Nonsimultaneous Rapid Pulse Trains (RaPiT) with Current Steering for Loudness Integration as a Basis for a new Loudness Encoding Strategy in Cochlear Implant Subjects

Gepubliceerd: 08-09-2020 Laatst bijgewerkt: 13-12-2022

Nonsimultaneous current steered pulse trains will lead to a single pitch percept whilst reducing the amount of current in comparison to conventional monopolar stimulation

Ethische beoordeling	Positief advies
Status	Werving gestart
Type aandoening	-
Onderzoekstype	Interventie onderzoek

Samenvatting

ID

NL-OMON20838

Bron
Nationaal Trial Register

Verkorte titel
RaPiT

Aandoening

Hearing Impared

Ondersteuning

Primaire sponsor: Prof.dr.ir. J.H.M. Frijns
Overige ondersteuning: Advanced Bionics Corporation

Onderzoeksproduct en/of interventie

Uitkomstmaten

Primaire uitkomstmaten

To discover the optimal pulse characteristics for controlled loudness growth with rapid pulse trains leading to a single pitch percept and eventually towards understanding of speech.

We will create and evaluate loudness curves for multiple sequentially steered modalities. In the first stage, we will look at pulse characteristics for loudness balancing like pulse amplitudes at threshold level (TL) and most comfortable level (MCL), pulse width, amount of sequential pulses, interpulse interval (IPI) and physical space between stimuli for the different modalities.
In the second stage, we will evaluate loudness growth by matching and ranking the experimental modalities in comparison to monopolar stimulation (MP).

Toelichting onderzoek

Achtergrond van het onderzoek

Sequential current steering provides an alternate means of inducing loudness and pitch perception. Frijns et al. (2009) found similar excitation patterns between simultaneous and com-pensated sequential stimulation in a computational model. The comparison of simultaneous and non-simultaneous current steering reveals that a patient cannot perceive differences between a single large pulse and multiple spatially or temporally separated smaller consecutive pulses when the spatial offset and/or temporal delay is small. Presenting pulse trains instead of single biphasic pulses can increase loudness perception without the need to increase the total amount of current per pulse (Van Wieringen et al., 2006). With this principle, it is hypothesized that a pulse train of several small pulses spaced by means of current steering can be perceived as similarly loud as a single larger pulse. Loudness growth will be also greater when a pulse phase is not directly compensated by the opposite-polarity phase, as is the case with conventional biphasic pulses (Deeks et al., 2018). Therefore, we will also create pulse trains where the opposite-polarity phases of the concurrent pulses will follow after all cathodic phases have stimulated the auditory nerve fibers. Unpublished computational modelling work at our clinic has established these pulse trains as a viable option for inducing loudness. Optimal characteristics of these pulse trains in terms of number of sequential pulses, pulse phase duration, interpulse interval and interpulse distance are unknown. This study aims to find the optimal characteristics for pulse trains with sequential current steering for loudness integration in order to induce controllable loudness growth and the perception of a single percept.

Doel van het onderzoek

Nonsimultaneous current steered pulse trains will lead to a single pitch percept whilst reducing the amount of current in comparison to conventional monopolar stimulation

Onderzoeksopzet

Three test sessions will be conducted

Onderzoeksproduct en/of interventie

All subjects will undergo loudness balancing and loudness ranking procedures to objectively assess the loudness growth functions. Subjective assessment of sound quality will also be measured.

Contactpersonen

Publiek

LUMC
Nicolaas van Groesen

0715261179

Wetenschappelijk

LUMC
Nicolaas van Groesen

0715261179

Deelname eisen

Belangrijkste voorwaarden om deel te mogen nemen (Inclusiecriteria)

Adult CI users
Subjects with implantation of CI at least nine months prior to date of measurement
Subjects perform at least 70% at CNC speech test (consonant-noun-consonant) at last clinical measurement

Belangrijkste redenen om niet deel te kunnen nemen (Exclusiecriteria)

Subjects who are unable to complete a consecutive 3 hours of testing due to medical circumstances or otherwise
Subjects with severe tinnitus
Subjects with hyperacusis

Onderzoeksopzet

Opzet

Type:	Interventie onderzoek
Onderzoeksmodel:	Anders
Toewijzing:	N.v.t. / één studie arm
Blindering:	Open / niet geblindeerd
Controle:	N.v.t. / onbekend

Deelname

Nederland

Status:	Werving gestart
(Verwachte) startdatum:	04-10-2020
Aantal proefpersonen:	20
Type:	Verwachte startdatum

Voornemen beschikbaar stellen Individuele Patiënten Data (IPD)

Wordt de data na het onderzoek gedeeld: Nog niet bepaald

Ethische beoordeling

Positief advies

Datum:	08-09-2020
Soort:	Eerste indiening

Registraties

Opgevolgd door onderstaande (mogelijk meer actuele) registratie

Geen registraties gevonden.

Andere (mogelijk minder actuele) registraties in dit register

Geen registraties gevonden.

In overige registers

Register	ID
NTR-new	NL8909
Ander register	METC-LDD : P20.017 / NL72344.058.20

Resultaten