



Feel the beat and improve the groove

Multimodal rhythm perception in cochlear implant users

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Introduction

- CI users typically perform on par with normally hearing (NH) controls in simple rhythmic tasks [1].
- Perception of real-world musical rhythms is important for groove perception (the pleasurable desire to move to music).
- NH listeners prefer moving to music of medium rhythmic complexity, compared to high and low complexity. This relationship follows an inverted U-shape, reflecting a "sweet spot" [2].
- CI users may benefit from additional sensory input complementing the auditory signal from the CI [3].
- **Feeling the beat** through rhythm-specific electro-haptic stimulation (EHS) could **improve** CI users' perception of **groove**.



Contact

Can electro-haptic stimulation improve CI users' perception of rhythm and groove?

Methods

Primary experimental group

20 CI-users

Reference group

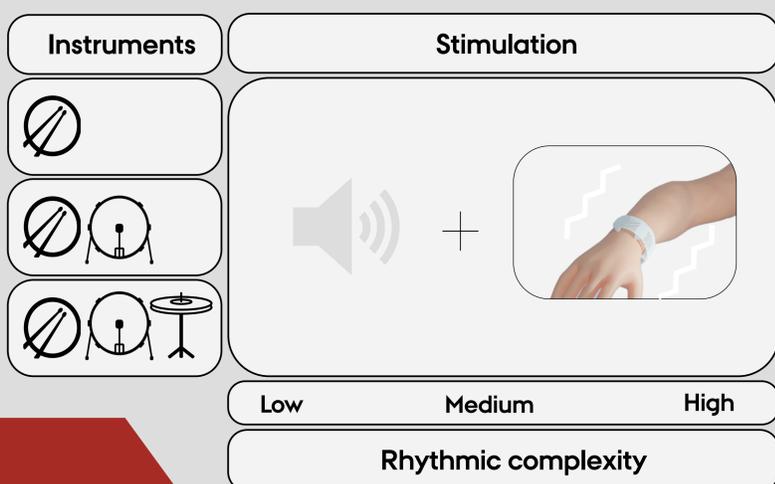
20 normally hearing controls

Stimuli

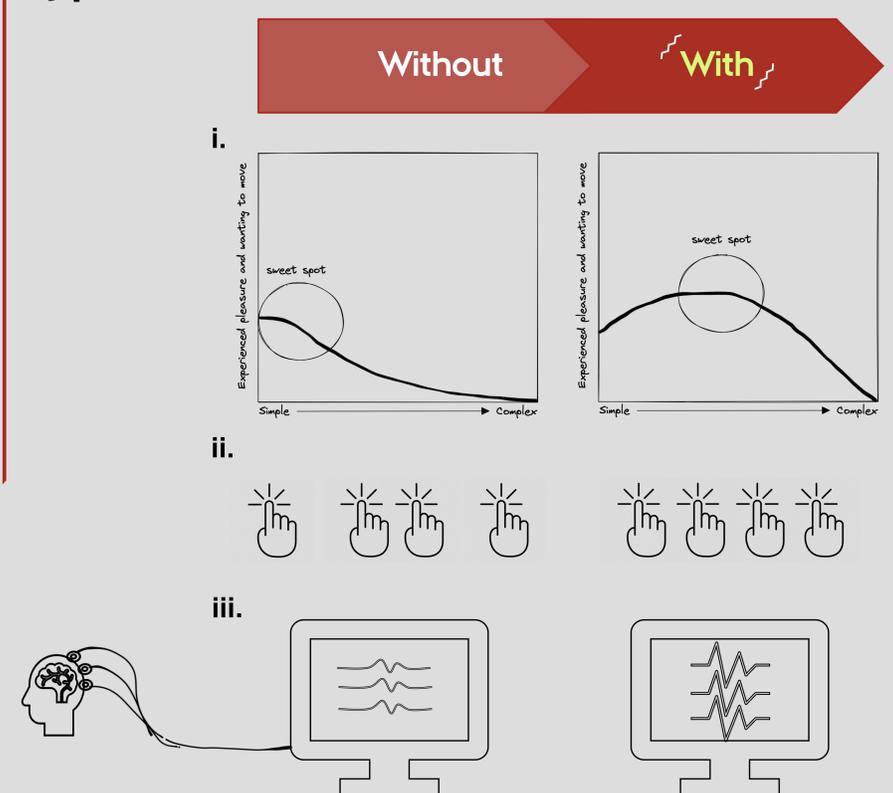
Drum-beats varying in rhythmic complexity and number of instruments.

Dependent measures

- "wanting to move" + "experienced pleasure"
- tapping along to the rhythm
- rhythm and groove perception indicators in EEG



Hypotheses



Quality of life ↑



References

- [1] C. J. Limb and A. T. Roy, "Technological, biological, and acoustical constraints to music perception in cochlear implant users," *Hear. Res.*, vol. 308, pp. 13–26, Feb. 2014, doi: 10.1016/j.heares.2013.04.009.
 [2] M. A. G. Witek, E. F. Clarke, M. Wallentin, M. L. Kringelbach, and P. Vuust, "Syncopation, Body-Movement and Pleasure in Groove Music," *PLoS ONE*, vol. 9, no. 4, p. e94446, Apr. 2014, doi: 10.1371/journal.pone.0094446.
 [3] M. D. Fletcher, "Using haptic stimulation to enhance auditory perception in hearing-impaired listeners," *Expert Rev Med Devices*, vol. 18, no. 1, pp. 63–74, Jan. 2021, doi: 10.1080/17434440.2021.1863782.

