LANGUAGE CYCLES
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WWR

Language Circle

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Individual differences in auditory-motor interactions shape speech processing

Temporal predictions from the motor system have been suggested to facilitate auditory perception. Given the inherent link between perception and production, the auditory and motor systems are tightly coupled during speech processing. In this presentation, I will share research in which we investigate whether individual differences in auditory-motor interactions affect speech processing, aiming to unveil mechanistic insights through behavioral, computational modeling, and Magnetoencephalography (MEG) approaches.

In a behavioral protocol, we observe that syllable discrimination performance is modulated by the stimulus phase, determined by a participant's own motor production rhythm. Remarkably, this finding is specific to a subgroup of the population exhibiting quantifiable speech auditory-motor synchronization. The observed pattern aligns with a neural oscillator model of speech segmentation, assuming a bidirectional interaction between auditory and speech motor cortices, but only if it incorporates individual differences in the strength of the auditory-motor connection. In a follow-up study, we find that auditory-motor synchronization strength correlates with rate discrimination performance, particularly at fast demanding rates, suggesting a potential contribution to auditory processing flexibility. Crucially, we find that auditory-motor synchronization strength also predicts continuous speech comprehension. Comprehension was, furthermore, predicted by the spontaneous speech production rate and the preferred auditory rate. Our neural data (MEG) are consistent with these behavioral observations. In summary, our findings offer insights into how characteristics of the auditory and motor systems shape speech processing.

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