

The HEAD Graduate School
Second Summer Workshop
What's new at HEAD?

June 15–16, 2009

Båsenberga Hotell & Konferens, Båsenberga, Sweden

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Welcome to Båsenberga...

... and to the HEAD Graduate School Second Summer Workshop. The purpose of the workshop is twofold: to give doctoral students within the field of hearing impairment and deafness hands-on experience of what it is like to be involved in organising a scientific conference, and to provide a forum for them to discuss their research with senior scientists as well as user organisations and industrial actors. This year's programme includes a total of 22 presentations by researchers within the field of hearing and deafness, including presentations by HEAD doctoral students and state-of-the-art presentations by seniors within the HEAD milieu. We are pleased to have keynote addresses given by three of our distinguished international guests, namely Sigfrid D. Soli, Brian C. J. Moore and Kathy Pichora-Fuller. In addition to the scientific contributions, the programme includes presentations by representatives from organisations with an interest in the field of hearing and deafness, namely The Association of the Swedish Deafblind, The Swedish National Association of the Deaf, The Swedish Cochlear Implant Children Society and The Swedish Association of Hard of Hearing People.

HEAD doctoral students and postdocs along with our administrative team have put a lot of work into planning the workshop, aiming for a good mix of science and social activities to give you a lasting impression of what's new at HEAD.

Mary Rudner

Chairman of the Organising Committee and
Director of Studies at HEAD Graduate School

Organising Committee

The workshop was organised by Mary Rudner, Marie-Louise Lund Mattsson, Björn Lidestam, Åsa Skagerstrand, Sarah Granberg, Kim Kähäri, Magnus Emilsson, Cecilia Henricson, Elisabet Classon, Elaine Hoi-Ning Ng, and Sushmit Mishra.

HEAD Graduate School

HEAD stands for HEaring And Deafness which denotes the field of research. The HEAD Graduate School is run in collaboration between the universities of Linköping and Örebro within the framework of the Swedish Institute for Disability Research (SIDR). It is also affiliated with Linnaeus Centre HEAD. Both the Graduate School and the Linnaeus Centre are funded by the Swedish Research Council. The HEAD Graduate School promotes excellent research training and is open to doctoral students whose projects fall within the broad field of hearing and deafness research. The activities of the Graduate School include courses, seminars, workshops and mobility incentives and it provides an excellent forum for developing links between research, clinicians, user organisations and industry.

The HEAD Graduate School currently has 19 members. Eight are based at SIDR in Örebro, seven are based at SIDR in Linköping, three are based at other centres in Sweden and one is based in Australia. A further nine students will be joining us shortly. Activities during the past year have included a series of open seminars with a line-up of distinguished speakers from Europe and North America and a series of internal discussion seminars. Several Graduate School members have taken the opportunity to attend conferences and make study visits. In the autumn the Graduate School will be giving two broad-based courses, one covering the field of hearing and deafness and the other covering relevant research methods. Building on last year's experience, the Graduate School will once again be organising a research workshop in collaboration with the Karolinska Institute.

For further information about the HEAD Graduate School and its activities please visit www.ihv.se/head.

Linnaeus Centre HEAD

HEaring And Deafness is the research focus of Linnaeus Centre HEAD, a centre of excellence for research in the field of Cognitive Hearing Science. This is an emerging, interdisciplinary field that unites knowledge from fields as diverse as cognitive psychology, clinical and medical audiology, psycholinguistics, psychoacoustics and sociology. Linnaeus Centre HEAD has obtained long-term financial support from the Swedish Research Council and Linköping University, where the centre is based. The backbone of the centre is a core group of scientists at the universities of Linköping, Örebro and Lund, many of whom have long-standing collaboration. Linnaeus Centre HEAD is governed by the Swedish Institute for Disability Research (SIDR) and Jerker Rönnberg is its director.

For further information about Linnaeus Centre HEAD please visit www.headcentre.se.

Swedish Institute for Disability Research (SIDR)

Founded in 2000, SIDR is run in collaboration between the universities of Linköping and Örebro. Disability Research is an interdisciplinary subject and includes medical, technical, behavioural and cultural perspectives. In research and research training SIDR aims to pursue excellence, adopt the perspective of the individual, promote collaboration with user organisations and industry and promote development of the International Classification of Functioning (ICF). The SIDR graduate programme is European leader in Disability Research.

For further information about SIDR please visit www.ihv.se.

Programme

Monday June 15th

09.30 **Coffee and sandwich**

09.50 **Welcome**

10.00 **Keynote address**
Sigfrid D. Soli: *Toward the international harmonization
of speech audiometry*
Introduced by Åsa Skagerstrand

11.00 **1st oral session: *Social and environmental aspects of
hearing impairment and deafness***
Chaired by Elisabet Classon & Elaine Hoi-Ning Ng

11.00 **State-of-the-art presentation**
Berth Danermark: *Psychosocial impact of hearing
impairment*

11.20 Emelie Rydberg: *Characteristics of people with
employment in the deaf population in Sweden*

11.40 Mats Berglund: *Hard-of-hearing adolescents reporting
some other disability or tinnitus: A replication study
including an age-related analysis*

12.00 Åsa Skagerstrand: *Perception of annoying sounds*

12.20 **Lunch**

13.20 **Presentation of organisations with an interest in the field of hearing and deafness**

Chaired by Björn Lidestam

13.20 Pontus Degsell: *The Association of the Swedish Deafblind (FSDB)*

13.35 Ragnar Veer & Ola Lundström: *The Swedish National Association of the Deaf*

13.50 **Introduction to posters and round-table discussions**

Chaired by Magnus Emilsson & Cecilia Henricson

13.50 Björn Lidestam: *Visual discrimination of vowel duration (poster)*

13.55 Shahram Moradi: *Comparison of deaf and hearing children in working memory and problem solving (poster)*

14.00 Adriana A. Zekveld: *Mismatch in the brain: Behavioral and neural correlates of explicit, cognitive processes during speech comprehension (round-table discussion)*

14.05 Hugo Hesser: *Experiential avoidance and acceptance as clinical mechanisms in the development and management of tinnitus disability (round-table discussion)*

14.10 **Posters and round-table discussions**

15.00 **Coffee**

- 15.30** **2nd oral session: *Developing clinical and research methods***
 Chaired by Sushmit Mishra & Elaine Hoi-Ning Ng
- 15.30 **State-of-the-art presentation**
 Gerhard Andersson: *Can we use the Internet in rehabilitation of hearing problems and tinnitus?*
- 15.50 Vendela Westin: *Randomized controlled trial of acceptance and commitment therapy for tinnitus distress*
- 16.10 Cornelia Weise: *Biofeedback-based behavioural treatment of chronic tinnitus: Results of a randomised controlled trial*
- 16.30 Break
- 16.40 **State-of-the-art presentation**
 Elina Mäki-Torkko: *Epidemiological and clinical studies on hearing in adult populations: Why bother and what about the pitfalls?*
- 17.00 Elinor Brunnberg: *New bilingual qualitative and quantitative method in studies with deaf and hard of hearing adolescents*
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- 17.20** **Break**
-
- 18.00** **Dinner and activities**
-
- 20.00** **Cheese and wine**

Tuesday June 16th

08.30

Keynote address

Brian C. J. Moore: *Effect of cochlear hearing loss on sensitivity to temporal fine structure*

Introduced by Stefan Stenfelt

09.30

Presentation of organisation with an interest in the field of hearing and deafness

Chaired by Elaine Hoi-Ning Ng

09.30

Jan-Peter Strömgren & Hans Ericson: *The Swedish Association of Hard of Hearing People (HRF)*

09.45

Ann-Charlotte Gyllenram: *Barnplantorna – The Swedish Cochlear Implant Children Society*

10.15

Coffee

10.45

3rd oral session: *The role of cognition and language in hearing impairment and deafness across the lifespan*

Chaired by Emelie Rydberg & Björn Lidestam

10.45

Malin Wass: *Cognitive skills and reading ability in children with CI*

11.05

Cecilia Henricson: *Children with congenital deafness and CI: Abilities of working memory, phonology and lexical access*

11.25

Magnus Emilsson: *Hearing impaired in working life: The impact of cognitive skills, type of work-related noise and type of work-task on performance*

11.45 **Lunch in the garden**

14.00 **3rd oral session continued**

Chaired by Emelie Rydberg & Björn Lidestam

14.00 Elisabet Classon: *Hearing impairment, linguistic processing and access to verbal long-term memory: An ERP study*

14.20 Elaine Hoi-Ning Ng: *Effects of hearing aid fitting strategy on cognitive outcome measurements*

14.40 Sushmit Mishra: *Sick and tired of listening*

15.00 **Coffee**

15.30-16.30 **Keynote address**

Kathy Pichora-Fuller: *What happens in the extra time it takes to understand speech in noise?*

Introduced by Elisabet Classon

Abstracts

10.00

Keynote address

Toward the international harmonization of speech audiometry

Sigfrid D. Soli

House Ear Institute, Los Angeles, USA

Many aspects of hearing assessment and treatment are similar throughout the world. Pure tone audiometry, evoked responses, physiological measures, surgical techniques, and usage of prosthetic devices all are practiced in much the same way everywhere. Speech audiometry has been a notable exception. The diversity of spoken language is a primary reason that speech audiometry is not harmonized. Recent advances in functional hearing assessment with speech point the way to a possible solution to this problem.

These advances utilize adaptive speech tests that can be administered to normally hearing individuals who speak a particular language, as well as to other speakers of that language with impaired hearing. The average performance of normally hearing speakers of a language defines a norm that is functionally equivalent to the norms for other languages. When measures of functional hearing ability in any language are expressed as deviations from the norm for that language, they can be compared directly with similar measures in other languages that are also expressed in the same way.

Examples from research in several languages will be used to demonstrate how norm-referenced functional hearing assessment can be used to harmonize speech audiometry across languages.

11.00

State-of-the-art presentation

Psychosocial impact of hearing impairment

Berth Danermark

Swedish Institute for Disability Research
School of Health and Medical Sciences, Örebro University

The presentation includes a review of the literature on the psychosocial impact of hearing impairment, mainly hearing loss, on children, particularly those with moderate-to-profound congenital disorders who have been the most extensively studied. There is also, however, increasing evidence of a significant impact of mild and unilateral hearing impairments; on adults of working age which is a much neglected area; and on elderly people. The review also includes comments on the methodological weaknesses of existing studies, emphasizing the need for a more systematic approach. The presentation is organized according to the ICF and a tentative Core set for Hearing Loss is also presented. The work with ICF core sets for hearing loss is under progress and will be presented.

11.20

Characteristics of people with employment in the deaf population in Sweden

Emelie Rydberg

HEAD Graduate School
Swedish Institute for Disability Research
School of Health and Medical Sciences, Örebro University

An employment or to be economically active is important for individuals as well as society. For the individual employment provides opportunities to self-support and participation in society, among other things. To society more individuals with profitable work implies fewer that are depending on social welfare. Research has shown that deaf people have lower employment rate than hearing people. Some of the questions asked in the present piece of research are: What are the characteristics of people with employment in the deaf population as compared to people without employment in the deaf population as well as compared to the general population? What are the characteristics of deaf people's employment? In what occupations and sectors of the economy are deaf people working? This study compares 2,144 people born between 1941 and 1980 who attended a special education program for the deaf and 100,000 randomly chosen individuals from the total population born between 1941 and 1980 in Sweden. Data consist of registered information about the individuals in the year 2005 and are taken from the Integrated database for labor market research.

11.40

Hard-of-hearing adolescents reporting some other disability or tinnitus: A replication study including an age-related analysis

Mats Berglund, Margaretha Lindén Boström, Carina Persson, Elinor Brunnberg

ICU, Örebro University

In two previous studies based on the survey, Life & Health Young 2005 in Örebro county 15-16 years old Hard-of-hearing (HH) students with some other disability (HHDIS) and HH with tinnitus (HHTINN) reported considerably higher scores for mental symptoms and substance use than adolescents ‘just’ HH or hearing adolescents.

In order to replicate these findings we analysed the 2007 survey and included adolescents in grade 7, 9 and 2 in secondary school concerning substance use and depression. We also used reference data from the corresponding adult survey Life & Health 2008. In grade 9 HHDIS (2.0%) and HHTINN (2.0 %) both reported strongly increased rates of risky alcohol consumption (55/51% versus 13%), daily tobacco use (57/54% versus 10%) and depression (43/43% versus 14%) than hearing or ‘just’ HH adolescents. Similar but less pronounced changes were present in grade 7 and grade 2. In HHDIS increased risk drinking was found until age 35, increased daily tobacco use until age 50 and increased depression until age 65. In HHTINN only rate of depression was increased in adult life.

HHDIS and HHTINN thus are important targets for preventive measures. In addition tinnitus in young people can be a marker like disability of vulnerability.

12.00

Perception of annoying sounds

Åsa Skagerstrand^{1, 2, 3}, Stefan Stenfelt⁴

¹HEAD Graduate School

²Swedish Institute for Disability Research

³School of Health and Medical Sciences, Örebro University

⁴Department of Technical Audiology, Linköping University

Persons using hearing aids experience annoying sounds in their daily soundscape (Skagerstrand et al, in press). Sounds that may cause reduced hearing aid usage and, as a consequence, reduced ability to achieve desired signals. Sounds that cause annoyance are common sounds in our daily surroundings, such as rustling paper, flowing water, traffic, porcelain, cutlery and machine tools. In the present study we are further investigating how people perceive this type of sounds. The aim is to study the perception of annoying sounds for three groups of subjects; 1) persons with normal hearing, 2) persons with sensorineural hearing loss not using hearing aids and 3) persons with sensorineural hearing loss using hearing aid.

Similarities and discrepancies are sought between the three study groups when comparing hearing status, cognitive performance, and loudness and annoyance scaling. In the presentation some results of the study will be discussed.

15.30

State-of-the-art presentation

Can we use the Internet in rehabilitation of hearing problems and tinnitus?

Gerhard Andersson

Swedish Institute for Disability Research
Department of Behavioural Sciences, Linköping University

In this 'state of the art' presentation an overview of guided Internet delivered rehabilitation methods will be presented. The focus will be on randomized controlled intervention trials, and results from studies on tinnitus and hearing impairment will be presented. Moreover, the role of the Internet in data collection and the use of the Internet for information seeking among patients will be discussed. Future challenges involve dissemination into regular health care settings and adjusting existing Internet portals for persons with disabilities.

15.50

Randomized controlled trial of acceptance and commitment therapy for tinnitus distress

Vendela Westin^{1,2,3}, Mikael Schulin⁷, Hugo Hesser^{2,3}, Magnus Stalby⁶, Gisela Wisung⁶, Reza Zare Noe⁷, Marianne Karlsson⁷, Ulrike Olofsson⁷, Ulrika Ermedahl-Bydairk³, Gerhard Andersson^{2,3,4,5}

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⁶Psykologpartners

⁷Department of Audiology, Linköping University Hospital

Objective: The aim of this study was to investigate the effects of Acceptance and Commitment Therapy (ACT) on tinnitus distress.

Methods: Participants were recruited through Web pages and newspaper articles as well as via a waiting list at the Audiology Department at Linköping University Hospital. Fifty two participants were included and randomly allocated to ACT or to a wait list control group (WLC). The drop-out rate was 11%. All participants underwent regular audiometry, measures of minimal masking levels and loudness discomfort levels. Treatment consisted of ten individual weekly one hour sessions. Outcome was measured using validated self-report inventories. Tinnitus Handicap Inventory (THI) was the primary outcome measure, complemented by measures of anxiety, depression, sleep difficulties and quality of life.

Results: On the THI, significant reductions were found in the treatment group immediately following treatment, with an effect size corresponding to those of cognitive behavioural therapy (Cohen's $d = 0.80$). Directly after treatment two of the five measures showed significant differences in favour of the treatment group.

Conclusions: ACT can help individuals decrease their tinnitus distress and other associated problems. This represents a new approach to the psychological management of tinnitus.

16.10

Biofeedback-based behavioural treatment of chronic tinnitus: Results of a randomised controlled trial

Cornelia Weise¹, Kristin Heinecke², Winfried Rief³

¹Clinic for Psychosomatics and Psychotherapy, Hannover Medical School, Germany

²Clinic for Psychiatry and Psychotherapy, University of Lübeck, Germany

³Department of Clinical Psychology and Psychotherapy, University of Marburg, Germany

Etiological tinnitus models assume that tinnitus is associated with negative appraisal, dysfunctional attention shift and heightened psychophysiological arousal. Thus cognitive-behavioural interventions are suggested treatments.

But as many tinnitus sufferers suspect an organic cause for their tinnitus they look for medical rather than psychological treatments. In order to account for these biomedical illness perceptions we developed and investigated the efficacy of a biofeedback-based behavioural treatment which may presumably be better accepted.

130 tinnitus patients were randomly assigned to an intervention or a waitlist group. Treatment consisted of 12 sessions of biofeedback-based behavioural intervention over a 3-month period. Patients in the waitlist group received treatment after the waiting period. Follow-up assessments took place 6 months after the end of the treatment.

Results of the RCT showed clear improvements with large effect sizes for general tinnitus annoyance ($g = 1.15$), tinnitus loudness ($g = 0.71$) and time per day listening to tinnitus ($g = 0.73$). Furthermore changes in coping and control cognitions were detected. All improvements were maintained over the follow-up period and medium to large follow-up effect sizes were observed.

The developed treatment was highly accepted and led to long-term stable improvements regarding tinnitus annoyance and tinnitus associated problems.

Through demonstrating psychophysiological interrelationships, the treatment enables patients to change their somatic illness perceptions to a more psychosomatic point of view.

16.40

State-of-the-art presentation

Epidemiological and clinical studies on hearing in adult populations: Why bother and what about the pitfalls?

Elina Mäki-Torkko

Department of Otolaryngology, Linköping University Hospital

The aim is to discuss hearing research from the epidemiological and clinical point of view. Firstly, a sample of 55-to 65-year-old population from Northern Finland is used to illustrate how epidemiological studies can be designed and conducted. The participants ($n = 850$) were recruited randomly from the population register and examined as a part of a European multicenter study on age related hearing impairment (ARHI). In addition to otoscopy and pure tone audiometry, background information was elicited by means of a structured interview covering subjective hearing difficulties, ear diseases, general health, occupational and leisure time noise exposure etc. Second part covers an ongoing clinical study on adult cochlear implant users operated in Linköping. An invitation letter and three questionnaires were sent to 86 patients who had used CI at least 12 months. The patients were asked to fill in GBI (Glasgow Benefit Index) and to answer questions about expectations and subjective outcome of implantation. They were also asked to let a relative or close friend to answer corresponding questions. Results of cognitive tests and clinical background data and are available in the patient files. Regarding both above mentioned projects methodological issues are discussed and preliminary results are presented.

17.00

New bilingual qualitative and quantitative method in studies with deaf and hard of hearing adolescents

Elinor Brunnberg

JPS/ICU- I See You, Örebro university

Previous survey studies for hearing impaired students have not used complete bilingual techniques. The present approach is the first using interactive survey methods with the possibility to answer in sign language. Our research group ICU has addressed HH/deaf adolescents in a number of psychosocial studies using different types of approaches. In upper secondary school for HH/deaf students we made a bilingual study (Swedish and Swedish sign language - SSL) in multiple methods in 2007/2008. In this study we did use methodologically new instruments and students were taking part in the study in their first language. The study, financed by Allmänna Arvsfonden, developed research methods increasing student's participation. A necessary component is language as well as cultural competence. Our interviewers were themselves deaf/HH. The planning process was conducted with representatives in special interest organisations. Study methods were qualitative interviews ($n = 25$), focus groups (PI-interviews, $N = 209$) and a web-based survey ($N = 95$). The qualitative methods did use visualised creative techniques. The web-based survey used the instrument "Query & Report". Technical support was given by Omnitor, a Swedish company with language and cultural competence. We will continue using interactive multi-lingual survey technique (SSL, Braille, written and spoken Swedish) to study psychosocial risks and to make interventions.

08.30

Keynote address

Effect of cochlear hearing loss on sensitivity to temporal fine structure

Brian C.J. Moore

Department of Experimental Psychology, University of Cambridge, U.K.

The basilar membrane acts as an array of bandpass filters, partially separating the different frequency components in a complex mixture of sounds. The response at each place on the basilar membrane can be considered as a carrier signal or temporal fine structure (TFS, the rapid oscillations with frequency close to the best frequency for that place), with a relatively slowly varying envelope. Recent evidence suggests that the ability to extract information from the TFS is reduced in people with cochlear hearing loss. This may adversely affect the ability to understand speech in the presence of background sounds. A psychoacoustic test for determining sensitivity to TFS is described (Moore and Sek, 2009), and it is demonstrated that, for people with cochlear hearing loss, scores on this test are correlated with the ability to use TFS information to understand speech in a background of a single talker (Hopkins and Moore, 2009).

References

- Hopkins, K., and Moore, B. C. J. (2009). "The importance of temporal fine structure information in speech at different spectral regions for normal-hearing and hearing-impaired subjects," *J. Acoust. Soc. Am.* (submitted).
- Moore, B. C. J., and Sek, A. (2009). "Development of a fast method for determining sensitivity to temporal fine structure," *Int. J. Audiol.* 48, 161-171.

10.45

Cognitive skills and reading ability in children with CI

Malin Wass^{1, 2, 3}, Björn Lyxell^{2, 3}, Birgitta Sahlén⁴, Lena Asker-Árnason⁴, Tina Ibertsson⁴, Mathias Hällgren⁵, Birgitta Larsby⁵, Elina Mäki-Torkko⁶

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Children with CI have a different course of development of basic academic skills such as language and reading skills, compared both with children with normal hearing, and children with severe hearing impairment or deafness, who have not been implanted. Increased knowledge about the cognitive development in children with CI is necessary in order to adjust their situation in various settings.

In the present study, working memory capacity, lexical access, phonological skills and reading ability was examined in 19 children with CI (age 5;7–13;4). Their performance was studied in relation to demographic factors and compared to 56 children with normal hearing.

The findings indicate that children with CI have general- (i.e. simultaneous storage and processing) and visuospatial working memory capacities equivalent to the hearing children. They had lower performance levels on most of the other cognitive tests. The differences were particularly prominent in tasks that required phonological working memory and/or extensive phonological processing. Seventy-five percent of the children with CI had a performance level comparable to hearing children in the tests of reading comprehension. Complex working memory was predictive of reading comprehension.

June 16
3rd oral session
*The role of cognition and language
in hearing impairment and deafness
across the lifespan*

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11.05

***Children with congenital deafness and CI: Development of
working memory, phonology and lexical speed***

Cecilia Henricson

HEAD Graduate School
Swedish Institute for Disability Research
Department of Behavioural Sciences, Linköping University

The purpose of the project is to examine development of working memory, phonological abilities and lexical speed in children (6–12 years) with Usher syndrome type I and children with Connexin 26 who have received cochlear implants. The examined cognitive abilities are important for language development and academic achievement in children with normal hearing and previous studies (e.g., Gathercole, 2006; Sahlén et al. 2006; Wass et al., 2007) have demonstrated that this is also the case for children with cochlear implants. The project will employ methods developed by Wass et al. Working memory, phonological abilities and lexical access will be investigated by means of a computerized test battery, SIPS (Sound Information Processing System). The participating children's non-verbal intelligence will be measured by the test block design from Wechsler's Intelligence Scales for Children.

June 16
3rd oral session
*The role of cognition and language
in hearing impairment and deafness
across the lifespan*

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11.25

Hearing impaired in working life: The impact of cognitive skills, type of work-related noise and type of work-task on performance

Magnus Emilsson

HEAD Graduate School
Swedish Institute for Disability Research
Department of Behavioural Sciences, Linköping University

An ongoing study on the acute effects of noise on performance in work-related non-auditory tasks will be presented. In the study, performance of normally hearing and hearing impaired individuals in three tasks in four sound conditions will be compared. In addition, the extent to which working memory, executive functions and phonological abilities can explain individual differences in susceptibility to noise disruption will be examined.

14.00

Hearing impairment, linguistic processing and access to verbal long-term memory: An ERP-study

Elisabet Classon^{1, 2, 3}, Jerker Rönnerberg^{2, 3}, Mary Rudner^{2, 3}.

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Behavioral research has shown that the quality of phonological representations deteriorates over time after sensory deprivation in the form of severe hearing impairment. Phonological representations play an important role in reading, speech comprehension and accessing word meaning. According to the cognitive model of Ease of Language Understanding impeded automatic access to features of long-term memory verbal representations results in mismatch between the incoming stimuli and stored representations. Mismatch slows down understanding as explicit, effortful processes putting heavier demands on working memory need to be engaged. Increased working memory load is in turn associated to less efficient memory encoding. My aim here is to present a study with the object of investigating the neural underpinnings of different aspects of linguistic processing and access to stored lexical representations in the presence of less than perfect phonological representations. Two groups of participants are to be included, individuals with post-lingually acquired severe hearing impairment and non-hearing impaired. We plan to record event-related potentials in priming paradigms including phonological and semantic tasks under conditions that engage either implicit, automatic or explicit, controlled memory access. Further, we aim to relate these results to important every-day functions such as memory encoding and speech comprehension.

14.20

Effects of hearing aid fitting strategy on cognitive outcome measurements

Elaine Hoi-Ning Ng^{1, 2, 3}, Mary Rudner^{2, 3}, Thomas Lunner^{2, 4, 5}, Jerker Rönnerberg^{2, 3}

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⁵Oticon A/S, Research Centre Eriksholm, Snekkersten, Denmark

The goal of amplification is to make speech audible and intelligible with optimized comfort and it can be achieved by adjusting settings of an amplification device. However, how hearing aid settings interact with cognitive processes is not fully understood. This study aims at examining the effect of different signal processing strategies of digital hearing aids on cognitive performance in experienced hearing aid users. A dual task, which consists of a primary perceptual speech recognition task and a secondary free recall memory task, is used to investigate the cognitive demands and memorial consequences with the use of binary time-frequency masking technique. A subset of the Swedish Hearing In Noise Test (HINT) sentences is used in the dual task. The cognitive and memory performance in different conditions are compared by looking into the primacy effect in the free recall memory task.

14.40

Sick and tired of listening

Sushmit Mishra^{1, 2, 3}, Mary Rudner^{2, 3}, Thomas Lunner^{2, 4, 5}, Stefan Stenfelt⁶,
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⁶Department of Technical Audiology, Linköping University

One of the major problems associated with hearing impairment is fatigue as a result of effortful, or cognitively taxing, listening. Cognitive capacity predicts performance on aided speech recognition in noise and the ability to benefit from the various signal processing algorithms in hearing aids. However, the importance of cognitive spare capacity once a spoken message has been understood is yet to be investigated. The present study is aimed to devise a test to measure the cognitive spare capacity in normal hearing and hearing impaired listeners. A memory test based on two digit numbers will be administered in various conditions. Memory load and type of executive function (updating and inhibition) will be manipulated in 2×2 factorial design. The test will be presented in three different noise conditions. The performance on the memory test will be compared to performance on a standardized cognitive test. The comparison of performance on the cognitive test and the memory test may provide insight into the cognitive spare capacity of the individuals.

15.30

Keynote address

***What happens in the extra time it takes to understand
speech in noise?***

Kathy Pichora-Fuller

Department of Psychology, University of Toronto, Canada

Even when words are correctly recognized, it takes longer to recognize speech heard in noise than speech heard in quiet. This presentation will explore what we know (and don't know) about what happens in the extra time that it takes to recognize words heard in noise. The evidence to be considered will include findings from a variety of different studies involving younger and older adults with good audiograms. A study of tracking of eye movements to measure the on-line processing of spoken words heard in quiet and noise illustrates the slowing of word comprehension. A lexical decision study illustrates how the priming (facilitation and inhibition) of speech depends on the amount and type of acoustical distortion applied to preceding congruent, incongruent, and neutral contexts. A study of auditory spatial attention illustrates that it takes time to switch attention to a speech target presented at an unexpected location. A working memory study illustrates the reduction in the number of words recalled when the words are presented in noise compared to when they are presented in quiet. In general, noise seems to slow comprehension, undermine priming, compromise attention switching, and reduce recall. The time-dependent interaction of auditory and cognitive processes will be discussed.

14.10

Round-table discussion

Mismatch in the brain: Behavioral and neural correlates of explicit, cognitive processes during speech comprehension

Adriana A. Zekveld¹, Mary Rudner^{2,3}, Jerker Rönnerberg^{2,3}

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Introduction: The working memory framework of Ease of Language Understanding (ELU) developed by Rönnerberg and colleagues (Rönnerberg, 2003; Rönnerberg et al., 2008) states that the demands on explicit processing increase when speech comprehension is impaired by background noise. Presenting additional contextual information on the speech content prior to the presentation of the stimulus (e.g., a correct semantic prime), may reduce the requirement of explicit processes (i.e., working memory capacity) by helping listeners to infer the meaning of the partly comprehensible speech. On the contrary, when incorrect contextual information is presented prior to the auditory stimulus (i.e., a semantically irrelevant prime), this difference between the expected and actually presented semantic content of the information will likely result in a relatively large mismatch. The amount of explicit processing required for speech comprehension when no prime is presented will likely be in between that required by the correct and incorrect-prime conditions.

Approach: In a first study, we will examine the neural correlates of explicit cognitive processes during speech comprehension in noise. Within individuals, the degree of explicit processing required during speech comprehension will be manipulated by varying the speech-to-noise ratio (SNR) of speech presented in background noise and by including two priming conditions. Relevant cognitive abilities will be assessed in order to examine their association with speech comprehension performance, the benefit/hinder obtained from additional contextual information (i.e., the [in]correct prime) and the activation of brain areas.

A draft research plan and test-protocol will be presented and discussed.

14.10

Round-table discussion

Experiential avoidance and acceptance as clinical mechanisms in the development and management of tinnitus disability

Hugo Hesser

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Approximately 10–20% of individuals who have tinnitus, suffer from debilitating symptoms, for which medical interventions are many times insufficient. Cognitive behaviour therapy offer one solution for those troubled by severe tinnitus, as research suggests its efficacy in reducing distress associated with the condition. However, several tinnitus patients are not clinically significantly improved following treatment and little is known about the underlying processes by which the therapy works. Moreover, it is still somewhat of a mystery why some individuals develop an unhealthy relationship with their auditory perceptual phenomena and why others do not.

Recently, empirical intervention literature within the area of behavioural medicine has emphasized acceptance and experiential avoidance as central psychological processes in chronic somatic conditions. Yet, this avenue has to date not been extensively explored with tinnitus. The speaker will in the present round table discussion provide a brief review of the extent literature, and discuss ongoing research projects and emerging data, which serve to enhance our understanding of how these processes are related to tinnitus disability and treatment. The talk will cover both experimental analogs and intervention research as well as psychotherapy process studies within the field.

14.10

Poster

Visual discrimination of vowel duration

Björn Lidestam

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Discrimination of vowel duration was explored with regard to discrimination threshold, error bias, and effects of modality and consonant context. 122 normal-hearing participants were presented with disyllabic-like items such as /lal-lal/ or /mam-mam/ in which the lengths of the vowels were systematically varied and were asked to judge whether the first or second vowel was longer. Presentation was either visual, auditory, or audiovisual. Vowel duration differences varied in 24 steps: 12 with a longer first /a/ and 12 with a longer last /a/ (range: ± 33 –400 ms). Results: 50% JNDs were smaller than the lowest tested step size (33 ms). 75% JNDs were in the 33–66 ms range for all conditions but V /lal/, with a 75% JND at 66–100 ms. Errors were greatest for visual presentation and for /lal-lal/ tokens. There was an error bias towards reporting the first vowel as longer, and this was strongest for /mam-mam/ and when both vowels were short, possibly reflecting a sublinguistic processing strategy.

14.10

Poster

Comparison of deaf and hearing children in working memory and problem solving

Shahram Moradi

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Aim: The aim of this study was to investigate and compare performance of deaf children in visuo-spatial working memory and problem solving.

Method: 30 deaf children and 30 hearing children were examined. We used Corsi Blocks and Tower of Hanoi (ToH).

Results: Results showed that in working memory performance of deaf children was better than hearing children but the result was not significant. In problem solving, hearing children outperformed significantly than deaf children.

Conclusion: Findings showed different effects of deafness on cognitive functions. It seems that consequences of deafness on cognitive abilities are task dependent and in different tasks there are different cognitive effects.

To reach a better understand of deafness effect on cognitive abilities, there are researches which focused on cognitive abilities from low level (such as attention) to high level (such as problem solving).

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