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THÈME

Evolution of environmental sound perception in cochlear implanted children

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Introduction

Children born with severe to profound hearing loss have difficulty in perceiving meaningful environmental and vocal sounds. This can impair the development of various brain processes, impacting development as a whole: language, attention, memory, etc. (Kral et al 2016, 2017; Sharma et al 2005). Hearing loss gives rise to compensatory perceptual and cognitive strategies rarely evaluated in children due to ill-adapted tools.

The ”sensory room” (Lasfargues-Delannoy et al., 2024) assesses how children respond to meaningful vocal, instrumental and environmental sounds and meaningless visual stimuli in a naturalistic setting generating qualitative data on environmental sound perception.

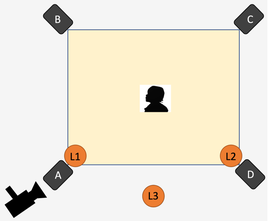
Objectives

1. Quantify auditory perception before and after cochlear implant (CI) over 12 months.
2. Define types of behavioral reactions in deafness and post-CI.

Materials and Methods

Population: 16 NHC (19 +/- 5 months) **and 14 DC prior CI** (17+/- 5 months) were included in a **12 month longitudinal study** (T0, T+3, T+6 and T+12 months**).**

DC realised T3, T6 and T12 post CI activation.

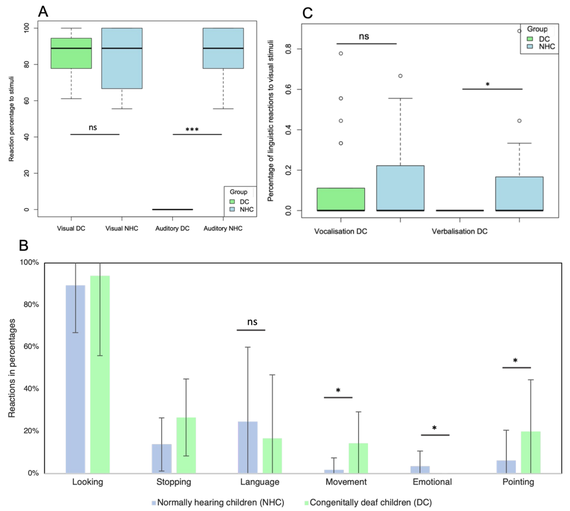


Task: Using the **« sensory room »** 18 environmental sounds and 9 visual stimuli were randomly generated through 4 speakers & 3 light sources.

Behavioural reactions to sounds (Looking, Stopping, Language Pointing etc) were coded and analysed over time.

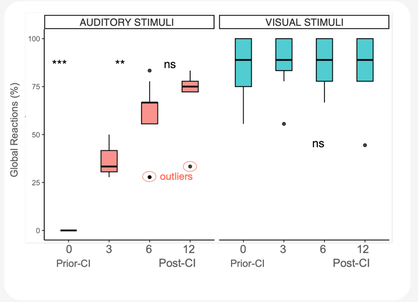
Results

DC prior CI vs NHC



- DC prior CI **do not** perceive environmental sounds but are **equally reactive** to visual stimuli than NHC.
- Deafness **generates significantly different behavioural reactions** to visual stimuli with increased movement and pointing and no verbalisation.

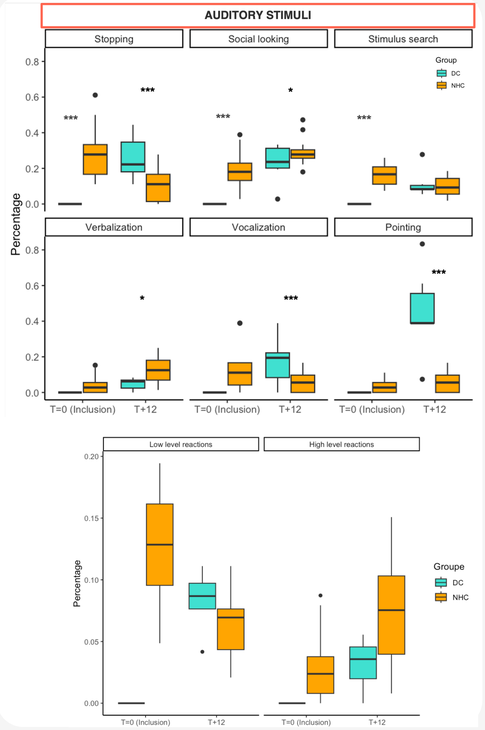
DC 12months post-CI vs NHC



- CI restores auditory function to NHC levels at 12 months post CI.

At 12 months post-CI, DC :

- **stop, point** and **vocalise** significantly more than NHC.
- Have **similar low-level reactions** (stopping, vocalising, searching) than NHC.
- Use significantly **less high-level reactions** than NHC (verbalisation, recognition).



Conclusion

- Prior CI, deafness engenders a cortical reorganisation that induces increased motor communication (pointing & movement) in DC than age matched NHC.
- Due to their deafness, DC invest only vocalizations as a linguistic output whereas age-matched NHC generated both vocalizations and verbalizations (high-level reactions).
- At 12 months post CI, the CI restores auditory function in DC enabling similar performances to NHC whilst behavioral reactional differences persist. The increased pointing could be a byproduct of rehabilitation and communication in deafness in coherence with the reduced social looking behaviors observed.

References

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