Vocal emotion recognition in children with cochlear implants: The EmoHI test for hearing-impaired populations

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Vocal emotion recognition is an essential part of oral communication. However, experimental stimuli are not always readily available or of good quality. The sound quality seems essential for testing hearing-impaired (HI) listeners, such as cochlear implant (CI) users for whom the audio signal is spectrotemporally degraded.

Hence, we developed a new vocal emotion recognition test with high-quality pseudospeech sound recordings that are suitable for testing HI listeners: the EmoHI test.

Research Objectives

Baseline performance measures

➡ To examine the age-related development in vocal emotion recognition in normal-hearing (NH) children during the school-age years as a baseline measure of performance on the EmoHI test.

➡ To study potential cross-language effects (Dutch vs. English listeners).

Suitability for HI listeners

➡ To examine the suitability of the EmoHI test for HI listeners by testing CI children.

The EmoHI Test

- Pseudospeech sentence productions from six speakers (3 male and 3 female Dutch speakers).
- Three core emotions: happy, sad, and angry.
  - Neutral emotions are also available, but these were not used in the current study.
- Visual feedback on the accuracy of responses.

Participants

- NH: 58 Dutch and 25 English children (4-12 yrs), and 15 Dutch and 15 English adults (18-30 yrs).
- CI: 14 Dutch prelingually deaf children (4-16 yrs)

Baseline NH results

- Overall improvement in performance as a function of age.
- Adult-like performance values were not reached by children of all tested ages on average.
- No differences across the tested languages.
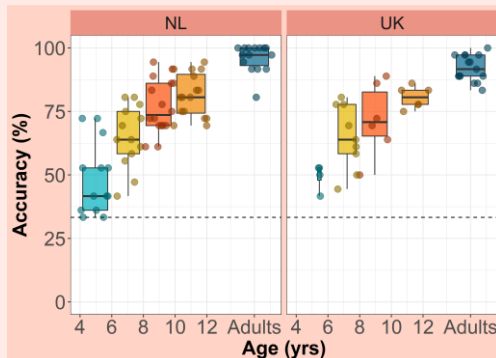
Results Dutch CI children

- All except one CI child performed above chance level (>33.3% correct).
- 7 out of 14 CI children performed within the NH age-appropriate range (however, always below the median), and 9 out of 14 CI children when re-adjusted for hearing age (age at CI implantation).
- High amount of variability in CI children's performance, ranging from ceiling (97.2%) to below chance-level performance (27.8%).
- Small trend for improvement as a function of age but less clear and consistent compared to NH children.
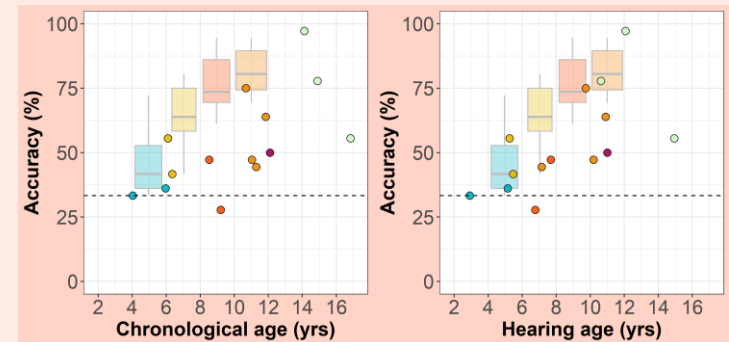
Take-home message

- NH: general improvement in performance with age beyond the school-age years. No differences across the tested languages, but performance may differ for phonologically more distant languages.
- CI: trend for improvement with age but not as consistent as for NH. Other factors than chronological age seem to heavily influence CI children's performance.

➡ The EmoHI test captures a wide range of age-related performances and seems suitable for testing HI populations, potentially also across different languages.

➡ The EmoHI test stimuli are publicly available via the Zenodo repository.

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