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Scope Interpretation: Evidence from Human and Large Language Models

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Abstract

This study investigates real-time processing and interpretation of quantified sentences in English and Chinese, focusing on cases where an existential quantifier precedes a universal quantifier. Using a self-paced reading (SPR) task and comprehension questions, we found that surface scope was processed faster than inverse scope, with differences emerging in later processing regions, aligning with the Processing Scope Economy principle. Cross-linguistic differences revealed that inverse scope was less accessible in Chinese than in English, confirming scope rigidity in Chinese. Working memory influenced offline interpretation but not online processing. Additionally, large language models only partially resembled human performance, with BERT-based models aligning with human data in English but not in Chinese, likely due to training biases. These findings contribute to understanding scope processing mechanisms, cross-linguistic variation, and cognitive constraints, while also informing the limitations of LLMs in modeling human sentence comprehension.