



Causal and clinical evidence support motor-language coupling in neurotypical adults and individuals with Parkinson's disease

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Abstract

The motor-language coupling hypothesis posits that action language processing is grounded in the motor system. In several studies, we provided causal and clinical evidence that supports this hypothesis. In the first study, we demonstrated that stimulating the left motor cortex differentially affected processing sentences with action verbs (e.g., throwing) compared to abstract visual verbs (e.g., to consider). Interestingly, the involvement of the motor cortex was similar when action verbs were used literally or figuratively. In the second study, we were interested in examining whether the involvement of the motor system is limited to action verbs or would be extended to nouns with high motor content (e.g., hammer). Findings from the second experiment indicated that stimulation of primary and higher-order motor regions modulated both action verbs and manipulated nouns compared to non-action verbs and non-manipulated nouns. These findings would lead to the hypothesis that action verbs and manipulated nouns would be significantly impaired compared to non-action verbs and non-manipulated nouns in movement disorders such as Parkinson's disease (PD), wherein the motor system is substantially compromised. Indeed, converging evidence confirms this account by showing more impairments in action vs. non-actions verbs. However, fewer studies examined the effect of PD on naming manipulated vs. non-manipulated objects. In the third study, we demonstrated that the naming of manipulated objects was significantly impaired in PD compared to non-manipulated objects. Overall, these findings provide insight into the action language processing in the human brain and have translational implications.

Keywords: Neurostimulation, Action words, Parkinson's disease

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doi.org/10.30514/icss.25.0.32

The 1st International Conference on the Science of Language & the Brain
(SOLAB 2023) 3-5 MAY