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Exploring Rumination's Impact on Agreement Attraction in Language Comprehension: A Case Marking Perspective using ACT-R

Wen-Hao*

Department of Cultural Psychology, Waseda University, China

DESCRIPTION

Understanding how cognitive processes like rumination affect language comprehension is a complex yet fascinating area of research. One aspect of language comprehension that can be influenced by cognitive states is agreement attraction, where an agreement error occurs due to the influence of an intervening noun. For example, in the sentence "The key to the cabinets are on the table," the plural noun "cabinets" mistakenly causes the verb to agree in number with it instead of the singular noun "key." Investigating whether case marking, the grammatical system that indicates the function of a noun in a sentence, affects agreement attraction during comprehension can provide valuable insights. Using computational models, particularly those based on the Adaptive Control of Thought Rational (ACT-R) framework, we can explore how rumination might impact this phenomenon. Rumination, characterized by repetitive and intrusive thoughts, can deplete cognitive resources and affect attentional processes. In language comprehension, this could mean a reduced ability to focus on relevant grammatical cues, potentially increasing susceptibility to agreement attraction errors. By simulating rumination within an ACT-R model, we can predict and analyze these cognitive dynamics in detail. ACT-R models human cognition by simulating the interactions between different cognitive modules, including memory, attention, and language processing. To study the effects of rumination on agreement attraction, we need to incorporate the mechanisms of rumination into this framework. This involves introducing production rules that simulate the repetitive and intrusive nature of ruminative thoughts, which consume cognitive resources and influence attentional allocation. Case marking provides clear grammatical cues about the syntactic roles of nouns, potentially aiding in the correct resolution of agreement dependencies. In languages with rich case marking, these cues can help distinguish the subject from other noun phrases, reducing the likelihood of agreement attraction errors. However, when cognitive resources are strained due to rumination, the effectiveness of these cues might be compromised. In the ACT-R model, we simulate the process of parsing sentences with agreement dependencies, considering both the presence and absence of case marking. Under normal cognitive conditions, the model uses grammatical cues to correctly resolve agreement, minimizing errors. However, when rumination is simulated by adding production rules that repeatedly activate irrelevant thoughts, the model's cognitive resources are depleted. This depletion affects attention and memory retrieval, making it more challenging to correctly process the case marking cues and increasing the likelihood of agreement attraction errors. For instance, in a language with rich case marking, the ACT-R model might show high accuracy in resolving agreement under normal conditions. However, when rumination is introduced, the model's ability to utilize case marking cues effectively is reduced, leading to more frequent agreement attraction errors. This can be attributed to the model's increased cognitive load and the diversion of attentional resources away from the relevant grammatical information. In contrast, in languages with poor case marking, agreement attraction might already be more frequent under normal conditions due to the lack of clear syntactic cues. When rumination is added to the model, the frequency of errors may increase further, illustrating how cognitive load exacerbates existing vulnerabilities in language processing. The results of these simulations can provide empirical predictions about the interaction between rumination, case marking, and agreement attraction.

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.