Composition of Complex Numbers: Delineating the role of the LATL

Esti Blanco-Elorrieta1,3 and Liina Pylkkänen1,2,3
NYU Abu Dhabi1; New York University, Departments of Linguistics2 and Psychology3

Introduction

- What is the neurobiology of our ability to create an infinity of conceptual representations from the basic building blocks of language?
- A broad methodologically diverse and internally consistent body of work strongly implicates the LATL as a basic site for semantic combination.
- However, the work on semantic combination has been quite focused on one particular domain: the adjectival modification of nouns.
- When trying a different type of combination, del Prato and Pylkkänen (2014) found that semantic composition but not numerical quantification elicited activity in this region.
- This conceptual combination is holistically and not a transformational one.
- The goal of the experiment: Characterize which elements constitute valid input to create the type of complex conceptual representations that engage the LATL AND define whether complex numbers undergo a composition process before being produced.

Materials and Methods

- 25 right-handed English native speakers.
- Continuous MEG data acquired during experimental session, 208 sensor array.
- Acquisition recording band 0-200Hz, sampling rate of 1000 Hz.
- Five conditions partitioned by block, pre-empted with condition-specific instruction.

A. Color modification: "Describe the colored digits"

B. Numeral quantification: "Name the quantity of colored digits and name the digits that are colored"

C. Complex number production task: "Name the colored complex number"

D. Complex number list task: "Name the colored complex number on the left and the colored units digit on its right individually"

E. Number list production task: "Name the colored digits individually"

Conclusions

- While quantificational phrases failed to engage the LATL, both adjectival modification and complex numbers reliably engaged the LATL.
- The engagement of the LATL is determined by the computations underlying the performed combinatorial process as opposed to the nature of the input items.
- This finding suggests that the LATL is not a general purpose combiner of meanings but rather specializes in some version of conceptual combination.
- This conceptual combination is potentially delimited to situations where one combining element characterizes a property of the other.
- The finding of combinatorial activity for our complex number condition conforms to theories suggesting that complex numbers undergo a composition process before being produced as opposed to being holistically processed and retrieved.

Contact: eb134@nyu.edu

*This research was supported by NYU-Abu Dhabi Institute Grant G1001 (L.P)