Abstract
This retrospective cross-sectional investigation compared the audiovisual speech perception outcomes between two groups of adult cochlear implant (CI) users at the pre-implantation and the 1 year post-implantation intervals. The subgroups included 21 subjects with a sudden or rapid hearing loss and 23 subjects with a progressive hearing loss. Speech perception measures included words and sentences presented in quiet and noise as well as sentences in audio-only, visual-only and audiovisual conditions.

The scores on auditory-only and visual-only speech perception measures were generally similar between groups prior to and after CI. At the pre-implantation interval, CI users with sudden and rapid hearing loss exhibited less auditory and visual enhancement than CI users with a progressive hearing loss. This was not observed at the 1 year post-CI interval.

Our findings suggest that (a) the temporal onset of hearing loss may negatively affect the 1 year post-implantation auditory-only speech perception, (b) a progressive hearing loss does not facilitate the development of lipreading skills (c) progressive hearing loss conveys significant audiovisual benefits prior to implantation.

Introduction
Problem: The clinical outcomes of sudden sensorineural hearing loss are important and could be used to:
- Counsel CI candidates.
- Provide insight into the controversial origins of lipreading. Other studies have suggested that CI users with rapid hearing loss were included to supplement the scarcity of adult CI users with sudden hearing loss.

Hypotheses
A) Potentially reflecting decreased neuronal atrophy and cortical reorganization, the post-CI auditory-only performance of Sudden/Rapid users will exceed Progressive users (4, 7-9).
B) Sudden/Rapid and Progressive CI users will exhibit similar lipreading performance, confirming the findings of prior studies (3, 4).
C) Sudden/Rapid users will exhibit poorer auditory or visual enhancement of audiovisual speech perception when compared to Progressive users, reflecting the increased time for perceptual learning and multi-sensory integration.

Participants
Participants were postlingually deafened with an onset of hearing loss and age at implantation ≥12 years who used a multichannel CI device with full electrode insertion. Disorders that alter the electrophysiological interface and fluctuating or central hearing losses were excluded.

Definitions
- Sudden/Rapid Hearing Loss: ≥30 dB hearing loss averaged over 3 frequencies occurring within 5 years. Hearing must be stable for 5 years prior to sudden or rapid hearing loss.
- Progressive Hearing Loss: ≥30 dB hearing loss over 3 frequencies over a period >5y.

Hypothesis A: Differences in the efficiency of audiovisual speech integration between CI users with sudden or rapid hearing loss and CI users with progressive hearing loss may be later exploited to explain cortical processing differences in CI outcomes (5, 6).

Hypothesis B: No differences between the pre-CI visual-only scores of Sudden/Rapid vs. Progressive CI users.

Hypothesis C: Slowly declining auditory abilities increases the efficiency of incorporating audio and visual information to improve speech perception. This suggests that lipreading is not a skill acquired by adaptation to a slowly declining auditory input.

Hypothesis D: Slowly declining auditory abilities increases the efficiency of incorporating audio and visual information to improve speech perception. This suggests that lipreading is not a skill acquired by adaptation to a slowly declining auditory input.

Hypothesis E: Slowly declining auditory abilities increases the efficiency of incorporating audio and visual information to improve speech perception. This suggests that lipreading is not a skill acquired by adaptation to a slowly declining auditory input.

References