Modulation of temporal distance estimation by item- vs. physical- distances in a VR environment

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Introduction

- Human have capability of recalling specific episodes in isolation and estimate their spatiotemporal relationship.
- How the temporal distance between events is estimated remains unclear.
- We hypothesized that the information load associated with these two distances are different:

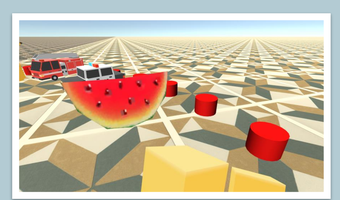
- item-distance
- physical-distance

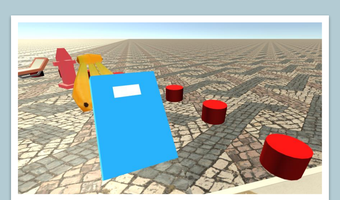
Behavioral task

Each trial started with a navigation period on the maze after which the participants were asked to make a memory judgement between two choices.

1) Passive virtual reality (VR) navigation

- A circular-maze track with 20 equally distance everyday-life objects.





2) Memory judgement

- Participants were asked to decide which object was physically closer to a cue object.


Choice object L


Cue


Choice object R

Behavioral Data

- **Participants**

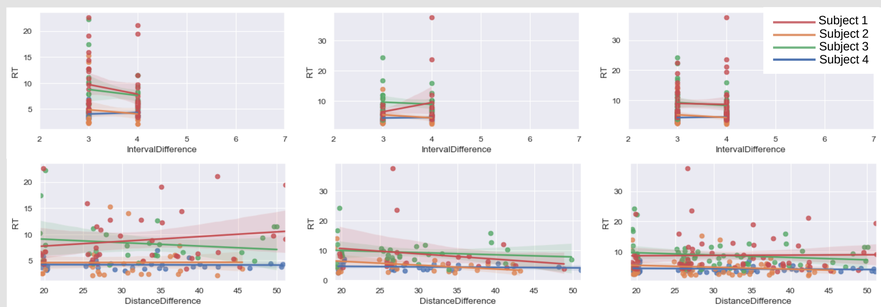
- 4 epilepsy patients with depth electrodes

- **Definition of temporal distance**

- Item-distance: Presented by the number of objects separated by the cue and two respective choice items during encoding.
- Physical-distance: Defined by the item-distance multiplied by the physical distance between any two time points (based on that trial's speed, ring size and navigation duration).

- **Reaction Time**

- We compared the differences between these 2 distance types. Linear regressions showed the slope in reaction time between the item-distance and physical-distance are different. (Subject A:-0.003, 0.286; Subject B: 0.003, -0.789; Subject C: -0.065, -1.166; Subject D: 0.090, -1.852)
- Top: item-distance *vs* down: physical-distance
- Three sorts: correct trials / incorrect trials / all trials



- **% correct:**

- 2-way repeated-measures ANOVA (distance: long/short; distance type: item/physical), we found a marginal interactional effect (p = 0.054).

	mean	S.D.	N
Item_long	.5342	.02781	4
Item_short	.5562	.14335	4
pysi_long	.6234	.05158	4
pysi_short	.4712	.10648	4

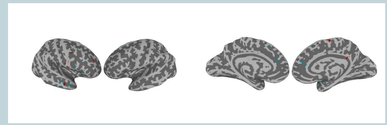
Conclusion

- RT didn't show significant effect on these two types of distance.
- A marginal interactional effect (p = 0.054) on 2-way repeated-measures ANOVA.
- Retrieval mechanism underpinning the two distances might rely on distinct brain circuits.

Future work

The subject's corresponding sEEG data will be explored to account for these discrepancies.

- Channels (2 subjects as example: red / blue)

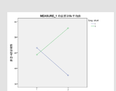


- Conditions

DistanceType + LongOrShort + DistanceType* LongOrShort

Multi Variables Test		
Effect		P
item_pys	比莱轨迹	.807
	威尔克 Lambda	.807
	霍特林轨迹	.807
	罗伊最大根	.807
long_short	比莱轨迹	.317
	威尔克 Lambda	.317
	霍特林轨迹	.317
	罗伊最大根	.317
item_pys * long_short	比莱轨迹	.054
	威尔克 Lambda	.054
	霍特林轨迹	.054
	罗伊最大根	.054

long_short	(I) item_pys	(J) item_pys	(I-J)	SD	P
1	1	2	.088	.028	.053
	2	1	-.088	.028	.053
2	1	2	-.085	.029	.061
	2	1	.085	.029	.061



Contact

KwokLab