Encoding and updating spatial information presented in narratives

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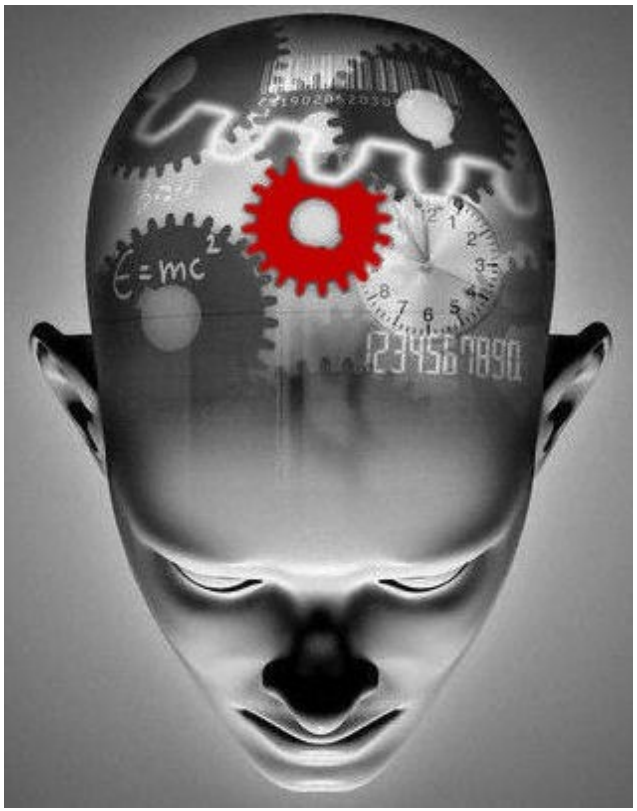
Interesting Prior Work

- Aim is to understand how humans reason about spatial information

Interesting Prior Work

Enter Experimental Psychology



Interesting Prior Work

- In one experiment, participants were asked to imagine walking towards teacher's chair (in a classroom) and rotate so as to face the class
- In other condition they were ask to physically mirror the walking
- Adults were better at reasoning about surrounding in the first case
- The difference between ages vanished for the later case

Introduction

Main Question

Understand how humans update the protagonist-object relations while reading a narrative

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- Participants were asked to read a narrative about a protagonist in a setting [learning]
- Then the protagonist rotates in some manner in the narration
- Participants are asked to answer queries of the form "Imagine facing x, point to y" [JRDs]

Prelimineries

- Sensory Motor Representation : *establishing links between the body and remote object. It codes self-object relations*
- Allocentric Representation

Prelimineries

- Sensory Motor Representation : *establishing links between the body and remote object*
- Allocentric Representation : *stores relation between object-objects from a preferred direction*

Prelimineries

- Learning Perspective : *the perspective from which locations in the narrative were described*
- Target Perspective

Prelimineries

- Learning Perspective : *the perspective from which locations in the narrative were described*
- Testing Perspective : *the protagonist's orientation following the described rotation*

Prelimineries

Measurement

- Baseline : accuracy for opposite-testing perspective [why?]
- Encoding Alignment Effect :
  accuracy for learning perspective - baseline
- Sensory-Motor Alignment Effect :
  accuracy for testing perspective - baseline

Experiment 1

- **Goal** : protagonist-object relation not updated automatically following imagined rotation
- **Method** : participants were asked to imagine the rotation of protagonist and answer questions
- **Brief Result** : most accurate results when imagined perspective was aligned with learned orientation.
  No updation of object-protagonist relation while during imagined rotation

Experiment 2

- **Goal** : movement relative to objects in remote environments may allow linking of remote locations to a sensorimotor framework
- **Method** : same as for experiment 1 except participants were asked to carry out the equivalent rotation in laboratory
- **Brief Result** : there was significant sensorymotor effect but encoding alignment effect was much more significant. Participants updated only information that was in front of them [central to task].

Experiment 3

- **Goal** : whether explicit instructions to visualize the described environment after all motions will develop sensorymotor effect
- **Method** : after protagonist's and actual rotation. participants were asked to describe the overall surrounding and not just the object at the front
- **Brief Result** : sensorymotor effect was not significant. When asked to visualize everything, participants refer to their originally constructed perspective.

Experiment 4

- **Goal** : Sensorymotor effect might still interfere when the physical rotation is different to the protagonist's
- **Method** : same as in experiment 1 except that participants were asked to move in different rotation uncorrelated with the protagonist's rotation
- **Brief Result** : no sensory motor effect was found. Difference in results for physical rotation which are congruent and incongruent to the protagonist's motion was insignificant. Participants responded faster for counteraligned position. [why?]

Conclusion

- (Rieser et al., 1994) physical movement relative to a remote, perceptually experienced environment enables people to update self-to-object relations
- No reliable source of evidence of such a sensorimotor effect when people moved relative to an imagined, described environment
- participants prefer to use their initial representation

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- Creating a mental picture from text is relatively hard than from visual sources
- Thus readers neglect a detail such as protagonist's rotation if that is inconsequential to the plot
- Then when answering to queries they go back to their vantage point which is the allocentric representation from default protagonist's view

Reference

[1] Encoding and updating spatial information presented in narratives, *Marios N. Avraamides, Alexia Galati, Francesca Pazzaglia, Chiara Meneghetti and Michel Denis* 2012. Quarterly journal of experimental psychology

[2] Picture Credit, *http://psychoanalysis.cz/xpsych.html*

Backup Slides

Results

Table 1. *Mean accuracy, orientation latency, and response latency as a function of perspective in Experiments 1, 2, and 3*

	Imagined perspective			
Experiment	*Learning*	*Testing*	*Opposite testing*	*Opposite learning*
Experiment 1				
Accuracy (%)	89.24 (17.84)	81.03 (20.82)	78.12 (25.25)	82.99 (22.07)
Orientation latency (ms)	2,895 (1,057)	3,617 (1,509)	3,582 (1,666)	3,568 (1,734)
Response latency (ms)	3,538 (1,418)	4,624 (2,013)	4,489 (1,974)	5,142 (2,489)
Experiment 2				
Accuracy (%)	88.19 (13.98)	81.60 (18.42)	77.40 (19.46)	81.17 (21.18)
Orientation latency (ms)	3,006 (778)	3,341 (956)	3,500 (1,156)	3,474 (1,374)
Response latency (ms)	3,398 (1,154)	4,544 (1,734)	4,443 (1,659)	4,512 (1,927)
Experiment 3				
Accuracy (%)	84.71 (19.96)	70.98 (24.60)	68.86 (22.72)	69.64 (23.48)
Orientation latency (ms)	3,201 (995)	3,889 (1,319)	3,805 (1,243)	3,688 (1,251)
Response latency (ms)	4,219 (1,199)	5,712 (1,979)	5,607 (1,909)	5,695 (2,172)

Note: Values in parentheses are Standard Deviations.

Results

Table 2. *Mean accuracy, orientation latency, and response latency as a function of congruency and perspective in Experiment 4*

	Imagined perspective			
Congruency	*Learning*	*Testing*	*Opposite testing*	*Opposite learning*
Congruent with learning				
Accuracy (%)	90.63 (17.55)	81.25 (25.57)	82.25 (28.07)	83.93 (21.75)
Orientation latency (ms)	2,818 (1,109)	3,115 (1,318)	3,108 (1,198)	3,128 (1,235)
Response latency (ms)	3,430 (1,506)	4,358 (1,962)	4,634 (2,747)	4,354 (2,070)
Congruent with updated				
Accuracy (%)	91.52 (14.85)	84.37 (19.43)	81.70 (21.65)	81.70 (22.94)
Orientation latency (ms)	2,921 (884)	3,236 (1,269)	3,323 (1,159)	3,119 (1,176)
Response latency (ms)	3,728 (2,097)	5,150 (2,424)	4,884 (1,634)	5,295 (2,430)
Incongruent				
Accuracy (%)	87.95 (17.84)	83.04 (20.19)	81.25 (25.57)	80.80 (25.79)
Orientation latency (ms)	2,852 (1,038)	3,089 (1,005)	3,237 (1,124)	3,410 (1,124)
Response latency (ms)	3,288 (1,012)	4,464 (1,748)	4,631 (1,559)	4,513 (1,701)

Note: Values in parentheses are Standard Deviations.