Landmark cues affect gait-agency and self-localization in space.

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Introduction

The sense of agency (SoA) describes the feeling of being in control of your actions and represents a core aspect of self-consciousness ranging from the sub-personal to the social contextual level [1]. Recently, we have extended research on SoA to movements of the entire body (locomotion) linking this line of research with that of path integration and spatial navigation [2].

In the current study we investigated how perturbations to two of the main sources of spatial information, i.e. allothetic/landmark and idiothetic/path integration cues [3], affect both one’s motor performance (MP) and one’s awareness thereof (SoA).

Experimental Setup

Participants walked with their avatar from a predefined start-location to one of two randomized targets by walking in the 4x4m tracking arena. In some of the trials, in randomized fashion, the avatar’s trajectory and, extending our previous paradigm [2], the target location could be deviated.

After each trial participants indicated whether the avatar’s movement presented on the screen corresponded to the movement they had just performed and rated their confidence in this response.

• Target Deviations: 0º, ±15º, ±30º
• Target Locations: @±10º
• Target Distance: 180cm

(Left) The Trial Schematic illustrates all possible combinations of avatar and target deviation trials as illustrated in the figures above. (Above) Walking Trajectories — with stationary targets at ±30º (left) and with targets moving by ±90º (right).

Green lines indicate 0º avatar deviations, red hues indicate avatar deviations to the left, blue hues indicate deviations to the right.

Agency Judgments [%Yes] — The highlighted area replicates the findings of our previous study [2] and shows that awareness for avatar deviations up to 15º is limited even though significant motor corrections occur. Participants judged significantly more trials to be veridical, if avatar and target deviations converged.

Certainty Ratings (0-3) — Participants were most certain about their responses in control trials when neither the avatar nor the target were deviated. The convergence effect is also apparent for these ratings.

Motor Performance (cm) — Participants were able to complete the task by compensating for both the idiothetic- and allothetic deviations and the combination thereof (p<0.001).

Conclusions

The present findings extend our previous work on gait-agency and illustrate that next to avatar displacements [2] also target displacements during goal-directed walking can affect the SoA.

Although purely allothetic deviations had no effect on SoA we report a significant interaction between the two types of deviations (convergence-effect): SoA was 11% higher in trials, in which the allothetic-deviations were associated with idiothetic-deviation (p<0.05), thus influencing this “private” aspect of self-consciousness.

References


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