Behavioral and neural patterns underlying self-other voice discrimination

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Abstract (max 300 words)

There is growing evidence showing that the representation of the human "self" recruits special systems across different functions and modalities. Compared to self-face and self-body representations, few studies have investigated neural underpinnings specific to self-voice. Moreover, self-voice stimuli in those studies were consistently presented through air and lacking bone conduction, rendering self-voice stimuli different to the self-voice perceived during natural speech. Accordingly, factors that contribute to self-voice perception and enable its discrimination from other familiar and unfamiliar voices remain largely unknown. In a series of four studies, we combined psychophysics, voice-morphing technology, and high-density EEG in order to identify perceptual and neural patterns underlying self-other voice discrimination (SOVD), both with air- and bone-conducted stimuli. We demonstrate that specifically self-other but not familiar-other voice discrimination improved for stimuli presented using bone as compared to air conduction. Furthermore, our data outline independent contributions of familiarity and acoustic processing to separating own from another's voice: although vocal differences increased general voice discrimination, self-voices were more confused with familiar than unfamiliar voices, regardless of their acoustic similarity. Finally, we identified a self-voice-specific EEG topographic map occurring around 345 ms post-stimulus and activating a network involving insula, cingulate cortex, and medial temporal lobe structures (Iannotti & Orepic, 2021). Occurrence of this map was modulated both with SOVD task performance and bone conduction. Specifically, the better participants performed at SOVD task, the less frequently they activated this network. In addition, the same network was recruited less frequently with bone conduction, which, accordingly, increased the SOVD task performance. Collectively, our findings show that concomitant vibrotactile stimulation improves auditory self-identification, thereby portraying self-voice as a fundamentally multimodal construct. This work could have an important clinical impact. Indeed, it reveals neural correlates of SOVD impairments, believed to account for auditory-verbal hallucinations, a common and highly distressing psychiatric symptom.

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References

Iannotti, G. R., Orepic, P., Brunet, D., Koenig, T., Alcoba-Banqueri, S., Garin, D. F. A., Schaller, K., Blanke, O., & Michel, C. M. (2021). EEG Spatiotemporal Patterns Underlying Self-other Voice Discrimination. *Cerebral Cortex*, bhab329. https://doi.org/10.1093/CERCOR/BHAB329