PRESS RELEASE

Not all aspects of human language and cognition can possibly be united with neurobiology, says IIT Hyderabad Researcher

The unique structures and forms of some aspects of human language and cognition are hard to be integrated with the brain structures.

Hyderabad: April 28, 2021: The limits and challenges in integrating human language and cognition with the human brain have been explored by Dr. Prakash Mondal (Assistant Professor, Department of Liberal Arts), heading the Language and Cognition Lab at the IIT Hyderabad. The main findings of his study suggest that human language and cognition cannot be successfully reduced to neurobiology for all aspects of human language. However, a certain kind of unity may be achieved between linguistic cognition and brain processes if they are applied to aspects of human language that are agreeable to more automated identification and categorization (such as who did what to whom in linguistic structures).

This study also draws upon recent neuroscientific work as evidence in support of the conclusions arrived at. The magnitude of the signals in the activity of the left anterior temporal lobe (LATL) in the brain increases when the first word in a phrase such as 'wooden furniture' is integrated into the second word. But the linguistic and logical aspects of such constructions are not captured by these patterns. Thus, many such properties of human language and cognition are hard to be integrated into and united with, human brain structures.

Aspects of human language that have complex mathematical patterns as deployed in human reasoning and other cognitive processes are hard to be united with brain structures. For instance, human language permits the formation of the negation of a sentence, as in 'It is not so that he wanted to run away' vs. the negation of a constituent, as in 'He ran to the store, not to his office'. This helps in reasoning about what it is that did not happen, as opposed to, about what it is that someone did not get to. No known brain mechanisms and processes capture this distinction in neuronal terms. Likewise, symmetric patterns can be found in human language, as in 'What I want is a book' vs. 'A book is what I want', and again, no known brain mechanisms and processes express this *mirror-like* reversal of the pieces of structures.

Dr. Prakash Mondal, the researcher, says, "With the rise of biological studies of language, we seem to become closer to a deep understanding of human language and cognition, but significant and often unique differences in experience, appearance, form, and organization of certain aspects of human language and cognition can pose hard problems and challenges to brain and cognitive sciences."

The detailed discussion of the issues concerned can be found in the article entitled 'Disunity with unity in cognition within the context of language–biology relations. *Journal of Theoretical and Philosophical Psychology*. https://doi.org/10.1037/teo0000156), and in the book *'Language, Biology, and Cognition: A Critical Perspective*' (Springer Nature, 2020).

Link to video abstract: https://youtu.be/ReqmvBssHfA

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