Niyazi Arslan, Amanda Vecellio & Xin Luo
Auditory Implant Lab
College of Health Solutions
Arizona State University

Music Remixing Preferences of Prelingual and Postlingual Cochlear Implant Users

Introduction

Music appreciation through electric hearing in **postlingually deafened and implanted cochlear implant (CI) users** often faces limitations, given their prior acoustic-hearing experience. Research has shown that this group benefits from music preprocessing strategies such as remixing songs to attenuate instruments with rich harmonic structures (e.g., Buyens et al., 2014; Pons et al., 2016). However, the optimal adjustment levels in musical sources vary among individuals and studies. Prior research on music remixing primarily tested **postlingually deafened and implanted adult CI users**, whose preferences for remixed music may be shaped by their musical experiences with pre-implant acoustic hearing, in great contrast to CI-mediated music. On the other hand, **prelingually deafened and implanted CI users** formed their musical preferences solely through electric hearing, which may result in different responses to remixed music.

Aims and Hypotheses

The main purpose of this study was to fill the knowledge gap on music perception in general, and music remixing preferences in specific, of teenage and young adult CI users who were prelingually deafened and implanted.

- The **postlingual group** may prefer attenuation of background music relative to vocals, while the **prelingual group** may favor small or no modifications to the songs, possibly due to their higher musical sophistication scores.
- For individual songs and participants, higher levels of song familiarity may lead to higher preference ratings for the original songs.
- Lower levels of vocal pleasantness would result in higher preference ratings for vocals-attenuated versions but lower preference ratings for music-attenuated versions.

Key Findings

- Compared to the **postlingual group**, the **prelingual group** had higher musical sophistication scores and significantly different patterns of preference ratings for the remixed versions of Spotify's most streamed songs. The **prelingual group** preferred the Original and Music-6 versions the most but the Vocals-12 version the least, while the **postlingual group** preferred the Vocals-12 version over the Music-12 version.
- The **prelingual group** was significantly more familiar with the songs than the **postlingual group**. However, song familiarity did not significantly affect the patterns of preference ratings for each group.
- The **prelingual group** rated vocal pleasantness significantly higher than the **postlingual group**. Vocal pleasantness significantly influenced preference patterns in both groups. For the **prelingual group**, higher vocal pleasantness increased preference for the Music-12 and Music-3-3-12 versions. For the **postlingual group**, their overall preference for the Vocals-12 version was mainly driven by their preference ratings for songs with very unpleasant vocals.

Experimental Setup

Participants

Prelingually deafened and implanted teenage and young adult CI users
- Seven participants
- Ages at testing ranging from 13 to 24
- Ages at implantation ranging from 1 to 3

Postlingually deafened and implanted older adult CI users
- Nine participants
- Ages at testing ranging from 60 to 77
- Ages at implantation ranging from 39 to 59

Goldsmiths Musical Sophistication Index (Gold-MSI)

Question 5 out of 40

I am able to judge whether someone is a good singer or not.

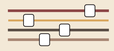
Completely Disagree | Strongly Disagree | Disagree | Neither Agree Nor Disagree | Agree | Strongly Agree | Completely Agree

Playlist

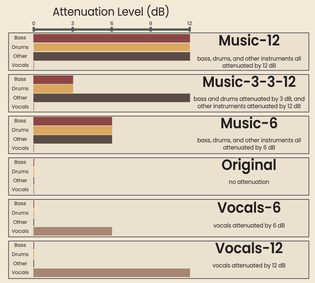
Blinding Lights — The Weeknd
Shape of You — Ed Sheeran
Cheap Thrills — Sia
Counting Stars — OneRepublic
Havana — Camila Cabello, Young Thug
Without Me — Halsey, Juice WRLD
Let Her Go — Passenger
Demons — Imagine Dragons
Do I Wanna Know — Arctic Monkeys
Drivers License — Olivia Rodrigo
Thank U, Next — Ariana Grande
Don't Start Now — Dua Lipa

3.40 — 4.40

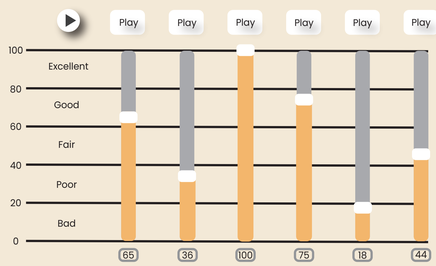
DEMUCS
Music Source Separation



Attenuation Level (dB)



webMUSHRA
web based Multiple Stimuli with Hidden Reference and Anchor (MUSHRA) test



Song Familiarity Rating

Vocal Pleasantness Rating

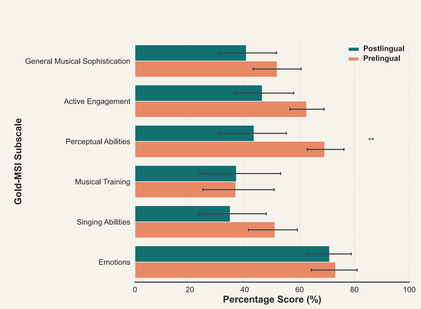
References

Buyens, W., Van Dijk, B., Moonen, M., & Wouters, J. (2014). Music mixing preferences of cochlear implant recipients: A pilot study. *International Journal of Audiology*, 53(5), 294–301. https://doi.org/10.3109/14992027.2013.873955

Pons, J., Janer, J., Rode, T., & Nogueira, W. (2016). Remixing music using source separation algorithms to improve the musical experience of cochlear implant users. *The Journal of the Acoustical Society of America*, 140(6), 4338–4349. https://doi.org/10.1121/1.4971424

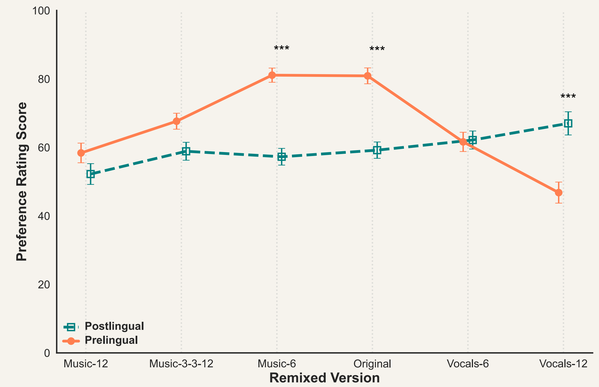
Results

Gold-MSI

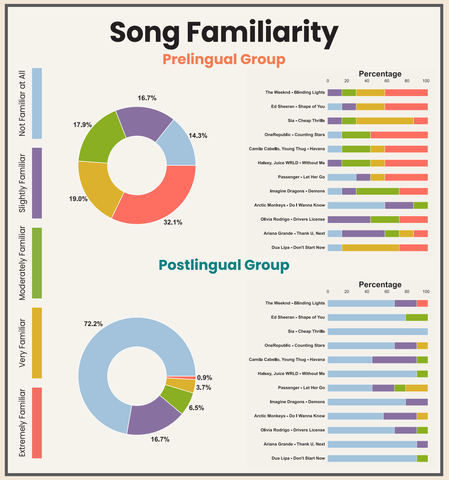


Asterisks indicate the level of statistical significance of the post-hoc pairwise comparisons
* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

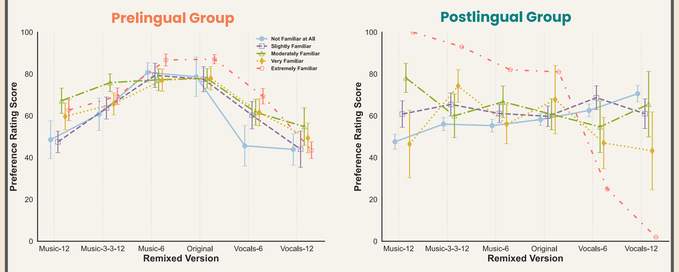
Musical Preference Ratings



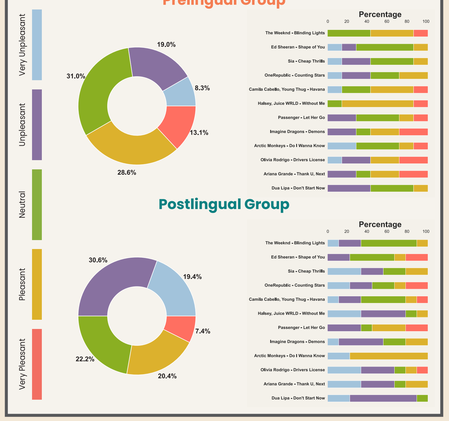
Song Familiarity



Musical Preference Ratings for Different Levels of Song Familiarity



Vocal Pleasantness



Musical Preference Ratings for Different Levels of Vocal Pleasantness