

The effects of sensorimotor cues on spatial reasoning performance

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Background

A typical result in the spatial updating and the perspective-taking literature is that performance suffers when a target needs to be localized from a perspective which is misaligned with the actual perspective of the participant. In spatial updating studies, this result has been traditionally attributed to the lack of vestibular and proprioceptive cues during the imagined movement which is required to adopt the imagined perspective. In perspective-taking studies inferior performance is often assumed to result from the construction of viewpointspecific memories.

The fact that the vast majority of these studies have used pointing as the response mode creates the possibility that the inferior performance from imagined perspectives is inherent to the response modality itself. Pointing is by definition strongly dependent on one's physical body and this may create difficulties when the task entails using pointing from a perspective other than that of the physical body. Results from several experiments will be reported in support of this hypothesis.

Method

The general methodology of the experiments involves comparing pointing with verbal responding under various conditions. Verbal responding is assumed to depend less on the orientation of the physical body and therefore is expected to posit less interference than pointing during the response execution phase.

First, I will discuss the results from a published spatial updating study (Avraamides et al. 2004). This study involved a triangle-completion task and showed that systematic errors occurring when people point to targets after imagined movements are absent when the response

is conveyed linguistically. Second, I will present unpublished results from two other research projects.

The first project compared pointing and verbal labeling performance in a task that required adopting imagined perspectives in a depicted spatial scene. Results from two experiments will be reported. Participants in these experiments viewed on computer monitors depictions of a table with various characters sitting around it. Then, they were asked to locate a certain character from the perspective of another (i.e., "imagine you are x, locate y"; where x and y are names of characters). Accuracy and latency for responding (by pointing and verbal labeling) was recorded. It should be mentioned that for these experiments the spatial scenes remained perceptually available throughout the task.

The experiments for the second project followed the same general methodology with the exception that the spatial scenes were conveyed through text descriptions. Therefore, the arrangements of objects in the scenes needed to be held in memory. The goal of this project was to assess the difficulty with pointing in tasks requiring reasoning about non-immediate environments.

Results and conclusions

The results from all experiments converge on the same point: spatial performance from misaligned imagined perspectives suffers as a result of using pointing as the response mode in immediate environments. A theoretical model of spatial updating and perspective-taking is sketched to accommodate these results along with the findings from the previous studies in these fields. This model draws heavily on the theorizing of May (2004) and the Stimulus-Response Compatibility literature. The results from the present experiments will be linked to similar findings from the SRC literature.



Keywords Spatial cognition • Perspective-taking • Spatial reasoning

References

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