

# Cross modality unidimensional spaces for processing time

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## INTRODUCTION

The TIME IS MOTION is a widely tested metaphorical mapping since Lakoff and Johnson (1980) suggested that our conceptual system is a metaphorical one (some reviews: Núñez & Cooperrider, 2013; Bendler & Beller, 2014). For a meta-analysis, see Von Sobbe, Scheifele, Maienborn, & Ulrich, 2019). However, one main question is whether the language modality (signed vs spoken languages) grounds differences on using these unidimensional spaces for processing sequential and deictic time when signers and speakers share the cultural framing of time (e.g., by clocks, calendars, etc.). This research hypothesized that the signed modality of language strengthens the lateral and the sagittal mental timelines. Alternative to the hypothesis, the strength of the lateral and the sagittal space-time mappings remain the same between language modalities.

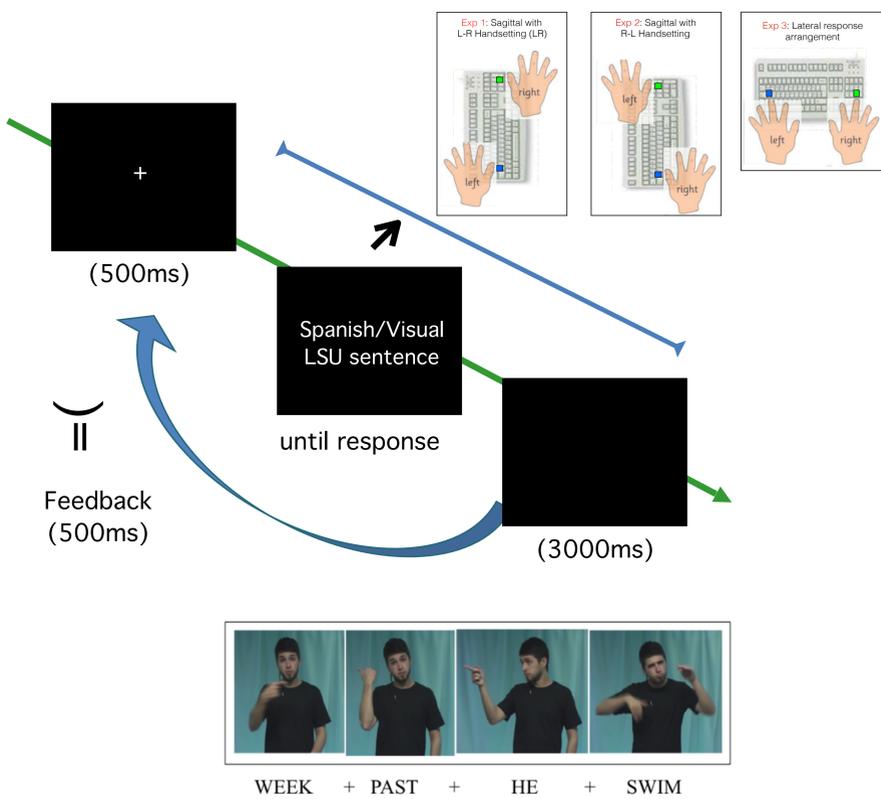
## OBJECTIVE

The aim of the present research was to test the effects of the language modality on the lateral and sagittal space-time mappings activation by running categorization tasks

## METHOD

**Temporal discrimination task:** In the congruent condition, for the sagittal axis, participants pressed the behind key (Exp 1: deaf signers. Exp 2: Spanish speakers) in response to past visual or written sentences, respectively, while the ahead key in response to future visual or written sentences. In the incongruent condition, this assignment was reversed. For the lateral axis, the behind and ahead key were replaced for the left and right keys.

**Materials:** 40 LSU visual sentences were generated from 20 action or state signs (e.g., to eat, to sleep, to go, to cry) and 9 temporal adverbial signs (e.g., THE PREVIOUS WEEK, THE NEXT WEEK, BEFORE, AFTER, YESTERDAY, TOMORROW, ALREADY, SOON, BEFORE) without bias for any grammar person. For Spanish, the visual sentences were translated. In translation, the syntax order remained the most as possible the same in both language modalities.

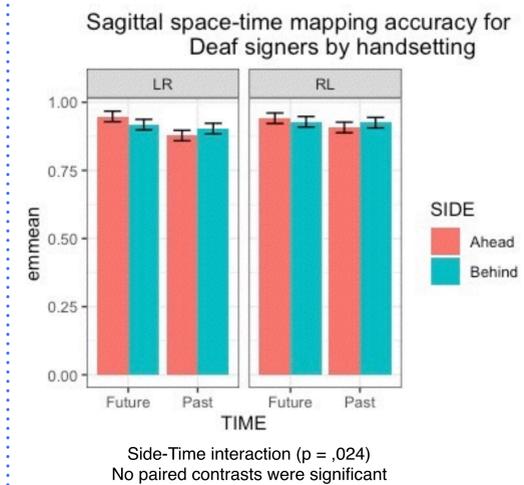
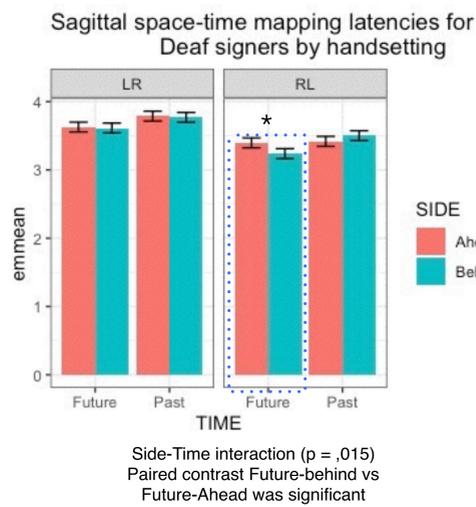


## RESULTS

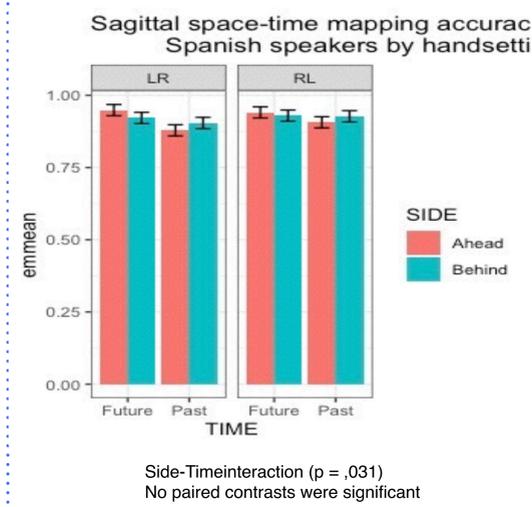
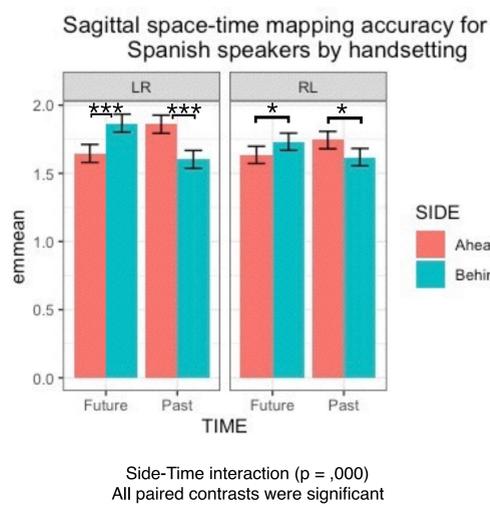
**Participants:** 101 (51 Deaf signers; 50 Spanish speakers matched on age  $M = 30,6$ ,  $SD = 8,2$  and schooling [proportion of undegraduated and secondary remained around 42 % and 58 %, respectively, between experiments]); 55 women; 13 left-hand [equally distributed by language modality]. Half of deaf signers enrolled in signing school in primary and the other half in secondary

**Design:** Repetead-measures ANOVA from Imm  
**Fixed factors:** Time (Past vs Future), Axis (Lateral vs Sagittal 2), Side (Left/Behind vs Right/Ahead) Mod (Signed vs Spoken),  
**Random factors:** Participant, Item Handsetting ([Behind with left-hand and Ahead with right-hand] vs [Behind with right-hand and Ahead with left-hand]) was manipulated as fixed and random factor in two different models.

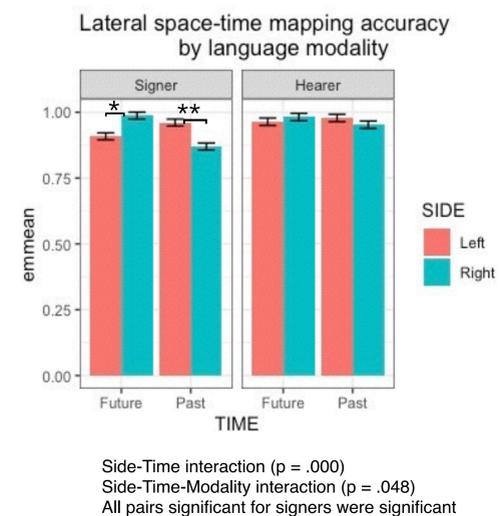
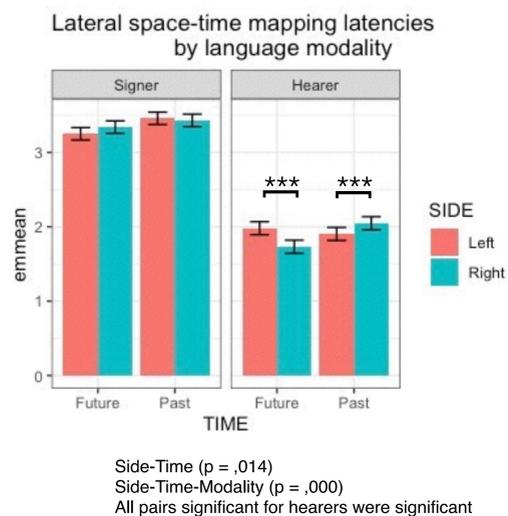
### Exp 1



### Exp 2



### Exp 3



## MAIN QUESTIONS AND FINDINGS

- Would be visual sentences an adequate stimuli for measuring the space-time mappings by latencies?
- At the sagittal timeline, what suggests the form of the spatial mappings for Future in RL handsetting for deaf signers? Does it would relate with handedness of signers?
- The handsetting seems to have different effects for sagittal timeline for deaf signers and for Spanish speakers. A common lateral mental timeline for LSU deaf signers and Spanish speakers Suggestions: a shared cultural framing for explaining a common lateral mental timeline, but a possible role of language modality for the sagittal mental timeline

## REFERENCES

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 Núñez, R., & Cooperrider, K. (2013). The tangle of space and time in human cognition. *Trends in Cognitive Sciences*, 17(5), 220-229.  
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 Von Sobbe, L., Scheifele, E., Maienborn, C., & Ulrich, R. (2019). The Space-Time Congruency Effect: A Meta-Analysis. *Cognitive Science*, 43(1), 1-23.

