Musician effect in normal hearing children and prelingually deafened pediatric and adolescent/adult CI users.

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The objective of this study is to identify the effect of musical experience and training on the perception of speech in quiet and in noise, as well as on perception of music-related stimuli, such as, pitch, timbre, emotion and melody recognition, in...

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

Summary

ID

NL-OMON42039

Source
ToetsingOnline

Brief title
MuPeD

Condition

- Hearing disorders

Synonym
deafness, Hearing impairment

Research involving
Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Groningen
Source(s) of monetary or material Support: Ministerie van OC&W,ZonMw VIDI grant

Intervention

Keyword: Cochlear implant, Music perception, Musician effect, Speech perception

Outcome measures

Primary outcome

Investigate the effect of musical experience and training on the perception of speech in quiet and in noise, and music perception using pitch, timbre and melody and emotion recognition in normal hearing listeners and cochlear implant users. The main study parameters are the percentage correct scores on each test.

Secondary outcome

Not applicable

Study description

Background summary

Cochlear implants (CIs) are prosthetic devices that restore hearing in profound deafness. Improvements in device design have produced good speech understanding in quiet, but speech perception in noise and enjoyment and perception of music are still not satisfactory. This is a factor that could profoundly affect the quality of life for many CI users, as CU users rank music after speech perception, as the second most important acoustical stimulus in their lives.

In addition to potential benefits for quality of life, exposure to music or musical training may also pose specific benefits for speech and sound perception. In normal hearing (NH) listeners, long-term musical experience can change the sound representation in the auditory system. Enhanced subcortical and cortical representation of speech and brainstem encoding of linguistic pitch are observed with musicians. These findings suggest that there may be a shared neural basis for music and language processing. Perhaps as a result of this, long-term musically experienced NH adults understand speech in noise better than non-musicians do. This effect may even be more robust in children because of neuroplasticity. Auditory plasticity is stronger in children than in adults. Four years of musical training during childhood leads to more grey

matter volume in certain parts of the brain.
Our previous research, has shown that musical training in adult CI users may help them better perform in some specific tasks, such as better identification of emotion in spoken speech. However, this population only included postlingually deafened adult CI users. Also, a musician effect was shown in speech intelligibility in acoustic simulations of CIs; in one of the speech in noise conditions there was a significant, although limited, benefit for adult musician . However, this benefit was rather limited, again, when observed in the adult population.

In this project, we would like to follow up on our earlier research with two new populations. 1) We hypothesize that pediatric musicians may show better results in music and speech perception tasks than pediatric non-musicians with and without CI simulation. This because of the positive effects of musical experience on music and speech perception that we found in adults. Moreover we expect these results to be stronger in comparison to the adult musician population, because of and the stronger brain neuroplasticity of children. 2) We also expect to a musician effect in prelingual CI users and hypothesize that musical training may be beneficial in the prelingually deafened, CI users. Musical training could possibly lead to better music perception and better speech perception skills in this population, which is even more important for this population because of the limitations already present due to their CI device. This population is an unusual one, as the prelingual children acquire their speech language development through their CI. Additional benefits in music contour identification, emotion identification and in speech perception would add to their possibilities in communication. For the prelingual adult population, who acquired speech language development based on their normal hearing before they turned deaf during early childhood, or on residual hearing before it started deteriorating, the effects of musical training could be smaller also because of less plasticity. If such relations as improvement of speech and music perception due to musical experience indeed exist, this may lead to the recommendation to implement musical training in the revalidation program of CI users. Such training may be even more important for both pediatric and adult prelingual deafened CI users, as they develop their language skills totally or partially via the CI. The population of healthy pediatric normal-hearing partiicipants will be included as a control group for the test group, as they provide baseline data on normal developmental trajectory of the factors studied with the test groups. This way we will be able to see if the effects we see in the study are within the normal developmental range, or if they really come from other factors, such as hearing impairment. This control group will be tested with the same protocol.

Study objective

The objective of this study is to identify the effect of musical experience and training on the perception of speech in quiet and in noise, as well as on perception of music-related stimuli, such as, pitch, timbre, emotion and melody

recognition, in normal hearing pediatric listeners using non-processed acoustical stimuli and cochlear implant simulations, as well as in prelingually deafened pediatric and adult CI users. Further, for a comparison of CI children to normal-hearing children, the developmental trajectory of the normal-hearing children will be assessed with a younger and an older age group of participants.

Study design

Part I: Case-control study. The participants listen to acoustic stimuli and the perception is measured via percent correct scores per test.
Part II: Intervention study. Both groups of prelingually deafened CI users will be randomly divided between an a musical training group and a control group. Before and after the training, which takes place during 8 weeks with weekly training session of 1,5 hour, testing is performed. Speech perception in quiet and noise, melodic contour identification and emotion recognition was tested following the standardized test condition as also used in part I of this study proposal.

Study burden and risks

There is no know risks or benefits associated with the participation in the experiment. The two/three sessions last for about 2.5-4 hours, totaling to a max of 8 hours of testing. Adequate breaks are built into the experiment.
The minor modifications in testing time, setting, or screening come from the fact that we include younger children in the control group. For these younger children, these will be adjusted to fit their limited attention span, to provide the most optimal comfort to them, while also being able to collect data in the most reliable way. Also these children may be not tested with the entire set of experiments, but only with selected ones, again to accommodate for the age-related limits in attention span. Otherwise all test and control groups will be tested with the same protocol and methodology.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adolescents (12-15 years)
Adolescents (16-17 years)
Adults (18-64 years)
Children (2-11 years)
Elderly (65 years and older)

Inclusion criteria

• Test group 1: 25 musically trained healthy participants (start musical training before the age of 7 and with 5 or more years musical experience), 11 to 18 years of age, with normal hearing, native Dutch speakers
• Test group 2: 25 non-musically trained healthy participants (no formal musical training < 7 years ago before the testing),11 to 18 years of age, with normal hearing, native Dutch speakers
• Test group 3: 30 pediatric prelingually deafened CI users, native Dutch speakers
• Test group 4: 30 adolescent/adult prelingually deafened CI users, native Dutch speakers
• Control group: healthy participants, 175 in younger group (4 to 10 years of age), and 175 in older group (11 to 18 years of age), with normal hearing, native Dutch speakers. Musical training is not an inclusion criterion here, as the control group will provide baseline control data of a developmental trajectory to which the test data will be compared to.

Exclusion criteria

A history of neurological and psychiatric disorders
Other mother language than Dutch
Hearing impairment (only applicable in normal hearing participants)
Multiple handicapted (only applicable in prelingually deafened CI users);Only applicable for the younger population:

Developmental disorders
Cognitive disabilities
Multiple handicaps

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

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	05-09-2014
Enrollment:	160
Type:	Actual

Ethics review

Approved WMO

Date:	19-06-2014
Application type:	First submission
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)

Approved WMO

Date:	23-04-2015
Application type:	Amendment
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)

Not approved

Date:	23-04-2015
Application type:	Amendment

Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)
Approved WMO Date:	27-07-2015
Application type:	Amendment
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)
Approved WMO Date:	20-01-2016
Application type:	Amendment
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	ID
CCMO	NL49090.042.14