

Annual Report 2014

VU University Medical Center Amsterdam, The Netherlands

**Otolaryngology-Head and Neck Surgery
section Ear & Hearing**

Part of the EMGO Institute for Health and Care Research (EMGO⁺)
Program: Quality of Care



*fundamentally curious
knowledge makes us better*

VU University Medical Center Amsterdam, EMGO Institute for Health and Care Research
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www.emgo.nl

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Preface

We are pleased to present to you our Annual Report 2014. It provides a summary of the scientific activities and achievements made within the section Ear & Hearing of the department of Otolaryngology-Head and Neck Surgery at the VU University Medical Center in Amsterdam. The year 2014 has been a very productive year. This is not only evident from the list of articles published in 2014 (page 21), but also from our efforts in obtaining grants (page 29), which continued to be successful. In addition, most of our projects in 2014 involved longstanding collaborations with prestigious national and international research groups. These are described on page 31. Part of our success is attributable to continued collaborations with these groups and we are very grateful for their partnership.

One of the most noteworthy changes in 2014 was the expansion of our research group. A total of five new PhD/junior students started their trajectories. The new projects are marked by:  in this report, so that you can easily identify these and learn about their content.

An important achievement in 2014 was the formalization of the cross-campus collaboration Language and Hearing. Another occasion of significance was Prof. Sophia Kramer's inaugural lecture in September. These, and other successes, are described in this report. For each of the ongoing projects, the key research findings or highlights are personally presented by the principal researcher involved (pages 9-24). Further details about each of these, plus general information about our work, can be found on our website <http://www.ac-vumc.nl/onderzoek/onderzoek.htm>. Here you can also learn more about the research team.

The attentive follower of our work may have noticed that our name has changed in 2014. We are no longer called "Audiology". Instead we are now "Ear & Hearing". The most important reason for this change is that it better expresses the multidisciplinary nature of our research. In addition, it emphasizes the close relationship between Audiology and Otology which we are aiming to tighten even further in the coming years.

Finally, we are very thankful again with Marieke Pronk's editorial efforts in assembling this Annual Report and organising the layout. Please enjoy reading it!

<i>Prof. Sophia E. Kramer, PhD</i>	Professor Auditory Functioning and Participation, neuropsychologist
<i>Theo Goverts, PhD</i>	Medical physicist-audiologist, head University Audiological Center, senior researcher
<i>Cas Smits, PhD</i>	Medical physicist-audiologist, senior researcher
<i>Erik F. Hensen, MD, PhD</i>	ENT surgeon, senior researcher
<i>Paul Merkus, MD, PhD</i>	ENT surgeon, senior researcher

Staff

See picture next page.

Top row (from left to right)

- | | |
|------------------------|-------------------------------------|
| - Erik Hensen, MD, PhD | Otolaryngologist, senior researcher |
| - Maarten van Loon, MD | Resident ENT-surgery, researcher |
| - Marieke Pronk, PhD | Senior researcher |
| - Paul Merkus, MD, PhD | Otolaryngologist, senior researcher |
| - Mariska Stam, MSc | PhD student |
| - Hans van Beek, BSc | Technician |

Second row (from left to right)

- | | |
|------------------------------|-------------------------------|
| - Elske Bolk, MSc | Clinical linguist, researcher |
| - Lisette van Leeuwen, MSc | PhD student |
| - Arjenne Gussenhoven, MSc | PhD student |
| - Mirjam Boesch Hospers, MSc | PhD student |
| - Jana Besser, MSc | PhD student |
| - Adriana Zekveld, PhD | Senior researcher |

Third row (from left to right)

- | | |
|-------------------------|---|
| - Theo Goverts, PhD | Medical physicist-audiologist, head University Audiological Center, staff member, senior researcher |
| - Daphne Hobé, MSc | Research assistant |
| - Thomas Koelewijn, PhD | Senior researcher |
| - Sophia Kramer, PhD | Professor Auditory Functioning and Participation, neuropsychologist |
| - Tim Bost, MSc | Medical physicist-audiologist resident, researcher |
| - Elke Huysmans, MSc | PhD student, clinical linguist |

Fourth row (from left to right)

- | | |
|------------------------|--|
| - Cas Smits, PhD | Medical physicist-audiologist, staff member, senior researcher |
| - Barbara Ohlenforst | PhD student |
| - Yang Wang | PhD student |
| - Yvonne Simis, PhD | Medical physicist-audiologist, senior researcher |
| - Wiepke Koopmans, PhD | Medical physicist-audiologist, researcher |
| - Feike de Graaff | PhD student |
| - Joost Festen, PhD | Professor emeritus, medical physicist-audiologist |

Bottom row (from left to right)

- | | |
|---------------------------------|--|
| - Rachel Williams, MSc | Research assistant, audiologist |
| - Marre Kaandorp, MSc | PhD student, medical physicist-audiologist |
| - Peter Jan Laverman, MSc | Medical physicist-audiologist resident, researcher |
| - Marlies Klijn | Research assistant |
| - Eveline van Beeck Calkoen, MD | Resident ENT-surgery, researcher |
| - Niek Versfeld, PhD | Medical physicist-audiologist, senior researcher |
| - Krista Jansen, PhD | Medical physicist-audiologist resident, researcher |



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Auditory Functioning and Participation

Research under this section is divided into three domains:

- Epidemiology of Hearing
- Listening effort and Cognition
- Innovation and Evaluation of Hearing Health Care.



Sophia E. Kramer, PhD
Professor Auditory
Functioning and
Participation

HIGHLIGHTS

12-09-2014 Inaugural Lecture. Title: From another viewpoint looking at hearing and hearing loss. The lecture (in Dutch) is available on Youtube: https://www.youtube.com/watch?v=TYc3zwm_T6Q



“The inaugural lecture provided an opportunity to me to share the team’s achievements in research and our plans and ambitions for the future in each of the three research domains. It was great to present the lecture before an audience of representatives of the University, the general public, colleagues, research partners, friends and family.”

2014 Over the year, a total of **five new Ph.D. students** came to join our team. The students are from different disciplines and the positions are across the three research domains.

“Cross-linking between research domains and disciplines is what brings opportunities for obtaining new insights and creating a culture of innovation”

Collaboration on VU/VUmc campus with Language and Hearing

HIGHLIGHTS

Education After the successful Minor Course on “Child, Language and Hearing” (2013) we extended the cross-campus collaborate activities on language and hearing together with the Martine Coene and colleagues, Faculty of Humanities, VU. Next to the Minor and its guest lectures and research-projects, a Master-course was setup on disorders in Language and Hearing. Theo Goverts, Elske Bolk, Yvonne Simis, and Cas Smits contributed to the course program.

Research Furthermore we started a research consortium on speech input for children together with Phonak and the patient organisation FOSS.



Theo Goverts, PhD
medical physicist-
audiologist
head of University
Audiological Center

“Students of Universities of Amsterdam, VU University Amsterdam, Leiden, Utrecht, and Groningen participated in the highly rated new Master course.”

Technical support and development for the research group



Hans van Beek, BSc.
research technician

HIGHLIGHTS

March 2014

Audio experiments combined with pupillometry for the fMRI.

September 2014

Audio experiment software and pupil light reflex software developed for the European Listen project.

"I support many of the researchers in our department by programming software for their experiments and by helping them build their experimental set-ups. Further, I host the websites of the NL-SH study and that of the research department in general (see below)."

<http://www.ac-vumc.nl/onderzoek/onderzoek.htm>

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Introduction

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Hearing impairment is one of the most prevalent chronic conditions in the Netherlands, Europe and even worldwide. Due to the ageing of our societies, the number of adults with hearing loss in the Netherlands will increase from 14% in 2010 to 20% in 2025. People need to work longer and hence, the number of hearing impaired adults in the workforce will increase considerably.

The section Audiology at the department of Otolaryngology-Head and Neck Surgery is divided into two programs: a) Auditory Functioning and Participation in society and b) Speech Recognition and Clinical research in society. Research projects are embedded in the program Quality of Care of the Institute for Health and Care Research (www.emgo.nl).

Auditory Functioning and Participation includes three themes:

- i. Epidemiology**
Whereas there is ample evidence showing that hearing impairment may have serious adverse effects on older individual's *psychosocial health*, wellbeing and *societal participation*, relatively little is known about the *longitudinal effects* and the effects of hearing impairment in *young and middle aged adults* (18-65 year). These two topics are addressed in two large cohort studies: the Longitudinal Aging Study Amsterdam (LASA) and the Netherlands Longitudinal Study on Hearing (NL-SH). **Read more**
- ii. Listening effort & cognition**
Hearing impairment imposes a constant strain on *speech communication*. Many people with hearing loss struggle to hear in daily life, even with the best hearing aids available. Effort, concentration and the exploitation of *cognitive resources* to compensate for the loss are

Please visit our website for more info on our research!

Project: PredictEAR- Prediction of hearing help seeking and hearing aid uptake: Do new predictors and subgroup effects hold the key to success?



HIGHLIGHTS

April 2014 Start data collection: Clients from hearing aid dispensers and ENT patients were invited for the Hearing Aid Uptake (HAU) Study. GP patients, clients from hearing aid dispensers, and a subsample of the LASA cohort were invited for the Hearing Help Seeking (HHS) Study.

Participants were asked to:

- fill in a questionnaire
- do the digit triplet test in noise by telephone
- provide access to their audiogram (HAU study)
- participate in a telephone interview about their hearing aid uptake status 5 weeks (t1) and 4 months (t2) after baseline (HAU study)

Dec 2014 End of recruitment (HAU: n=385; HHS: n=197)



Marieke Pronk, PhD
senior researcher

Research Assistants:
Daphne Hobé, Rachel Williams

"The reasons why so few hearing-impaired older adults seek help or take up hearing aids are still largely unknown. In this project, we aim to identify the hearing-related, demographical, attitudinal, and social key predicting variables."

"I can't wait to start analysing the data. We are particularly curious about the variables that have never been investigated before, such as stage of hearing health behaviour change, self-efficacy of hearing aid use, technology use, and social participation. The results will give us valuable insight into the profiles and the possibly changeable assets of older adults currently not receiving the hearing care they may need."

Project: National Longitudinal Study on Hearing (NL-SH study) – second wave



Check out our newsletters for more highlights > www.hooronderzoek.nl

HIGHLIGHTS

May, October 2014 Conferences: World Congress of Audiology, Brisbane, Australia and the First International meeting on Internet and Audiology, Linköping, Sweden: At both conferences I gave an oral presentation about our longitudinal NL-SH results on change in speech recognition ability in adults over 5 years.

June 2014 Publication in International Journal of Audiology: Our manuscript entitled "Comorbidity in adults with hearing difficulties: Which chronic medical conditions are related to hearing impairment?" was published.

Autumn 2014 Embedded PhD-project granted: Our proposal called "The transition from normally hearing to hearing impaired: NL-SH third wave" was granted by EMGO⁺ as an embedded PhD-project.



Mariska Stam, MSc
PhD student

"My visit to this leading world congress was supported by a scholarship of the International Society of Audiology. I met so many researchers from all over the world, that was really exciting. In Sweden, we shared ideas about the opportunities of using Internet in Audiology."

"A key finding was that self-reported diabetes was significantly associated with poorer hearing ability, which supports previous evidence. However, in clinical practice the awareness for this connection has to grow."

"Longitudinal studies in hearing are scarce, and therefore we are proud that the NL-SH study will continue in the upcoming years. A 10-year follow-up measurement will be performed in the embedded PhD-project, referring to our strong collaboration with internal and external partners, both in academia and industry."

Project: Auditory and cognitive contributions to speech understanding in adverse conditions



*Jana Besser, MSc.
PhD student*

HIGHLIGHTS

07-2014 Article Accepted for publication: "Speech-in-speech listening on the LiSN-S test by older adults with good audiograms depends on cognition and hearing acuity at high frequencies", *Ear and Hearing*, 36(1), 24–41.

12-2014 Manuscript submitted to International Journal of Audiology

12-2014 PhD thesis submitted to examination board: "The connected Ear – Influences of Cognitive and Auditory-Temporal Processing on Speech Understanding in Adverse Conditions"

"We found that LiSN-S outcomes are poorer for normal-hearing people at older ages than for people up to the age of 60 years and that LiSN-S outcomes were influenced by combinations of auditory and cognitive factors."

"The pattern of suprathreshold (cognitive vs. auditory-temporal) contributions to speech understanding depends on the masking condition and hearing status."

"Auditory-temporal and cognitive processing, contribute to speech understanding in adverse conditions. The specific combination of factors determining the ability to understand speech in an adverse condition depends on the listener's age, their hearing status, the type of the masker, and the spatial configuration of the listening situation."

Project: The effect of top-down control of attention on speech perception and effort in adverse listening conditions

HIGHLIGHTS

01-2014 Publication in JASA: The influence of informational masking on speech perception and pupil response in adults with hearing impairment

03-2014 Publication in Hearing Research: The pupil response is sensitive to divided attention during speech processing



*Thomas Koelewijn, PhD
senior researcher*

"At the beginning of the year our study on the effect of different types of maskers and working memory capacity on speech perception and listening effort in people with hearing loss was accepted in JASA. This nicely wrapped up my previous project"

"I am in my second year of my VENI project which resulted in a nice publication in Hearing Research on the effect of divided attention on listening effort"

Project: "LISTening Effort in the European Population: A new innovative program of research and training" or LISTEN607373.



INSTITUTE OF PHYSIOLOGY
AND PATHOLOGY OF HEARING



Barbara Ohlenforst, MSc
PhD student



Yang Wang, MSc
PhD student

HIGHLIGHTS

April 2014 Kick-off meeting in Amsterdam

Discussion and design of Career Development plan for the first two years.

November-2014 First participant tested

After an extensive period of preparation and design of the experimental setup to measure the peak pupil dilation and the pupil light reflex, the recruiting and testing of adult participants with normal hearing and hearing impairment started in November 2014.

December 2014 Final search output for systematic reviews

The search output for two systematic reviews, from a thorough search of the literature, to provide a summary of previous relevant studies with the focus on i) hearing aid technology in combination with listening effort and ii) the pupillary light reflex in combination with hearing impairment.

"We found interesting differences in the measured pupil light reflex during our pilot test depending on the color and intensity conditions of the test stimuli."

"Fixed signal to noise ratios might provide similar intelligibility levels, but the amount of speech information might differ for every listener."

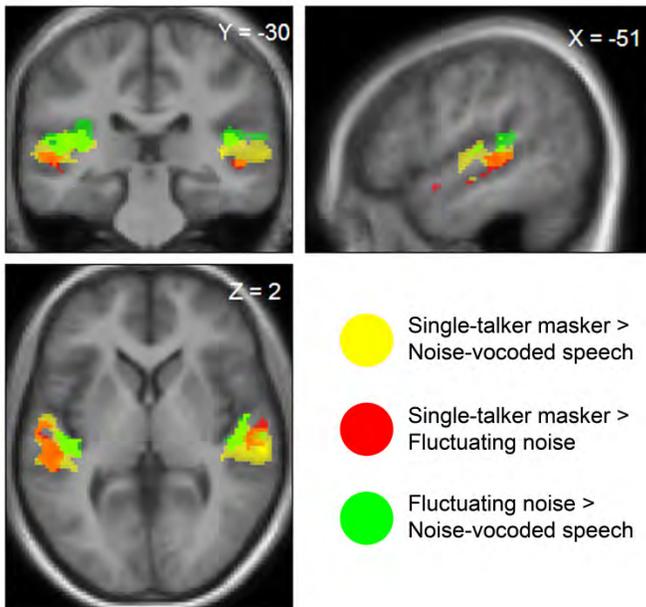
Project: What the eyes tell us about listening: The neural and cognitive correlates of pupil dilatation as measure of listening effort



*Adriana Zekveld, PhD
senior researcher*

HIGHLIGHTS

28-06-2014 Publication in NeuroImage: The eye as a window to the listening brain: Neural correlates of pupil size.



“This paper describes the results of a study in which young, normal hearing listeners performed a speech reception threshold test. We simultaneously acquired pupillometry and functional magnetic resonance imaging data. The data showed that the pupil response likely reflects the cumulative processing load required during listening. The processes reflected by the pupil likely include target-masker segregation and conflict processes.”

“The Figure on the left shows the effect of the type of degradation used to degrade the target speech on brain activation during listening. The activation map shows the result of the contrasts between speech masked by a single-talker masker and noise-vocoded speech (yellow areas), the activation evoked by the single-talker masker relative to fluctuating noise (red areas) and the activation evoked by fluctuating noise relative to noise-vocoded speech (green areas). The Figure is adopted from Zekveld et al., NeuroImage 101, 76-86.”

Project: Mismatch in the brain

29-04-2014 Publication in Frontiers in Neuroscience: Cognitive processing load during listening is reduced more by decreasing informational masking than by increasing spatial separation between target and masker speech

“The first part of this study revealed that although both gender and location differences between target and masker facilitate speech perception, only gender differences lower cognitive processing load. This once again demonstrates that the pupil response provides information about speech perception that complements performance data.”

Project: Improvement of the Amsterdam Inventory for Auditory Disabilities and Handicap (AIADH) in the new protocol for hearing aid prescription and reimbursement



Mirjam Boeschen
Hospers, MSc
Junior researcher

HIGHLIGHTS

February 2014 Start research project: Optimization of the Amsterdam Inventory for Auditory Disabilities and Handicap in the Dutch protocol for hearing aid description and reimbursement.

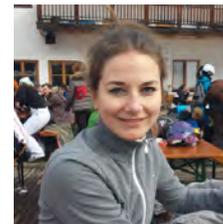
May 2014 The first meeting with stakeholders was organized: Stakeholders (e.g. patients, hearing aid dispensers, researchers, audiologists) were able to report their experiences with the use of the AIADH in the new protocol and suggest changes.

June - November Item Response Theory (IRT) analysis: We re-evaluated the psychometric properties of the AIADH using data of 2300 respondents from the National Longitudinal Study on Hearing (NL-SH).

“Collaborating with so many different stakeholders is interesting. It teaches me a lot about the different perspectives in the field of Audiology. The experiences with the questionnaire were analyzed and categorized to determine areas for improvement.”

“It is exciting to see the advantages of IRT. It allows examination of the reliability of each item of the AIADH separately, for any degree of subjective hearing ability. The results provide a basis for a more efficient and adaptive way of testing, namely Computer Adaptive Testing (CAT). A CAT creates an optimal test for each examinee, resulting in a short, but reliable test. This is one of the few studies in the field of Audiology using IRT”.

Project: Development of an integrated ICF intake for Otology and Audiology



Lisette van
Leeuwen, MSc
PhD student

HIGHLIGHTS

01-10-2014 Start PhD-trajectory: To develop an integrated method for mapping patients with hearing problems using a comprehensive and standardized approach based on the ICF Core Set for Hearing Loss.

End 2014 - 2015 First study: Patient record study, to gain qualitative insight into the current intake documents at the otology and audiology department, and how these contents relate to the International Classification of Functioning Disability and Health (ICF), specifically to the Core Sets for Hearing Loss.

“The ICF offers a framework for a comprehensive understanding of health and health-related states of adults with hearing loss”.

“To facilitate the use of the ICF in the otology/audiology setting, the Core Sets for Hearing Loss were developed. These Core Sets can be taken into account when conducting a comprehensive, multidisciplinary assessment.”

“The present project is part of the validation phase of the Core Sets for Hearing Loss through field trials.”

Project: Evaluation of the Vocational Enablement Protocol (VEP) for employees with hearing impairment: A cost-effectiveness study

HIGHLIGHTS

6-09-2013 Revised manuscript submitted: A process evaluation of implementing a protocol for employees with hearing difficulties in clinical practice.

6-11-2014 Submission of 4th manuscript: The effectiveness of a vocational enablement protocol for employees with hearing difficulties.

1-10-2014 Completion of the study: Hopefully the thesis defense can take place in 2015.



Arjenne Gussenhoven, MSc
PhD student

“Based on the process evaluation we concluded that the VEP has high fidelity. All steps of the protocol were accurately followed. On average, 31% of the recommendations provided by the VEP professionals were implemented according to the patients. Compliance rate was highest for hearing aid uptake (51%). Both employees and professionals were highly satisfied with the VEP.”

“Compared to Care as Usual, the VEP was not more effective for Need For Recovery at 12 month follow-up”. However, it was more effective in improving self-acceptance and for reducing the use of maladaptive behavior among hearing impaired employees. A great result as these are two essential elements of quality of life”

Project: Speech recognition and temporal resolution in listeners with unilateral hearing loss; intra- and inter-individual differences



*Tim Bost, MSc
medical physicist –
audiologist trainee*

HIGHLIGHTS

Spring 2014 Approval Medical Research Ethics Committee:

The MERC of VUmc has approved the research proposal and all documents involved.

Fall 2014 Programming experiments:

All experiments are programmed and beta versions are tested at the moment of writing. The expected start of measurements is February 2015.

“We want to find answers to questions like: Does the unaffected ear of a patient with unilateral hearing loss (UHL) perform as well good as the ear of a normal hearing listener?, and: Is there top-down compensation for a UHL, or does the abnormal ear also affect performance of the better ear?”

“In the end, we want to know what we should advise patients with UHL in terms of care.”

Project: Technical innovations for fitting and rehabilitation of adult CI users



*Feike de Graaff, MSc
PhD student*

HIGHLIGHTS

03-11-2014 Start PhD trajectory

End 2014 – early 2015 First study: Systematic review to investigate whether multiple programs are being used by hearing aid and CI users, and if these programs are properly used in specific listening environments.

“The fitting of a CI, the rehabilitation, the evaluation of progress during rehabilitation, and troubleshooting is a labour-intensive process. In this study, technical solutions will be developed, examined, and implemented to increase the efficiency of the process for both the CI team and patient. ”

Project: The influence of linguistic skills on speech understanding in noise



*Elke Huysmans, MSc
PhD student*

HIGHLIGHTS

January 2014 Publication in special issue of Lingua

‘Long-term effects of congenital hearing impairment on language performance in adults’

June 2014 Analysis of language samples completed

Thus permitting further data analysis to examine the relation between congenital or acquired hearing impairment, spoken language production and the abilities to understand speech in noise.

15-09-2014 Seminar for speech and language therapists

‘Long-term effects of congenital hearing impairment on linguistic skills’

“Moderate to severe congenital hearing impairment (MSCHI) affects morphosyntactic correctness of spoken language production in adults.”

“Speech and language therapists tend to train hearing impaired children mainly in the area of articulation, while morphosyntax is more vulnerable to deficits in the long term. A shift in focus is needed.”

Project: A detailed look at speech recognition in realistic dynamic listening scenarios

HIGHLIGHTS

Oct 2014 Workshop Moving Sounds and Moving Listeners

A two day workshop on the use of motion tracking and moving audio in hearing research was attended to gain inside on development of a real-time virtual auditory space.

Nov 2014 Realistic dynamic scenarios are identified

With input from the NVVS (Dutch Association for the Hearing Impaired) we identified realistic dynamic scenarios and made recordings in these situations.

Fall 2014 Recordings of realistic dynamic scenarios and analysis

Together with Steve Colburn, Hearing Research Center, Boston University, we recorded realistic dynamic scenarios and analyzed these recordings in terms of listening clues.



*Theo Goverts, PhD
medical physicist –
audiologist
head of University
Audiological Center*



*Krista Jansen, PhD
medical physicist –
audiologist trainee*

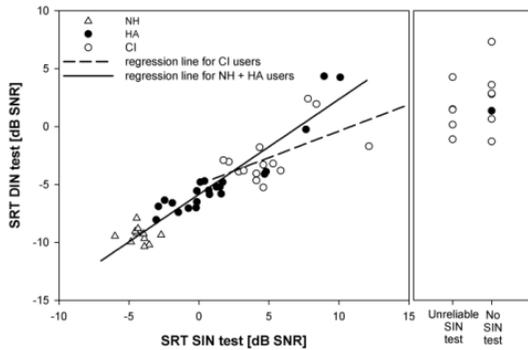
“In this project we aim to identify and characterize realistic dynamic scenarios in which speech communication takes place. We will investigate speech recognition performance in those realistic dynamic listening situations for individuals with normal and impaired hearing.”

Project: Prediction of speech recognition for cochlear-implant users

HIGHLIGHTS

August 2014 Online publication in international Journal of Audiology: Assessing speech recognition abilities with digits in noise in cochlear implant and hearing aid users.

November 2014 Submission of manuscript: The influence of lexical-access ability and vocabulary knowledge on different measures of speech recognition in noise



Marre Kaandorp, MSc
PhD student
medical physicist-
audiologist

“In the assessment of speech recognition in noise of aided hearing-impaired listeners with hearing aids or cochlear implants, the DIN test is a feasible, reliable and valid test.”

“Speech recognition in noise is related to lexical-access speed and to a lesser extend to vocabulary size for normal hearing listeners with various levels of proficiency in Dutch.”

Project: Determining normative data for the Digits-in-Noise test for children in complex acoustical conditions

HIGHLIGHTS

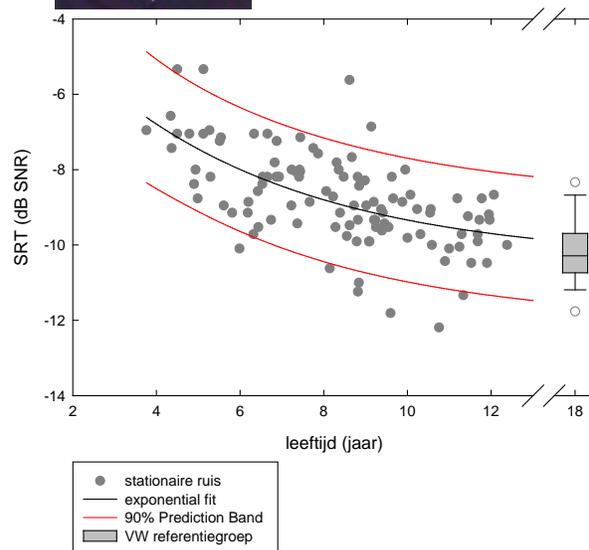
31-1-2014 NVA Presentation: We presented our results in a plenary session of scientific meeting of the Dutch Audiology Association. A manuscript is currently in preparation.

1-4-2014 Dissemination of normative data: Normative data were disseminated to audiological centers to aid clinical application of the DIN-test with children.

“Young children need a better signal-to-noise ratio for speech intelligibility in noise. They use fluctuations and spatial cues less effectively than adults”



Wiepke Koopmans, PhD
medical physicist-
audiologist



Project: Speech recognition in fluctuating noise, the influence of forward masking

HIGHLIGHTS

8-2014 Project start

12- 2014 Preliminary measurements: The measurements indicate that we will be able to quantify the influence of forward masking in fluctuating noise signals.



*Peter Jan Laverman, MSc
medical physicist –
audiologist trainee*

“We try to quantify the influence of forward masking in speech recognition in fluctuating noise. Forward masking is the effect where the hearing threshold is influenced by the masker when the masker signal has ended. Forward masking effects are larger for hearing impaired listeners, which results in poorer speech recognition abilities in fluctuating noise.”

“In a series of experiments we use a smart method to quantify the effect of forward masking in both fluctuating noise and speech recognition in fluctuating noise.”

Project: Equivalence of the Dutch and American-English digits-in-noise (DIN) test

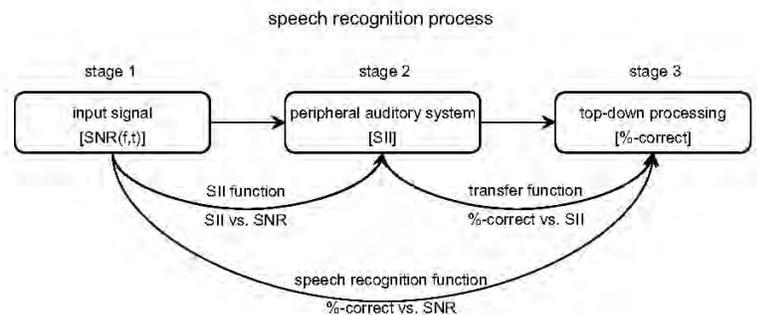
07- 2014 Submission to the International Journal of Audiology

*Cas Smits, PhD
medical physicist-audiologist*

“The Dutch Digits-In-Noise test (NL DIN) and the American-English version (US DIN) are speech-in-noise tests for diagnostic and clinical usage. The present study investigated group differences between NL DIN and US DIN speech reception thresholds (SRTs) in steady-state noise and interrupted noise for monaural, diotic and dichotic listening conditions.”

Project: The interpretation of speech reception threshold data

Following previous work [Smits and Festen (2011, 2013) J. Acoust. Soc. Am.] involving the interpretation of speech reception threshold (SRT) data in steady-state noise and fluctuating noise, in a new study CI and vocoded speech were considered.



Projects:

- Cochlear implantation in non-standard cases
- Head and neck paragangliomas
- Evaluation of the etiology of congenital sensorineural hearing loss

HIGHLIGHTS

March 2014 Grant:

Stichting het Heinsius Houboldt Fonds Stipendium. Personal Grant for the advancement of neurotology in the Netherlands.

March 2014: Invited speaker:

Otorhinolaryngological Research Society Meeting Royal College of Surgeons, London, United Kingdom.

July 2014: Publication in Head and Neck:

Genetics of hereditary head and neck paragangliomas. Boedeker CC, Hensen EF, Neumann HP, Maier W, van Nederveen FH, Suárez C, Kunst HP, Rodrigo JP, Takes RP, Pellitteri PK, Rinaldo A, Ferlito A.

Oktober 2014: Publication in Otology and Neurotology:

The addition of a contralateral microphone for unilateral cochlear implant users: not an alternative for bilateral cochlear implantation. Van Loon MC, Goverts ST, Merkus P, Hensen EF, Smits C.

November 2014: Publication in Otology and Neurotology:

Stapedotomy in cochlear implant candidates with far advanced otosclerosis: a systematic review of the literature and meta-analysis. Van Loon MC, Merkus P, Smit CF, Smits C, Witte B, Hensen EF.



Erik F. Hensen, MD PhD
ENT surgeon
senior researcher

“In selected cases of profound hearing loss, an ‘old’ and relatively simple technique such as stapedotomy may be more effective than the nowadays widely used advanced, complex and costly technique of cochlear implantation.”

“In patients with hearing loss or tinnitus due to the rare condition of paraganglioma, genetic analysis is of paramount importance. Especially in the Netherlands, hereditary variants are prevalent and the causative gene directs clinical decision making.”

Projects

- Cochlear implantation in adults with asymmetric sensorineural hearing loss.
- Stapedotomy in cochlear implant candidates with far advanced otosclerosis



Maarten van Loon, MD
researcher
resident ENT-surgery

HIGHLIGHTS

21-06-2014 Oral Presentation: Cochlear implantation in adults with asymmetric sensorineural hearing loss, 13th International Conference on Cochlear Implants, Munich, Germany.

12-2014 Publication in Otology & neurotology: Stapedotomy in cochlear implant candidates with advanced otosclerosis: a systematic review of the literature and meta-analysis.

“Cochlear implantation is a successful method to rehabilitate subjects with asymmetric sensorineural hearing loss. Bimodal stimulation results in increased speech recognition abilities, speech recognition in noise, spatial speech recognition as well as increased, localization abilities.”

“Stapedotomy can achieve excellent results in patients with far advanced otosclerosis. We therefore feel that a stapedotomy should be performed before cochlear implantation. A second contralateral stapedotomy can further increase the outcome as it restores binaural hearing.”

Cochlear implantation in adults with asymmetrical sensorineural hearing loss
 MC van Loon, C Simba, SJ Goverts, CHJM Simst, CP Huisman, P Mathew
 Department of Otolaryngology – Head and Neck surgery, VU University Medical Center, Amsterdam, the Netherlands

Introduction
 In the Netherlands, the criteria for cochlear implantation (CI) have changed over the years. Currently, adults with speech recognition scores below 20% are considered candidates for CI (measured using CVC words at 60 dB SPL in the best aided condition). Patients with a functionally deaf ear and moderate-to-severe contralateral hearing loss (SNHL) in the contralateral ear are non-standard candidates for CI. These patients could benefit from a CI in their deaf ear for speech recognition in noise, localization abilities, and music perception. This study aimed to investigate the benefits of CI in a group of adults with asymmetric hearing loss.

Methods
 Patients were enrolled if they demonstrated speech recognition scores of 20% in their worse ear and 60-80% in their best ear. Patients had a postlingual onset of their hearing loss and less than 20 years of auditory deprivation. Seven adults participated and received an bilateral Medtrac cochlear implants in their worst hearing ear. Patients were evaluated with their CI alone, with hearing aid alone and with both CI and hearing aid (i.e. bimodal stimulation). Evaluations were made preoperatively and at three, six and twelve months after CI. The test included: pure-tone audiometry, speech recognition in quiet, speech recognition in noise, spatial speech recognition in noise, sound localization, music perception and quality of life questionnaires. The preliminary results of speech recognition at three (preCI) and six months (preCI) are presented as well as an example of the increase in localization abilities using bimodal stimulation.

Results
 Before CI, the aided speech recognition on the deaf side was 0% for all patients; the average speech recognition in the best ear was 70% (Figure 1). In the implanted ear, CI resulted in average speech recognition scores of 70% and 70% after three and six months, respectively. Bimodal stimulation further increased speech recognition to 80% (three months) and 85% (six months). Figure 2 illustrates that CI resulted in lower SRTscores in all listening conditions. Bimodal stimulation also led to an improvement in localization abilities in an individual patient, as shown in Fig. 3.

Conclusion
 The preliminary results of this study demonstrate that CI in adults with asymmetrical SNHL results in an increase in speech recognition in quiet, but especially in noise and spatial and localisation abilities. Hence, CI appears to be a successful method to rehabilitate subjects with asymmetric SNHL. It seems that the standard criteria for CI are too stringent for persons with asymmetrical hearing loss.

Projects

- **Implications for Cochlear Implantation (see van Loon)**
- **Otology Questionnaire Amsterdam (OQUA)**
- **Oto-audiologic intake in a ICF model (see van Leeuwen)**
- **Supporting Hearing in Elderly Citizens (see de Graaff)**



*Paul Merkus, MD, PhD
ENT surgeon
senior researcher*

HIGHLIGHTS

January 2014 First VUmc International Otology Course, Amsterdam: Otology Class for Young ENTs

Seventy-five ENT residents and specialists participated in a two day course in the heart of Amsterdam. Interactive sessions with an international group of well-known teachers.

March 2014 Flemish-Dutch Otologic Conference

VUmc hosted the 24nd version of the Flemish-Dutch Otologic Conference in the Royal Tropical Institute in Amsterdam.

December 2014 ZonMw Grant Multicenter Cost-effectiveness project.

The application of a 4 year multicenter project: *Cost effectiveness of follow-up with diffusion-weighted MRI versus 2nd look surgery after primary cholesteatoma treatment* has been positively judged by ZonMw.

The project will start in 2015 [Merkus VUmc and Pauw, Erasmus are co-leaders]

December 2014 International CI Book Completion

"Surgery for Cochlear Implantation and other Auditory Implants" authors: Sanna, Merkus, Free, Falcioni in a Thieme world-wide educational full color book. [market release 2015]

"This year, new ideas and our international and national reputation lead to new projects.

First a new international course (Otology Class) which was organized and will be held each year in a different European city (2014 Amsterdam, 2015 Madrid)"

"VUmc was asked to host the Flemish-Dutch top-otologist conference and had a successful gathering in Amsterdam. The Dutch ENT society asked Pauw and Merkus to send in an application for a ZonMw grant concerning multicenter Cost-effectiveness project. Already 20 centers have agreed to join and start in 2015."

"New and ongoing PhD projects had a constructive year: Maarten van Loon, has published two new papers and will defend his thesis in 2015. Lisette van Leeuwen has made a promising new start in the ICF Oto-audiologic intake project. Feike de Graaf has started her European project on Supporting Hearing in the Elderly Citizens. Eveline van Beeck Calkoen has constructed a firm scientific basis and has written the first paper for her Congenital Hearing Loss project."

Publications

- (1) Boedeker CC, Hensen EF, Neuman HP, Maier W, van Nederveen FH, et al. Genetics of hereditary head and neck paragangliomas. 2014. *Head and Neck-Journal for the Sciences and Specialties of the Head and Neck*, 36, 907-916.
- (2) de Hon M. Meelopen met KNO arts Paul Merkus. 2014. *I.O .Magazine*, 11, 20-23.
- (3) Granberg S, Pronk M, Swanepoel, DW, Kramer, SE; Hagsten H, et al. The ICF core sets for hearing loss project: Functioning and disability from the patient perspective. 2014. *International Journal of Audiology*, 53, 777-786.
- (4) Huysmans E, de Jong J, van Lanschot-Wery JH, Festen JM, Goverts ST. Long-term effects of congenital hearing impairment on language performance in adults. 2014. *Lingua*, 139, 102-121.
- (5) Kilman L, Zekveld A, Hallgren M, Ronnberg J. The influence of non-native language proficiency on speech perception performance. 2014. *Frontiers in psychology*, 5, 651.
- (6) Koelewijn T, Shinn-Cunningham BG, Zekveld AA, Kramer SE. The pupil response is sensitive to divided attention during speech processing. 2014. *Hearing research*, 312, 114-120.
- (7) Koelewijn T, Zekveld AA, Festen JM, Kramer SE. The influence of informational masking on speech perception and pupil response in adults with hearing impairment. 2014. *Journal of the acoustical society of America*, 135, 1596-1606.
- (8) Kramer SE, Pronk M, Smits C, Stam M. Gehoorstoornissen. 2014. Web publication. *Nationaal Kompas Volksgezondheid\Gezondheidstoestand\Ziekten en aandoeningen\Zenuwstelsel en zintuigen\Gehoortoornissen*. <<http://www.nationaalkompas.nl>>
- (9) Kramer SE. Vergroot uw woordkennis: pupillometrie. 13 September 2014. National newspaper. *de Volkskrant*, appendix Sir Edmund.
- (10) Kramer SE, Stam M. Meedoen aan het Nationaal Hooronderzoek loont! 2014. Magazine. *Horen, Feb/March*, 32-33.
- (11) Kramer SE. Gehooronderzoek? Ook naar de ogen kijken. 2014. Magazine. *Horen, Dec*, 10-11.
- (12) Merkus P, Di Lella F, Di Trapani G, Pasanisi E, Beltrame MA, et al. Indications and contraindications of auditory brainstem implants: systematic review and illustrative cases. 2014. *European Archives of Oto-Rhino-Laryngology*, 271, 3-13.
- (13) Pronk M, Deeg DJH, Smits C, Twisk JW, van Tilburg TG, Festen JM, Kramer SE. Hearing Loss in Older Persons: Does the Rate of Decline Affect Psychosocial Health? 2014. *Journal of aging and health*, 26, 703-723.
- (14) Pronk M, Sant N, Kramer SE, Deeg DJH. Wanneer je gehoor je in de steek laat. 2014. Web publication. *Kennislink*. <http://www.kennislink.nl/publicaties/wanneer-je-gehoor-je-in-de-steek-laet#citation13>>
- (15) Smit CF. Eardrop Apeldoorn: Doofheid is een taboe in Kenia. 2014. Regional newspaper. *Stentor*. 20-11-2014.
- (16) Stam M, Kostense PJ, Lemke U, Merkus P, Smit JH, Festen JM, Kramer SE. Comorbidity in adults with hearing

- difficulties: Which chronic medical conditions are related to hearing impairment? 2014. *International Journal of Audiology*, 53, 392-401.
- (17) Vaerenberg B, Smits C, de Ceulaer G, Zir E, Harman S, Jaspers N. Cochlear Implant Programming: A Global Survey on the State of the Art. 2014. *Scientific World Journal*, 501738.
- (18) van Loon MC, Merkus P, Smit CF, Smits C, Witte BI, et al. Stapedotomy in Cochlear Implant Candidates With Far Advanced Otosclerosis: A Systematic Review of the Literature and Meta-analysis. 2014. *Otology & neurotology*, 35, 1707-1714.
- (19) van Loon MC, Goverts ST, Merkus P, Hensen EF, Smits C. The Addition of a Contralateral Microphone for Unilateral Cochlear Implant Users: Not an Alternative for Bilateral Cochlear Implantation. 2014. *Otology & neurotology*, 35, E233-E239.
- (20) Vlaming SMG, MacKinnon RC, Jansen M, Moore DR. Automated screening for high-frequency hearing loss. 2014. *Ear and Hearing*, 3, 667-679.
- (21) Vreeken HL, van Rens GH, Knol DL, van Reijen NA, Kramer SE, et al. Dual sensory loss: A major age-related increase of comorbid hearing loss and hearing aid ownership in visually impaired adults. 2014. *Geriatrics & Gerontology International*, 14, 570-576.
- (22) Zekveld AA, Heslenfeld DJ, Johnsrude IS, Versfeld NJ, Kramer SE. The eye as a window to the listening brain: Neural correlates of pupil size as a measure of cognitive listening load. 2014. *Neuroimage*, 101, 76-86.
- (23) Zekveld AA, Kramer SE. Cognitive processing load across a wide range of listening conditions: Insights from pupillometry. 2014. *Psychophysiology*, 51, 277-284.
- (24) Zekveld AA, Rudner M, Kramer SE, Lyzenga J, Ronnberg J. Cognitive processing load during listening is reduced more by decreasing voice similarity than by increasing spatial separation between target and masker speech. 2014. *Frontiers in neuroscience*, 8, 88.

Grants

1. NWO Kiem, the Netherlands
Analysis of realistic data with speech input for children
 - Project leader: Theo Goverts
 - Partners: VU University, Humanities, LHCA (Martine Coene), Phonak AG Netherlands (Cas van Opstal), FOSS/FODOK (Arend Verschoor), Phonak AG Zürich (Manuela Feilner)
 - Also involved: Cas Smits, Yvonne Simis, Elske Bolk
 - Seeding money for a research project
 - Start date: 1-2-2015
2. Heinsius Houbolt Foundation, the Netherlands
Heinsius Houbolt Stipendium, personal grant
 - Recipient: Erik Hensen
 - Partners: LUMC Leiden (Andel van der Mey)
 - Also involved: Thijs van Hees, Eveline van Beeck Calkoen
 - Start date: 1-3-2014
3. VU University, the Netherlands
University Research Chair, personal grant
 - Recipient: Sophia Kramer
 - Financial support to further build the research line
4. EMGO+, Embedded Ph.D. Grant, the Netherlands
NL-SH third wave: a study on the transition from being normally hearing to becoming hearing impaired
 - Project leaders: Sophia Kramer, Mariska Stam
 - Partners: Phonak AG Switzerland (Ulrike Lemke), VUmc, Dept. of Ophthalmology (Ruth van Nispen)
 - Financial support for a PhD student
 - Start date: 1-1-2015
5. EMGO+, Cohort Booster, the Netherlands
For the NL-SH
 - Project leader: Sophia Kramer
 - Partners: LASA, NESDA, NTR, Generation2, Hoorn.
 - Also involved: Mariska Stam
 - Financial support for infrastructure to boost NL-SH study
 - Start date: 1-6-2015
6. Heinsius Houbolt Foundation, the Netherlands
Development of an integral intake for Audiology and Otology
 - Project leaders: Sophia Kramer, Paul Merkus, Theo Goverts
 - Also involved: Lisette van Leeuwen
 - Financial continued support for a PhD student (one year)
 - Start date: ongoing project since 2013
7. Oticon Foundation, Denmark
LISTEN
 - Project leaders: Sophia Kramer, Adriana Zekveld, Graham Naylor, Thomas Lunner
 - Partners: Eriksholm Research Centre
 - Also involved: Barbara Ohlenforst, Yang Wang, Hans van Beek
 - Financial support for the 4th year of two PhD students
 - Start date: 15-03-2017
8. Phonak AG Switzerland
NL-SH second wave
 - Project leaders: Sophia Kramer, Mariska Stam
 - Partners: Phonak AG Switzerland (Ulrike Lemke)
 - Financial support for the start of a postdoc research project
 - Start date: 1-9-2014

9. AudioNova International

Evaluation of a Support Program

- Project leader: Sophia Kramer
- Partners: AudioNova International (Bernadette Paulissen), Schoonenberg Hoorcomfort (Vera Jansen)
- Also involved: Marieke Pronk
- Financial support for a PhD student
- Start date: 1-5-2015

10. International Society of Audiology Scholarship

Travel Grant, personal grant

- Recipient: Mariska Stam
- Financial support for conference attendance
- World Congress of Audiology (4-5-2014)

Partners in Research

International

1. Advanced Bionics
2. Boston University, Hearing Research Center, Boston, USA
3. Boston University, Auditory Neuroscience Lab, Boston, MA, USA
4. Cochlear Ltd. Europe, Mechelen
5. Eargroup, Antwerp, Belgium
6. Eriksholm Research Centre- Oticon, Snekkersten, Denmark
7. Gruppo Otologico, Piacenza-Rome, Italy
8. Indiana University/CDT, Bloomington, IL, USA
9. Linköping University, Linnaeus center HEAD, Linköping, Sweden
10. Ono Academic College, Faculty of Health Profession, Communication Sciences and Disorders Department, Ono, Israel.
11. Örebro University, Swedish Institute of Disability Research (SIDR), Örebro, Sweden
12. Phonak AG, Switzerland
13. Queen's University, Kingston, ON, Canada
14. University of Toronto Mississauga, Dept. Psychology, Mississauga, ON, Canada
15. University of Pretoria, Department of Speech-Language Pathology and Audiology, South Africa
16. Western University, Faculty of Health Sciences, School of communication sciences and disorders and National Center for Audiology, London, ON, Canada
17. World Hearing Center, Institute of Physiology and Pathology of Hearing, Kajetany, Poland.

National

1. Erasmus University Medical Center, Rotterdam, Dept. of ENT
2. Nationaal Programma Gehooronderzoek (consortium)
3. Schoonenberg Hoorcomfort B.V., Dordrecht
4. VU University Amsterdam, Faculty of Arts
5. VU University Amsterdam, Faculty of Psychology and Education
6. VU University Amsterdam, Medical Natural Sciences
7. VU University Medical Center Amsterdam, Dept. Epidemiology and Biostatistics, Longitudinal Aging Study Amsterdam
8. VU University Medical Center Amsterdam, Dept. Ophthalmology
9. University of Amsterdam, Faculty of Humanities, Psychology
10. University of Amsterdam, Faculty of Humanities, Linguistics
11. University of Amsterdam, Pedagogical Sciences and Educational Sciences