Perception of speakers vocal characteristics through cochlear implants

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Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Hearing disorders
Study type	Observational non invasive

Summary

ID

NL-OMON40018

Source ToetsingOnline

Brief title Speaker identity in CIs / SpIdCI

Condition

• Hearing disorders

Synonym deafness, hearing-loss

Research involving Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Groningen **Source(s) of monetary or material Support:** NWO

Intervention

Keyword: Aging, Cochlear implants, Hearing disorders, Speech perception

Outcome measures

Primary outcome

The primary outcome will be the difference in VTL between two speech sounds required for the participants to achieve a fixed level of performance. In other words, participants who can hear two speech sounds produced by two speakers with smallest VTL difference would most likely be good utilizers of this voice cue. These differences will be estimated by fitting psychometric functions to the measured scores as a function of VTL. Some of the planned experiments will provide normative data for the perception of this speech dimension in CI users, while other experiments will inform on the perceptual mechanisms involved in speech perception. The normative data for CI listeners will also be compared to that obtained in NH listeners.

Secondary outcome

Not applicable.

Study description

Background summary

Cochlear-implants (CIs), by stimulating electrically the auditory nerve fibres, can restore close to normal speech comprehension in most deaf patients,. However, CIs only allow good speech intelligibility in quiet environments and listeners* performance dramatically drops in noisy situations. When a normal-hearing (NH) listener is confronted with a number of speakers talking at the same time, they can use the perceived vocal characteristics of the speakers (such as the voice pitch or vocal tract length) to identify and segregate the competing speech streams. Unfortunately, some of the acoustic cues carrying the vocal characteristics are not properly transmitted by the implant. This is the case, for instance, for voice pitch, which is discarded due to the limitations of the implant, essentially at the electrode-nerve interface. This deficit partially explains the difficulty CI listeners have to understand speech in noise. However, some other vocal characteristics, such as the vocal-tract length of the speaker, are likely to be better preserved in the implant signal processing. This vocal characteristic determines to a large extent the perceived size of the speaker and is crucial for speaker discrimination. Despite their importance, it is not known if these acoustic cues could be transmitted through the CIs and be effectively used by CI users to improve speech perception in noise. We will, therefore for the first time, conduct a systematic study of the perception of this speech dimension in CI users. Better understanding of how vocal characteristics are perceived by CI recipients will allow improving speech enhancement strategies in the implant processors, which will help to increase the intelligibility of speech in adverse situations by CI users.

Study objective

The main goal of the study is to characterize the perception of vocal characteristics through a cochlear implant. It will span a number of aspects: psychophysical characterisation, its relation to speaker discrimination, its relation to single voice intelligibility, and its relation to competing voices segregation. The study focuses primarily on vocal-tract length (VTL) but another principal voice characteristic, glottal-pulse rate (GPR), will also be manipulated. The proposed project consists of 9 experiments spreading to 3 years.

Study design

The study is an observational study, with both within-subject and across-group comparisons. In all experiments of the study, a measurement variable is collected as a function of VTL (and GPR), manipulated parametrically. The subjects are presented with auditory stimuli and given a behavioural task. They then have to make a judgement and have to provide an answer on a computer screen. Thus, the measurement variables will be, in different experiments: percent-correct discrimination and percent-correct identification.

Study burden and risks

There is no known risk, nor benefit associated with participation. The test session will last for a maximum of 3 hours per listener, including breaks. Session duration can easily be accommodated on the request of the participant as needed. The sound level will always be adjusted to a comfortable listening level for the participant.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age

Adults (18-64 years) Elderly (65 years and older)

Inclusion criteria

- Age > 18
- Dutch native speaker
- No language disorder
- Good hearing for the healthy volunteers

Exclusion criteria

- Frisian native speakers
- For NH, pure tone average (PTA) higher than 25 dB HL in the best ear.

Study design

Design

Study type:	Observational non invasive
Intervention model:	Other
Allocation:	Non-randomized controlled trial
Masking:	Open (masking not used)
Control:	Active
Primary purpose:	Other

Recruitment

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NL	
Recruitment status:	Recruitment stopped
Start date (anticipated):	24-05-2013
Enrollment:	212
Туре:	Actual

Ethics review

Approved WMO	
Date:	11-04-2013
Application type:	First submission
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register CCMO **ID** NL42302.042.12