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Short communication

Visual experience facilitates allocentric spatial representation

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Abstract

Representing the position of the objects independently from our own position is a fundamental cognitive ability. Here we investigated whether this ability depends on visual experience. Congenitally blind, late blind and blindfolded sighted participants haptically learnt a room-sized regularly shaped array of objects, and their spatial memory was tested to determine which spatial reference frame was used. Crucially, the use of an object-based reference frame requires representing the regular structure of the array. We found that blindfolded sighted and late blind participants, that is those with visual experience, showed a preferential use of the object-based or "allocentric" reference frame. On the contrary, congenitally blind participants preferred a self-based, or egocentric, reference frame. This suggests that, due to its developmental effect on the multisensory brain areas involved in spatial cognition, visual experience is necessary to develop a preference for an object-based, allocentric reference frame.

Highlights

• Previous studies showed that regular sets of objects are allocentrically represented.
• We tested congenitally and late blind, and blindfolded sighted participants. • Visual experience determined the reference frame for spatial representation. • by affecting the multisensory brain areas involved in spatial cognition.



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Abbreviations

CB, congenitally blind; LB, late blind; S, sighted

Keywords

Spatial cognition; Multisensory integration; Visual experience; Blindness; Reference frames; Neural plasticity

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