

Language sensorimotor informativeness enhances situated simulation

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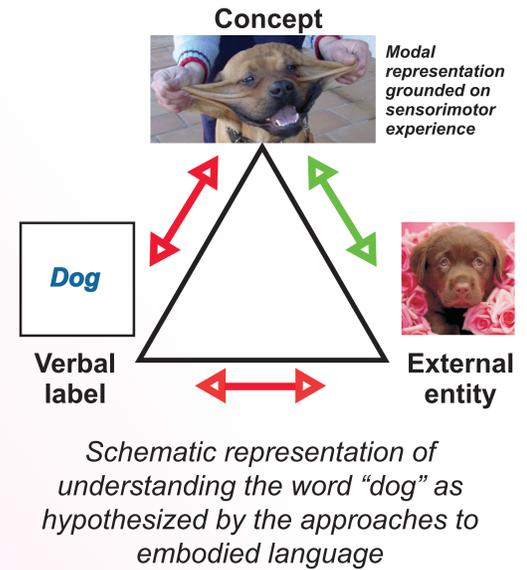
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Introduction

Approaches to embodied language hold that comprehension of linguistic material makes use of neural systems ordinarily used for perception and action [1, 2, 3]. The recruitment of perceptual and motor areas during language understanding is thought to entail a simulation process that reproduces, in a situated manner, the situation described [4]: for example, empirical evidence has shown support that simulation takes into account implicit and explicit properties of objects and actors implied in sentences [5]. However, the issue concerning to what extent the amount of sensorimotor information carried by the linguistic constituents of a sentence contributes to situate the simulation process has not yet been addressed. This study is aimed at filling this gap. Specifically, we investigated whether:

- 1) The specificity of simulation during sentence understanding is influenced by sensorimotor informativeness of linguistic constituents;
- 2) The amount of sensorimotor information carried by verbs is more effective than that carried by nouns in situating the simulation ;
- 3) The sensorimotor informativeness of linguistic constituents of sentences that express behavioral events that are not part of human motor repertoire affects the simulation process, if any.



Methods

Stimuli

Forty-eight sentences matched for syllable number, word length, and lexical frequency, expressing behavioral events belonging to human motor repertoire, and 48 sentences expressing action that do not make sense.

Descriptive Action Verb
 (DAV, Specific behaviour)

Interpretative Action Verb
 (IAV, Multitude of behaviours)

Noun of graspable object

Noun of non-graspable object

Sensible word pairs

To squeeze the orange

To recycle the bottle

To water the flowerbed

To book the medical

Non-sensible word pairs

To water the handle

To book the cabbage

To squeeze the sunset

To recycle the herd

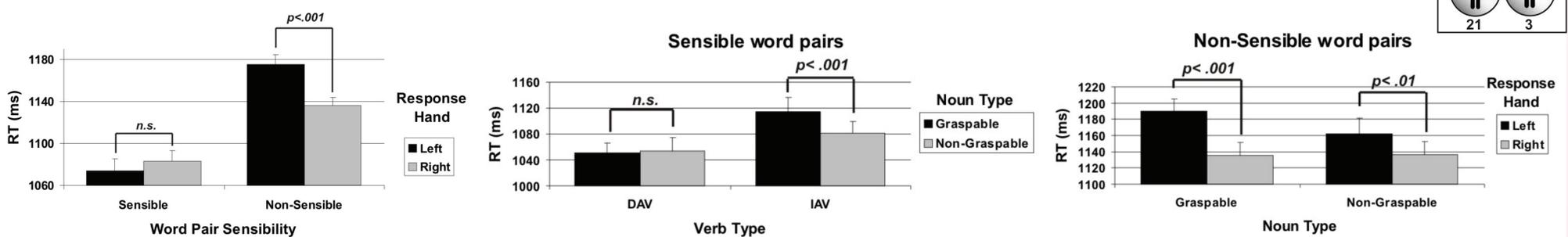
Task

Participants were asked to perform a sensibility judgement task. Half of participants pressed, as quickly as possible, a left key with their left hand if the sentence made sense and a right key with their right hand if the sentence did not make sense, and viceversa for the other half of participants.

Experimental design

2 Verb Type (DAV and IAV) X 2 Noun Type (Graspable and Non-Graspable Object) X 2 Response Hand (Right or Left) X 2 Word Pair Sensibility (Yes or No). Response Times (RTs) measured for corrected trials were analysed (ANOVA).

Results



Conclusions

Our findings suggest that the amount of sensorimotor information carried by linguistic constituents of sentences significantly affect the specificity of the simulation process entailed in language understanding. In sensible sentences, the simulation of the action expressed by a verb carrying a high amount of sensorimotor information drags behind the simulation of a class of objects on which the action can be performed. The sensorimotor informativeness of a noun acts to situate the simulation process by specifying the particular action among all those that are expressed by a verb with a low sensorimotor descriptive power. The simulation is active also during the understanding of sentences that describe behavioural events that do not make sense. In this case, simulations of referents denoted by the verb and the noun remain mutually independent. Overall, our findings are in line with the theoretical framework of embodied language and have relevant implications for physiological and neural models concerning the relationships between language and the sensorimotor system.

References

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Acknowledgments

This work was supported by the FP7 project ROSSI, Emergence of communication in Robots through Sensorimotor and Social Interaction,