

NEURAL HEALTH MEASURES ARE CORRELATED WITH THE PLACE PITCH SENSITIVITY

BACKGROUND

Most cochlear implant (CI) users show great progress in speech recognition, but there are also patients who receive limited benefits from the device. An important factor that may contribute to the variable CI outcomes is the health of spiral ganglion neurons (SGNs). Different neural health measures have been shown to be correlated with the SGN density in animal studies. However, in human CI users, these measures were not correlated with each other and with speech recognition performance.

OBJECTIVE

This study investigated whether neural health measures have stronger correlations with local pitch sensitivity than with speech recognition performance, due to less involvement of top-down processing in temporal/place pitch discrimination than in speech recognition.

CONCLUSION

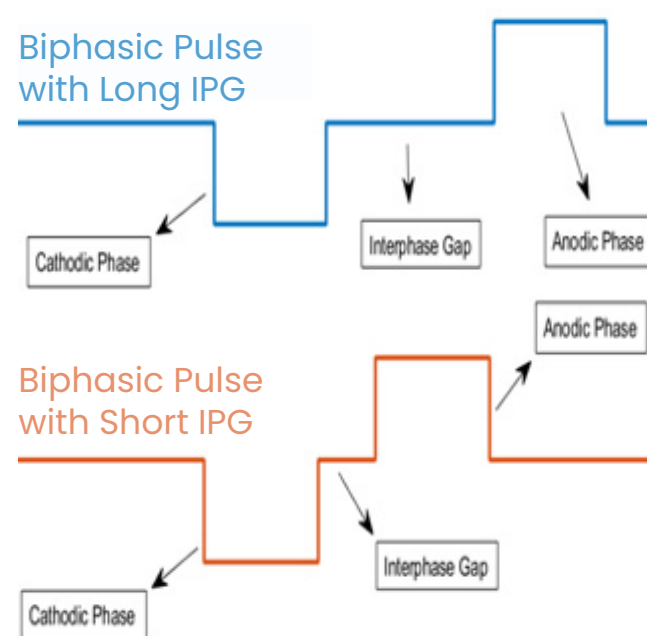
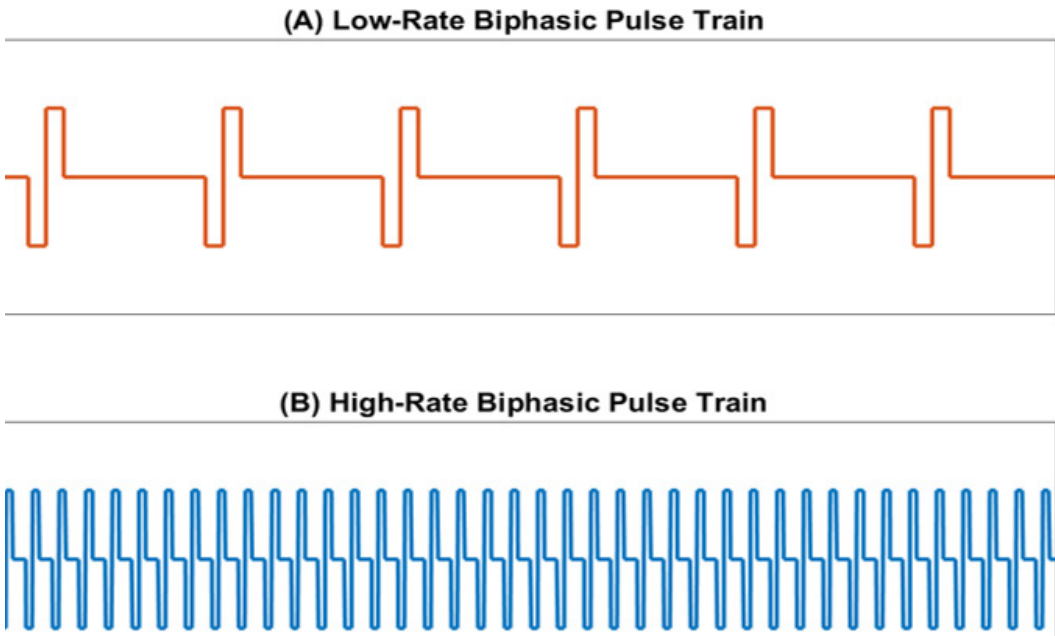
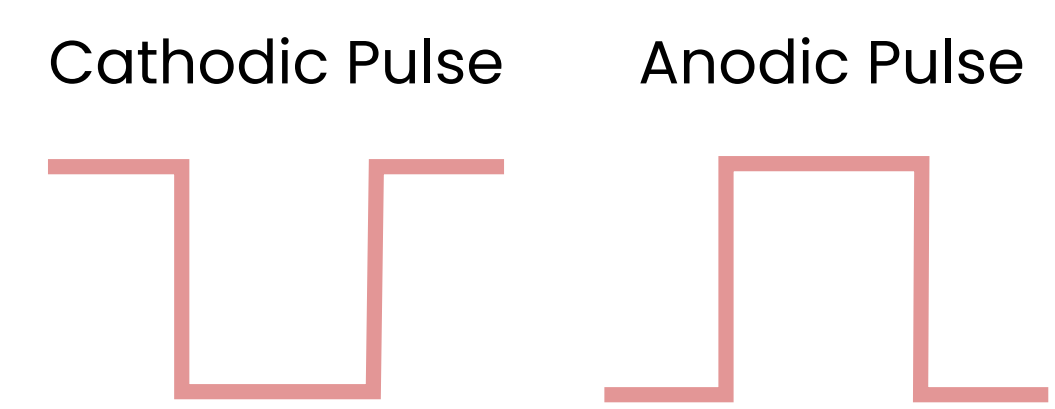
The primary question of the current study was whether neural health estimates correlate with place and temporal pitch ranking performance in human CI users. Correlation analyses showed that smaller IPG offsets of ECAP AGF were associated with poorer VCR thresholds. This finding may suggest that the central axon demyelination reflected by the IPG offsets of ECAP AGF may play an important role in the place pitch sensitivity of CI users.

Measures

Eight postlingually deaf adults took part in this study, and five electrodes were tested in each participant.



Neural Health Estimates

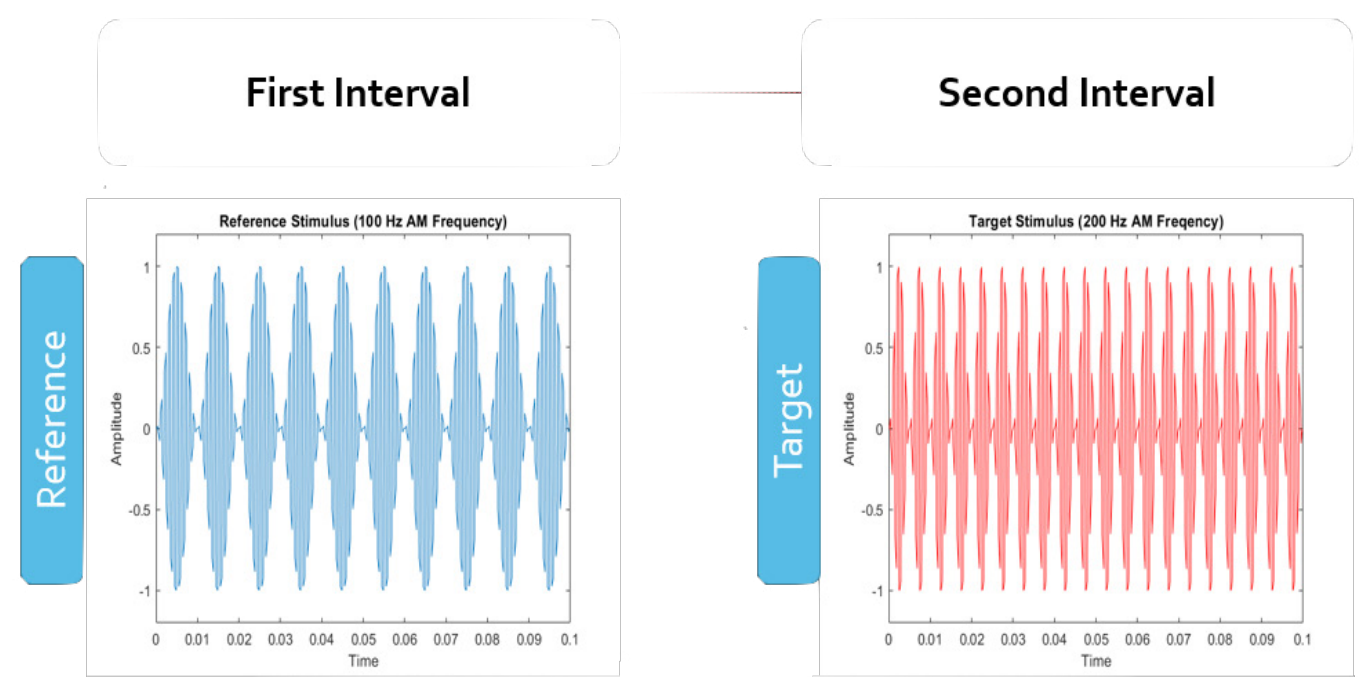


Polarity Effect (PE): Detection thresholds were measured using cathodic and anodic triphasic pulse to estimate neural health near the stimulation side.

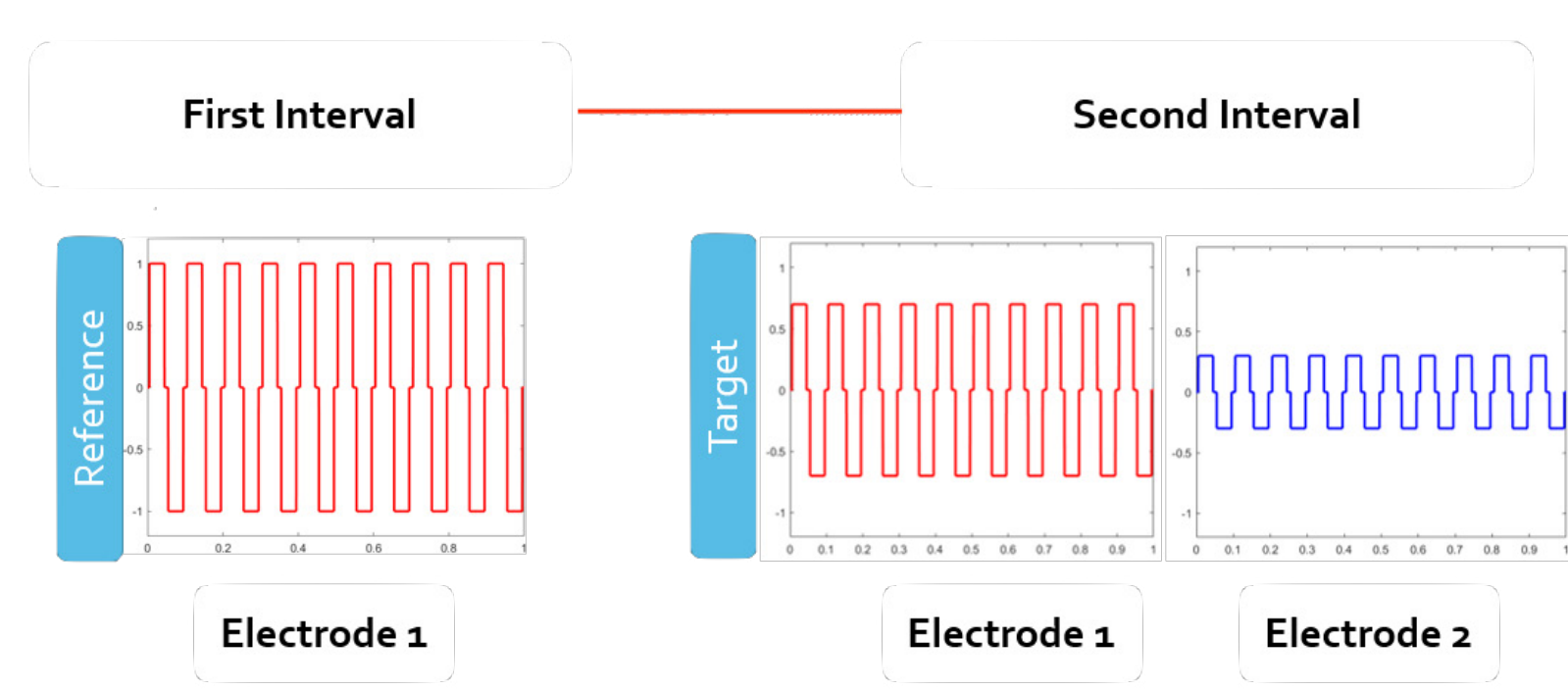
Multipulse Integration (MPI): Detection thresholds were measured with low rate and high rate biphasic pulse trains to estimate MPI slopes.

Interphase Gap (IPG) Offset of ECAP Amplitude Growth Function: ECAP responses were recorded by biphasic pulse trains with short interphase gap and biphasic pulse trains with long interphase gap.

Pitch Ranking Measures

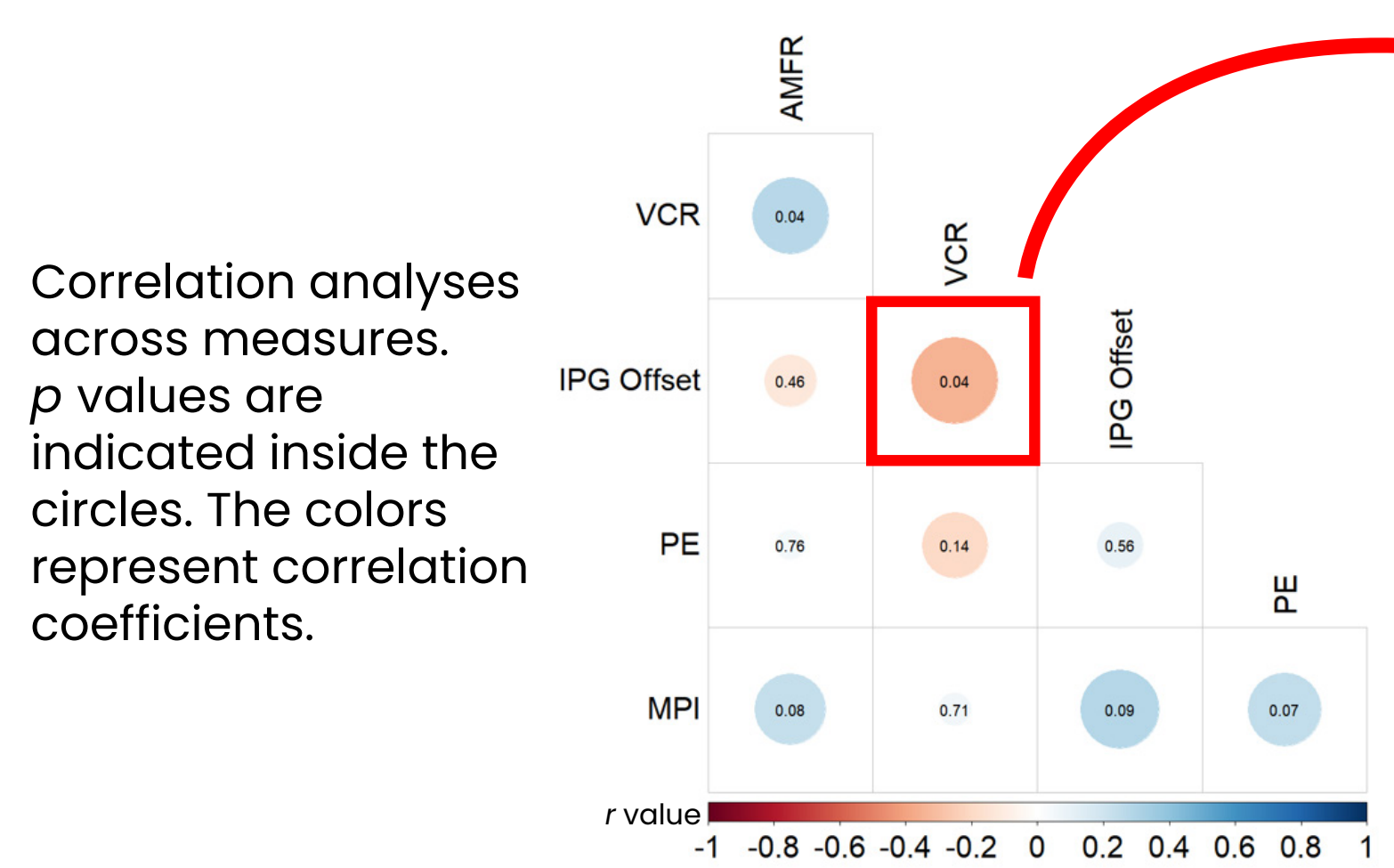


Amplitude Modulation Frequency Ranking (AMFR) : To measure the temporal pitch perception of CI users, an adaptive procedure was used to detect AMFR thresholds.

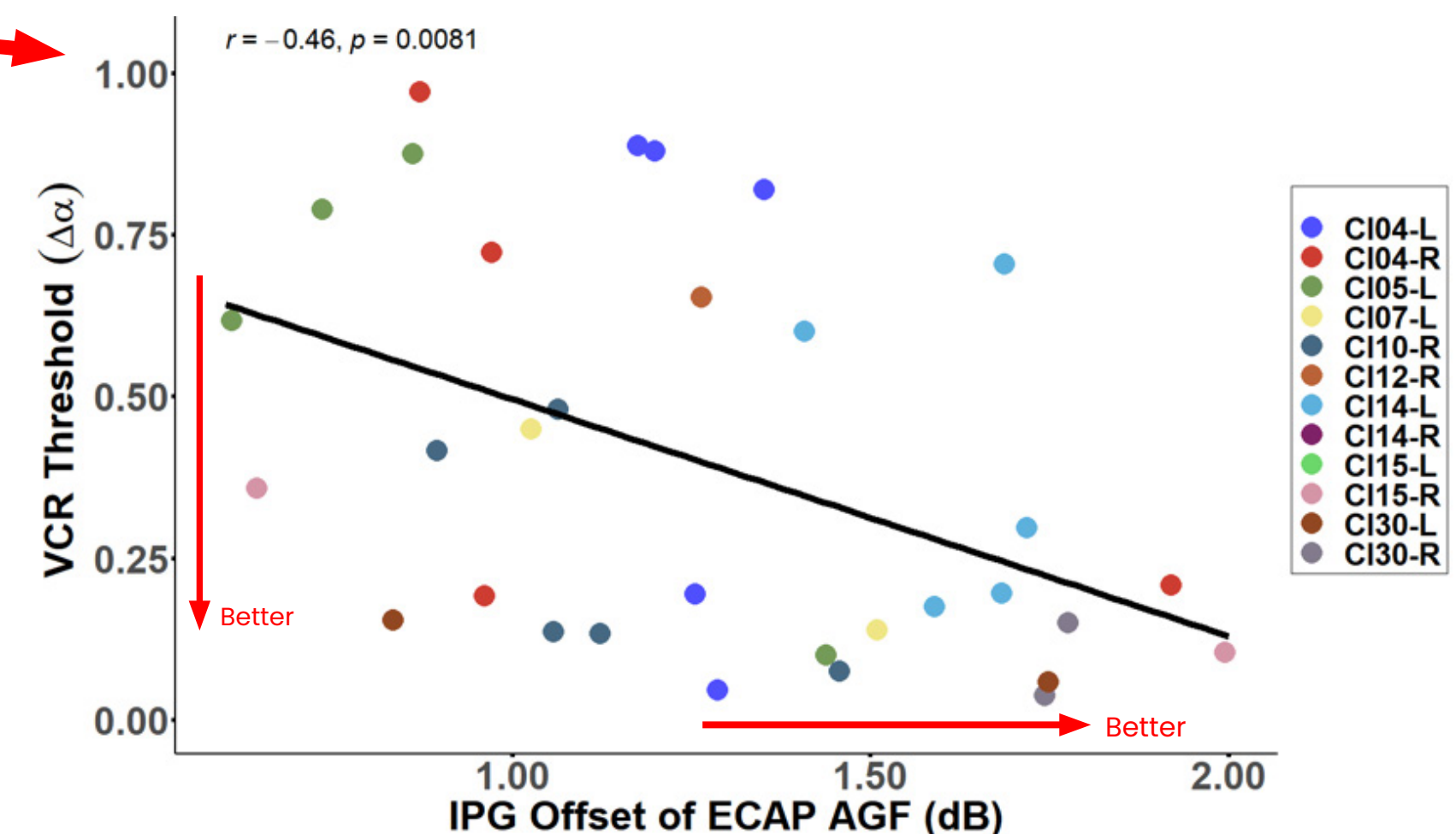


Virtual Channel Ranking (VCR): To measure the place pitch perception of CI users, an adaptive procedure was used to detect VCR thresholds.

Results



Correlation analyses across measures. *p* values are indicated inside the circles. The colors represent correlation coefficients.



The scatter plot of correlation analysis between VCR thresholds and IPG offsets after removing outliers.