Eye movements during mental imagery: A closer look at the spatial reference frame

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1. Introduction

People tend to look back at spatial locations of visually encoded information when they recall this information through visual imagery. Multiple studies confirmed this so-called looking-at-nothing (LAN) effect, but the nature of the spatial reference frame underlying this effect remains unclear[1]. Specifically, the location of an object can be associated either with the absolute location of the object in the visual environment (i.e., its fixed coordinates) or with its relative location in relation to other spatial cues (e.g., other objects or some kind of spatial reference frame within the environment)[2].

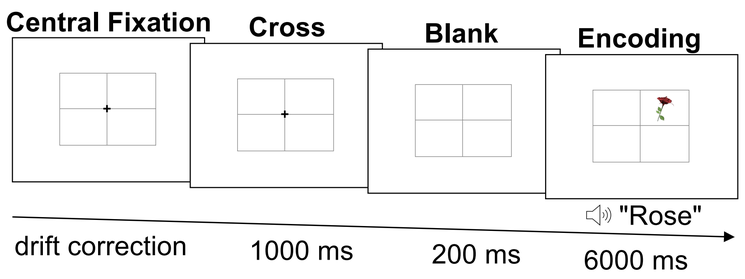
In this study, we investigated the underlying mechanisms of the LAN effect by examining which spatial indexes (absolute vs. relative) play a role for eye movements to absent objects during visual imagination of previously seen objects.

2. Method

34 participants (20 f, 14 m), mean age: 24.0 years, (*SD* = 5.7).

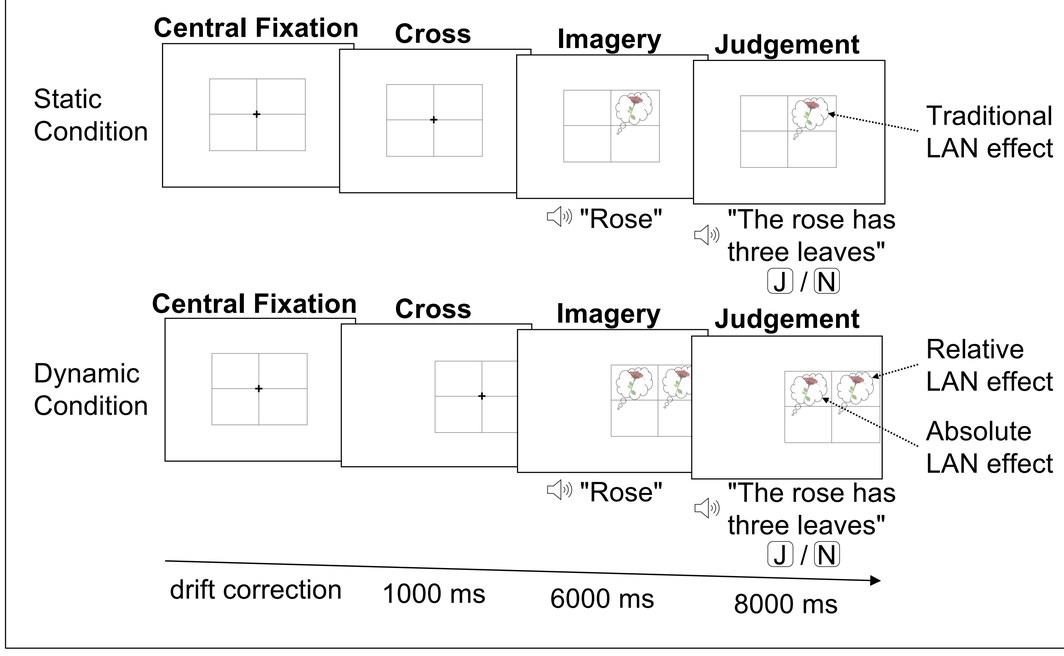
Encoding Phase

Participants memorized different objects that were subsequently presented in one of four possible quadrants in a central 2x2 grid.



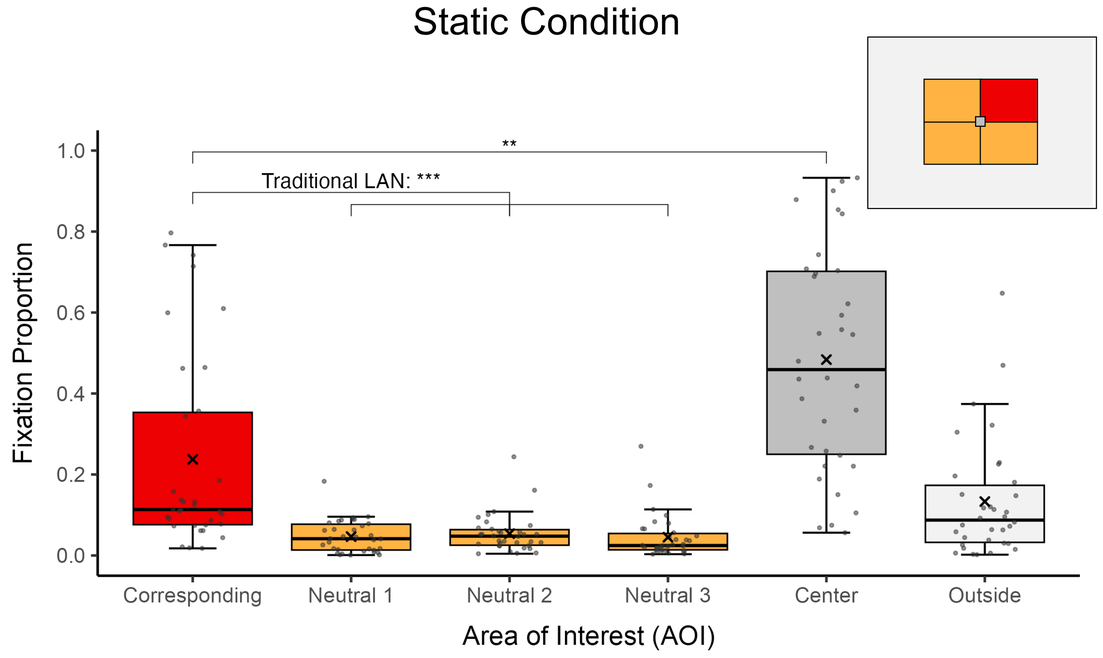
Recall Phase

Participants visualized each object in their mind's eye for 7 s. Afterwards, they judged whether a statement about a visual detail of the object was true or false.



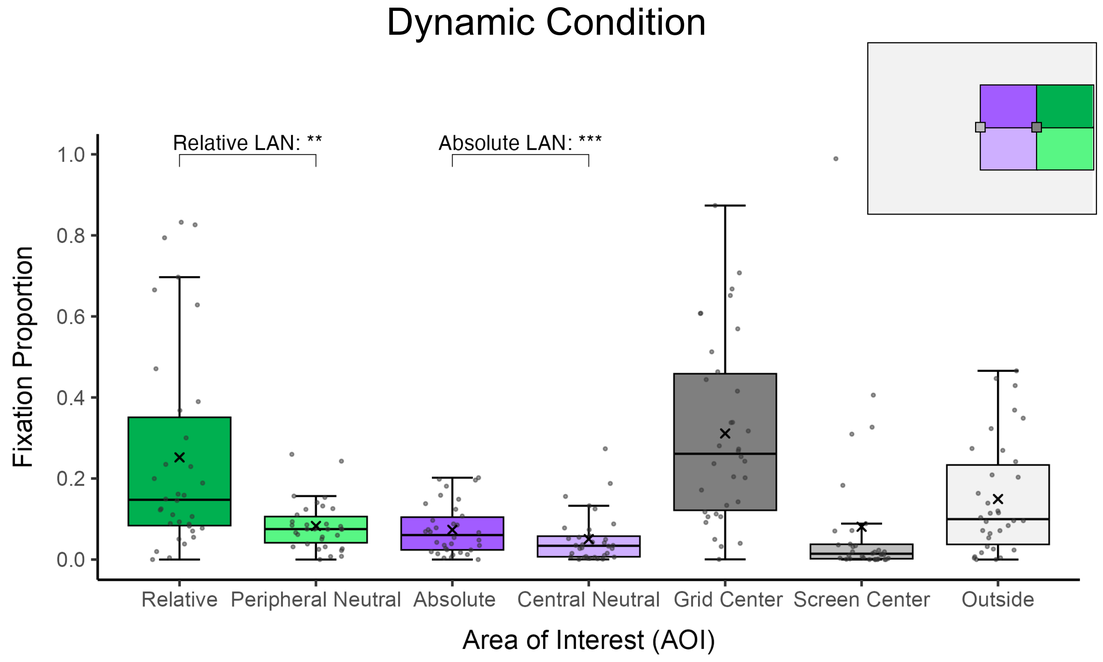
3. Results

Static Condition



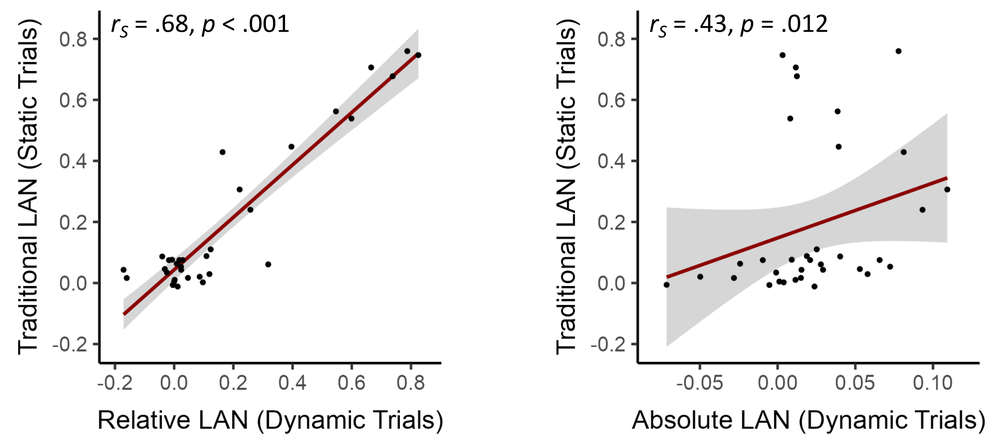
Additional time analysis: The traditional LAN effect was present for most of the recall time (~ 10 s).

Dynamic Condition



Additional time analyses: The relative LAN effect was present for most of the recall time (~ 8 s). The absolute LAN effect was present for a short period during recall (~ 1 s).

Relationship Between Conditions



→ LAN behavior was stable between the conditions.

4. Conclusion

- The traditional LAN effect can be divided into two effects:
  - Relative LAN: Using a relative spatial reference frame
  - Absolute LAN: Using an absolute spatial reference frame
- People associate an object's location mainly with its relative position in relation to other spatial cues within the environment
- Individual differences in …
  - … which object location is preferred (relative or absolute)
  - … whether LAN behavior is shown or whether no eye movements are made during visual imagery

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References

[1] Ferreira, F., Apel, J., & Henderson, J. M. (2008). Taking a new look at looking at nothing. *Trends in Cognitive Sciences, 12*(11), 405–410.

[2] Hollingworth, A., & Rasmussen, I. P. (2010). Binding objects to locations: The relationship between object files and visual working memory. *Journal of Experimental Psychology: Human Perception and Performance*, 36(3), 543–564.