P143

AUDITORY OBJECTIVE MEASURES

Reliability of connectivity for the assessment of hearing perception in the cochlear implant recipients

Davide Brotto, Dolores Catelan, Margherita Pegolo, Gino Marioni, Nicole Galoforo, Flavia Sorrentino, Annibale Biggeri, Elisa Lovato, Cosimo De Filippis, Patrizia Trevisi

Abstract

- The cochlear implant (CI) is the gold standard treatment for profound hearing loss with insufficient hearing aid benefit [1].
- Standard tests using regular words and sentences as speech material showed a ceiling effect in patients with optimal perceptual abilities [2].
- The use of tests that exploit meaningless linguistic units (‘logatomes’) is useful to ensure greater accuracy and objectivity of outcomes in CI subjects [3] as nonword repetition is a complex phonological processing task in which the subject is asked to listen and then repeat meaningless words [4].
- The connectivity can be used in patients implanted for single-sided deafness (SSD) [5,6] or who have bilateral deafness characterized by significant asymmetry or who use bimodal aids [7] allowing selective CI stimulation without any involvement of the contralateral ear.

Clinical audiometer Madsen Astera2

Portable screening audio-impedance meter R15C

Cochlear™ Wireless Mini Microphone 2+

Objective

1. To assess the reliability of an auditory perception test in CI patients (with optimal auditory outcome), comparing the results of subjective audiometric tests (pure-tone and speech audiometry) obtained first with the regular method (i.e. in the audiometric booth), and then with direct streaming of the acoustic input to the CI processor

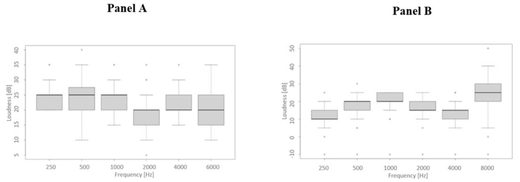
2. To analyze the use of an audiometric test using logatomes to carry out a more objective assessment of the perceptual abilities of the high-performing patients

Methods and Materials

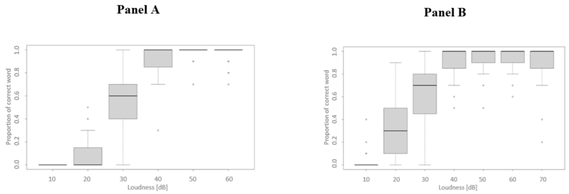
- **Study sample:** 32 patients with unilateral or bilateral severe-to-profound hearing loss rehabilitated with CI (brand Cochlear™), 100% speech intelligibility at 50 dB HL, ≥ 9 years of age
- **Data collection:** 32 CI patients underwent pure-tone and speech audiometry in two modalities: 1) in an audiometric booth and 2) via direct streaming to the processor using a connectivity system
- **Data analysis:** Correlation and concordance analyses were performed

Results

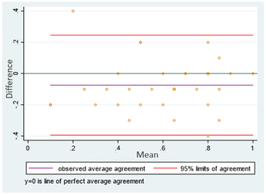
Pure-tone audiometry’s results with audiometric booth (A) and connectivity (B)



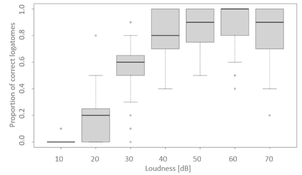
Speech audiometry’s results of bisyllabic words with audiometric booth (A) and connectivity (B)



Concordance between audiometric booth and connectivity at 30 dB HL (bisyllabic words)



Speech audiometry’s results of logatomes with connectivity



Conclusion

- **Pure-tone audiometry** showed a low correlation between the audiometry in the soundbooth and via connectivity and **speech audiometry** revealed a high correlation but a low concordance between the two instruments showing how connectivity should be considered as an additional assessment tool that can provide more information about the perceptual abilities of the hearing-impaired patient
- The use of **logatomes** could be useful for discriminating patients with high performances in terms of auditory outcomes and working memory
- The evaluation through **connectivity** showed better results in pure-tone and speech audiometry than those of regular audiometry in soundbooth suggesting the use of connectivity as an additional testing device

References

[1] Lenarz T. Cochlear implant – state of the art. GMS Current Topics in Otorhinolaryngology – Head and Neck Surgery; 16:Doc04 [Internet]. 2018 Feb 19 [cited 2024 Feb 20]; Available from: http://www.egms.de/en/journals/cto/2018-16/cto000143.shtml
[2] Gifford RH, Shallop JK, Peterson AM. Speech Recognition Materials and Ceiling Effects: Considerations for Cochlear Implant Programs. Audiol Neurotol [Internet]. 2008 [cited 2024 Feb 14];13(3):193–205. Available from: https://www.karger.com/Article/FullText/113510
[3] Boothroyd A, Nittrouer S. Mathematical treatment of context effects in phoneme and word recognition. The Journal of the Acoustical Society of America [Internet]. 1988 Jul 1 [cited 2024 Jul 5];84(1):101–14. Available from: https://pubs.aip.org/asa/article/84/1/101/956756/Mathematical-treatment-of-context-effects-in
[4] Rødvik AK, Von Koss Torkildsen J, Wie OB, Storaker MA, Silvola JT. Consonant and Vowel Identification in Cochlear Implant Users Measured by Nonsense Words: A Systematic Review and Meta-Analysis. J Speech Lang Hear Res [Internet]. 2018 Apr 17 [cited 2024 Feb 14];61(4):1023–50. Available from: http://pubs.asha.org/doi/10.1044/2018_JSLHR-H-16-0463
[5] Távora-Vieira D, Marino R. Re-training the deaf ear: Auditory training for adult cochlear implant users with singlesided deafness. Cochlear Implants International [Internet]. 2019 Sep 3 [cited 2024 Feb 14];20(5):231–6. Available from: https://www.tandfonline.com/doi/full/10.1080/14670100.2019.1603652
[6] Agostinelli A, Pegolo M, Montino S, Maritan F, Gambalonga M, Trevisi P, et al. Improving Auditory Perception in Pediatric Single-Sided Deafness: Use of Cochlear Implants’ Direct Connection for Remote Speech Perception Rehabilitation. Am J Audiol. 2023 Mar;32(1):52–8.
[7] Fitzpatrick EM, Carrier V, Turgeon G, Olmstead T, McAfee A, Whittingham J, et al. Benefits of auditory-verbal intervention for adult cochlear implant users: perspectives of users and their coaches. International Journal of Audiology [Internet]. 2022 Dec 2 [cited 2024 Jun 17];61(12):993–1002. Available from: https://www.tandfonline.com/doi/full/10.1080/14992027.2021.1993361

19›22 September 2024
Paris, France
CNIT Paris La Défense