Selection of obstacle avoidance reach trajectories

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Introduction & Methods

- In two experiments, we studied the role of visual attention during the preparation of manual movements around an obstacle.
- Participants performed rapid hand movements to a goal position avoiding a central obstacle either on the left or right side, depending on the pitch of the acoustical go signal.
- We used a dot probe paradigm to analyze the deployment of spatial attention in the visual field during the motor preparation.
- Briefly after the go signal but still before the hand movement actually started, a visual transient was flashed either on the planned pathway of the hand (congruent trials) or on the opposite, movement-irrelevant side (incongruent trials).

Behavioral and Motor Performance

Exp. 1: Congruent vs. Incongruent Path

- Typical trajectories with the left or right hand around the obstacle (A). Shaded areas depict the locations where the dot probes were flashed during movement preparation. Black dots on the trajectories represent the "via points" of the movements, at which the lateral excursion was maximal. Superimposed is the mean via point.
- Movement onset latencies of reaches along the right-hand (B) and left-hand side (C). The area shaded in gray represents the period in time at which the visual transient is flashed.

Exp. 2: The Obstacle’s Margin

- (A) Probe positions in Exp. 2. In Experiment 2, participants fixated the goal location throughout the trial. The task-irrelevant dot probes were flashed equidistantly to the fixation cross either on the planned movement path (congruent) or on the opposite side (incongruent) or on the relevant margin of the obstacle.
- The dot probe was flashed peripherally either at the same side as the hand was instructed to travel along (congruent, solid line) or at the opposite side (incongruent, dotted line) or at the relevant margin of the obstacle (margin, dashed line).

Exp. 1: Congruent vs. Incongruent Path

Conclusions

- This study presents new evidence about the role of "attentional landscapes" (Baldauf & Deubel, 2011) in the preparation process of visual-guided reaches.
- In a dot probe paradigm, we could show in the signature of human physiological responses that visual attention not only selects movement goals well in advance of movement initialization but also selects locations along the intended path around an obstacle.

References: