle, and, similarly, arched reaches appear lower when the path was clear. Here, we test whether these biases emerge not only from the actual presence or absence of obstacles, but also from the actor's belief of whether an obstacle is present or not.

Method



Participants (n=80) viewed hands reaching for objects with either straight or arched trajectories and reported their perceived disappearance point on a touch screen. We varied whether:

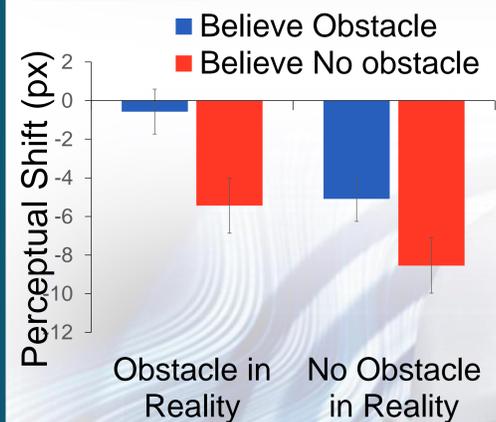
- (1) an obstacle was in the way or not, so that either a straight or arched reach was predicted
- (2) the observed actor believed an obstacle to be present, signalled through their statements (e.g., "The path is clear" or "Something's in the way!").

We also varied, between subjects, whether participants had to explicitly incorporate the actor's belief into their predictions, by asking them to report, before each action: a) whether the actor's belief signalled a straight or arched reach, b) whether the actor believed an obstacle to be present or not, or c) to make no response.

Conclusions

Here we provide evidence, for the first time, for a top-down influence of prior expectation on action observation, involving sophisticated higher-order processing of theory of mind ("mentalizing"), and reveal that our perceptual experience of others' actions is derived from an integration of bottom-up sensory input and high-level cognition.

Results



We analysed the difference between real final hand coordinates and participant's reports (perceptual shift), along the Y axis.

Reported disappearance points were distorted towards expectations, derived from both the actual presence/absence of obstacles ($p < .001$) and the actor's belief about them ($p < .001$). Actions were reported higher when obstacle was present in reality and when the actor merely believed there was an obstacle.

As predicted, the influence of the actor's belief increased the more people had to use it to form explicit action predictions. The influence of the actual environmental constraints (reality) remained constant across tasks.

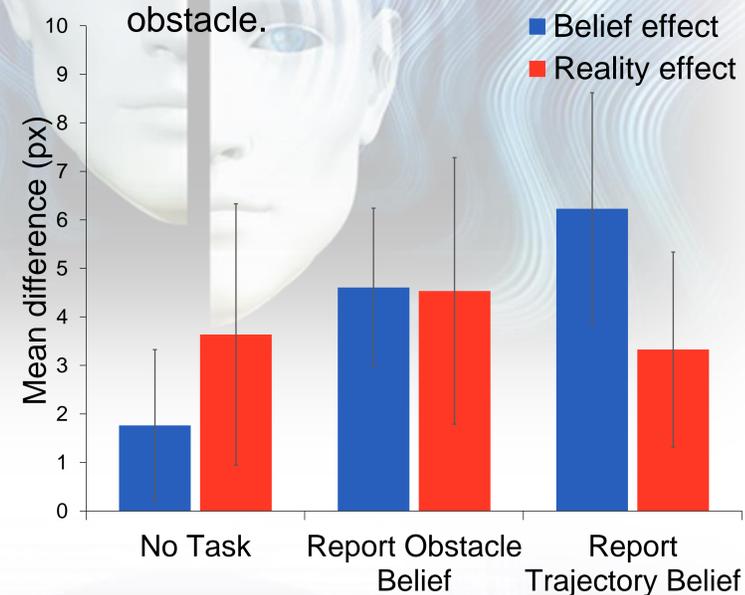
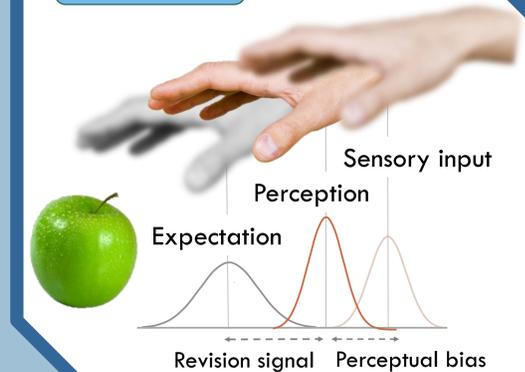


Figure 1



Discussion

Action perception is perceptually corrected towards the predicted, more efficient trajectory, in line with Bayesian integration accounts and our prior work. These predictions are derived from both: what the environment suggests others will do, and what we think they will do, based on the beliefs they hold.