



Embedding in language and in thinking: A double dissociation in aphasia and aTOMia

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Embedding in Language and Thinking: A Double Dissociation in Aphasia and aTOMia

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Introduction

Can we think without language? We examined this fundamental question about the relation between language and thought using a cognitive neuropsychological approach, examining whether a dissociation can be detected between language and thought. We focused on a specific aspect of the relation between language and thought, by examining whether the ability to embed thoughts (as part of theory of mind, TOM) relies on the ability to create and comprehend syntactic embedding structures that express these states (e.g., "Dana thought that the world is flat").

Method

We tested eight adults after stroke. Four of them had agrammatic aphasia, which involved a syntactic deficit in embedding, identified using five comprehension, production, and grammaticality-judgment syntactic tasks from the BAFLA battery (Friedmann, 1998). Four others had aTOMia (TOM deficit), diagnosed using 16 stories and 4 cartoons from the aTOMia battery, assessing second-order theory of mind abilities (Balaban et al., 2016). The syntactic assessment also included a novel technique for the assessment of the comprehension of embedding that does not allow for the usual agrammatic strategy of understanding sentences on the basis of agent-theme word order. The task includes 26 sentences with an embedded clause that included a pronoun. The interpretation of the pronoun depends on the correct construction of an embedded sentence. Participants are asked to whom the pronoun refers, answering using a picture selection (e.g., "Shira said that I love Coriander/ Shira said: I love Coriander. Who loves Coriander?" The participant had to select between pictures of Shira and the experimenter holding a coriander leaf).

Results

The results showed a double dissociation between embedding in language and embedding in thinking. The four participants with a TOM deficit performed very well on the comprehension and production of syntactic embedding (95%) while their performance on the aTOMia battery was poor (36%). In contrast, the participants with agrammatic aphasia were able to represent second-order mental states (90%) but still showed a significant impairment in the comprehension and production of syntactic embedding (46%). This created a classical double dissociation between embedding in language and in thought.

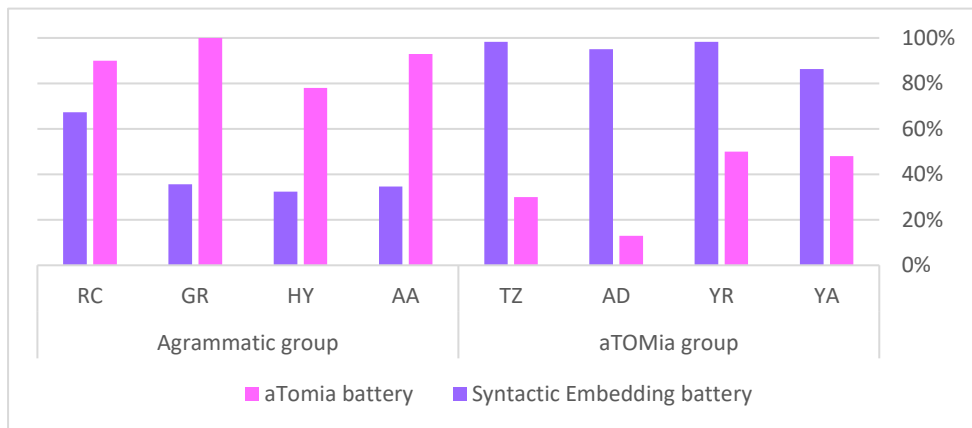


Figure 1. Average score on the syntactic battery and the aTOMia battery of each participant

Conclusion

The double dissociation that was found indicates that unlike developmental studies that reported a dependency between linguistic embedding and mental embedding (de Villiers & de Villiers, 2003; de Villiers & Pyers, 2002), once these two abilities are acquired, they are independent. These findings expand our understanding of the relationship between language and thinking. Philosophers like Kant and Davidson have argued that "speaking a language is not a trait man can lose while retaining the power of thought" (Davidson, 1973, p.4). However, our study indicates that individuals with aphasia *can* retain the ability to think about other people's thoughts even when they lose syntactic abilities. This indicates that at least in this domain thought is not completely dependent on language.

If caretakers believe that people with aphasia cannot think and represent thoughts of others, they may not communicate with people with aphasia about such relations. However, this study shows that one can lose the ability to speak about something, but still be able to reflect about it and understand it. Creating a dialogue about other people's thoughts with those who have lost crucial aspects of their language ability is possible and desirable.

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