Final Programme
and Abstracts

8th EFAS Congress

Joint meeting with the 10th Congress of the German Society of Audiology (Deutsche Gesellschaft für Audiologie e.V., DGA)

in collaboration with Arbeitsgemeinschaft Deutschsprachiger Audiologen und Neurootologen (ADANO)

6–9 June 2007
Heidelberg/Germany

European Federation of Audiological Societies (EFAS)

www.efas2007.org

Deutsche Gesellschaft für Audiologie e. V.

Hey, have you heard about the new Paediatric Accessories for Nucleus® Freedom™?

The Babyworn™ allows the Freedom™ BTE to be configured as a miniaturised wearing option, perfect for babies and younger children.

Snugfit™ can be easily shaped to fit the ear, delivering maximum comfort, retention and security of BTE components.

To learn more about the entire range of new accessories contact Cochlear or visit **www.cochlear.com**.

Cochlear Ltd (ABN 96 002 618 073) 14 Mars Road, Lane Cove NSW 2066, Australia, Tel: 61 2 9428 6555 Fax: 61 2 9428 6352
Cochlear Americas Denver - USA Tel: 1 303 790 9010
Cochlear AG Basel - Switzerland Tel: 41 61 205 0404
Cochlear Europe Ltd London - UK Tel: 44 1932 87 1500
Cochlear GmbH Hannover - Germany Tel: 49 511 542 770
Cochlear Italy Bologna - Italy Tel: 39 051 343578
Cochlear France Toulouse - France Tel: 33 5 34 63 85 85
Nihon Cochlear Co Ltd Tokyo - Japan Tel: 81 3 3817 0241
Cochlear (HK) Ltd Hong Kong Tel: 852 2530 5773
Cochlear Benelux NV Mechelen - Belgium Tel: 32 15 36 28 77
Cochlear Nordic AB Göteborg - Sweden Tel: 46 31 335 14 61/62
Cochlear Canada Inc Toronto - Canada Tel: 1 416 972 5082

Hear now. And always

Cochlear™

Final Programme and Abstracts

8th EFAS Congress

Joint meeting with the

10th congress of the German Society of Audiology (Deutsche Gesellschaft für Audiologie e.V., DGA)

in collaboration with

Arbeitsgemeinschaft Deutschsprachiger Audiologen und Neurootologen (ADANO)

6 – 9 June 2007

Heidelberg/Germany

European Federation of Audiological Societies (EFAS)

www.efas2007.org

Contents

Invitation

On behalf of the German Society of Audiology, which represents the audiologists of the three German-speaking countries Austria, Switzerland and Germany, it is a great pleasure to invite you to the eighth conference of the European Federation of Audiological Societies.

The meeting in June 2007 will take place in the romantic city of Heidelberg right in the centre of the old town.

The special atmosphere of the narrow streets with historic buildings which can all be reached in walking distance from the congress venue (Heidelberg Convention Centre „Stadthalle“) will provide the specific ambience for a productive scientific and social meeting.

The topics of this conference will focus on hearing in Europe. Special topics are

- the socioeconomic impact of hearing disorders,
- the epidemiology,
- etiology, diagnosis and treatment of childhood hearing loss,
- occupational noise-induced hearing loss and
- hearing loss in the elder population.

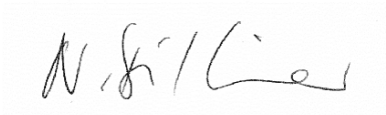
Special interest will also be given to all kinds of hearing devices and psychoacoustics.

We try to join experts of different specialties with an international reputation who will present state-of-the-art lectures. Representatives from the European commission and competent authorities will be invited to provide a broader perspective on research and services in the field of hearing loss and related communication disorders. The conference shall help to leverage this important health care topic to an appropriate level to increase funding and awareness in politics.

We look forward to welcoming you in Heidelberg.

On behalf of the organising committee

Thomas Lenarz MD, PhD
Conference President



Norbert Dillier, PhD
President of the DGA

EFAS, DGA and ADANO

European Federation of Audiology Societies (EFAS)
Board of EFAS

Chairman: *Joseph Attias (Israel)*
Vice Chairman: *Kajsa-Mia Holgers (Sweden)*
Past Chairman: *Hans Verschuure (Netherlands)*
General Secretary: *Ligija Kise (Latvia)*
Treasurer: *Thomas Spillmann (Switzerland)*
Auditors: *Alexandru Pascu (Romania) , Wieslaw Sulkowski (Poland)*

Deutsche Gesellschaft für Audiologie (DGA):

President: Norbert Dillier (Zürich)
Vice President:
Thomas Lenarz (Hannover)
General Secretary:
Wolfgang Döring (Aachen)
Treasurer: Patrick Zorowka (Innsbruck)
Additional board members:
Ingeborg Hochmair (Innsbruck)
Rainer Klinke (Frankfurt)
Birger Kollmeier (Oldenburg)

Arbeitsgemeinschaft Deutsch-sprachiger Audiologen und Neurootologen (ADANO):

President: Peter Plinkert (Heidelberg)
Vice Chairman:
Rudolf Probst (Zürich)
Vice Chairman:
Martin Walger (Köln)
General Secretary:
Sebastian Hoth (Heidelberg)
Treasurer: Uwe Baumann (Frankfurt)

Organisation

Conference President:
Thomas Lenarz, MD, PhD (Hannover, Germany)

Organisation:
Deutsche Gesellschaft für Audiologie e.V. (DGA)

Business Office
c/o Haus des Hörens
Marie-Curie-Straße 2
26129 Oldenburg
Tel: +49 4 41–21 72-500
Fax: +49 4 41–2172-550
E-Mail: info@dga-ev.com
Web: www.dga-ev.com

Organising Committee:

Norbert Dillier (DGA President, Zürich)
Thomas Lenarz (Conference President, Hannover)
Gottfried Diller, Friedberg/Heidelberg
Sebastian Hoth, ADANO, Heidelberg
Jürgen Kießling, Gießen
Birger Kollmeier, DGA Board, Oldenburg
Peter Plinkert, ADANO, Heidelberg
Patrick Zorowka, DGA Board, Innsbruck

Scientific Advisory Board

Austria	K. Stephan, W. Baumgartner
Belgium	P. Govaerts, E. Offeciers, J. Wouters
Czech Republic	J. Prihodova, D. Herrmannova
Croatia	B. Marn
Denmark	B. Walter, T. Dau, J. Thomsen
Estonia	K. Kruustilk
Finland	M. Sorri, I. Pyykkö
France	R. Dauman, J.-P. Bebear, A. Uziel
Georgia	Kevanishvili
Greece	G. Gavalas, T. Nikolopoulos
Hungary	J. Pytel, J. Kiss, A. Torkos
Iceland	E. Sindrason
Ireland	T. Pitt, L. Viani
Israel	J. Attias, H. Sohmer, Y. Henkin, H. Pratt
Italy	A. Martini, S. Burdo, F. Grandori, V. Colletti
Latvia	L. Kise
Lituania	I. Uluziene
Malta	E.P. Balzan
Netherlands	H. Verschuure, W. Dreschler, T. Houtgast, A. Snik, B. van Zanten
Norway	E. Laukli, O. Bo Vie
Poland	W. Sulkowski, M. Sliwinska
Portugal	A. Alvarenga
Romania	A. Pascu
Russia	G. Tavartkilazde
Serbia	B. Mikic, M. Simonovic
Slowenia	J. Vatovec
Slowakia	M. Profant
Spain	J. Barrajas, A. Ramos Marcias
Sweden	K.-M. Holgers, S. Arlinger, A. Leijon
Switzerland	T. Spillmann, R. Probst, R. Häusler
Turkey	A. Atas
Ukraine	T. Kulakova
United Kingdom	L. Luxon, S. Gatehouse(†), M. Lutman, G. O'Donoghue

General Information

Venue

Heidelberg Convention Centre ("Stadthalle")
Neckarstaden 24
D-69117 Heidelberg/Germany
Tel.: 0 62 21–1 42 28 12

Date

Wednesday June 6th 2007 to
Saturday June 9th 2007

Registration Guidelines

Participants are encouraged to register via the Internet. To register online, please use the congress website address www.efas2007.org. Confirmation will be sent upon receipt of payment. Registration for events that are included in the registration fee must also be marked on the form in order to obtain a ticket. Please note that registration for the various events will be on a "first-come first-served" basis and that the number of participants may be limited.

The registration fee for participants includes:

- all congress material,
- abstract book,
- daily tea/coffee,
- lunches,
- welcome reception,
- congress banquet,
- admission to all congress sessions,
- entrance to the exhibition.

Pre-conference registration can be performed using the online registration facility. Registration is a prerequisite for the submission of a scientific paper.

On site registration in Heidelberg

On site registration will start on Wednesday, 6 June, 8.00 am.

Certificate of attendance

All participants will receive a certificate of attendance at the registration desk after the congress.

Please inform the congress office in advance, if you have to leave earlier.

CEU Information

The Congress is accredited by the DGA in the category “Clinical Medical Audiology” and in the category “Scientific-technical Audiology”. In both categories 18 points will be provided. Evaluation sheets are available at the registration desk.

National Accreditation

Eine Zertifizierung der 10. Jahrestagung der DGA, gemeinsam mit dem 8. Kongress der EFAS als Veranstaltung ist anerkannt

- im Rahmen der freiwilligen Fortbildung für Ärzte durch die Landesärztekammer Baden-Würtemberg (29 Punkte)
- im Rahmen der postgradualen Fortbildung zum/r Medizinphysiker/in von der DGMP (24 Punkte) und
- von der Bundesinnung der Hörgeräteakustiker KdöR (BIHA) (20 Punkte)

Badges

Each participant will receive a name badge upon registration. For security reasons all participants are requested to wear their badge during all the congress activities and social events. The cost for replacing a lost badge is EUR 100.

Meals

Coffee and lunches are included in the registration fee and will be served daily during the congress.

Social Programme

In order to make your stay in Heidelberg most enjoyable and memorable we have planned the following events:

Wednesday, 6 June 2007
6.30–10.00 pm
Opening ceremony with the Lord Mayor of Heidelberg and Welcome Reception
(Stadthalle, Großer Saal)

Thursday, 7 June 2007
6.00–11.00 pm
Boat trip on the river Neckar to Dilberg Castle
(fee: 60 EUR per person)

Friday, 8 June 2007
8.00–0.00 pm
Congress banquet at Heidelberg Castle, reception at Castle Altar

Industry Exhibition

The industry exhibition takes place at the 1st floor of the Congress Hall City Hall Heidelberg. It spans the Brentano room, Hölderlin Hall, Sebastian Münster Hall as well as the Ballroom. Visitors get the possibility to exchange their experiences as well as to become acquainted with the latest developments and information about audiological and related products by exhibits and competent explanations.
The industry exhibition is opened during the entire congress (Wednesday to Friday from 08:00 to 18:00 and Saturday from 08:00 to 13:00). Short presentations of company representatives will be given in the Great Hall on Thursday, 07.06.2007, from 12:30 to 13:30. They provide an overview about the most important products and exhibits of the fair in order to facilitate the contact between exhibitors and visitors.
The floor plan of the industry exhibition in the Congress building shows the locations of the exhibitors.

(S = Snack Bar, C = Coffee)

The following exhibitors will demonstrate their products:

(1) G.R.A.S. Sound & Vibration A/S, Holte

(2) Otologics GmbH, Heidelberg

(3) Neurelec GmbH, Saarbrücken

(4) Varibel, Meppel

(5) Ulrich Keller Medizin-Technik, Weinheim

(6) Audio Medizintechnik Steinmeier GmbH, Braunschweig

(7) HörTech gGmbH, Oldenburg

(8) Auric Hörsysteme GmbH & Co. KG, Rheine

(9) Vivosonic Inc., Toronto

(10) Cochlear AG, Hannover

(11) MED-EL Elektromedizinische Geräte GmbH, Starnberg

(12) Vereinigung der Hörgeräteindustrie (Association of the Hearing Aid Industry), represented by „Forum Besser Hören“. These companies are:

Audio Service GmbH
Beltone Deutschland GmbH
Bernafon Hörgeräte GmbH
Bruckhoff & Partner GmbH
GN ReSound GmbH
Hansaton Akustik GmbH
Hörmann Audifon GmbH
Interton Hörgeräte GmbH
Oticon GmbH
Phonak GmbH
Siemens Audiologische Technik GmbH
Starkey Laboratoies (Germany) GmbH
Unitron Industries GmbH
Widex micro-technic GmbH

(13) AURITEC Medizindiagnostische Systeme GmbH, Hamburg

(14) Informa Healthcare, London

(15) Acousticon Hörsysteme GmbH, Reinheim

(16) Advanced Bionics GmbH, München

(17) Inno Force, Balzers

(18) GN ReSound A/S, Ballerup
Beltone
GN Otometrics

(19) Mack Medizin-Technik GmbH, Pfaffenhofen

(20) Amplifon Deutschland GmbH, Hamburg (without booth)

(21) Siemens Audiologische Technik GmbH, Erlangen
(truck in front of the entrance)

We wish all visitors and exhibitors a successful exhibition and interesting discussions.

Sponsors

We would like to thank all exhibitors for their participation, especially the main sponsors of the EFAS Congress, who are:

Gold Sponsor	Cochlear GmbH
Silver Sponsor	MED-EL Elektromedizinische Geräte GmbH Advanced Bionics GmbH
Bronze Sponsor	Neurelec GmbH Vereinigung der Hörgeräteindustrie (VHI) (Association of the Hearing Aid Industry) Amplifon Deutschland GmbH GN ReSound A/S

We would like to thank Amplifon for sponsoring:

- the trip with the cog railway to the castle,
- the music at the Congress banquet and
- the boat trip to Rainbach.

We would like to thank Cochlear, MED-EL and Advanced Bionics for sponsoring:
- congress bags for the participants

We would like to thank Cochlear and MED-EL for sponsoring:
- batches for the participants

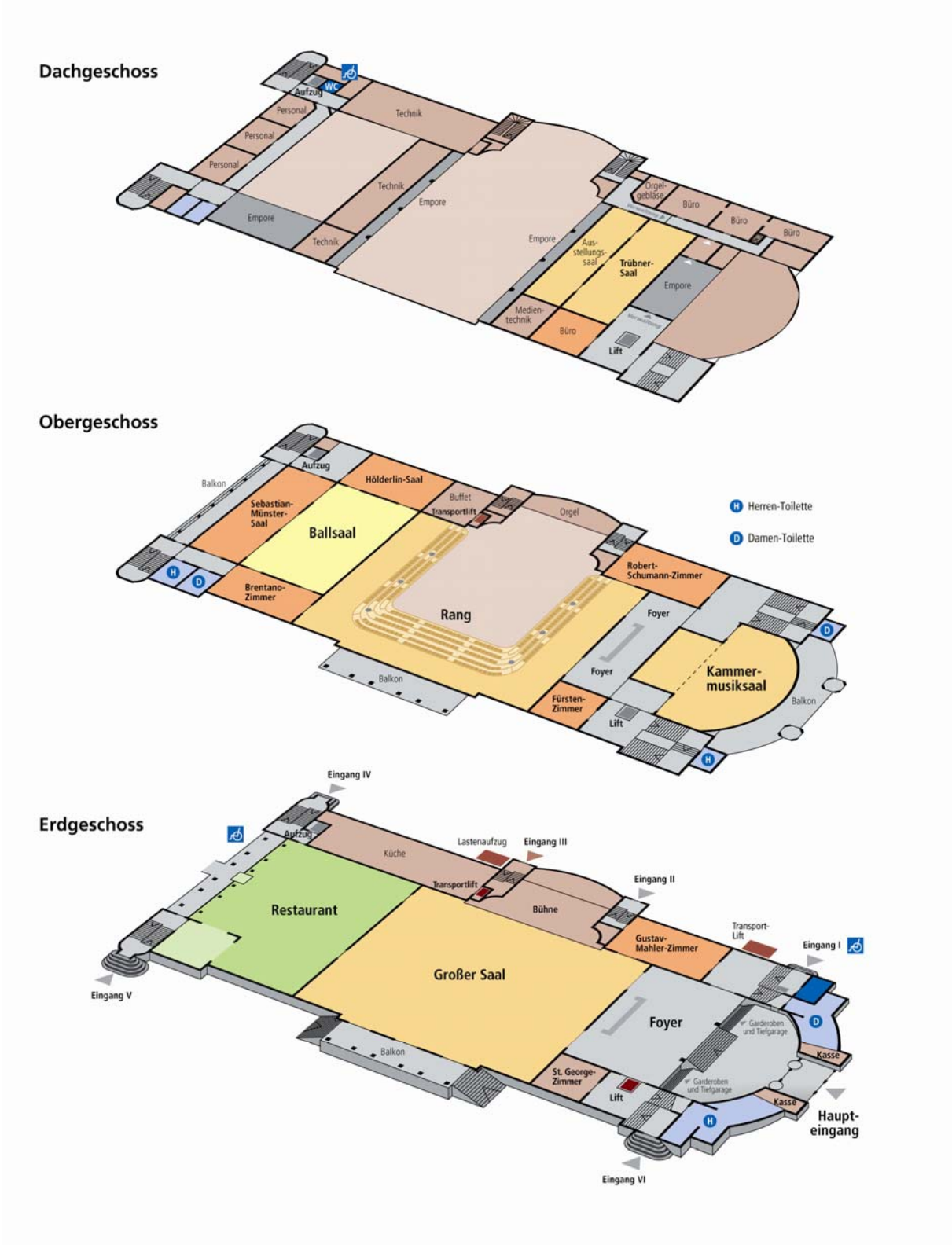
We would like to thank Advanced Bionics for sponsoring:
- writing pads and pencils for the congress bags

We would like to thank Neurelec for sponsoring:
- tickets for the congress banquet

The following companies and organisations support the congress by advertisements:

- KIND Hörgeräte
- Auric Hörsysteme GmbH & Co. KG
- Karger Verlag
- Ulrich Keller Medizin-Technik

Location Plan



Scientific Programme

Keynote lectures
The following topics will be reviewed and presented by distinguished experts in plenary keynote lectures:

- Sprachverstehen (Speech recognition) – Birger Kollmeier, Oldenburg D
- Ear Europe - Jan Grote, Leiden NL
- Epidemiology & Socioeconomic Impact of Hearing Loss in Europe – Adrian Davies, Manchester UK
- Electric stimulation of the human cochlea, cochlear nucleus and inferior colliculus: Implications for speech recognition – Robert V. Shannon, Los Angeles USA
- Rehabilitation programs in Europe - current concepts and future perspectives – Sue Archbold, Nottingham UK
- Preservation and Regeneration of the Auditory System – Joe Miller, Ann Arbor USA
- Mechanisms and models of normal and impaired hearing – Torsten Dau, Copenhagen DK

The schedule for these keynote lectures can be found below.

Structured sessions
Structured sessions are dedicated to specific scientific topics which are characterized by the diversity and interdisciplinary aspect of audiology. The sessions are moderated by experienced scientists who summarize the problem area and introduce the invited speakers. The list of topics and details of the 10 structured sessions can be found below.

Tutorials
Tutorials are an additional opportunity for continuing education open to all congress participants who are interested in the specific areas. To follow the presentations basic knowledge in audiology and neurotology but no prior expert knowledge in the specific topic area is required.
The tutorial courses are intended to provide new audiological professionals and interested persons of neighbouring disciplines insights into selected topics of audiology. Also, persons working in an area of audiology where more profound knowledge of the respective topic would be desirable but not absolutely required may take profit from these tutorial courses. Details and schedules can be found below.

Tutorials stellen ein zusätzliches Weiterbildungsangebot für alle Tagungsteilnehmer dar, die an der jeweiligen Thematik interessiert sind. Das Niveau der Beiträge setzt bewusst kein Expertenwissen auf den genannten Gebieten voraus, jedoch Grundkenntnisse in der Audiologie und Neurootologie.
Die Kurse sollen einerseits Einsteigern in der Audiologie und Interessenten benachbarter Fachgebiete einen Einblick in ausgewählte Themen der Audiologie vermitteln. Andererseits ist der Besuch besonders für solche Personen sinnvoll, die in einem Bereich der Audiologie tätig sind, in dem weitergehende Kenntnisse in der jeweiligen Thematik wünschenswert wären, aber keine unbedingte Voraussetzung sind. Weitere Einzelheiten finden Sie unten.

Poster exhibition
The poster exhibition constitutes a discussion forum and will be of high value during the whole EFAS/DGA congress. Therefore, every poster presenter will have the opportunity to give a short oral summary of his or her poster during the free paper sessions. The 3 best posters will be awarded a poster prize. The selection of the best posters is done by all conference participants and an expert group appointed by the conference organizers. Every participant will receive three sticker points at the registration which can be assigned to any of the posters. Members of the expert group will receive ten points each. The poster prizes will be handed over to the winning authors during the closing ceremony at 13:00 on Saturday, June 9.

The size of the posters should be limited to **110 cm width and 140 cm height**.

All posters will be on display during the whole meeting. Authors of posters which are listed with even numbers are kindly requested to be present at their posters during the coffee breaks of Thursday, June 8. Authors of posters with odd numbers are kindly requested to be present at their posters during the coffee breaks of Friday, June 9.

Posters may be put in place starting from Wednesday morning, June 6 (beginning of DGA Annual Meeting) and need to be removed until Saturday, June 9 at 14:00. Left posters will not be mailed.

Free paper sessions
The time for presentations of free papers is limited to 10 minutes, followed by five minutes of discussion. Short paper presentations (poster presentations) are limited to 3 minutes followed by 2 minutes of discussion. The chair persons are kindly requested to strictly enforce the planned schedule.

All presentations will be projected using the officially installed networked computers. Presentation from private notebooks will not be possible. The slide preview room is equipped with facilities to copy presentations from CD-ROMs or memory sticks to the congress computers. We recommend to provide the PowerPoint files as ‚pack and go', to guarantee a presentation without difficulties. Presentations generated on Macintosh should be Microsoft compatible. Experienced staff will be available for assistance.

Scientific Programme at a glance
6 – 7 June 2007

8th EFAS / 10th DGA CONGRESS HEIDELBERG 2007 (06 – 09 June 2007)				
Room	**Großer Saal**	**Kammermusiksaal**	**Trübnersaal**	**Robert-Schumann-Zimmer**
Wednesday June 6 2007	**10. DGA-Jahrestagung (Annual Meeting of the German Society of Audiology)**			
08:00 - 10:00	**Registration**			
10:00 - 11:00	**Welcome Keynote Lecture 01 Sprachverstehen (Speech recognition) (lecture will be held in German) Birger Kollmeier, Oldenburg, D**	—	—	**Posters**
11:00 - 13:00	**Structured session 1 Moderne Sprachaudiometrie: Forschung und Klinik (Current speech audiometry research and clinic, in German) (Moderation: B. Kollmeier, P. Plinkert)**	**Sitzung des DGA-Fachausschusses Hörgeräte-Technologie und -Versorgung**	**Sitzung des DGA-Fachausschusses Pädaudiologie**	**Posters**
13:00 - 14:00	**Lunch break, Posters, Exhibition**			
14:00 - 15:30	**Structured session 2 Sprachentwicklung bei normalhörenden und hörgeschädigten Kindern (Speech and language development in normal hearing and hearing impaired children,.in German) (Moderation: G. Diller, B. Bertram)**	**Free papers 01 Sprachaudiometrie (in German)**	**Tutorial A Hörgeräte (Hearing aids. Note: lectures in German) (Moderation: J. Kiessling)**	**Tutorial B Prediction of PTA in children using objective measures (Moderator: J. Attias)**
15:30 - 16:00	**Coffee break, Posters, Exhibition**			
16:00 - 17:00	**Free papers 02 Cochlear Implants 1: Objective Measures**	**Free papers 03 Tinnitus**	**Tutorial A (Cont.)**	**Tutorial B (Cont.)**
17:00 - 18:00	**DGA-Mitgliederversammlung**	**Free papers 04 Cochlear Implants 2: Bioengineering**	—	**Posters**
18:00 - 18:30	**Break, Exhibition**			
18:30 - 22:00	**Welcome Reception, Opening Ceremony**			

Thursday June 7 2007	**8th EFAS / 10th DGA Congress**

Room	**Großer Saal**	**Kammermusiksaal**	**Trübnersaal**	**Robert-Schumann-Zimmer**
08:00 - 08:45	**Keynote Lecture 02 Ear Europe Jan Grote, Leiden, NL**	—	—	**Posters**
8:45 - 9:30	**Keynote Lecture 03 Epidemiology & Socioeconomic Impact of Hearing Loss in Europe Adrian Davis, Manchester, UK**	—	—	**Posters**
09:30 - 10:30	**Coffee break, Posters, Exhibition**			
10:30 - 12:30	**Structured session 3 Research programs in Europe and EU politics (Moderators: M. Vlaming, D. Moore)**	**Free papers 05 Cochlear Implants 3: Fitting Methods**	**Free papers 06 Noise induced hearing loss 1**	**Posters**
12:30 - 13:30	**Lunch break, Short Company Presentations** Moderation: Jürgen Kiessling			
13:30 - 15:00	**Structured session 4 Genetics and childhood hearing loss (Moderators: A. Ramos, A. Lesinski-Schiedat)**	**Free papers 07 Research in EU: speech audiometry**	**Free papers 08 Cochlear Implants 4: Performance**	**Posters**
15:00 - 15:30	**Coffee break, Posters, Exhibition**			
15:30 - 17:00	**Structured session 5 Noise induced and age-related hearing loss (Moderators: M. Sliwinska, U. Rosenhall)**	**Free papers 09 Cochlear Implants 5: Speech perception**	**Free papers 10 Hearing instruments: Technology & Services**	**Posters**
17:00 - 18:00	**Panel Discussion (H)Ear Europe (Moderator: G. O'Donoghue)**	**Free papers 11 Noise induced hearing loss 2**	—	**Posters**
18:00 - 21:00	Boat trip to Rainbach (Dilsberg)			

Scientific Programme at a glance
8 – 9 June 2007

Friday June 8 2007	8th EFAS / 10th DGA Congress			
Room	**Großer Saal**	**Kammermusiksaal**	**Trübnersaal**	**Robert-Schumann-Zimmer**
08:00 - 08:45	Keynote Lecture 04 Electric stimulation of the human cochlea, cochlear nucleus and inferior colliculus: Implications for speech recognition Robert V. Shannon, Los Angeles. USA	—	—	Posters
08:45 - 10:15	Structured session 6 Technical Devices I: Implantable Hearing Aids and Cochlear Implants (Moderators: N. Dillier, T. Lenarz)	Free papers 12 Research in EU: neonatal screening	Free papers 13 Objective Audiometry	Posters
10:15 - 10:45	Coffee break, Posters, Exhibition			
10:45 - 12:30	Structured session 7 Technical Devices II: Hearing Instruments (Moderators: W. Dreschler, J. Kiessling)	Free papers 14 Cochlear Implants 6: Bimodal, EAS, Music	Free papers 15 Childhood hearing loss	Posters
12:30 - 13:30	Lunch break, EFAS General Assembly			
13:30 - 14:15	Keynote Lecture 05 Rehabilitation programs in Europe - current concepts and future perspectives Sue Archbold, Nottingham, UK	—	—	Posters
14:15 - 16:15	Structured session 8 Audiological Diagnostics (Moderators: R. Probst, S. Hoth)	Free papers 16 Hearing instruments: Verification & Evaluation	Free papers 17 Genetics of hearing disorders	Free papers 18 Cochlear Implants 7: Research and Clinic
16:15 - 16:45	Coffee break, Posters, Exhibition			
16:45 - 18:15	Structured session 9 Preservation and Regeneration of the Auditory System (Moderators: M. Knipper, T. Stöver)	Free papers 19 Speech audiometry	Free papers 20 Age related hearing loss	Free papers 21 Psychoacoustics
20:00 - 24:00	Congress Banquet, Heidelberg Castle			

Saturday June 9 2007	8th EFAS / 10th DGA Congress			
Room	**Großer Saal**	**Kammermusiksaal**	**Trübnersaal**	**Robert-Schumann-Zimmer**
08:15 - 09:00	Keynote Lecture 06 Preservation and Regeneration of the Auditory System Josef M. Miller, Ann Arbor, USA	—	—	Posters
09:00 - 09:45	Keynote Lecture 07 Mechanisms and models of normal and impaired hearing Torsten Dau, Copenhagen, DK	Tutorial C Anpassmethoden für Cochea-Implantate (Fitting Methods for Cochlear Implant Speech Processors,.in German) (Moderation: J. Müller-Deile, R.D. Battmer)	Tutorial D Ménière's Disease - How to diagnose and how to treat (Moderators: B. Ceranic, H.P. Wit)	Posters
09:45 - 10:15	Coffee break, Posters, Exhibition			
10:15 - 12:00	Structured session 10 Psychoacoustics in Audiology (Moderators: B. Kollmeier, D. Pressnitzer)	Tutorial C (Cont.)	Tutorial D (Cont.)	Posters
12:00 - 13:00	Free papers 22 Implantable hearing devices		Free papers 23 Inner Ear Disorders, Ménière, Ototoxicity	Posters
13:00 - 13:15	Closing Ceremony, Farewell			

List of Sessions

Keynote lectures (Großer Saal)		ID
Keynote Lecture 01 Sprachverstehen (Speech recognition) (lecture will be held in German) Birger Kollmeier, Oldenburg, D (Moderation: W. Döring)	06-Jun-2007 10:00-11:00	KL-1
Keynote Lecture 02 Ear Europe Jan Grote, Leiden, NL (Moderation: T. Lenarz)	07-Jun-2007 08:00-08:45	KL-2
Keynote Lecture 03 Epidemiology & Socioeconomic Impact of Hearing Loss in Europe Adrian Davis, Manchester, UK (Moderation: T. Spillmann)	07-Jun-2007 08:45-09:30	KL-3
Keynote Lecture 04 Electric stimulation of the human cochlea, cochlear nucleus and inferior colliculus: Implications for speech recognition Robert V. Shannon, Los Angeles. USA (Moderation: N. Dillier)	08-Jun-2007 08:00-08:45	KL-4
Keynote Lecture 05 Rehabilitation programs in Europe - current concepts and future perspectives Sue Archbold, Nottingham, UK (Moderation: F. Coninx)	08-Jun-2007 13:30-14:15	KL-5
Keynote Lecture 06 Preservation and Regeneration of the Auditory System Josef M. Miller, Ann Arbor, USA (Moderation: T. Moser)	09-Jun-2007 08:15-09:00	KL-6
Keynote Lecture 07 Mechanisms and models of normal and impaired hearing Torsten Dau, Copenhagen, DK (Moderation: J. Verhey)	09-Jun-2007 09:00-09:45	KL-7
Structured sessions and Tutorials		
Structured session 1 **Moderne Sprachaudiometrie: Forschung und Klinik (Current speech audiometry research and clinic, in German)** **(Moderation: B. Kollmeier, P. Plinkert, 06-Jun-2007, 11:00-13:00, Großer Saal)**		
Sprachaudiometrie in der Diagnostik	Probst, R.	SS01-1
Sprachaudiometrie in der Begutachtung	Brusis, T.	SS01-2
Sprachaudiometrie bei Kindern	Meister, H.	SS01-3
Sprachaudiometrie in der CI-Versorgung	Müller-Deile, J.	SS01-4
Sprachaudiometrie in der Forschung	Brand, T.	SS01-5
Structured session 2 **Sprachentwicklung bei normalhörenden und hörgeschädigten Kindern (Speech and language development in normal hearing and hearing impaired children, in German)** **(Moderation: G. Diller, B. Bertram, 06-Jun-2007, 14:00-15:30, Grosser Saal)**		
Sprachprobleme als Folge eingeschränkten Hörens	Diller, G.	SS02-1
Präverbale Dialoge	Horsch, U.	SS02-2
Frühe kognitive Leistungen und spätere Sprachentwicklungsstörungen	Pauen, S.	SS02-3

Auditives Arbeitsgedächtnis	Lürsen, U.	SS02-4
Doppelter Erstspracherwerb - Mehrspracherwerb	Schmitz-Salue, C.	SS02-5
Structured session 3 **Research programs in Europe and EU politics** **(Moderators: M. Vlaming, D. Moore, 07-Jun-2007, 10:30-12:30, Großer Saal)**		
Overview on European Hearing Research Projects	Vlaming, M.	SS03-1
Nano Ear: Aims, Application Process and Structure of the Consortium	Stöver, T.	SS03-2
HearCom: A mid term overview	Houtgast, T.	SS03-3
Education of Audiology in Europe	Verschuure, H.	SS03-4
Health Lifescience - EuroHear	N.N.	SS03-5
Future needs of European Hearing Research	Moore, D.	SS03-6
Structured session 4 **Genetics and childhood hearing loss** **(Moderators: A. Ramos, A. Lesinski-Schiedat, 07-Jun-2007, 13:30-15:00, Großer Saal)**		
Childhood hearing loss from a clinician's perspective including early detection, diagnostics, treatment and perspectives	Ramos Macias, A.	SS04-1
Paediatric Cochlear Implantation in the First and in the Second Year of Life: a Comparative Study	Lesinski-Schiedat, A., Illg, A., Büchner, A., Lenarz, T.	SS04-2
The Genetics of Hearing Loss in Childhood	Cremers, C.W.R.J.	SS04-3
Newborn hearing screening and beyond: the state-of-the-art in Europe	Grandori, F.	SS04-4
Principles of genetics in hearing loss	Kubisch, C.	SS04-5
Structured session 5 **Noise induced and age-related hearing loss** **(Moderators: M. Sliwinska, U. Rosenhall, 07-Jun-2007, 15:30-17:00, Großer Saal)**		
Age-related hearing loss – epidemiological and etiological aspects	Rosenhall, U.	SS05-1
Noise-induced hearing loss as a complex disorder influenced by environmental and genetic factors	Sliwinska-Kowalska, M.	SS05-2
The value of otoacoustic emissions in the evaluation of noise-induced hearing damage	Ceranic, B.	SS05-3
Tinnitus in aging population	Mazurek, B.	SS05-4
Structured session 6 **Technical Devices I: Implantable Hearing Aids and Cochlear Implants** **(Moderators: N. Dillier, T. Lenarz, 08-Jun-2007, 08:45-10:15, Großer Saal)**		
Implantable hearing systems: Common denominators and future developments - a clinical perspective	Häusler, R. , Stieger, C., Kompis, M.	SS06-1
Audiological aspects and test procedures for the evaluation of middle ear prostheses (including BAHA)	Snik, A.	SS06-2
Benefits of objective measures in cochlear implants	Burdo, S.	SS06-3
Signal processing for cochlear implants and combined bimodal and electroacoustic stimulation	McDermott, H.	SS06-4
Children with Cochlear Implants: Bilateral Implantation	Zarowski, A., Jans, M., Theuwis, L., Somers, Th., Offeciers, F.E.	SS06-5
Structured session 7 **Technical Devices II: Hearing Instruments** **(Moderators: W. Dreschler, J. Kiessling, 08-Jun-2007, 10:45-12:30, Großer Saal)**		
Sounds towards the tympanic membrane	Kiessling, J.	SS07-1
Compensation of hearing deficiencies in the inner ear	Hohmann, V.	SS07-2

The use of both ears	Wouters, J.	SS07-3
The fitting process of complex hearing aids	Dreschler, W.	SS07-4
Subjective and objective evaluation methods of complex hearing aids	Holube, I., Fredelake, S., Hansen, M.	SS07-5
Structured session 8 **Audiological Diagnostics** **(Moderators: R. Probst, S. Hoth, 08-Jun-2007, 14:15-16:15, Großer Saal)**		
Conductive Hearing Loss	Quaranta, N.	SS08-1
OAE latency and tuning: implications for cochlear models and diagnostic perspectives	Moleti, A., Sisto, R.	SS08-2
Transient and steady state auditory responses	Mühler, R.	SS08-3
Loudness scaling	Brand, T.	SS08-4
Speech Audiometry	Hagerman, B.	SS08-5
Binaural hearing and auditory functioning	Dreschler, W.	SS08-6
Structured session 9 **Preservation and Regeneration of the Auditory System** **(Moderators: M. Knipper, T. Stöver, 08-Jun-2007, 16:45-18:15, Großer Saal)**		
Preservation and regeneration of the auditory system	Knipper M.	SS09-1
Molecular mechanism in the regenerative biology of hearing	Loewenheim, H.	SS09-2
Stem cells in the auditory and vestibular organs of the inner ear	Senn, P.	SS09-3
The potential of growth factors for regeneration of the auditory system	Stöver, T.	SS09-4
The potential of growth factors for preservation of the auditory system	Panford-Walsh, R.	SS09-5
Structured session 10 **Psychoacoustics in Audiology** **(Moderators: B. Kollmeier, D. Pressnitzer, 09-Jun-2007, 10:15-12:00, Großer Saal)**		
The auditory profile – proposal from the European Hearcom Project	Dreschler, W.A., Kollmeier, B.	SS10-1
Binaural psychoacoustics in hearing- impaired listeners	Akeroyd, M., Gatehouse, S.	SS10-2
Recognition of complex temporal envelopes in normal-hearing listeners and cochlear implantees	Ardoint, M., Gorea, A., Debruille, X., Pressnitzer, D., Lorenzi, C.	SS10-3
The representation of intensity and periodicity in the human brain, as revealed by functional MRI and MEG	Uppenkamp, S., Ernst, S.M.A., Gutschalk, A., Rupp, A.	SS10-4
Panel Discussion **(H)Ear Europe** **(Moderator: G. O'Donoghue, 07-Jun-2007, 17:00-18:00, Großer Saal)**		
Ear Europe	Grote, J.	SSP1-1
Epidemiology & Socioeconomic Impact of Hearing Loss in Europe	Davis, A.	SSP1-2
Research programs in Europe and EU politics	Vlaming, M.	SSP1-3
Research programs in Europe and EU politics	Moore, D.	SSP1-4
Genetics and childhood hearing loss	Ramos Macias, A.	SSP1-5
Genetics and childhood hearing loss	Lesinski-Schiedat, A.	SSP1-6
Noise induced and age-related hearing loss	Sliwinska-Kowalska, M.	SSP1-7
Noise induced and age-related hearing loss	Rosenhall, U.	SSP1-8

Tutorials		
Tutorial A **Hörgeräte (Hearing aids. Note: lectures in German)** **(Moderation: J. Kiessling, 06-Jun-2007, 14:00-17:00, Trübnersaal)**		
Aktuelle Entwicklungen auf dem Hörgerätesektor	Bayer, E.	TTA-1
Charakterisierung von Hörgeräten	Holube, I.	TTA-2
Auswirkungen von Schallschlauch- und Ventdimensionen auf Frequenzgang und Okklusion	Bertges Reber, M.	TTA-3
Die ISO-Norm zur kategorialen Lautheitsskalierung und deren Anwendung für Hörgeräteanpassung und -kontrolle	Kinkel, M.	TTA-4
Datalogging - ein wirkungsvolles Instrument für die Hörgerätefeinanpassung und die Kundenberatung	Tchorz, J.	TTA-5
Tutorial B **Prediction of PTA in children using objective measures** **(Moderator: J. Attias, 06-Jun-2007, 14:00-17:00, Robert-Schumann-Zimmer)**		
Applications of OAE in the prediction of hearing threshold	Probst, R.	TTB-1
Auditory Brainstem Evoked Potentials in Objective Audiometric Assessment	Pratt, H.	TTB-2
Prediction of the audiogram using Auditory Steady-State Evoked Responses	Attias, J.	TTB-3
Prediction of the audiogram in adults and older children using the N1-P2 long latency response – accuracy and speed of testing	Lightfood, G.	TTB-4
Tutorial C **Anpassmethoden für Cochea-Implantate (Fitting Methods for Cochlear Implant Speech Processors,.in German)** **(Moderation: J. Müller-Deile, R.D. Battmer, 09-Jun-2007, 09:00-13:00, Kammermusiksaal)**		
Entwicklung der Cochlear Implant-Anpassung	Battmer, R.-D.	TTC-1
CI-Anpassung bei Erwachsenen: Real life fitting	Wesarg, T.	TTC-2
CI-Anpassung bei Kindern: Unterstützung durch ECAP-Messungen	Dillier, N.	TTC-3
Stapedius-Reflexmessungen bei der Anpassung	Stephan, K.	TTC-4
Bilaterale CI-Anpassung	Brill, S.	TTC-5
CI und Hörgerät bei der elektroakustischen Stimulation (EAS)	Böhm, M.	TTC-6
Anpassmethoden bei der bimodalen Versorgung	Baumann, U.	TTC-7
Späte Potentiale bei der CI-Anpassung	Hoth, S.	TTC-8
Audiologische Kontrollen	Müller-Deile, J.	TTC-9
Technische Kontrollen des CI-Systems	Battmer, R.-D.	TTC-10
Tutorial D **Ménière's Disease - How to diagnose and how to treat** **(Moderators: B. Ceranic, H.P. Wit, 09-Jun-2007, 09:00-12:00, Trübnersaal)**		
Aetio-pathophysiology of Ménière's disease with a particular reference to the association with migraine and the effect of noise	Ceranic, B.	TTD-1
Can Ménière's disease be diagnosed objectively?	Wit, H.P.	TTD-2
How can we prove an endolymphatic hydrops?	Scholz, G.	TTD-3
Clinical aspects and treatment of Ménière's disease	Dauman, R.	TTD-4

Free paper sessions

ID	Title	Authors	Session
FP01	**Sprachaudiometrie (in German) (06-Jun-2007, 14:00-15:30, Kammermusiksaal) (Chair persons: P. Plath, M. Vischer)**		
O001	Trainingseffekte und Listenäquivalenz des Freiburger Einsilbertests im Störschall	Hoppe, U., Mallinger, E., Digeser, F.	FP01-1
O002	Überprüfung von Hörgeräteversorgungen mit dem Basler Satztest	Kompis, M., Krebs,M. , Bertges Reber, M., Häusler, R.	FP01-2
O003	Sprachverstehen vor Hintergrundlärm bei hochgradig asymmetrischer Innenohrschwerhörigkeit nach Hörsturz	Bedeshem, C., Pfister, M., Zenner, H.P., Plontke, S.K.	FP01-3
O004	Anwendung des 'Oldenburger Satztests (OLSA)' zum Nachweis der Effizienz einer bilateralen Versorgung bei Patienten mit Cochlea-Implantaten und / oder Hörgeräten	Döring, W.H., Dujardin, H., Thürmer, C., Westhofen, M.	FP01-4
O005	Bestimmung der Sprachverständlichkeit im Störgeräusch für Freifeld-Bedingungen in unterschiedlichen Wiedergaberäumen	Müller, A., Brand, T., Kallinger, M., Mertins, A., Kollmeier, B.	FP01-5
P01	Prediction of speech intelligibility in fluctuating noise	Meyer, R., Brand, T.	FP01-6
P02	Hörgeätekontrolle in der HNO-Arztpraxis mit Tonschwellen-, Sprach-Audiogramm und Lautheitsskalierung, falls notwendig Korrektur der auffälligen Parameter.	Müller-Kortkamp, C. K. M., Moser, L. M.	FP01-7
P03	Improvement of speech intelligibility by audio hearing systems	Seidler, H.	FP01-8
FP02	**Cochlear Implants 1: Objective Measures (06-Jun-2007, 16:00-17:00, Großer Saal) (Chair persons: U. Hoppe, A. Morsnowski)**		
O006	Neural adaptation and the recovery function: Some insights from a simple mathematical model	Lai, W., Dillier, N.	FP02-1
O007	Influence of active electrode location and electrode configuration on the electrical excitation fields in cochlear implant stimulation	Tognola, G., Federica, S., Parazzini, M., Alessia, P., Ravazzani, P., Grandori, F.	FP02-2
O008	Clinical application of an automatic system to record and analyze electrically evoked compound action potentials in cochlear implant patients	Gärtner, L., Büchner, A., Battmer, R.D., Lenarz, T.	FP02-3
O009	SmartNRI: algorithm and mathematical basis	Arnold, L., Boyle, P.	FP02-4
FP03	**Tinnitus (06-Jun-2007, 16:00-17:00, Kammermusiksaal) (Chair persons: A. Limberger, B. Larsby)**		
O010	Measuring the perception of soft sounds in tinnitus patients with hyperacusis using the Oldenburg loudness scaling	Dauman, R., Grugel, L.	FP03-1
O011	Research on otoacoustic emission responses in patients suffering from tinnitus	Kulak Kayikci, M.E., Belgin, E.	FP03-2

O012	Auditory attention and tinnitus: the objective determination of tinnitus decompensation	Delb, W., Fen Low, Y., Corona-Strauss, F.I., Strauss, D.J.	FP03-3
P04	QoL perception: Comparison between tinnitus patients and their relatives (Preliminary results)	Oliveira, V., Meneses, R.F.	FP03-4
P05	Our experience with tinnitus workshop	Geczy, B.B., Vatovec, J.	FP03-5
P06	Effects of Prolonged Gacyclidine Intracochlear Perfusion on cochlear function and histology in Guinea Pigs	Wenzel, G.I., Lim, H.H., Warnecke, A.,Stoever, T., Lobl, Th., Schloss, J., Schwab, B., Lenarz Th.	FP03-6
FP04	**Cochlear Implants 2: Bioengineering (06-Jun-2007, 17:00-18:00, Kammermusiksaal) (Chair persons: H. Skarzynski, G. Gavalas)**		
O013	Corticosteroids and cochlear implantation – useful treatment to reduce electrode insertion trauma? Results from CAP-measurements of cochlear-implanted guinea pigs	Tillein, J., Ye, Q., Kiefer, J., Gstoettner, W., Braun, S.	FP04-1
O014	Neurotrophic effects of trangenic fibroblasts on neonatal spiral ganglion cells	Stöver, T., Warnecke, T., Wissel, K., Berkingali, N., Lenarz, T.	FP04-2
O015	Transient deafness in young candidates for cochlear implants	Attias, J., Raveh, E.	FP04-3
O016	Estimation of abnormalities of Cochlear Implant electrode placement using Spread of Excitation measurement	Walkowiak, A., Kostek, B., Lorens, A., Obrycka, A., Wasowski, A., Skarzynski, H.	FP04-4
FP05	**Cochlear Implants 3: Fitting Methods (07-Jun-2007, 10:30-12:30, Kammermusiksaal) (Chair persons: J. Kiss, R. Schönfeld)**		
O017	Early Changes of Electrical Stapedius Reflex Threshold over Time in Patients Supplied with CI	Koci, V., Stephan, K.	FP05-1
O018	CAEP measurement of sound discrimination of CI patients in noise	Igelmund, P., Meister, H., Brockhaus-Dumke, A., Fürstenberg, D., von Wedel, H., Walger, M.	FP05-2
O019	Influences of syllabic compression on speech evoked potentials in Cochlear Implant users	Wohlberedt, T., Digeser, F., Hessel, H., Hoppe, U.	FP05-3
O020	Remote Fitting of Cochlear Implant System	Wasowski, A., Lorens, A., Obrycka, A., Putkiewicz, J., Skarzynski, H.	FP05-4
O021	Pilot Study of Remote Measurement and Fitting of Cochlear Implant Recipients	Wesarg, T., Kröger, S., Gerber, O., Kind, H., Reuss, S., Roth, J., Junge, F., Novakovich, A., Aschendorff, A., Laszig, R.	FP05-5

O022	Simulation of modern signal processing strategies in cochlear implants	Bräcker, T., Schulte, M., Plotz, K., Hohmann, V.	FP05-6
O023	The New HarmonyTM Soundprocessor – Outcomes With The HiRes120 Speech Coding Strategy	Brendel, M., Buechner, A., Krueger, B., Frohne-Buechner, C., Lenarz, T.	FP05-7
O024	Bilateral cochlear implant	Morsnowski, A., Müller-Deile, J.	FP05-8
FP06	**Noise induced hearing loss 1** **(07-Jun-2007, 10:30-12:30, Trübnersaal)** **(Chair persons: S. Arlinger, A. Pascu)**		
O025	The relationship between tone- and speech-audiometry based assessments of hearing loss	Sukowski, H., Brand, T., Wagener, K., Kollmeier, B.	FP06-1
O026	The role of OAEs in monitoring NIHL in individuals	Helleman, H.W., Helleman, H.W., Jansen, N., Simis, Y.J.W., Dreschler, W.A.	FP06-2
O027	Otoacoustic emissions as a test for mild hearing loss early detection	Sisto, R., Moleti, A.	FP06-3
O028	Changes in DPOAE and hearing threshold fine structure after noise-exposure	Janssen, T., Müller, J.	FP06-4
O029	Implementation & Evaluation of an Internet Test to Screen for Hearing at Work.	de Laat, J.A.P.M.	FP06-5
O030	Hearing conservation	Russo, I.C.P.	FP06-6
O030 a	Incidence of occupational noise-induced hearing loss in Poland in 1999–2006	Sulkowski, W.J., Szymczak, W.	FP06-7
P07	Miniaturized dosimeter for an individualized prevention of hearing loss in the working environment and daily life	Müller, A., Witte H., Grosch, J.	FP06-8
P08	Development of a method to evaluate the influence of designed hearing protectors for classical orchestral musicians on perception and/or differentiation of sounds	Günter, J., Emmerich, E., Richter, F.	FP06-9
P09	Deterioration of frequency discrimination by contralateral noise in subjects with noise-induced hearing loss	Dörrie, M., Bungert-Kahl, P., Fuchs, M., Meister, E.F., Oeken, J., Rübsamen, R.	FP06-10
P10	Impact of impulsive noise after shooting on hearing assessment using Pure Tone Audiometry, High Frequency Audiometry and Otoacoustic Emissions registration.	Kantor, I., Jurkiewicz, D., Usowski, J., Rapiejko, P.	FP06-11
FP07	**Research in EU: speech audiometry** **(07-Jun-2007, 13:30-15:00, Kammermusiksaal)** **(Chair persons: B. Hagerman, J. de Laat)**		
O031	International cross-validation of sentence intelligibility tests	Wagener, K.C., Brand, T., Kollmeier, B.	FP07-1
O032	Development of a speech in noise test (Matrix)	Koopman, J., Houben, R., Dreschler, W.A., Verschuure, J.	FP07-2
O033	Development of French speech materials for the assessment of speech intelligibility in noise	Boon, E., Luts, H., Wable, J., Wouters, J.	FP07-3

O034	Effect of telephone bandwidth on digit triplet test	Lutman, M.E., Phipps, H.L.	FP07-4
O035	Cognitive aspects of speech recognition in noise	Larsby, B., Hällgren, M., Lyzenga, J.	FP07-5
O036	Auditory Processing	van Esch, T., Sol, J., Dreschler, W.A.	FP07-6
FP08	**Cochlear Implants 4: Performance (07-Jun-2007, 13:30-15:00, Trübnersaal) (Chair persons: A. Bohnert, A. von Wieringen)**		
O037	Development of speech understanding of adult Cochlear Implant recipients between 1984 and 2004	Rost, U., Straußß-Schier, A., Joseph, G., Büchner, A., Lenarz, T.	FP08-1
O038	Learning to use grammar – past tense in the spoken narratives of children with cochlear implants at the hearing age of 2 to 5 years	Huttunen, K., Peltokorpi, S.	FP08-2
O039	Localization abilities in bilaterally implanted children	van Deun, L., van Wieringen, A., Scherf, F., Deggouj, N., Desloovere, C., Dhooge, I., Offeciers, E., van de Heyning, P., Wouters, J.	FP08-3
O040	Brain activation patterns during auditory processing in children with right versus left Cochlear Implants	Henkin, Y., Attali, O., Yaar-Sofer, Y., Hildesheimer, M., Kishon-Rabin, L.	FP08-4
O041	Estimation of Speech Perception with the CI from preoperative Data	Joseph, G., Büchner, A., Battmer, R.D., Lenarz, T.	FP08-5
O042	Musical attitude of implanted children:speech and musical perception results of one year follow-up	Yucel, E., Sennaroglu, G., Budak, B., Belgin, E.	FP08-6
FP09	**Cochlear Implants 5: Speech perception (07-Jun-2007, 15:30-17:00, Kammermusiksaal) (Chair persons: M. Hey, D. Herrmannova)**		
O043	Speech perception in children using hi-resolution 120: preliminary report	Mancini, P., Bosco, E., D'Agosta, L ., Traisci, G., D'Elia, C., Filipo, R.	FP09-1
O044	Preliminary results of the Adult multicentral European HiRes 120 study	Kienast, B., Boyle, P.	FP09-2
O045	Speech perception of finnish adult cochlear implant users during four years of implant use	Välimaa, T., Sorri, M.	FP09-3
O046	How can you hear? Results from an Everyday Listening Questionnaire	Krüger, B., Brendel, M., Frohne-Büchner, C., Lesinski-Schiedat, A., Büchner, A., Lenarz, T.	FP09-4
O047	A prospective longitudinal quality of life study before and after cochlear implantation in post-lingually deafened adults	Meis, M., Lesinski-Schiedat, A, Plotz, K, Dillier, N., Walger, M., Wechtenbruch, J. & Hessel, H.	FP09-5

P11	Life quality of the adults underwent cochlear implantation	Sahli, S., Aksoy, A.	FP09-7
P12	Self-esteem of adolescents with cochlear implant and normal hearing, comparison between levels of depressive emotioning and sensitiveness towards criticism	Sahli, S., Belgin, E.	FP09-8
P13	Functional results after bilateral Cochlea Implantation - The Zurich experience	Veraguth, D., Huber, A., Laske, A., Binkert, A., Dillier, N.	FP09-9
FP10	**Hearing instruments: Technology & Services (07-Jun-2007, 15:30-17:00, Trübnersaal) (Chair persons: T. Pitt, T. Wesarg)**		
O048	Steady State Gain Reduction produced by Amplitude Modulation Based Noise Reduction in Digital Hearing Aids	Hoetink, A.E., Körössy, L., Dreschler, W.A.	FP10-1
O049	A special hearing aid with high directivity: the hearing glasses	Boone, M.	FP10-2
O050	Satisfaction of use with a commercial array-microphone hearing system	Verschuure, J., Homans, N., van der Zwan, J.	FP10-3
O051	Audiological Comparison of BTE Fitting Options	Branda, E., Chalupper, J.	FP10-4
O052	Patient preferences for direct hearing aid provision by a private dispenser. A discrete choice experiment.	Grutters, J.P.C., Joore, M.A., Kessels, A., Anteunis, L.J.C.	FP10-5
O053	Assessing the safety and efficiency of direct hearing aid provision by a private hearing aid dispenser: setting the research agenda	Joore, M.A., Grutters, J.P.C., Stokroos, R.J., van der Horst, F., Verschuure, J., Dreschler, W.A., Anteunis, L.J.C.	FP10-6
FP11	**Noise induced hearing loss 2 (07-Jun-2007, 17:00-18:00, Kammermusiksaal) (Chair persons: W. Sulkowski, B. Lütkenhöner)**		
O054	Hearing disorders in musicians	de Laat, J.A.P.M., Jansen, E.J.M., Neerings, M., Dreschler, W.A.	FP11-1
O055	Musicians and music-induced hearing disorders	Arlinger, S.	FP11-2
O056	The Audiovisual Noise Indicator – an appropriate instrument to reduce noise in classrooms.	Pilgramm, M., Lebisch, H., Hanel, J.	FP11-3
P14	Changes in hearing of music students - repeated advanced measurements	Svensson, E.B., Lindblad, A.-C.	FP11-4
P15	EEG activity while listening to piano music with and without out-of tune tones – a study on musicians	Oswald, S., Epler,T., Emmerich, E., Huonker, R., Richter, F.	FP11-5
P16	Effects of exposure at UMTS electromagnetic field on human hearing	Sliwinska-Kowalska, M., Zmyslony, M., Politanski, P., Bak, M., Kotylo, P., Woznicka, E., Thuroczy, G., Ravazzani, P.	FP11-6

FP12	**Research in EU: neonatal screening (08-Jun-2007, 08:45-10:15, Kammermusiksaal) (Chair persons: von Wedel; E. Hojan)**		
O057	Experience of newborn screening for deafness in slovenia	Vatovec, J., Geczy, B., Gros, A.	FP12-1
O058	UNHS program – preliminary results in Romania	Georgescu, M., Pascu, A.	FP12-2
O059	Universal neonatal screening in Poznañ	Sekula, A., Obrêbowski, A., Hashimoto, A., Jackowska, J.	FP12-3
O060	Validity of threshold estimation obtained with the VRA method “VideoVRA”	Kjærbøl, E.	FP12-4
O061	Peripheral and Central Hearing Disorders in Persons with Intellectual Disability	Neumann, K., Hey, C., Koseki, J., Baumann, U., Hild, U., Hoth, S., Herer, G., Janssen, T., Montgomery, J., Hoffmann, E., Ludwig, A., Rübsamen, R.	FP12-5
P17	Follow up of neonatal screened babies	Spindler, M.	FP12-6
P18	Frequency-specific assessment of hearing loss in newborns and infants by means of extrapolated DPOAE I/O-functions	Haszprunar, B., Niedermeyer, H., Janssen, T.	FP12-7
P19	Implementation of a Universal Newborn Hearing Screening programme in existing health services/ a pilot project in the Tyrol	Nekahm-Heis, D., Hirst-Stadlmann, A., Oberaigner, W., Stephan, K.	FP12-8
FP13	**Objective Audiometry (08-Jun-2007, 08:45-10:15, Trübnersaal) (Chair persons: T. Janssen; G. Tavartkiladze)**		
O062	The effects of contralateral stimulation on DPOAE fine structure	Mauermann, M., Kollmeier, B.	FP13-1
O063	Ear asymmetries and sex differences in neonatal TEOAEs	Berninger, E.	FP13-2
O064	Fast detection of ABR- responses using neural synchronization stability and single sweep analysis	Corona-Strauss, F., Delb, W., Strauss, D. J.	FP13-3
O065	Auditory Evoked Responses and the Threshold of Hearing	Lütkenhöner, B.	FP13-4
O066	Comparison of response thresholds derived from auditory steady state responses (ASSRs), tone pip-evoked auditory brainstem response (ABR) and click-evoked ABR with respect to their suitability for hearing aid fitting in small children	Koseki, J.-C., Neumann, K.	FP13-5
P20	Calibration effects on optimal stimulus paradigms for measurement of distortion product otoacoustic emissions in humans	Oswald, J., Kandzia, F., Janssen, T.	FP13-6
P21	Application of ABRs elicited by tone pips in diagnosis of retrocochlear hearing loss	Kochanek, K., Orkan-Lecka, E., Durrant, J. D., Œliwa, L., Skarzynski, H.	FP13-7

P22	Stochastic resonance on the intensity of DPOAE's	Tóth, F., Nagy, A. L., Vajtai, R., Gingl, Z., Rovó, L., Jóri, J., Kiss, J. G.	FP13-8
FP14	**Cochlear Implants 6: Bimodal, EAS, Music (08-Jun-2007, 10:45-12:30, Kammermusiksaal) (Chair persons: H. Meister; M. Lutman)**		
O067	Prosody perception in cochlear implant recipients wearing a hearing aid in the contralateral ear.	Landwehr, M., Pyschny, V., Walger, M., von Wedel, H., Meister, H.	FP14-1
O068	Acoustical frequency discrimination and speech perception in noise in EAS implanted ears	Baumann, U., Helbig, S., Gstöttner, W.	FP14-2
O069	Partial Deafness Cochlear Implantation: Outcomes with the DUET	Lorens, A., Polak, M., Piotrowska, A., Skarzynski, H.	FP14-3
O070	Increasing Frequency Intervals Improves Melody Recognition in Cochlear Implant Users	Digeser, F., Hast, A., Wesarg, T., Hessel, H., Hoppe, U.	FP14-4
O071	Music Perception with the Double Electrode Mode in the Nucleus Freedom CI System	Büchler, M., Lai, W., Dillier, N.	FP14-5
O072	Cochlear Implantation as a treatment for unilateral deafness associated with ipsilateral tinnitus: a case study	Büchner, A., Lesinski-Schiedat, A., Battmer, R.D., Khajehnouri, Y., Lenarz T.	FP14-6
P23	Voice discrimination by cochlear implant users	Pyschny, V., Weber, J., Walger, M., von Wedel, H., Meister, H.	FP14-7
P24	Pitch discrimination for different musical instruments with cochlear implant simulations	Haumann, S., Mühler, R., Ziese, M., von Specht, H.	FP14-9
P25	Pitch Ranking of Complex Tones using a Model of the Virtual Channels in the Nucleus Freedom System	Omran, S.A., Büchler, M., Lai, W., Dillier, N.	FP14-10
FP15	**Childhood hearing loss (08-Jun-2007, 10:45-12:30, Trübnersaal) (Chair persons: K. Plotz; K. Neumann)**		
O073	Children With Complex Needs : Cochlear Implant Candidates and Users	Herrmannova, D.	FP15-1
O074	Risk factors of auditory neuropathy / auditory synaptopathy in children	Beutner, D., Foerst, A., Lang-Roth, R., von Wedel, H., Hüttenbrink, K-B., Walger, M.	FP15-2
O075	Die phonologische Informationsverarbeitung bei hörbeeinträchtigten Kindern	Stumpf, P., Coninx, F.	FP15-3
O076	Vestibulo-cochlear symptoms due to large vestibular aquaeduct syndrome in children	Passou, E., Gavalas, G., Maroudias, N., Xenelis, I.	FP15-4
P26	Clinical findings and imaging in large endolymphatic duct and sac syndrome	Bartel-Friedrich, S., Amaya, B.,	FP15-5

		Rasinski, C., Kösling, S.	
P27	What is 'normal hearing' in paediatric audiometry?	Campbell, P.E.	FP15-6
P28	Clinical application of the Cochlea Scan for Hearing Threshold Estimation in Children	Knief, A., Schmidt, C.-M., Deuster, D., am Zehnhoff-Dinnesen, A.	FP15-7
P29	Does fluctuating conductive hearing loss affect children's phonological development in the early ages?	Stalnacke, H., van Doorn, J., Czigler, P. E.	FP15-8
P30	Diagnosis of secretory otitis media in otherwise healthy infant as a predicitive value for chronic disease in early childhood	Zupan, L.	FP15-9
P31	Basic auditory discrimination in children with auditory processing disorders (APD)	Ludwig, A., Baldauf, J., Kotz, S., Friederici, A., Rübsamen, R.	FP15-10
P32	Prediction of speech pereception from the acoustic conditions of unoccupied classrooms	Mora Espino, R., Zenker Castro, F., Rodríguez Jiménez, M.C., Mesa Suárez, J.L., Coello Marrero, A., Barajas de Prat, J.J.	FP15-11
P33	Effects of chronic railway noise exposure on children anxiety levels and emotion responses	Ekin, M.C., Atas, A., Aksoy, S.	FP15-12
FP16	**Hearing instruments: Verification & Evaluation (08-Jun-2007, 14:15-16:15, Kammermusiksaal) (Chair persons: E. Laukli; M. Kinkel)**		
O077	New Standard for the Measurement of Speech Amplification in Modern Hearing Instruments	Vlaming, M., Holube, I.	FP16-1
O078	Evaluation of noise reduction algorithms in hearing aids with the Acceptable Noise Level Test (ANLT)	Schlüter, A., Holube, I., Bitzer, J., Simmer, U., Brand, T.	FP16-2
O079	Verification of the hearing aid output using ecologically valid sounds in the lab (MPOver)	Kiessling, J., Müller, M., Keidser, G., Bentler, R.A.	FP16-3
O080	A comparison and real life evaluation of different data logging systems	Tiefenau, A., Fröhlich, M.	FP16-4
O081	Sounds perceived as disturbing by hearing aid users in their daily soundscape	Skagerstrand, Å.	FP16-5
O082	Questionnaires For Hearing Aid Evaluation – Useful tools or Wasting Time?	Latzel, M., Blab, S., Auer, M., Heuermann, H.	FP16-6
O083	Successful and unsuccessful users of bilateral amplification – differences and similarities in binaural performance	Köbler, S., Hagerman, B., Lindblad, A., Olofsson, Å.	FP16-7
P34	Analog versus digital hearing aids in patients with noise-induced hearing-loss	Sulkowski, W.J., Sward-Matyja, M., Kowalska, S.	FP16-8
P35	New Stimuli for Evaluation of Multichannel Noise Reduction Hearing Aids	Rout, A., Hanline, L.E., Halling, D. E.	FP16-9
P36	Speech recognition in a realistic noise field: a test method for hearing and hearing aid evaluation	Laukli, E., Andersen, R.	FP16-10

P37	Development of an Audio Compact Disc for Speech Audiometry Testing	Trimmis, N., Markatos, N., Malaperdas, K., Papadas, T.	FP16-11
FP17	**Genetics of hearing disorders (08-Jun-2007, 14:15-16:15, Trübnersaal) (Chair persons: S. Plontke; N.N.)**		
O084	The prelingual deafness DFNB9 is caused by a synaptopathy of inner hair cells	Moser, T., Roux, I., Safieddine, S., Nouvian, R., Grati, M., Simmler, MC., Perfettini., I., Le Gall M., Rostaing, P., Hamard, G.,Triller, A., Avan, P., Petit, C.	FP17-1
O085	Identification of modifier genes for connexin 26-related hearing impairment	Hilgert, N., van Camp, G.	FP17-2
O086	Laser Microdissection and Pressure Catapulting is superior to conventional manual dissection for isolating cellular compartments of the cochlea	Torkos, A., Wissel, K., Warnecke, A., Lenarz, T., Stöver, T.	FP17-3
O087	Genotypes and phenotypes of various nonsyndromic hearing losses of genetic origin	Kiss, J. G., Nagy, A. L., Csáki, R., Tóth, F., Klem, J., Kovács, K., Jóri, J.	FP17-4
FP18	**Cochlear Implants 7: Research and Clinic (08-Jun-2007, 14:15-16:15, Robert-Schumann-Zimmer) (Chair persons: A. Büchner, W.K. Lai)**		
O088	Socialisation of CI children over the past 10 years – expectation reached?	Lesinski-Schiedat, A., Chute, P., Lenarz, T., Lesinski, M.	FP18-1
O089	Examining “Informational Masking” in Cochlear Implant users.	Pyschny, V., Landwehr, M., Walger, M., von Wedel, H., Meister, H.	FP18-2
O090	Speech recognition in noise by hearing-impaired children using fm systems	Mora Espino, R., Zenker Castro, F., Rodríguez Jiménez, M.C., Mesa Suárez, J.L., Coello Marrero, A., Barajas de Prat, J.J.	FP18-3
O091	Influence of the mixing ratio of a FM-system on speech understanding in noise for CI user	Hey, M., Hocke, T., Scholz, G., Anft, D., Abels, D., Schmid, C., Kompis, M., Seeling, K., Hessel, H., Begall, K.	FP18-4
P38	Influence of Iridium Coating and Application of Steroids on Electrical Stimulation with Cochlear Implants	Paasche, G., Lesinski-Schiedat, A., Stöver, T., Lenarz, T.	FP18-5

P39	Fine-tuning of implant material-cell interactions by laser microstructuring	Reich, U., Reuter, G., Müller, P., Stöver, T., Chichkov, B., Lenarz, T.	FP18-6
P40	Synaptic contact number and transmitter exocytosis are maximal in mouse inner hair cells corresponding to frequencies of best hearing.	Meyer, A., Egner, A., Yarin, Y., Moser, T.	FP18-7
P41	The perception of prosodic cues in normal listeners and cochlear implant recipients	Meister, H., Landwehr, M., Pyschny, V., Walger, M., von Wedel, H.	FP18-8
P42	Language development in profoundly deaf children with and without cochlear implants	Suárez Rodríguez, M., Rodríguez Jiménez, M.C., Leal Hernández, E. Coello Marrero, A and Zenker Castro, F.	FP18-9
P43	What is the prognostic quality of the electrical acoustic nerve test performed before cochlear implantation for the speech reception obtained after rehabilitation?	Rader, T., Wechtenbruch, J., Baumann, U., Suckfüll, M., Matthias, Ch., Hempel, J.M.	FP18-10
P44	Expectation of cochlear implant benefits prior to implantation	Piotrowska, A., Putkiewicz, J., Lorens, A., Pankowska, A., Zgoda, M., Lutek, A., Skarzynski, H.	FP18-11
P45	School Education, out of School Education, Vocational Training and Employment Status of Young People who grew up with Cochlear Implants	Huber, M., Hitzl, W., Albegger, K.	FP18-12
P46	Making AGC work: variable presentation level speech testing	Khajehnouri, Y., Büchner, A., Lenarz, T.	FP18-13
P47	A verification protocol of fm systems for children with cochlear implant	Zenker Castro, F., Mora Espino, R., Rodríguez Jiménez, M.C., Mesa Suárez, J.L., Coello Marrero, A., Suárez Rodríguez, M., Barajas de Prat, J.J.	FP18-14
P48	Unified approach to hearing instrument fitting and rehabilitation: Professional end-user opinions in Germany, the Netherlands, and the UK	Vormann, M., Wagener, K.	FP18-15
P49	Neuronal fitting of hearing aids	Kurz, H.-R.	FP18-16

FP19	**Speech audiometry (08-Jun-2007, 16:45-18:15, Kammermusiksaal) (Chair persons: N. Trimmis, K. Wagener)**		
O092	Intelligibility of German digit triplets for non-native German listeners	Warzybok, A., Wagener, K.C., Brand, T.	FP19-1
O093	The Adaptive Auditory Speech Test (AAST) - development of of the Polish version.	Coninx, F., Lorens, A., Piotrowska, A., Hübinger, P., Skarzynski, H.	FP19-2
O094	Normalisation of the "Time-Compressed" and " Dichotic Digit" speech tests	Canatan, M. D., Budak, B.	FP19-3
O095	The effect of age over the dichotic digit test	Zenker Castro, F., Mora Espino, R., De Lucas Carmona, G., Fernández Belda, R., and Barajas, J.J.	FP19-4
O096	Listening Effort and Speech Intelligibility	Schulte, M., Meis, M., Wagener, K.	FP19-5
P50	The phonetic contents of texts as function of the intended age group.	Koopman, J., Verschuure, J.	FP19-6
P51	Turkish Hearing in Noise Test	Cekic, S., Sennaroglu, G., Soli, S.D.	FP19-7
P52	Word Recognition Scores by Native and Non-Native Speakers of Modern Greek Language	Trimmis, N., Markatos, N., Malaperdas, K., Papadeas, E.	FP19-8
FP20	**Age related hearing loss (08-Jun-2007, 16:45-18:15, Trübnersaal) (Chair persons: K.-M. Holgers, R. Mühler)**		
O097	Hearing in two samples of 55- to 65-year-old populations in Northern Finland	Mäki-Torkko, E., Hannula, S., Jounio-Ervasti, K., Sorri, M.	FP20-1
O098	The impact of aging and age related hearing loss on otoacoustic emissions	Hoth, S., Gudmundsdottir, K., Plinkert, P.	FP20-2
O099	Older people with hearing impairment: Examining the variations in the use of health services and maintenance of autonomy and independence. A prospective study	El Refaie, A.	FP20-3
O100	Examinations of the brainstem function in diabetic patients	Kiss, J. G., Várkonyi, T. T., Tóth, F., Rovó, L., Lengyel, Cs., Légrády, P., Jóri, J.	FP20-4
O101	Random gap detection threshold: a useful measure of auditory aging?	Owens, D., Campbell, P.E., Liddell, A., DePlacido, C., Wolters, M.	FP20-5
O101 a	Peculiarities of Age Related Hearing Loss in Females and Males	Sharashenidze N., Kevanishvili Z.	FP20-6
P53	Hearing, communication, and use/non-use of hearing aids by older people	Erber, N. P.	FP20-7

P54	Can extended high frequency hearing thresholds be used to detect auditory processing difficulties in an aging population?	Liddell, A., Campbell, P.E., Owens, D., DePlacido, C., Wolters, M.	FP20-8
P55	Aural rehabilitation, person centred or cost effective?	DePlacido, C.	FP20-9
FP21	**Psychoacoustics** **(08-Jun-2007, 16:45-18:15, Robert-Schumann-Zimmer)** **(Chair persons: T. Brand, J. Tchorz)**		
O102	Automatic screening and detection of threshold fine structure	Verhey, J.L., Mauermann, M., Heise, S.	FP21-1
O103	Threshold fine structure and its role in temporal integration	Verhey, J.L., Lendzian, H., Mauermann, M.	FP21-2
O104	The new ISO 16832 „Acoustics – Loudness scaling by means of categories“	Kinkel M.	FP21-3
O105	Does the natural sounds loudness estimation method work for patients with "dead regions"?	Hojan-Jezierska, D., Skrodzka, E., Hojan, E.	FP21-4
P56	Development of Frequency Selectivity Map (FSMap) depiction system for hearing impairment	Nakaichi, T., Sakamoto, S.	FP21-5
P57	Measuring the diffusiveness of spatial sound: A common framework for binaural perception, neurophysiological correlates and modelling	Lüddemann, H., Riedel, H., Kollmeier, B.	FP21-6
P58	Mechanisms of speech masking release: role of temporal and spectral cues	Gnansia, D., Meyer, B., Frachet, B., Philippon, B., Jourdes, V., Lorenzi, C.	FP21-7
P59	A scanner noise impact on functional Magnetic Resonance Imaging studies	Bogorodzki, P., Piatkowska-Janko, E., Wolak, T., Sliwa, L., Kochanek, K., Orzechowski, M., Kurjata, R., Golebiowski, M., Skarzynski, H.	FP21-8
P60	Evaluation of differences between audiometric and ASSR thresholds	Sliwa, L., Kochanek, K., Piotrowska, A., Plka, A., Skarzynski, H.	FP21-9
FP22	**Implantable hearing devices** **(09-Jun-2007, 12:00-13:00, Großer Saal)** **(Chair persons: J. Pytel, C. Stieger)**		
O106	BAHA in children, audiological results	Snik, A., Kunst, S., Leijendeckers, J., Bosman, A., Mylanus, E., Cremers, C.	FP22-1
O107	Implantable hearing aid transducers: Output measured for different coupling parameters	Stieger, C., Arnold, A., Candreia, C., Pfiffner, F., Kompis, M., Bernhard, H., Häusler, R.	FP22-2

O108	Comparison of Indicators for Efficient Coupling of an Electromagnetic Transducer (Otologics MET™) to the Ossicles.	Maier, H., Sancez-Hanke, M., Leuwer, R.	FP22-3
P61	Concepts for the expansion of the audiological indication range of implantable air conduction hearing devices	Winter, M., Wesendahl, T.	FP22-4
P62	Audiological results with implantable hearing device vibrant soundbridge in moderate to severe mixed hearing loss	Mojallal, H., Teschner, M., Schwab, B., Stöver, T., Lenarz, T.	FP22-5
P63	First results for the treatment of combined hearing loss using the Vibrant Soundbridge with a round window approach and prosthesis bound application	Mlynski, R., Müller, J., Hagen, R.	FP22-6
FP23	**Inner Ear Disorders, Ménière, Ototoxicity (09-Jun-2007, 12:00-13:00, Trübnersaal) (Chair persons: J. Barajas, R. Matschke)**		
O109	The effect of endolymphatic shunt surgery on macula and crista function	Park, J.J.-H., Westhofen, M.	FP23-1
O110	VENG Abnormalties in BPPV	Atas, A., Aksoy, A., Turan, E.	FP23-2
O111	Hearing complaints related to solvent exposure: Possible connections to (central) auditory processing disorder	Fuente, A., McPherson, B.	FP23-3
P64	Evaluations of Electrocochleography in Possible Meniere's Disease without Hearing Loss	Han, K.Y., Song, Y.J., Ko, H.S., Park, Y.J., Kim, J.H.	FP23-4
P65	Hearing impairment and balance disorders in patients with anti-cancer chemotherapy	Usowski, J., Kantor, I., Jurkiewicz, D.	FP23-5
P66	A systematic review of the role of tympanostomy tubes (grommets) in the management of recurrent acute otitis media and otitis media with effusion	Bylander-Groth A., Jörgensen F., Axelsson S., Bengtsson Boström K., Eckerlund I., Pettersson A., Ryding M., Uhlén I., Hellström S.	FP23-6

Posters

ID	Title	Authors	Session
P01	Prediction of speech intelligibility in fluctuating noise	Meyer, R., Brand, T.	FP01-6
P02	Hörgeätekontrolle in der HNO-Arztpraxis mit Tonschwellen-, Sprach-Audiogramm und Lautheitsskalierung, falls notwendig Korrektur der auffälligen Parameter.	Müller-Kortkamp, C. K. M., Moser, L. M.	FP01-7
P03	Improvement of speech intelligibility by audio hearing systems	Seidler, H.	FP01-8
P04	QoL perception: Comparison between tinnitus patients and their relatives (Preliminary results)	Oliveira, V., Meneses, R.F.	FP03-4
P05	Our experience with tinnitus workshop	Geczy, B.B., Vatovec, J.	FP03-5
P06	Effects of Prolonged Gacyclidine Intracochlear Perfusion on cochlear function and histology in Guinea Pigs	Wenzel, G.I., Lim, H.H., Warnecke, A.,Stoever, T., Lobl, Th., Schloss, J., Schwab, B., Lenarz Th.	FP03-6
P07	Miniaturized dosimeter for an individualized prevention of hearing loss in the working environment and daily life	Müller, A., Witte H., Grosch, J.	FP06-7
P08	Development of a method to evaluate the influence of designed hearing protectors for classical orchestral musicians on perception and/or differentiation of sounds	Günter, J., Emmerich, E., Richter, F.	FP06-8
P09	Deterioration of frequency discrimination by contralateral noise in subjects with noise-induced hearing loss	Dörrie, M., Bungert-Kahl, P., Fuchs, M., Meister, E.F., Oeken, J., Rübsamen, R.	FP06-9
P10	Impact of impulsive noise after shooting on hearing assessment using Pure Tone Audiometry, High Frequency Audiometry and Otoacoustic Emissions registration.	Kantor, I., Jurkiewicz, D., Usowski, J., Rapiejko, P.	FP06-10
P11	Life quality of the adults underwent cochlear implantation	Sahli, S., Aksoy, A.	FP09-7
P12	Self-esteem of adolescents with cochlear implant and normal hearing, comparison between levels of depressive emotioning and sensitiveness towards criticism	Sahli, S., Belgin, E.	FP09-8
P13	Functional results after bilateral Cochlea Implantation - The Zurich experience	Veraguth, D., Huber, A., Laske, A., Binkert, A., Dillier, N.	FP09-9
P14	Changes in hearing of music students - repeated advanced measurements	Svensson, E.B., Lindblad, A.-C.	FP11-4
P15	EEG activity while listening to piano music with and without out-of tune tones – a study on musicians	Oswald, S., Epler,T., Emmerich, E., Huonker, R., Richter, F.	FP11-5
P16	Effects of exposure at UMTS electromagnetic field on human hearing	Sliwinska-Kowalska, M., Zmyslony, M., Politanski, P., Bak, M., Kotylo, P., Woznicka, E., Thuroczy, G., Ravazzani, P.	FP11-6

P17	Follow up of neonatal screened babies	Spindler, M.	FP12-6
P18	Frequency-specific assessment of hearing loss in newborns and infants by means of extrapolated DPOAE I/O-functions	Haszprunar, B., Niedermeyer, H., Janssen, T.	FP12-7
P19	Implementation of a Universal Newborn Hearing Screening programme in existing health services/ a pilot project in the Tyrol	Nekahm-Heis, D., Hirst-Stadlmann, A., Oberaigner, W., Stephan, K.	FP12-8
P20	Calibration effects on optimal stimulus paradigms for measurement of distortion product otoacoustic emissions in humans	Oswald, J., Kandzia, F., Janssen, T.	FP13-6
P21	Application of ABRs elicited by tone pips in diagnosis of retrocochlear hearing loss	Kochanek, K., Orkan-Lecka, E., Durrant, J. D., Œliwa, L., Skarzynski, H.	FP13-7
P22	Stochastic resonance on the intensity of DPOAE's	Tóth, F., Nagy, A. L., Vajtai, R., Gingl, Z., Rovó, L., Jóri, J., Kiss, J. G.	FP13-8
P23	Voice discrimination by cochlear implant users	Pyschny, V., Weber, J., Walger, M., von Wedel, H., Meister, H.	FP14-7
P24	Pitch discrimination for different musical instruments with cochlear implant simulations	Haumann, S., Mühler, R., Ziese, M., von Specht, H.	FP14-9
P25	Pitch Ranking of Complex Tones using a Model of the Virtual Channels in the Nucleus Freedom System	Omran, S.A., Büchler, M., Lai, W., Dillier, N.	FP14-10
P26	Clinical findings and imaging in large endolymphatic duct and sac syndrome	Bartel-Friedrich, S., Amaya, B., Rasinski, C., Kösling, S.	FP15-5
P27	What is 'normal hearing' in paediatric audiometry?	Campbell, P.E.	FP15-6
P28	Clinical application of the Cochlea Scan for Hearing Threshold Estimation in Children	Knief, A., Schmidt, C.-M., Deuster, D., am Zehnhoff-Dinnesen, A.	FP15-7
P29	Does fluctuating conductive hearing loss affect children's phonological development in the early ages?	Stalnacke, H., van Doorn, J., Czigler, P. E.	FP15-8
P30	Diagnosis of secretory otitis media in otherwise healthy infant as a predicitive value for chronic disease in early childhood	Zupan, L.	FP15-9
P31	Basic auditory discrimination in children with auditory processing disorders (APD)	Ludwig, A., Baldauf, J., Kotz, S., Friederici, A., Rübsamen, R.	FP15-10
P32	Prediction of speech pereception from the acoustic conditions of unoccupied classrooms	Mora Espino, R., Zenker Castro, F., Rodríguez Jiménez, M.C., Mesa Suárez, J.L., Coello Marrero, A., Barajas de Prat, J.J.	FP15-11

P33	Effects of chronic railway noise exposure on children anxiety levels and emotion responses	Ekin, M.C., Atas, A., Aksoy, S.	FP15-12
P34	Analog versus digital hearing aids in patients with noise-induced hearing-loss	Sulkowski, W.J., Sward-Matyja, M., Kowalska, S.	FP16-8
P35	New Stimuli for Evaluation of Multichannel Noise Reduction Hearing Aids	Rout, A., Hanline, L.E., Halling, D. E.	FP16-9
P36	Speech recognition in a realistic noise field: a test method for hearing and hearing aid evaluation	Laukli, E., Andersen, R.	FP16-10
P37	Development of an Audio Compact Disc for Speech Audiometry Testing	Trimmis, N., Markatos, N., Malaperdas, K., Papadas, T.	FP16-11
P38	Influence of Iridium Coating and Application of Steroids on Electrical Stimulation with Cochlear Implants	Paasche, G., Lesinski-Schiedat, A., Stöver, T., Lenarz, T.	FP18-5
P39	Fine-tuning of implant material-cell interactions by laser microstructuring	Reich, U., Reuter, G., Müller, P., Stöver, T., Chichkov, B., Lenarz, T.	FP18-6
P40	Synaptic contact number and transmitter exocytosis are maximal in mouse inner hair cells corresponding to frequencies of best hearing.	Meyer, A., Egner, A., Yarin, Y., Moser, T.	FP18-7
P41	The perception of prosodic cues in normal listeners and cochlear implant recipients	Meister, H., Landwehr, M., Pyschny, V., Walger, M., von Wedel, H.	FP18-8
P42	Language development in profoundly deaf children with and without cochlear implants	Suárez Rodríguez, M., Rodríguez Jiménez, M.C., Leal Hernández, E. Coello Marrero, A and Zenker Castro, F.	FP18-9
P43	What is the prognostic quality of the electrical acoustic nerve test performed before cochlear implantation for the speech reception obtained after rehabilitation?	Rader, T., Wechtenbruch, J., Baumann, U., Suckfüll, M., Matthias, Ch., Hempel, J.M.	FP18-10
P44	Expectation of cochlear implant benefits prior to implantation	Piotrowska, A., Putkiewicz, J., Lorens, A., Pankowska, A., Zgoda, M., Lutek, A., Skarzynski, H.	FP18-11
P45	School Education, out of School Education, Vocational Training and Employment Status of Young People who grew up with Cochlear Implants	Huber, M., Hitzl, W., Albegger, K.	FP18-12
P46	Making AGC work: variable presentation level speech testing	Khajehnouri, Y., Büchner, A., Lenarz, T.	FP18-13

P47	A verification protocol of fm systems for children with cochlear implant	Zenker Castro, F., Mora Espino, R., Rodríguez Jiménez, M.C., Mesa Suárez, J.L., Coello Marrero, A., Suárez Rodríguez, M., Barajas de Prat, J.J.	FP18-14
P48	Unified approach to hearing instrument fitting and rehabilitation: Professional end-user opinions in Germany, the Netherlands, and the UK	Vormann, M., Wagener, K.	FP18-15
P49	Neuronal fitting of hearing aids	Kurz, H.-R.	FP18-16
P50	The phonetic contents of texts as function of the intended age group.	Koopman, J., Verschuure, J.	FP19-6
P51	Turkish Hearing in Noise Test	Cekic, S., Sennaroglu, G., Soli, S.D.	FP19-7
P52	Word Recognition Scores by Native and Non-Native Speakers of Modern Greek Language	Trimmis, N., Markatos, N., Malaperdas, K., Papadeas, E.	FP19-8
P53	Hearing, communication, and use/non-use of hearing aids by older people	Erber, N. P.	FP20-6
P54	Can extended high frequency hearing thresholds be used to detect auditory processing difficulties in an aging population?	Liddell, A., Campbell, P.E., Owens, D., DePlacido, C., Wolters, M.	FP20-7
P55	Aural rehabilitation, person centred or cost effective?	DePlacido, C.	FP20-8
P56	Development of Frequency Selectivity Map (FSMap) depiction system for hearing impairment	Nakaichi, T., Sakamoto, S.	FP21-5
P57	Measuring the diffusiveness of spatial sound: A common framework for binaural perception, neurophysiological correlates and modelling	Lüddemann, H., Riedel, H., Kollmeier, B.	FP21-6
P58	Mechanisms of speech masking release: role of temporal and spectral cues	Gnansia, D., Meyer, B., Frachet, B., Philippon, B., Jourdes, V., Lorenzi, C.	FP21-7
P59	A scanner noise impact on functional Magnetic Resonance Imaging studies	Bogorodzki, P., Piatkowska-Janko, E., Wolak, T., Sliwa, L., Kochanek, K., Orzechowski, M., Kurjata, R., Golebiowski, M., Skarzynski, H.	FP21-8
P60	Evaluation of differences between audiometric and ASSR thresholds	Sliwa, L., Kochanek, K., Piotrowska, A., Plka, A., Skarzynski, H.	FP21-9
P61	Concepts for the expansion of the audiological indication range of implantable air conduction hearing devices	Winter, M., Wesendahl, T.	FP22-4
P62	Audiological results with implantable hearing device vibrant soundbridge in moderate to severe mixed hearing loss	Mojallal, H., Teschner, M., Schwab, B., Stöver, T., Lenarz, T.	FP22-5

P63	First results for the treatment of combined hearing loss using the Vibrant Soundbridge with a round window approach and prosthesis bound application	Mlynski, R., Müller, J., Hagen, R.	FP22-6
P64	Evaluations of Electrocochleography in Possible Meniere's Disease without Hearing Loss	Han, K.Y., Song, Y.J., Ko, H.S., Park, Y.J., Kim, J.H.	FP23-4
P65	Hearing impairment and balance disorders in patients with anti-cancer chemotherapy	Usowski, J., Kantor, I., Jurkiewicz, D.	FP23-5
P66	A systematic review of the role of tympanostomy tubes (grommets) in the management of recurrent acute otitis media and otitis media with effusion	Bylander-Groth A., Jörgensen F., Axelsson S., Bengtsson Boström K., Eckerlund I., Pettersson A., Ryding M., Uhlén I., Hellström S.	FP23-6

List of Authors

ID	Authors	Title	Session
SS10-2	Akeroyd, M., Gatehouse, S.	Binaural psychoacoustics in hearing- impaired listeners	SS10
KL-5	Archbold, S.	Rehabilitation programs in Europe - current concepts and future perspectives	KL-5
SS10-3	Ardoint, M., Gorea, A., Debruille, X., Pressnitzer, D., Lorenzi, C.	Recognition of complex temporal envelopes in normal-hearing listeners and cochlear implantees	SS10
O055	Arlinger, S.	Musicians and music-induced hearing disorders	FP11-2
O009	Arnold, L., Boyle, P.	SmartNRI: algorithm and mathematical basis	FP02-4
O110	Atas, A., Aksoy, A., Turan, E.	VENG Abnormalties in BPPV	FP23-2
TTB-3	Attias, J.	Prediction of the audiogram using Auditory Steady-State Evoked Responses	TTB
O015	Attias, J., Raveh, E.	Transient deafness in young candidates for cochlear implants	FP04-3
P26	Bartel-Friedrich, S., Amaya, B., Rasinski, C., Kösling, S.	Clinical findings and imaging in large endolymphatic duct and sac syndrome	FP15-5
TTC-1	Battmer, R.-D.	Entwicklung der Cochlear Implant-Anpassung	TTC
TTC-10	Battmer, R.-D.	Technische Kontrollen des CI-Systems	TTC
TTC-7	Baumann, U.	Anpassmethoden bei der bimodalen Versorgung	TTC
O068	Baumann, U., Helbig, S., Gstöttner, W.	Acoustical frequency discrimination and speech perception in noise in EAS implanted ears	FP14-2
TTA-1	Bayer, E.	Aktuelle Entwicklungen auf dem Hörgerätesektor	TTA
O003	Bedeshem, C., Pfister, M., Zenner, H.P., Plontke, S.K.	Sprachverstehen vor Hintergrundlärm bei hochgradig asymmetrischer Innenohrschwerhörigkeit nach Hörsturz	FP01-3
O063	Berninger, E.	Ear asymmetries and sex differences in neonatal TEOAEs	FP13-2
TTA-3	Bertges Reber, M.	Auswirkungen von Schallschlauch- und Ventdimensionen auf Frequenzgang und Okklusion	TTA
O074	Beutner, D., Foerst, A., Lang-Roth, R., von Wedel, H., Hüttenbrink, K-B., Walger, M.	Risk factors of auditory neuropathy / auditory synaptopathy in children	FP15-2
P59	Bogorodzki, P., Piatkowska-Janko, E., Wolak, T., Sliwa, L., Kochanek, K., Orzechowski, M., Kurjata, R., Golebiowski, M., Skarzynski, H.	A scanner noise impact on functional Magnetic Resonance Imaging studies	FP21-8
TTC-6	Böhm, M.	CI und Hörgerät bei der elektroakustischen Stimulation (EAS)	TTC
O033	Boon, E., Luts, H., Wable, J., Wouters, J.	Development of French speech materials for the assessment of speech intelligibility in noise	FP07-3
O049	Boone, M.	A special hearing aid with high directivity: the hearing glasses	FP10-2
O022	Bräcker, T., Schulte, M., Plotz, K., Hohmann, V.	Simulation of modern signal processing strategies in cochlear implants	FP05-6

SS01-5	Brand, T.	Sprachaudiometrie in der Forschung	SS01
SS08-4	Brand, T.	Loudness scaling	SS08
O051	Branda, E., Chalupper, J.	Audiological Comparison of BTE Fitting Options	FP10-4
O023	Brendel, M., Buechner, A., Krueger, B., Frohne-Buechner, C., Lenarz, T.	The New HarmonyTM Soundprocessor - Outcomes With The HiRes120 Speech Coding Strategy	FP05-7
TTC-5	Brill, S.	Bilaterale CI-Anpassung	TTC
SS01-2	Brusis, T.	Sprachaudiometrie in der Begutachtung	SS01
O071	Büchler, M., Lai, W., Dillier, N.	Music Perception with the Double Electrode Mode in the Nucleus Freedom CI System	FP14-5
O072	Büchner, A., Lesinski-Schiedat, A., Battmer, R.D., Khajehnouri, Y., Lenarz T.	Cochlear Implantation as a treatment for unilateral deafness associated with ipsilateral tinnitus: a case study	FP14-6
SS06-3	Burdo, S.	Benefits of objective measures in cochlear implants	SS06
P66	Bylander-Groth A., Jörgensen F., Axelsson S., Bengtsson Boström K., Eckerlund I., Pettersson A., Ryding M., Uhlén I., Hellström S.	A systematic review of the role of tympanostomy tubes (grommets) in the management of recurrent acute otitis media and otitis media with effusion	FP23-6
P27	Campbell, P.E.	What is ‘normal hearing’ in paediatric audiometry?	FP15-6
O094	Canatan, M. D., Budak, B.	Normalisation of the "Time-Compressed" and " Dichotic Digit" speech tests	FP19-3
P51	Cekic, S., Sennaroglu, G., Soli, S.D.	Turkish Hearing in Noise Test	FP19-7
SS05-3	Ceranic, B.	The value of otoacoustic emissions in the evaluation of noise-induced hearing damage	SS05
TTD-1	Ceranic, B.	Aetio-pathophysiology of Ménière’s disease with a particular reference to the association with migraine and the effect of noise	TTD
O093	Coninx, F., Lorens, A., Piotrowska, A., Hübinger, P., Skarzynski, H.	The Adaptive Auditory Speech Test (AAST) - development of of the Polish version.	FP19-2
O064	Corona-Strauss, F., Delb, W., Strauss, D. J.	Fast detection of ABR- responses using neural synchronization stability and single sweep analysis	FP13-3
SS04-3	Cremers, C.W.R.J.	The Genetics of Hearing Loss in Childhood	SS04
KL-7	Dau, T.	Mechanisms and models of normal and impaired hearing	KL-7
TTD-4	Dauman, R.	Clinical aspects and treatment of Ménière’s disease	TTD
O010	Dauman, R., Grugel, L.	Measuring the perception of soft sounds in tinnitus patients with hyperacusis using the Oldenburg loudness scaling	FP03-1
KL-3	Davis, A.	Epidemiology & Socioeconomic Impact of Hearing Loss in Europe	KL-3
SSP1-2	Davis, A.	(H)Ear Europe	SSP1
O029	de Laat, J.A.P.M.	Implementation & Evaluation of an Internet Test to Screen for Hearing at Work.	FP06-5
O054	de Laat, J.A.P.M., Jansen, E.J.M., Neerings, M., Dreschler, W.A.	Hearing disorders in musicians	FP11-1

O012	Delb, W., Fen Low, Y., Corona-Strauss, F.I., Strauss, D.J.	Auditory attention and tinnitus: the objective determination of tinnitus decompensation	FP03-3
P55	DePlacido, C.	Aural rehabilitation, person centred or cost effective?	FP20-9
O070	Digeser, F., Hast, A., Wesarg, T., Hessel, H., Hoppe, U.	Increasing Frequency Intervals Improves Melody Recognition in Cochlear Implant Users	FP14-4
SS02-1	Diller, G.	Sprachprobleme als Folge eingeschränkten Hörens	SS02
TTC-3	Dillier, N.	CI-Anpassung bei Kindern: Unterstützung durch ECAP-Messungen	TTC
O004	Döring, W.H., Dujardin, H., Thürmer, C., Westhofen, M.	Anwendung des 'Oldenburger Satztests (OLSA)' zum Nachweis der Effizienz einer bilateralen Versorgung bei Patienten mit Cochlea-Implantaten und / oder Hörgeräten	FP01-4
P09	Dörrie, M., Bungert-Kahl, P., Fuchs, M., Meister, E.F., Oeken, J., Rübsamen, R.	Deterioration of frequency discrimination by contralateral noise in subjects with noise-induced hearing loss	FP06-9
SS07-4	Dreschler, W.	The fitting process of complex hearing aids	SS07
SS08-6	Dreschler, W.	Binaural hearing and auditory functioning	SS08
SS10-1	Dreschler, W.A., Kollmeier, B.	The auditory profile – proposal from the European Hearcom Project	SS10
P33	Ekin, M.C., Atas, A., Aksoy, S.	Effects of chronic railway noise exposure on children anxiety levels and emotion responses	FP15-12
O099	El Refaie, A.	Older people with hearing impairment: Examining the variations in the use of health services and maintenance of autonomy and independence. A prospective study	FP20-3
P53	Erber, N. P.	Hearing, communication, and use/non-use of hearing aids by older people	FP20-7
O111	Fuente, A., McPherson, B.	Hearing complaints related to solvent exposure: Possible connections to (central) auditory processing disorder	FP23-3
O008	Gärtner, L., Büchner, A., Battmer, R.D., Lenarz, T.	Clinical application of an automatic system to record and analyze electrically evoked compound action potentials in cochlear implant patients	FP02-3
P05	Geczy, B.B., Vatovec, J.	Our experience with tinnitus workshop	FP03-5
O058	Georgescu, M., Pascu, A.	UNHS program – preliminary results in Romania	FP12-2
P58	Gnansia, D., Meyer, B., Frachet, B., Philippon, B., Jourdes, V., Lorenzi, C.	Mechanisms of speech masking release: role of temporal and spectral cues	FP21-7
SS04-4	Grandori, F.	Newborn hearing screening and beyond: the state-of-the-art in Europe	SS04
KL-2	Grote, J.	Ear Europe	KL-2
SSP1-1	Grote, J.	(H)Ear Europe	SSP1
O052	Grutters, J.P.C., Joore, M.A., Kessels, A., Anteunis, L.J.C.	Patient preferences for direct hearing aid provision by a private dispenser. A discrete choice experiment.	FP10-5
P08	Günter, J., Emmerich, E., Richter, F.	Development of a method to evaluate the influence of designed hearing protectors for classical orchestral musicians on perception and/or differentiation of sounds	FP06-8
SS08-5	Hagerman, B.	Speech Audiometry	SS08

P64	Han, K.Y., Song, Y.J., Ko, H.S., Park, Y.J., Kim, J.H.	Evaluations of Electrocochleography in Possible Meniere's Disease without Hearing Loss	FP23-4
P18	Haszprunar, B., Niedermeyer, H., Janssen, T.	Frequency-specific assessment of hearing loss in newborns and infants by means of extrapolated DPOAE I/O-functions	FP12-7
P24	Haumann, S., Mühler, R., Ziese, M., von Specht, H.	Pitch discrimination for different musical instruments with cochlear implant simulations	FP14-9
SS06-1	Häusler, R. , Stieger, C., Kompis, M.	Implantable hearing systems: Common denominators and future developments - a clinical perspective	SS06
O026	Helleman, H.W., Helleman, H.W., Jansen, N., Simis, Y.J.W., Dreschler, W.A.	The role of OAEs in monitoring NIHL in individuals	FP06-2
O040	Henkin, Y., Attali, O., Yaar-Sofer, Y., Hildesheimer, M., Kishon-Rabin, L.	Brain activation patterns during auditory processing in children with right versus left Cochlear Implants	FP08-4
O073	Herrmannova, D.	Children With Complex Needs : Cochlear Implant Candidates and Users	FP15-1
O091	Hey, M., Hocke, T., Scholz, G., Anft, D., Abels, D., Schmid, C., Kompis, M., Seeling, K., Hessel, H., Begall, K.	Influence of the mixing ratio of a FM-system on speech understanding in noise for CI user	FP18-4
O085	Hilgert, N., van Camp, G.	Identification of modifier genes for connexin 26-related hearing impairment	FP17-2
O048	Hoetink, A.E., Körössy, L., Dreschler, W.A.	Steady State Gain Reduction produced by Amplitude Modulation Based Noise Reduction in Digital Hearing Aids	FP10-1
SS07-2	Hohmann, V.	Compensation of hearing deficiencies in the inner ear	SS07
O105	Hojan-Jezierska, D., Skrodzka, E., Hojan, E.	Does the natural sounds loudness estimation method work for patients with "dead regions"?	FP21-4
TTA-2	Holube, I.	Charakterisierung von Hörgeräten	TTA
SS07-5	Holube, I., Fredelake, S., Hansen, M.	Subjective and objective evaluation methods of complex hearing aids	SS07
O001	Hoppe, U., Mallinger, E., Digeser, F.	Trainingseffekte und Listenäquivalenz des Freiburger Einsilbertests im Störschall	FP01-1
SS02-2	Horsch, U.	Präverbale Dialoge	SS02
TTC-8	Hoth, S.	Späte Potentiale bei der CI-Anpassung	TTC
O098	Hoth, S., Gudmundsdottir, K., Plinkert, P.	The impact of aging and age related hearing loss on otoacoustic emissions	FP20-2
SS03-3	Houtgast, T.	HearCom: A mid term overview	SS03
P45	Huber, M., Hitzl, W., Albegger, K.	School Education, out of School Education, Vocational Training and Employment Status of Young People who grew up with Cochlear Implants	FP18-12
O038	Huttunen, K., Peltokorpi, S.	Learning to use grammar – past tense in the spoken narratives of children with cochlear implants at the hearing age of 2 to 5 years	FP08-2
O018	Igelmund, P., Meister, H., Brockhaus-Dumke, A., Fürstenberg, D., von Wedel, H., Walger, M.	CAEP measurement of sound discrimination of CI patients in noise	FP05-2
O028	Janssen, T., Müller, J.	Changes in DPOAE and hearing threshold fine structure after noise-exposure	FP06-4

O053	Joore, M.A., Grutters, J.P.C., Stokroos, R.J., van der Horst, F., Verschuure, J., Dreschler, W.A., Anteunis, L.J.C.	Assessing the safety and efficiency of direct hearing aid provision by a private hearing aid dispenser: setting the research agenda	FP10-6
O041	Joseph, G., Büchner, A., Battmer, R.D., Lenarz, T.	Estimation of Speech Perception with the CI from preoperative Data	FP08-5
P10	Kantor, I., Jurkiewicz, D., Usowski, J., Rapiejko, P.	Impact of impulsive noise after shooting on hearing assessment using Pure Tone Audiometry, High Frequency Audiometry and Otoacoustic Emissions registration.	FP06-10
P46	Khajehnouri, Y., Büchner, A., Lenarz, T.	Making AGC work: variable presentation level speech testing	FP18-13
O044	Kienast, B., Boyle, P.	Preliminary results of the Adult multicentral European HiRes 120 study	FP09-2
SS07-1	Kiessling, J.	Sounds towards the tympanic membrane	SS07
O079	Kiessling, J., Müller, M., Keidser, G., Bentler, R.A.	Verification of the hearing aid output using ecologically valid sounds in the lab (MPOver)	FP16-3
O104	Kinkel M.	The new ISO 16832 „Acoustics – Loudness scaling by means of categories“	FP21-3
TTA-4	Kinkel, M.	Die ISO-Norm zur kategorialen Lautheitsskalierung und deren Anwendung für Hörgeräteanpassung und -kontrolle	TTA
O087	Kiss, J. G., Nagy, A. L., Csáki, R., Tóth, F., Klem, J., Kovács, K., Jóri, J.	Genotypes and phenotypes of various nonsyndromic hearing losses of genetic origin	FP17-4
O100	Kiss, J. G., Várkonyi, T. T., Tóth, F., Rovó, L., Lengyel, Cs., Légrády, P., Jóri, J.	Examinations of the brainstem function in diabetic patients	FP20-4
O060	Kjærbøl, E.	Validity of threshold estimation obtained with the VRA method “VideoVRA”	FP12-4
P28	Knief, A., Schmidt, C.-M., Deuster, D., am Zehnhoff-Dinnesen, A.	Clinical application of the Cochlea Scan for Hearing Threshold Estimation in Children	FP15-7
SS09-1	Knipper M.	Preservation and regeneration of the auditory system	SS09
O083	Köbler, S., Hagerman, B., Lindblad, A., Olofsson, Å.	Successful and unsuccessful users of bilateral amplification – differences and similarities in binaural performance	FP16-7
P21	Kochanek, K., Orkan-Lecka, E., Durrant, J. D., Œliwa, L., Skarzynski, H.	Application of ABRs elicited by tone pips in diagnosis of retrocochlear hearing loss	FP13-7
O017	Koci, V., Stephan, K.	Early Changes of Electrical Stapedius Reflex Threshold over Time in Patients Supplied with CI	FP05-1
KL-1	Kollmeier, B.	Sprachverstehen (Speech recognition) (lecture will be held in German)	KL-1
O002	Kompis, M., Krebs,M. , Bertges Reber, M., Häusler, R.	Überprüfung von Hörgeräteversorgungen mit dem Basler Satztest	FP01-2
O032	Koopman, J., Houben, R., Dreschler, W.A., Verschuure, J.	Development of a speech in noise test (Matrix)	FP07-2
P50	Koopman, J., Verschuure, J.	The phonetic contents of texts as function of the intended age group.	FP19-6

O066	Koseki, J.-C., Neumann, K.	Comparison of response thresholds derived from auditory steady state responses (ASSRs), tone pip-evoked auditory brainstem response (ABR) and click-evoked ABR with respect to their suitability for hearing aid fitting in small children	FP13-5
O046	Krüger, B., Brendel, M., Frohne-Büchner, C., Lesinski-Schiedat, A., Büchner, A., Lenarz, T.	How can you hear? Results from an Everyday Listening Questionnaire	FP09-4
SS04-5	Kubisch, C.	Principles of genetics in hearing loss	SS04
O011	Kulak Kayikci, M.E., Belgin, E.	Research on otoacoustic emission responses in patients suffering from tinnitus	FP03-2
P49	Kurz, H.-R.	Neuronal fitting of hearing aids	FP18-16
O006	Lai, W., Dillier, N.	Neural adaptation and the recovery function: Some insights from a simple mathematical model	FP02-1
O067	Landwehr, M., Pyschny, V., Walger, M., von Wedel, H., Meister, H.	Prosody perception in cochlear implant recipients wearing a hearing aid in the contralateral ear.	FP14-1
O035	Larsby, B., Hällgren, M., Lyzenga, J.	Cognitive aspects of speech recognition in noise	FP07-5
O082	Latzel, M., Blab, S., Auer, M., Heuermann, H.	Questionnaires For Hearing Aid Evaluation – Useful tools or Wasting Time?	FP16-6
P36	Laukli, E., Andersen, R.	Speech recognition in a realistic noise field: a test method for hearing and hearing aid evaluation	FP16-9
SS04-2	Lesinski-Schiedat, A., Illg, A., Büchner, A., Lenarz, T.	Paediatric Cochlear Implantation in the First and in the Second Year of Life: a Comparative Study	SS04
SSP1-6	Lesinski-Schiedat, A.	(H)Ear Europe	SSP1
O088	Lesinski-Schiedat, A., Chute, P., Lenarz, T., Lesinski, M.	Socialisation of CI children over the past 10 years – expectation reached?	FP18-1
P54	Liddell, A., Campbell, P.E., Owens, D., DePlacido, C., Wolters, M.	Can extended high frequency hearing thresholds be used to detect auditory processing difficulties in an aging population?	FP20-8
TTB-4	Lightfood, G.	Prediction of the audiogram in adults and older children using the N1-P2 long latency response – accuracy and speed of testing	TTB
SS09-2	Loewenheim, H.	Molecular mechanism in the regenerative biology of hearing	SS09
O069	Lorens, A., Polak, M., Piotrowska, A., Skarzynski, H.	Partial Deafness Cochlear Implantation: Outcomes with the DUET	FP14-3
P57	Lüddemann, H., Riedel, H., Kollmeier, B.	Measuring the diffusiveness of spatial sound: A common framework for binaural perception, neurophysiological correlates and modelling	FP21-6
P31	Ludwig, A., Baldauf, J., Kotz, S., Friederici, A., Rübsamen, R.	Basic auditory discrimination in children with auditory processing disorders (APD)	FP15-10
SS02-4	Lürsen, U.	Auditives Arbeitsgedächtnis	SS02
O065	Lütkenhöner, B.	Auditory Evoked Responses and the Threshold of Hearing	FP13-4
O034	Lutman, M.E., Phipps, H.L.	Effect of telephone bandwidth on digit triplet test	FP07-4

O108	Maier, H., Sancez-Hanke, M., Leuwer, R.	Comparison of Indicators for Efficient Coupling of an Electromagnetic Transducer (Otologics MET™) to the Ossicles.	FP22-3
O097	Mäki-Torkko, E., Hannula, S., Jounio-Ervasti, K., Sorri, M.	Hearing in two samples of 55- to 65-year-old populations in Northern Finland	FP20-1
O043	Mancini, P., Bosco, E., D'Agosta, L ., Traisci, G., D'Elia, C., Filipo, R.	Speech perception in children using hi-resolution 120: preliminary report	FP09-1
O062	Mauermann, M., Kollmeier, B.	The effects of contralateral stimulation on DPOAE fine structure	FP13-1
SS05-4	Mazurek, B.	Tinnitus in aging population	SS05
SS06-4	McDermott, H.	Signal processing for cochlear implants and combined bimodal and electroacoustic stimulation	SS06
O047	Meis, M., Lesinski-Schiedat, A, Plotz, K, Dillier, N., Walger, M., Wechtenbruch, J. & Hessel, H.	A prospective longitudinal quality of life study before and after cochlear implantation in post-lingually deafened adults	FP09-5
SS01-3	Meister, H.	Sprachaudiometrie bei Kindern	SS01
P41	Meister, H., Landwehr, M., Pyschny, V., Walger, M., von Wedel, H.	The perception of prosodic cues in normal listeners and cochlear implant recipients	FP18-8
P40	Meyer, A., Egner, A., Yarin, Y., Moser, T.	Synaptic contact number and transmitter exocytosis are maximal in mouse inner hair cells corresponding to frequencies of best hearing.	FP18-7
P01	Meyer, R., Brand, T.	Prediction of speech intelligibility in fluctuating noise	FP01-6
KL-6	Miller, J.M., Hernandez, J., Schrott-Fischer, A., Glueckert, R., Altschuler, R.A.	Preservation and Regeneration of the Auditory System	KL-6
P63	Mlynski, R., Müller, J., Hagen, R.	First results for the treatment of combined hearing loss using the Vibrant Soundbridge with a round window approach and prosthesis bound application	FP22-6
P62	Mojallal, H., Teschner, M., Schwab, B., Stöver, T., Lenarz, T.	Audiological results with implantable hearing device vibrant soundbridge in moderate to severe mixed hearing loss	FP22-5
SS08-2	Moleti, A., Sisto, R.	OAE latency and tuning: implications for cochlear models and diagnostic perspectives	SS08
SS03-6	Moore, D.	Future needs of European Hearing Research	SS03
SSP1-4	Moore, D.	(H)Ear Europe	SSP1
P32	Mora Espino, R., Zenker Castro, F., Rodríguez Jiménez, M.C., Mesa Suárez, J.L., Coello Marrero, A., Barajas de Prat, J.J.	Prediction of speech pereception from the acoustic conditions of unoccupied classrooms	FP15-11
O090	Mora Espino, R., Zenker Castro, F., Rodríguez Jiménez, M.C., Mesa Suárez, J.L., Coello Marrero, A., Barajas de Prat, J.J.	Speech recognition in noise by hearing-impaired children using fm systems	FP18-3
O024	Morsnowski, A., Müller-Deile, J.	Bilateral cochlear implant	FP05-8
O084	Moser, T., Roux, I., Safieddine, S., Nouvian, R., Grati, M., Simmler, MC., Perfettini., I., Le Gall M., Rostaing, P., Hamard, G.,Triller, A., Avan, P., Petit, C.	The prelingual deafness DFNB9 is caused by a synaptopathy of inner hair cells	FP17-1

SS08-3	Mühler, R.	Transient and steady state auditory responses	SS08
O005	Müller, A., Brand, T., Kallinger, M., Mertins, A., Kollmeier, B.	Bestimmung der Sprachverständlichkeit im Störgeräusch für Freifeld-Bedingungen in unterschiedlichen Wiedergaberäumen	FP01-5
P07	Müller, A., Witte H., Grosch, J.	Miniaturized dosimeter for an individualized prevention of hearing loss in the working environment and daily life	FP06-7
SS01-4	Müller-Deile, J.	Sprachaudiometrie in der CI-Versorgung	SS01
TTC-9	Müller-Deile, J.	Audiologische Kontrollen	TTC
P02	Müller-Kortkamp, C. K. M., Moser, L. M.	Hörgeätekontrolle in der HNO-Arztpraxis mit Tonschwellen-, Sprach-Audiogramm und Lautheitsskalierung, falls notwendig Korrektur der auffälligen Parameter.	FP01-7
SS03-5	N.N.	Health Lifescience - EuroHear	SS03
P56	Nakaichi, T., Sakamoto, S.	Development of Frequency Selectivity Map (FSMap) depiction system for hearing impairment	FP21-5
P19	Nekahm-Heis, D., Hirst-Stadlmann, A., Oberaigner, W., Stephan, K.	Implementation of a Universal Newborn Hearing Screening programme in existing health services/ a pilot project in the Tyrol	FP12-8
O061	Neumann, K., Hey, C., Koseki, J., Baumann, U., Hild, U., Hoth, S., Herer, G., Janssen, T., Montgomery, J., Hoffmann, E., Ludwig, A., Rübsamen, R.	Peripheral and Central Hearing Disorders in Persons with Intellectual Disability	FP12-5
P04	Oliveira, V., Meneses, R.F.	QoL perception: Comparison between tinnitus patients and their relatives (Preliminary results)	FP03-4
P25	Omran, S.A., Büchler, M., Lai, W., Dillier, N.	Pitch Ranking of Complex Tones using a Model of the Virtual Channels in the Nucleus Freedom System	FP14-10
P20	Oswald, J., Kandzia, F., Janssen, T.	Calibration effects on optimal stimulus paradigms for measurement of distortion product otoacoustic emissions in humans	FP13-6
P15	Oswald, S., Epler,T., Emmerich, E., Huonker, R., Richter, F.	EEG activity while listening to piano music with and without out-of tune tones – a study on musicians	FP11-5
O101	Owens, D., Campbell, P.E., Liddell, A., DePlacido, C., Wolters, M.	Random gap detection threshold: a useful measure of auditory aging?	FP20-5
P38	Paasche, G., Lesinski-Schiedat, A., Stöver, T., Lenarz, T.	Influence of Iridium Coating and Application of Steroids on Electrical Stimulation with Cochlear Implants	FP18-5
SS09-5	Panford-Walsh, R.	The potential of growth factors for preservation of the auditory system	SS09
O109	Park, J.J.-H., Westhofen, M.	The effect of endolymphatic shunt surgery on macula and crista function	FP23-1
O076	Passou, E., Gavalas, G., Maroudias, N., Xenelis, I.	Vestibulo-cochlear symptoms due to large vestibular aquaeduct syndrome in children	FP15-4
SS02-3	Pauen, S.	Frühe kognitive Leistungen und spätere Sprachentwicklungsstörungen	SS02
O056	Pilgramm, M., Lebisch, H., Hanel, J.	The Audiovisual Noise Indicator – an appropriate instrument to reduce noise in classrooms.	FP11-3
P44	Piotrowska, A., Putkiewicz, J., Lorens, A., Pankowska, A.,	Expectation of cochlear implant benefits prior	FP18-11

	Zgoda, M., Lutek, A., Skarzynski, H.	to implantation	
TTB-2	Pratt, H.	Auditory Brainstem Evoked Potentials in Objective Audiometric Assessment	TTB
SS01-1	Probst, R.	Sprachaudiometrie in der Diagnostik	SS01
TTB-1	Probst, R.	Applications of OAE in the prediction of hearing threshold	TTB
O089	Pyschny, V., Landwehr, M., Walger, M., von Wedel, H., Meister, H.	Examining “Informational Masking” in Cochlear Implant users.	FP18-2
P23	Pyschny, V., Weber, J., Walger, M., von Wedel, H., Meister, H.	Voice discrimination by cochlear implant users	FP14-7
SS08-1	Quaranta, N.	Conductive Hearing Loss	SS08
P43	Rader, T., Wechtenbruch, J., Baumann, U., Suckfüll, M., Matthias, Ch., Hempel, J.M.	What is the prognostic quality of the electrical acoustic nerve test performed before cochlear implantation for the speech reception obtained after rehabilitation?	FP18-10
SS04-1	Ramos Macias, A.	Childhood hearing loss from a clinician's perspective including early detection, diagnostics, treatment and perspectives	SS04
SSP1-5	Ramos Macias, A.	(H)Ear Europe	SSP1
P39	Reich, U., Reuter, G., Müller, P., Stöver, T., Chichkov, B., Lenarz, T.	Fine-tuning of implant material-cell interactions by laser microstructuring	FP18-6
SS05-1	Rosenhall, U.	Age-related hearing loss – epidemiological and etiological aspects	SS05
SSP1-8	Rosenhall, U.	(H)Ear Europe	SSP1
O037	Rost, U., Strauß-Schier, A., Joseph, G., Büchner, A., Lenarz, T.	Development of speech understanding of adult Cochlear Implant recipients between 1984 and 2004	FP08-1
P35	Rout, A., Hanline, L.E., Halling, D. E.	New Stimuli for Evaluation of Multichannel Noise Reduction Hearing Aids	FP16-8
O030	Russo, I.C.P.	Hearing conservation	FP06-6
P11	Sahli, S., Aksoy, A.	Life quality of the adults underwent cochlear implantation	FP09-7
P12	Sahli, S., Belgin, E.	Self-esteem of adolescents with cochlear implant and normal hearing, comparison between levels of depressive emotioning and sensitiveness towards criticism	FP09-8
O078	Schlüter, A., Holube, I., Bitzer, J., Simmer, U., Brand, T.	Evaluation of noise reduction algorithms in hearing aids with the Acceptable Noise Level Test (ANLT)	FP16-2
P31	Schmidt, A., Hirst-Stadlmann, A., Oswald-Pfaffermayr, E., Nekahm-Heis, D.	Chronic Middle Ear Problemsin Adults and Preschool-Children with Cleft Palate	FP15-10
SS02-5	Schmitz-Salue, C.	Doppelter Erstspracherwerb - Mehrspracherwerb	SS02
TTD-3	Scholz, G.	How can we provean endolymphatic hydrops	TTD
O096	Schulte, M., Meis, M., Wagener, K.	Listening Effort and Speech Intelligibility	FP19-5
P03	Seidler, H.	Improvement of speech intelligibility by audio hearing systems	FP01-8

O059	Sekula, A., Obrêbowski, A., Hashimoto, A., Jackowska, J.	Universal neonatal screening in Poznañ	FP12-3
SS09-3	Senn, P.	Stem cells in the auditory and vestibular organs of the inner ear	SS09
KL-4	Shannon, B.	Electric stimulation of the human cochlea, cochlear nucleus and inferior colliculus: Implications for speech recognition	KL-4
O101a	Sharashenidze N., Kevanishvili Z.	Peculiarities of Age Related Hearing Loss in Females and Males	FP20-6
O027	Sisto, R., Moleti, A.	Otoacoustic emissions as a test for mild hearing loss early detection	FP06-3
O081	Skagerstrand, Å.	Sounds perceived as disturbing by hearing aid users in their daily soundscape	FP16-5
P60	Sliwa, L., Kochanek, K., Piotrowska, A., Plka, A., Skarzynski, H.	Evaluation of differences between audiometric and ASSR thresholds	FP21-9
SS05-2	Sliwinska-Kowalska, M.	Noise-induced hearing loss as a complex disorder influenced by environmental and genetic factors	SS05
SSP1-7	Sliwinska-Kowalska, M.	(H)Ear Europe	SSP1
P16	Sliwinska-Kowalska, M., Zmyslony, M., Politanski, P., Bak, M., Kotylo, P., Woznicka, E., Thuroczy, G., Ravazzani, P.	Effects of exposure at UMTS electromagnetic field on human hearing	FP11-6
SS06-2	Snik, A.	Audiological aspects and test procedures for the evaluation of middle ear prostheses (including BAHA)	SS06
O106	Snik, A., Kunst, S., Leijendeckers, J., Bosman, A., Mylanus, E., Cremers, C.	BAHA in children, audiological results	FP22-1
P17	Spindler, M.	Follow up of neonatal screened babies	FP12-6
P29	Stalnacke, H., van Doorn, J., Czigler, P. E.	Does fluctuating conductive hearing loss affect children's phonological development in the early ages?	FP15-8
TTC-4	Stephan, K.	Stapedius-Reflexmessungen bei der Anpassung	TTC
O107	Stieger, C., Arnold, A., Candreia, C., Pfiffner, F., Kompis, M., Bernhard, H., Häusler, R.	Implantable hearing aid transducers: Output measured for different coupling parameters	FP22-2
SS03-2	Stöver, T.	Nano Ear: Aims, Application Process and Structure of the Consortium	SS03
SS09-4	Stöver, T.	The potential of growth factors for regeneration of the auditory system	SS09
O014	Stöver, T., Warnecke, T., Wissel, K., Berkingali, N., Lenarz, T.	Neurotrophic effects of trangenic fibroblasts on neonatal spiral ganglion cells	FP04-2
O075	Stumpf, P., Coninx, F.	Die phonologische Informationsverarbeitung bei hörbeeinträchtigten Kindern	FP15-3
P42	Suárez Rodríguez, M., Rodríguez Jiménez, M.C., Leal Hernández, E. Coello Marrero, A and Zenker Castro, F.	Language development in profoundly deaf children with and without cochlear implants	FP18-9
O025	Sukowski, H., Brand, T., Wagener, K., Kollmeier, B.	The relationship between tone- and speech-audiometry based assessments of hearing loss	FP06-1

O030a	Sulkowski, W.J., Szymczak, W.	Incidence of occupational noise-induced hearing loss in Poland in 1999–2006	FP06-7
P34	Sulkowski, W.J., Sward-Matyja, M., Kowalska, S.	Analog versus digital hearing aids in patients with noise-induced hearing-loss	FP16-8
P14	Svensson, E.B., Lindblad, A.-C.	Changes in hearing of music students - repeated advanced measurements	FP11-4
TTA-5	Tchorz, J.	Datalogging - ein wirkungsvolles Instrument für die Hörgerätefeinanpassung und die Kundenberatung	TTA
O080	Tiefenau, A., Fröhlich, M.	A comparison and real life evaluation of different data logging systems	FP16-4
O013	Tillein, J., Ye, Q., Kiefer, J., Gstoettner, W., Braun, S.	Corticosteroids and cochlear implantation – useful treatment to reduce electrode insertion trauma? Results from CAP- measurements of cochlear-implanted guinea pigs	FP04-1
O007	Tognola, G., Federica, S., Parazzini, M., Alessia, P., Ravazzani, P., Grandori, F.	Influence of active electrode location and electrode configuration on the electrical excitation fields in cochlear implant stimulation	FP02-2
O086	Torkos, A., Wissel, K., Warnecke, A., Lenarz, T., Stöver, T.	Laser Microdissection and Pressure Catapulting is superior to conventional manual dissection for isolating cellular compartments of the cochlea	FP17-3
P22	Tóth, F., Nagy, A. L., Vajtai, R., Gingl, Z., Rovó, L., Jóri, J., Kiss, J. G.	Stochastic resonance on the intensity of DPOAE's	FP13-8
P37	Trimmis, N., Markatos, N., Malaperdas, K., Papadas, T.	Development of an Audio Compact Disc for Speech Audiometry Testing	FP16-10
P52	Trimmis, N., Markatos, N., Malaperdas, K., Papadeas, E.	Word Recognition Scores by Native and Non-Native Speakers of Modern Greek Language	FP19-8
SS10-4	Uppenkamp, S., Ernst, S.M.A., Gutschalk, A., Rupp, A.	The representation of intensity and periodicity in the human brain, as revealed by functional MRI and MEG	SS10
P65	Usowski, J., Kantor, I., Jurkiewicz, D.	Hearing impairment and balance disorders in patients with anti-cancer chemotherapy	FP23-5
O045	Välimaa, T., Sorri, M.	Speech perception of finnish adult cochlear implant users during four years of implant use	FP09-3
O039	van Deun, L., van Wieringen, A., Scherf, F., Deggouj, N., Desloovere, C., Dhooge, I., Offeciers, E., van de Heyning, P., Wouters, J.	Localization abilities in bilaterally implanted children	FP08-3
O036	van Esch, T., Sol, J., Dreschler, W.A.	Auditory Processing	FP07-6
O057	Vatovec, J., Geczy, B., Gros, A.	Experience of newborn screening for deafness in slovenia	FP12-1
P13	Veraguth, D., Huber, A., Laske, A., Binkert, A., Dillier, N.	Functional results after bilateral Cochlea Implantation - The Zurich experience	FP09-9
O103	Verhey, J.L., Lendzian, H., Mauermann, M.	Threshold fine structure and its role in temporal integration	FP21-2
O102	Verhey, J.L., Mauermann, M., Heise, S.	Automatic screening and detection of threshold fine structure	FP21-1
SS03-4	Verschuure, H.	Education of Audiology in Europe	SS03
O050	Verschuure, J., Homans, N., van der Zwan, J.	Satisfaction of use with a commercial array-microphone hearing system	FP10-3
SS03-1	Vlaming, M.	Overview on European Hearing Research	SS03

		Projects	
SSP1-3	Vlaming, M.	(H)Ear Europe	SSP1
O077	Vlaming, M., Holube, I.	New Standard for the Measurement of Speech Amplification in Modern Hearing Instruments	FP16-1
P48	Vormann, M., Wagener, K.	Unified approach to hearing instrument fitting and rehabilitation: Professional end-user opinions in Germany, the Netherlands, and the UK	FP18-15
O031	Wagener, K.C., Brand, T., Kollmeier, B.	International cross-validation of sentence intelligibility tests	FP07-1
O016	Walkowiak, A., Kostek, B., Lorens, A., Obrycka, A., Wasowski, A., Skarzynski, H.	Estimation of abnormalities of Cochlear Implant electrode placement using Spread of Excitation measurement	FP04-4
O092	Warzybok, A., Wagener, K.C., Brand, T.	Intelligibility of German digit triplets for non-native German listeners	FP19-1
O020	Wasowski, A., Lorens, A., Obrycka, A., Putkiewicz, J., Skarzynski, H.	Remote Fitting of Cochlear Implant System	FP05-4
P06	Wenzel, G.I., Lim, H.H., Warnecke, A.,Stoever, T., Lobl, Th., Schloss, J., Schwab, B., Lenarz Th.	Effects of Prolonged Gacyclidine Intracochlear Perfusion on cochlear function and histology in Guinea Pigs	FP03-6
TTC-2	Wesarg, T.	CI-Anpassung bei Erwachsenen: Real life fitting	TTC
O021	Wesarg, T., Kröger, S., Gerber, O., Kind, H., Reuss, S., Roth, J., Junge, F., Novakovich, A., Aschendorff, A., Laszig, R.	Pilot Study of Remote Measurement and Fitting of Cochlear Implant Recipients	FP05-5
P61	Winter, M., Wesendahl, T.	Concepts for the expansion of the audiological indication range of implantable air conduction hearing devices	FP22-4
TTD-2	Wit, H.P.	Can Ménière's disease be diagnosed objectively?	TTD
O019	Wohlberedt, T., Digeser, F., Hessel, H., Hoppe, U.	Influences of syllabic compression on speech evoked potentials in Cochlear Implant users.	FP05-3
SS07-3	Wouters, J.	The use of both ears	SS07
O042	Yucel, E., Sennaroglu, G., Budak, B., Belgin, E.	Musical attitude of implanted children:speech and musical perception results of one year follow-up	FP08-6
SS06-5	Zarowski, A., Jans, M., Theuwis, L., Somers, Th., Offeciers, F.E.	Children with Cochlear Implants: Bilateral Implantation	SS06
P47	Zenker Castro, F., Mora Espino, R., Rodríguez Jiménez, M.C., Mesa Suárez, J.L., Coello Marrero, A., Suárez Rodríguez, M., Barajas de Prat, J.J.	A verification protocol of fm systems for children with cochlear implant	FP18-14
O095	Zenker Castro, F., Mora Espino, R., De Lucas Carmona, G., Fernández Belda, R., and Barajas, J.J.	The effect of age over the dichotic digit test	FP19-4
P30	Zupan, L.	Diagnosis of secretory otitis media in otherwise healthy infant as a predicitive value for chronic disease in early childhood	FP15-9

Abstracts

KL01

Sprachverstehen (Speech recognition)

Kollmeier, B.

Medizinische Physik, Universität Oldenburg &
Kompetenzzentrum HörTech, D-26111 Oldenburg, Germany

Um den Einfluß einer Schwerhörigkeit auf die Sprachverarbeitung im täglichen Leben besser verstehen zu können und um den derzeit noch begrenzten Effekt moderner Hörgeräte bei der Verbesserung der Situation für Schwerhörende nachvollziehen zu können, ist ein gründliches Verständnis der Mechanismen und Einflußfaktoren auf das Sprachverstehen in Ruhe und unter Störgeräusch sehr wünschenswert. Dieser Beitrag wird daher die theoretischen Hintergründe, die verwendeten Meßmethoden und die praktischen Konsequenzen der Sprachaudiometrie für den individuellen Patienten im Überblick beschreiben. Eine besondere Betonung liegt auf der Vergleichbarkeit von Sprachverständlichkeitstests zwischen verschiedenen Sprachen, die einen wichtigen Teil des Europäischen Hearcom-Projektes betrifft. Weiterhin soll diskutiert werden, wie gut wir das Sprachverständnis bei Normal- und Schwerhörenden bereits verstanden haben: Sowohl „bottom-up"- als auch „top-down"-Strategien müssen angenommen werden, um das Sprachverstehen unter Störschall quantitativ verstehen zu können. Computer-Modelle, die ein nahezu perfektes „Weltwissen" voraussetzen, d. h. eine genaue Erwartungshaltung des zu erkennenden Sprachelements, können überraschend gut die Leistungsfähigkeit des Menschen bei der Wahrnehmung unter Störschall beschreiben. Sie haben jedoch Grenzen: Eine besondere Herausforderung für die kognitiven Fähigkeiten der Hörer stellt die Sprachwahrnehmung unter fluktuierendem Störschall dar, bei der Hörgestörte in ihrer Leistungsfähigkeit zur Kombination der in den Rausch-Pausen verbleibenden Sprach-Information stark von Normalhörenden abweichen. Außerdem ergibt sich ein Unterschied bei der Verarbeitung „einfacher" im Vergleich zu „schwierigen" semantischer Satzstrukturen, die das Arbeitsgedächtnis stärker beanspruchen. Die Entwicklung von Modellen, die diese verschiedenen Aspekte des Sprachverstehens quantitativ beschreiben, könnte daher für die Weiterentwicklung von technischen Hörhilfen einen wichtigen Beitrag liefern.(Unterstützt von der Deutschen Forschungsgemeinschaft, dem EU-Projekt Hearcom und der Audiologie-Initiative Niedersachsen).

English version:

In order to better understand the effect of hearing impairment on speech perception in everyday listening situations as well as the limited effect of modern hearing instruments in improving the situation for hearing-impaired listeners, a thorough understanding of the mechanisms and factors influencing speech recognition in quiet and in noise is highly desirable. This talk will therefore review the theoretical background, the currently employed measurement methods, and the practical implications of measuring speech recognition in patients. A special emphasis will be put on the comparability of speech intelligibility tests across different languages which is considered in the European HEARCOM project. Further on, the degree to which we understand how speech recognition "works" in normal and hearing-impaired listeners will be discussed. Both bottom-up and top-down strategies have to be assumed when trying to understand speech reception in noise. Computer models that assume a near-to-perfect "world knowledge", i.e., an accurate anticipation of the speech unit to be recognized, can surprisingly well predict the performance of human listeners in noise and may provide a useful tool in hearing aid development. Finally, the cognitive abilities of human listeners when understanding speech are challenged by considering fluctuating background noise where hearing impaired listeners vary considerably in their respective ability to combine the information from "listening into the dips". In addition, the performance for syntactically "difficult" vs. "simple" sentence structures highlight the interaction between hearing impairment and cognitive processing structures, such as, e.g., working memory.

(Work supported by DFG, CEC-Project Hearcom, and the Audiologie-Initiative Niedersachsen).

KL02

Ear Europe

Grote, J. J.

International Federation of Oto-Rhino-Laryngological Societies

In 1995 a WHO resolution (48.9) for the prevention of Hearing Loss was approved. The action was a combined effort of IFOS and ISA.

Since then no concerted action has been taken.

Hearing International takes care of Hearing Centers mainly in Asia, but the major problem of hearing loss needs action. IFOS started the worldwide action "Hearing for All". Hearing loss is the most occurring handicap in the world, 10% of the world population will be 12% in 2015. Prevention is urgent.

A strategy to combine all NGO's working in this field will take to much time and is difficult because of the nature of the handicap. Action is needed.

IFOS has developed the action plan with the RAND Corporation. Action will focus on awareness on all levels to start with International Organizations as WHO, World Bank, UNESCO and United Nations. Hearing loss is not included in their programs. The first result is a paragraph in the Global Vaccination program. We have to work to be included in the International Plan on Aging.

Awareness must be stimulated in the United Nations in connection with the millennium goal I "Fighting poverty" and millennium goal II "Primary education for children". If hearing loss is not mentioned, governments will not take action.

In the developing world the action will focus on vaccination and integration of primary ear care in primary health care. in the developed world the action will focus on noise protection (especially children and young adults are at risk) and tertiary prevention (rehabilitation with hearing aids). It is unacceptable that in the developed countries in general 1 in 3/5 elderly people who need a hearing aid, do not have one and are excluded of society.

Action for awareness is difficult because hearing impairment is not appealing as disability. We need more studies on the socio economic consequences of hearing loss in Europe.

In the century of communication a normal hearing is the first prerequisite for socio economic development and for employment.

KL03

Epidemiology & Socioeconomic Impact of Hearing Loss in Europe

Davis, A.

MRC Hearing and Communication Group, School of Psychological Sciences, University of Manchester, Manchester M13 9PL

There are about 82million adults (18+years) in Europe who have bilateral hearing impairment of at least 25 dB HL (averaged over 0.5, 1, 2 & 4kHz). Many of these people, maybe as many as 48million might substantially benefit from amplification through hearing aids, whilst probably only 10 – 12 million actually do benefit from hearing aids. The overall number of people with hearing problems that will substantially benefit from hearing aid will increase to about 54million in the next 8 – 10 years due to the increasingly elderly population in Europe. If proportion of those who seek help for their problems remains the same the numbers using hearing aids will increase by 1million. There are about 1.2m adults with profound deafness that is acquired later in life. However, if new technology improves take up and benefit and image is markedly improved then there will be a considerable demand for hearing services, both hearing aids and implants (cochlear, middle ear and possibly brainstem). How this demand will be met is a problem as those who are more socioeconomically able will gain better access to these services unless there is positive effort to reduce inequalities of hearing healthcare provision. It is clear that in societies with social medicine provision the cost impact of hearing impairments and provision of hearing aids could become very substantial if technological advances make hearing aids more acceptable to the hearing impaired. Recent work, in Europe and in Australia has shown that hearing impaired people are less likely to be in well paid jobs and more likely to have a lower weekly income or not to have paid employment. It is a matter for debate, discussion and empirical data (not much available!) as to whether provision of hearing services will close the gap between the hearing and hearing impaired in terms of income and socioeconomic impact.

KL04

Electric stimulation of the human cochlea, cochlear nucleus and inferior colliculus: Implications for speech recognition

Shannon, R.V. (1), Colletti, V. (2), Lenarz, M. (3), Lim, H. (3), Lenarz, T. (3)

(1) House Ear Institute, Los Angeles, CA, USA

(2) University of Verona Medical School, Verona, ITALY

(3) Medizinische Hochschule Hannover, Hannover, German

Cochlear implants are not useful for patients with no remaining auditory nerve, so prosthetic devices have been designed to stimulate the cochlear nucleus in the brainstem and the inferior colliculus in the midbrain, using both surface and penetrating electrodes. We will present psychophysical results and speech recognition results from surface and penetrating electrodes at the level of the cochlear nucleus and inferior colliculus. Surprisingly, psychophysical measures of temporal, spectral and intensity resolution are mostly similar across stimulation sites and electrode types. Speech recognition is excellent in cochlear implants and in some patients with stimulation of the cochlear nucleus, but not in patients who lost their auditory nerve from bilateral vestibular schwannomas (NF2). Quantitative comparison of results from electrical stimulation of the auditory system at different stages of neural processing, and across patients with different etiologies can provide insights into auditory processing mechanisms. An emerging hypothesis is that the normal auditory system contains a separate processing subsystem for speech patterns that is distinct as early in the system as the cochlear nucleus. Presumably, this subsystem is damaged during tumor removal.

KL05

Rehabilitation programs in Europe - current concepts and future perspectives

Archbold, S.

Ear Foundation, Nottingham

Cochlear implantation for children is now a mature service, and one which is considered safe and effective. Early implantation is being undertaken increasingly in the first years of life, following early identification, and giving the increased likelihood of even better outcomes. Traditional models of service delivery provided excellent clinic-based services, with intensive early habilitation. However, the current challenges faced by implant centres, extend beyond this short time-frame; those implanted, whether adult or child, require life-long support. With the growing numbers being implanted, requiring long-term management, clinic-based services are increasingly over-stretched particularly in under-resourced health-care services.

For children, implantation is unusual in having major outcomes in terms of spoken language developed in home and school rather than in clinic, and over years rather than months. The process of implantation is one which has life-long implications for these children and their families and fundamentally changes their communication and educational options. It also makes new demands on families and on non-specialist teachers who are not part of the cochlear implant team, but who are essential for successful long-term use in children. For adults, the acquisition of new hearing requires changes in the family dynamics too, and the support required by the deaf adult changes over time. As the technology develops, traditional models of service delivery are challenged to provide the long-term support for the growing numbers of patients. Additionally, as numbers grow, intensive provision becomes unsustainable, with implant centres questioning their methods of service delivery as an effective means of providing for long-term management.

A recent review of services throughout Europe found great concerns about the long-term management of the technology for both children and adults. Major issues to arise were the management of the technology, the management of device failures and demands of implementing new technologies. Parents and adults alike expressed major concerns about the need for local technology support services to be available. Implementing complex technology in the community in the long-term for both adults and children is only possible by engaging parents, families and the local professionals, particularly teachers, from the outset, and utilising their expertise. This calls for a critical appraisal of the traditional approach to service delivery.

The new technologies not only provide us with the ability to provide implantation, but they give us with easy, instant means to provide learning resources and communicate effectively over distances. The apparent tension between keeping some implant expertise at the implant centre, with the need to make local services available, can be overcome utilizing the latest technology with web-based and internet access to services. Distance learning materials can provide resources for children, parents, teachers, clinicians and adults alike, in time and cost-effective ways. There are several initiatives currently underway in Europe, utilizing modern technologies to providing expertise in the community, and to implement training packages and resources for families and local professionals.

In order to make the opportunities brought by cochlear implantation available to all, and sustain them in the long-term, alternative models of service delivery should be considered. A move from clinic-based specialist services towards community-based services could engage the knowledge and skills of those who know the children and adults best –their parents, families, teachers and local therapists. Engaging them fully in the process ensures sustainability of culturally and linguistically appropriate support, wherever they live, and whatever their background. Cochlear implantation is now a mature service and it is time in its development to move services back to where they belong - at home and at school. This is the real world, and where implantation must be successfully managed in the future.

KL06

Preservation and Regeneration of the Auditory System

Miller, J.M. (1, 2), Hernandez, J. (1), Schrott-Fischer, A. (3), Glueckert, R. (3), Altschuler, R.A. (1)

(1) Kresge Hearing Research Institute, University of Michigan, Ann Arbor, MI 48109-0506

(2) Center for Hearing & Communication, Karolinska Institutet, S-17176 Stockholm, SE

(3) Department of Otolaryngology, Medical University Innsbruck, Austria

Interventions to prevent cochlear sensorineural cell death as well as regrowth and regeneration of these cells may provide future drug treatments for prevention and treatment of deafness. Recent studies have shown that noise-induced and drug-induced hearing loss and the associated sensory cell death may be prevented with agents that prevent or scavenge free radicals, prevent excitotoxicity, increase blood flow or inhibit cell death pathways. Following loss of sensory cells, deafferentation, as with other nerves, the auditory nerve degenerates. Studies have shown that nerve growth factors and electrical stimulation may rescue spiral ganglion cells from deafferentation-induced death. We have extended these studies to assess the efficacy of these factors to regrow the auditory nerve. We find that both neurotrophic factors and electrical stimulation cause a robust regrowth of afferent processes. Regrown fibers are directed into the region of the organ of Corti, as well as into the scala tympani, which may have significant implications for a closer integration of cochlear implants with the auditory nerve. Most recently we examined the use of stem cells to replace the auditory nerve, for those patients in which the rescue from cell death or regrowth is no longer possible. In this first study we tested if influences that guide auditory nerve differentiation during normal development can induce mouse embryonic stem cell (mESC) differentiation to an auditory nerve-like phenotype in vitro and in vivo. For in vitro assessment, 48h expression of neurogenin 1, a proneural gene associated with early auditory nerve differentiation was combined with application of Brain Derived Neurotrophic Factor (BDNF) and Glial cell-line Derived Neurotrophic Factor (GDNF), neurotrophic factors also involved in the auditory nerve fate choice. For in vivo studies, mESCs were placed into scala tympani and modiolus of guinea pig cochleae four - five weeks following deafening and 48h of in vivo neurogenin 1 induction was followed by 14 days chronic intrascalar infusion of BDNF and GDNF. With either in vitro or in vivo differentiation, approximately 70% of mESC reach a neuronal phenotype, based on TUJ1 immunostaining. The majority of these had an auditory nerve-like glutamatergic phenotype based on vesicular glutamate transporter immunostaining. Controlled transient induction of genes important in determining developmental spiral ganglion cell fate may provide an important tool in the use of stem cells to replace the auditory nerve.

This work was supported by NIH grants DC03820 and P30 Grant DC05188, the Ruth and Lynn Townsend Professorship and UAW/GM funds.

KL07

Mechanisms and models of normal and impaired hearing

Dau, T.

Technical University of Denmark

There are at least two main reasons why auditory processing models are constructed: to represent the results from a variety of experiments within one framework, and to explain the functioning of the system. Specifically, processing models help generate hypotheses that can be explicitly stated and quantitatively tested for complex systems. The models can also help determine how a deficit in one or more components affects the overall operation of the system. The development of auditory models has been hampered by the complexity of the individual auditory processing stages and their interactions. The result is a multiplicity of auditory models described in the literature which differ in their degree of complexity and quantification. Most of the models can be broadly referred to as functional models, that is, they simulate some experimentally observed input-output behavior of the auditory system without explicitly modeling the precise internal physical mechanisms involved. In this talk, several models of normal and impaired auditory processing are summarized. The emphasis will be on physiologically inspired perception models and the perceptual consequences of hearing impairment with respect to frequency analysis, temporal (fine-structure and envelope) analysis, speech perception and pattern recognition. Some of the models can be useful for technical and clinical applications, such as improved man-machine communication by employing auditory-model-based processing techniques, or new processing strategies in digital hearing aids and cochlear implants.

SS01

Sprachaudiometrie in der Diagnostik

Probst, R.

Department of Otorhinolaryngology, University Hospital Zürich, Switzerland

Die klinische Sprachaudiometrie ist eine komplexe Testsituation, in der grundsätzlich unabhängige Funktionen wie Gehör, Wortschatz und Sprachkenntnis, Sprachverständnis, Gedächtnis oder Aufmerksamkeit geprüft werden. Die Wechselwirkung dieser verschiednen Ebenen macht die Beurteilung nur eines Aspektes wie beispielsweise des Hörverlusts problematisch und unsicher. So leistet die Sprachaudiometrie in der Diagnostik des Gehörs nur beschränkte Dienste. In der audiologischen Topodiagnostik (Ort des Schadens) spielt die Sprachaudiometrie heute eine untergeordnete Rolle, da spezifischere und effektivere Testverfahren zur Verfügung stehen. Die Quantifizierung eines Hörverlustes mittels sprachaudiometrischen Methoden ist aus den genannten Gründen mit Unsicherheiten behaftet. Zudem sprechen methodologische Gründe gegen den breiten klinisch-diagnostischen Einsatz der Sprachaudiometrie. Die Validität und Reliabilität der Sprachaudiometrie sind vom Testumfang und damit vom Zeitaufwand abhängig, der oft ein ungünstiges Verhältnis für genügende diagnostische Genauigkeit aufweist. Darunter leidet die klinisch-diagnostische Effizienz der Sprachaudiometrie.

Dennoch hat die Sprachaudiometrie aufgrund der überragenden Wichtigkeit der Sprache in der auditiven Kommunikation eine funktionelle diagnostische Bedeutung, deren Stellenwert aber im genannten Kontext mit den entsprechenden Einschränkungen zu beurteilen ist. In der funktionelle Diagnostik hilft die Sprachaudiometrie beim funktionellen Vergleich der Seiten, bei der Indikationsstellung von spezifischen Massnahmen wie eine Operation, die Versorgung mit einem Hörgerät oder Cochlear Implant und bei der Messung des Rehabilitationserfolgs, der allerdings ebenfalls multifunktionell ist und nur zu einem Teil mit Sprachtests erfasst werden kann. Dabei erfassen Sprachtests mit Störlärm eine andere Dimension als Tests in Ruhe.

SS01

Sprachaudiometrie in der Begutachtung

Brusis, T.

Köln

Im Königsteiner Merkblatt (4. Auflage, 1996) wird ausgeführt, dass der sprachaudiometrische Befund in der Regel die wichtigste Grundlage für die Bewertung der MdE bildet. Die sprachaudiometrische Untersuchung erfolgt monaural über Kopfhörer mit Hilfe der Zahlwörter und der Einsilber des Freiburger Tests (gemäß DIN 45621). Die Verständlichkeitskurven für Zahlwörter sollen in Lautstärkestufen von 5 dB aufgenommen werden, die Verständlichkeit der Einsilber (in %) sollten Stufen von 10 dB bestimmt werden. Dabei sollen die Pegel von 60, 80 und 100 dB einbezogen werden. Zur Berechnung des prozentualen Hörverlustes ist die Tabelle von Boenninghaus und Röser (1973) zugrunde zu legen. Da sich oft bei Hochtonverlusten kein oder nur ein geringer prozentualer Hörverlust errechnen lässt, hat Feldmann (1988) das gewichtete Gesamtwortverstehen vorgeschlagen. Dabei wird das Einsilberverstehen bei 60 dB dreimal, bei 80 dB zweimal und bei 100 dB einmal bewertet. Dadurch soll erreicht werden, dass das Hörvermögen für Einsilber bei geringer Lautstärke (60 dB = gleich Unterhaltungssprache) stärker berücksichtigt wird als das bei 80 oder gar 100 dB.

Eigene Untersuchungen haben ergeben, dass die Berücksichtigung des gewichteten Gesamtwortverstehens folgende Änderungen bedingt:

1. Das gewichtete Gesamtwortverstehen sinkt durchschnittlich um 25 Punkte

2. Der prozentuale Hörverlust steigt durchschnittlich um 5 %

3. Die MdE steigt durchschnittlich um 2,5 %

Bei der Auswertung von 100 Gutachtenfällen hat sich des weiteren ergeben, dass bei Verwendung des gewichteten Gesamtwortverstehens in 50 % der gleiche Hörverlust und in weiteren 50 % ein höherer Hörverlust ermittelt wird. Bezogen auf die „Ohren“ ergab sich:

2 x 5 % Hörverlust – Erhöhung

75 x 10 % Hörverlust – Erhöhung

22 x 20 % Hörverlust – Erhöhung

1 x 15 % Hörverlust – Erhöhung

In Einzelfällen ergibt sich sogar eine Erhöhung des prozentualen Hörverlustes von 20 % auf 40 %, also auf den doppelten Wert.

Diese Untersuchung zeigt, dass es durch die Verwendung des gewichtete Gesamtwortverstehens zu einer sehr unterschiedlichen Anhebung der Hörverlustwerte kommt, in einzelnen Fällen zur Verdoppelung. Wenn man aber alle leichten Fälle anheben wollte, könnte man auch den Durchschnittswert einer HV-Erhöhung um 5 % bzw. eine MdE-Anhebung von 2,5 % vertreten, was gerechter wäre!

Das gewichtete Gesamtwortverstehen wurde 1973 als neues Bewertungskriterium eingeführt. Aus heutiger Sicht – 34 Jahre später – stellt sich die Frage, ob es sinnvoll ist, bei 60 dB, 80 dB und 100 dB zu messen. 100 dB stellt eine Lautstärke dar, die schmerzhaft sein kann und auch heute bei den audiometrischen Untersuchungen möglichst vermieden werden sollte. Die 60 dB-Lautstärke stellt zwar ungefähr die Lautstärke der Unterhaltungssprache dar. Die Schwelle des 100 %igen Einsilberverstehens bei einem Normalhörigen liegt aber nicht bei 60 dB sondern bei 48 dB. Es stellt sich daher die Frage, ob nicht besser bei 50, 65 und 80 dB oder 50, 70 und 90 dB gemessen werden sollte. Falls man sich für andere Lautstärken entscheidet, müssten allerdings neue Tabellen entwickelt werden, da die Tabelle von Boenninghaus und Röser (1973) für das Einsilberverstehen bei 60, 80 und 100 dB konzipiert wurde.

Für und gegen die Verwendung von Störgeräuschen gibt es eine Vielzahl von Argumenten. Das Sozialgericht Oldenburg (Urteil vom 26.11.1991) hat abgelehnt, die Ergebnisse einer in binauralen Prüfung mit dem Marbur-ger Satztest im freien Sprachfeld mit Einwirkung eines umweltsimulierenden Störgeräusches in die Bewertung einer Lärmschwerhörigkeit einzubeziehen: Gerade die Abstraktheit, das „labormäßige“ der herkömmlichen Meßmethoden, fördere die Verlässlichkeit der Ergebnisse. Auch bei Arbeitsunfällen und sonstigen Berufskrankheiten würde der MdE-Satz abstrakt bestimmt, d.h. ohne Einbeziehung konkreter Belastungssituationen aus der Arbeitswelt.

Bei Ausländern, die der deutschen Sprache nicht ausreichend mächtig sind, ist nach Padzierniak (1988) uneingeschränkt eine sprachaudiometrische Untersuchung möglich. Herr Puder, Doktorand meiner Klinik, hat herausgefunden, dass eine sprachaudiometrische Untersuchung mittels des Freiburger Tests nur bei ausländischen Probanden mit guten und befriedigenden Sprachkenntnissen die gleichen Ergebnisse ergibt. Bei Ausländern ohne deutsche Sprachkenntnisse verschieben sich die Kurven allerdings um ca. 5 dB.

Theissing (1979) hat festgestellt, dass bei Nachbegutachtungen in vielen Fällen ein schlechteres Sprachaudiogramm zu erheben ist als bei der Erstuntersuchung. Daraus hat er geschlossen, dass die Reproduzierbarkeit des Sprachaudiogrammes unter Routinebedingung keineswegs den hohen Grad erreicht wie des Tonschwellenaudiogrammes und dass das Ergebnis der sprachaudiometrischen Untersuchung stark abhängig ist von der untersuchenden Stelle (Gutachter, Praxis, Klinik). Dies ergebe sich aus der Häufung konstant „besserer“ bzw. „schlechterer“ Sprachaudiogramme von verschiedenen Untersuchungsorten.

Es stellt sich daher die Frage, ob die Messmethodik und das Auswertungsverfahren der Sprachaudiometrie für die Begutachtung überhaupt geeignet sind.

SS01

Speech audiometry in children

Meister, H.

University of Cologne, Jean Uhrmacher Institute for Clinical ENT-Research

In clinical practice, numerous speech audiometric tests for children have been used throughout the last decades. Whilst children above school-age are usually examined with methods applied on adults there is a large range of different tests for younger children from approximately 3 years on. Measuring speech perception in young children makes demands in several aspects considering motivation, attention, and memory. Another question is whether the tests meet basic criteria such as validity, sensitivity and reliability.

At first, the presentation gives an overview over numerous speech audiometric tests used with children. It addresses advantages and disadvantages of the methods and gives insight into present developments. Applications with respect to pheripheral hearing loss and (central) auditory disorders are discussed.

SS01

Sprachaudiometrie in der CI-Versorgung

Müller-Deile, J.

Christian-Albrechts-Universität zu Kiel, Kiel

Im Rahmen der Cochlea-Implantat-Versorgung bietet die Sprachaudiometrie sowohl in Ruhe als auch im Störschall ein unverzichtbares Verfahren bei der Indikationsstellung, der Optimierung der Sprachprozessoranpassung und der Evaluation des Rehabilitationserfolges. Unterschiedliche Tests haben ihren praktischen Nutzen für die verschiedenen Aufgabenstellungen gezeigt.

Die audiologische Indikation für ein Cochlea-Implantat ist dann gegeben, wenn das Restgehör des Patienten mit den besten, optimal angepassten Hörgeräten ein ausreichendes Sprachverstehen nicht gewährleistet. Dieses wird im deutschen Sprachraum traditionell mit Hilfe des Freiburger Einsilbertests beurteilt.

Im Rahmen der postoperativen Basistherapie haben Logatomteste einen festen Platz gefunden. Sie geben wichtige Hinweise für das logopädische Hörtraining und sind in Einzelfällen hilfreich bei der Aufdeckung von Problemen der Frequenzzuordnung zu den intracochleären Elektroden.

Zur Evaluation der Sprachverständlichkeit mit dem CI setzen wir in Ruhe den Freiburger Sprachverständlichkeitstest ein. Dabei dient die Registrierung der Diskriminationsfunktion mit Zahlen der funktionellen Bestimmung der Wahl der Empfindlichkeitseinstellung des Sprachprozessors, mit der sich die Lage aller Diskriminationsfunktionen auf der Pegelachse verschieben lässt. Mit dem vielfach in der Kritik stehenden Einsilberteil des Testes messen wir die Diskrimination bei 50, 60, 70 und 80 dB. Die verbesserte Dynamik der Sprachprozessoren bedingt die Erweiterung des Messbereichs auf 50 dB. Die mittlere Test-Retest-Differenz, die eine Aussage über die Messgenauigkeit des Tests bei den CI-Patienten gestattet, liegt bei 10±8%. Auch bei diesem Patientenkollektiv lässt sich die von verschiedenen Autoren beschriebene Unausgeglichenheit der Testlisten beobachten, allerdings scheinen andere Listen von der mittleren Schwierigkeit abzuweichen.

Für die Messungen im Störgeräusch hat sich die adaptive Bestimmung der Schwelle mit dem Oldenburger Satztests gegenüber dem Einsatz des HSM- und des Marburger Satztests bei festen Signal-Rauschabständen durchgesetzt. Dabei sind Algorithmen, die auch den Signal-Rauschabstand für eine Sprachverständlichkeit im Bereich um 80% bestimmen, nicht geeignet.

Auch die Erfassung des Gewinns der bilateralen Cochlea-Implantat-Versorgung erfolgt mit Hilfe des Oldenburger Satztests. Hier erfordert eine genaue Evaluation Messungen in neun Hörsituationen.

Zur Evaluation und Dokumentation der Hörentwicklung bei Kindern nutzen wir neben den klassischen Mainzer und Göttinger Kinder-Sprachverständlichkeitstesten die Sprachteste des FFHT und den Oldenburger Kinder-Reim-Test. Letzterer ermöglicht auch aussagekräftige Messungen im Störgeräusch.

SS01

Sprachaudiometrie in der Forschung

Brand, T.

Universität Oldenburg

In der audiologischen Praxis in Deutschland werden meist Sprachverständlichkeitstests in Ruhe eingesetzt (Freiburger Einsilber und Zahlen). Für die Forschung ist diese Situation nicht besonders interessant, weil die Abhängigkeit der Sprachverständlichkeit von Sprachpegel und Hörverlust in Ruhe weitestgehend geklärt ist. Interessanter sind Situationen im Störgeräusch, die besser diejenigen Situation widerspiegeln, in denen Hörverluste zu einer pathologischen Beeinträchtigung der Kommunikationsfähigkeit führen. Von besonderem Interesse sind dabei sprachsimulierende Störgeräusche unterschiedlicher Modulationsgrade, wobei der Modulationsgrad ein Maß dafür ist, wie viele Störsprecher gleichzeitig sprechen (Wagener und Brand 2006, Wagener et al., 2006). Diese Art von Störgeräuschen ermöglicht eine sehr gute diagnostische Differenzierung zwischen verschiedenen Hörstörungen.

Ein weiterer Forschungszweig sind räumliche Störschall-Nutzschall-Anordnungen, die eine Erfassung der Leistung des binauralen Gehörs bei der Störgeräuschbefreiung in „Cocktail-Party-Situationen“ ermöglichen.

Für beide Gebiete (modulierte Störgeräusche und binaurale Sprachverständlichkeit) gibt es zudem Modellansätze, die aus dem Tonaudiogramm die zu erwartende Sprachverständlichkeit vorhersagen (Beutelmann und Brand, 2006, Meyer et al. 2006). Diese Vorhersagemodelle können in der Audiologie angewendet werden, um Patienten zu erkennen, die eine zentral bedingte Störung der Sprachverständlichkeit aufweisen.

Gegenwärtig wird an einer Kombination der Modelle sowohl für modulierte als auch für räumliche Störgeräusche gearbeitet.

Beutelmann R, Brand T (2006) Prediction of speech intelligibility in spatial noise and reverberation for normal-hearing and hearing-impaired listeners. Journal of the Acoustical Society of America, 120, p. 331-342.

Meyer R, Brand T, Kollmeier B (2006) Vergleich verschiedener Methoden zur Vorhersage der Sprachverständlichkeit in fluktuierendem Störgeräusch. 9. Jahrestagung der Deutschen Gesellschaft für Audiologie, CD-Rom (im Druck).

Wagener KC, Brand T (2005) Sentence intelligibility in noise for listeners with normal hearing and hearing impairment: Influence of measurement procedure and masking parameters. International Journal of Audiology 44 (3), p. 144-157

Wagener KC, Brand T, Kollmeier B (2006) The role of silent intervals for sentence intelligibility in fluctuating noise in hearing-impaired listeners. International Journal of Audiology, 45(1), p. 26-33.

SS02

Sprachprobleme als Folge eingeschränkten Hörens?

Diller, G.

Relevanz des Themas: Weltweit zeigen Studien, dass mehr als 50% der frühversorgten hörbehinderten Kinder eine erfolgreiche Hör-Sprachentwicklung durchlaufen und dabei ähnliche Entwicklungsmuster zeigen wie hörende Kinder. Die verbleibende Gruppe der Kinder zeigt Verzögerungen oder gravierende Störungen der Sprachentwicklung. Ausreichende Erklärungen dafür sind noch nicht gefunden.

Bisherige Forschungen: Bisher werden für diese hohe Variabilität z. B. das Alter des Kindes bei der CI-Versorgung, die Dauer der CI-Nutzung, die primäre Kommunikationsform im familiären Umfeld und die Art der Fördermaßnahmen etc. (vgl. z. B. Kirk 2000) angesehen. Solche Faktoren spielen zwar eine Rolle, sie tragen aber nur teilweise zur Erklärung für subnormal verlaufende Entwicklungen in den Bereichen Sprachverstehen und -produktion bei. Erklärungsmuster, die diese Sprachlernprozesse vorrangig als Resultat einer grundlegend eingeschränkten Perzeptionsleistung beschreiben (z. B. das Hören ist defizitär, die Wahrnehmungsschärfe ist eingeschränkt oder die sensorische Prägnanz ist reduziert), reichen nicht aus.

Eine kritische Beurteilung dieser Ansätze und der aus ihr abgeleiteten Empfehlungen für die rehabilitative Praxis kommt nicht umhin, einige grundsätzliche Einwände zu diskutieren. Dies betrifft u. a. die Vorausläuferfähigkeiten, wie z. B. die Nutzung prosodischer Merkmale der Inputsprache, die Gesamtqualität der Inputsprache, die Entwicklung eines Sprachgedächtnisses, das Verhältnis zwischen prä- und postoperativem Hören, aber auch die Unterschiede auf der intraindividuellen nicht-sensorischen, kognitiven Ebene der Sprachverarbeitung.

Neue Forschungsansätze und Ergebnisse: Im Unterschied zu den bisherigen Ansätzen, vgl. u..a . Szagun (2001), gehen andere Erklärungsversuche von der Annahme aus, dass den großen individuellen Unterschieden in den Ergebnissen der kindlichen Sprachlernprozesse kognitive und linguistische Faktoren wie Sprachverarbeitung, Aufmerksamkeit, Gedächtnisleistungen sowie die Anwendung unterschiedlicher Lernstrategien zugrunde liegen könnten (vgl. z. B. Pisoni und Cleary 2004).

Theoretisch knüpfen diese neueren Studien an Modellvorstellungen an, die davon ausgehen, dass beschrieben werden kann, wie Kinder sprachlichen Input analysieren, aufspalten, Teile repetieren, vergleichen, zu phonologisch stabilen Gedächtnis-einträgen verwandeln und auch wieder abrufen. Um Neues zu lernen, vor allem um Sprache zu lernen, scheinen die individuellen Fähigkeiten zur phonologischen Verarbeitung und Speicherung auditiv-sprachlichen Inputs von erheblicher Bedeutsamkeit zu sein.

Damit werden u. a. Fragen zur Entwicklung von präverbalen Dialogen, frühen kognitiven Leistungen und späteren Sprachentwicklungsstörungen sowie zum phonologischen Arbeitsgedächtnis in den Mittelpunkt der Diskussion gestellt. In diesem Zusammenhang stellt das Problem des doppelten Erstspracherwerb bzw. Mehrspracherwerbs besonders in Ländern mit hohem Migrantenanteil eine zusätzliche Herausforderung dar.

SS02

Preverbal Dialogues

Horsch, U.

University of Education Heidelberg

Background/ Aims: From the very first day of life parents are in close contact with their child and introduce both other people and the world to their newborn in a mutually dialogical way. Proceeding hand in hand they pass on basic dialogical competences. Our research “Dialogic Development of Infants” addresses the broad dialogic development of parents and infants within the first 18 months of life. Our objective is to describe these preverbal dialogs. Particular emphasis will be placed on the dialogic elements: vocalisation of the infant, greeting behaviours, motherese and dialogic echo of the parents.

Methods: The empirical data is derived from a longitudinal study within the first 18 months of the infant’s life. The data is collected monthly by video recording in the natural setting. Using this method the dialogic development of Polish, American and German mother-child dyads is observed and documented. Participants (n= 111 in Germany) are infants with normal hearing (n=73) and hearing loss (n=12) as well as “preemies” (n=18) and infants with Down-Syndrome (n=8). Computerized analyses are used for the evaluation of the data in order to study correlations among variables e.g. vocalisation and dialogic echo of the parents.

Results: The results demonstrate a negative correlation of greeting behavior with the dialogic echo (r= -0.30) and the infant’s vocalizations (r=-0.34). Parents use more greeting behaviors and less dialogic echo when the infant vocalizes less. Furthermore the greeting behaviors correlate with the use of motherese / fatherese (r=0.87). This correlation is highly significant (p= 0.0051***). Another significant correlation exists between the infant’s vocalization and the dialogic echo (r= 0.82; p=0.0126).

Conclusions: Parents increase the amount of greeting behavior to encourage the infant to enter into the dialog. This conclusion stems from the highly significant correlation between greeting behavior and the use of motherese / fatherese.

Horsch, U. (2006): Der Dialog beginnt - Zur Notwendigkeit einer Bildungsdiskussion in der Frühpädagogik. In: Hörpäd 6, 206-218
Horsch, U. (2007): Der ununterbrochene Dialog - Wie Eltern mit ihrem hörgeschädigten Kind in Beziehung treten können. In: Spektrum Hören 1
Horsch U., et al. (2006): Turns as basic patterns of the dialogue in the parent-child-dyad. Abstract/Poster ICIS Kyoto.

SS02

Frühe kognitive Leistungen und spätere Sprachentwicklungsstörungen

Pauen, S.

Psychologisches Institut, Universität Heidelberg

Schon seit geraumer Zeit wird diskutiert, dass frühkindliche kognitive Leistungen, wie etwa die Objektpermanenz, die Symbolfunktion oder die Fähigkeit, Mittel-Zweck Relation zu verstehen, wichtige Voraussetzungen für den Spracherwerb darstellen.

In jüngster Zeit mehren sich allerdings Hinweise darauf, dass weniger globale Maße der geistigen Entwicklung als vielmehr sprachspezifische Leistungen, wie etwa die Fähigkeit, Kategorien zu bilden, in Zusammenhang mit der Sprachentwicklung stehen.

Der vorliegende Beitrag berichtet von Erkenntnissen einer umfassenden Längsschnittstudie (GLAD), die in Berlin durchgeführt wurde. Anhand der Daten aus dieser Studie wird konkret diskutiert, inwiefern

(a) die oben genannten globale Maße der kognitiven Entwicklung,

(b) Kategorisierungsleistungen als sprachspezifische kognitive Leistungen, oder/und

(c) allgemeine Maße der Informationsverarbeitung, wie etwa die visuelle Aufmerksamkeit,

zur Vorhersage der Entstehung von Spracherwerbsstörungen bzw. zur Vorhersage der

allgemeinen Sprachkompetenz geeignet sind.

SS02

Speech / Language Learning and Auditory Memory in Cochlear-Implant-supplied children

Lürßen, U.

Background: Background for this presentation is the research of my thesis “Untersuchung zum Wortschatz und phonologischen Gedächtnis bei Cochlear-Implant-versorgten Kindern”. Up to now there do exist only a few studies about the connection of language and auditory / phonological memory in the context of speech and language learning of Cochlear-Implant-supplied children. This connection is very important for the rehabilitation process with Cochlear-Implant-supplied children and adults.

After the Cochlear-Implant-supply the auditory / phonological perception and comprehension of language must be stabile enough to build up a representation into the mental lexicon. The expressive language needs representation of words with the correct phonological-phonetic, lexical-semantic and morphological-syntactic characteristics.

Research study: My thesis started with 10 Cochlear-Implant-supplied children (5 per group). It was used a receptive and an expressive vocabulary test, a Fast Mapping Test for words, a none-standardised test for narrative abilities, 8 subtests from a neuropsychological test (5 memory tests and 3 free-recall-tests). The quantitative and qualitative evaluation of the results based on testspecific working questions and working assumptions. Group- and age-effects and correlations were examined based on the children’s hearing age. Furthermore the results were evaluated on specific individual effects. The examination has its theoretical foundation on the working memory model from Baddeley & Hitch (1974) and Baddeley et al. (1986, 1990 and 1998) as well as on the speech production model from Levelt (1989).

Results: One result shows developmental language disorders in expressive vocabulary of at least 6 children. By way of contrast the receptive vocabulary of all children are inconspicuous. The total result does not show any significant group- or age-effects or effects which could be explained on biographical facts. The results of the memory tests were conspicuous, if the memory material was only presented once, if only little or none extra semantic information had been given or if the memory span was probably overstretched with the task of remembering and repeating a whole sentence. For the demand to repeat a sentence there must be the correct auditory comprehension, a phonological analysis, a lexical-semantic and a morphological-syntactic analysis as well as the correct comprehension, memory and speech production abilities. The results show relevance for the Auditory-Verbal Therapy of Cochlear-Implant-supplied children and Cochlear-Implant-supplied adults.

SS02

Multilingualism

Schmitz-Salue, C.

Praxis für Phoniatrie und Pädaudiologie

Multilingualism is something very common since there are more than 5000 languages but only 200 states in the world. In early childhood children all over the world learn more than one language without developing speech or language problems. They can learn languages either simultaneously (“doppelter Erstspracherwerb”) or they start learning a second language as soon as they enter kindergarten (“früher Zweitspracherwerb”). There is no evidence that bilingual children learn to speak later. Bilingual speech development shoes the same steps as monolingual speech development.

Researchers of the project “the Multilingual Brain” (University of Basel, coordinated by Prof. Cordula Nitsch) could show by fMRI investigations that people who learned more than one language in the early childhood develope different speech-processing strategies compared to those who learn more languages later in their life. These specific speech-processing strategies are activated when an adult person is learning new languages.

What consequences can be drawn out of that for the therapy of hearing-impaired children with multilingual surrounding? 1. Because development of spoken language depends on acoustic stimulation hearing loss ha to be diagnosed and treated properly as soon as possible! 2. Parents and caregivers should use their most comfortable language to talk to the child. 3. Speech therapy in the language of the therapist makes sense, if the child uses this language frequently. Otherwise the therapist should instruct and support parents and caregivers in the process of learning and speech development according to Natural Auditory Oral Education.

Gawlitzek-Maiwald, I. & R. Tracy: Bilingualismus in der frühen Kindheit.
In: Hannelore Grimm (Hg.). Enzyklopädie der Psychologie, Band 3: Sprachentwicklung. Hrsg.: Hannelore Grimm. Göttingen: Hogrefe, 2000, (Band Band-Nr. 3)
Tracy, Rosemarie: Sprache und Sprachentwicklung : Was wird erworben?
In: H. Grimm (ed.). Enzyklopädie der Psychologie. Göttingen: Hogrefe, 2000, S. 495-535, (Band Band-Nr. 3) www.unibas.ch/mulitlingualbrain
C. Nitsch, Das mehrpsrachige Gehirn, RV+Mehrsprachigkeit.19.06.06.pdf.

SS03

EU research programs in audiology and hearing

Vlaming, M.

VU University Medical Centre, Amsterdam

There is a growing tendency to harmonize research activities for audiology and hearing in Europe. Such harmonization may benefit for European's leading position in high level hearing research, hearing health care services, audiological training and hearing instrument industry. Research and development programs that are funded by the European Commission can play an essential role to keep this leading position. In the past 7 years the European Commission has funded hearing research for about 60 Million Euro as part of the FP6 and FP5 programs. This relates to about 25 multi-national projects, with funding budgets ranging from a few hundred thousand for a small project up to around 10 million Euro for a large Integrated Project. Some 2 to 5 Million Euro has been made available for individual fellowships in the Marie-Curie program. It is noted that EU funding is still a relative small part on all European funded hearing research. Most other research is based on national research programs or initiated from hearing aid/device manufacturers. The potential to improve on quality is large when national groups will cooperate together. By that it is possible to harmonize on diagnostic methods and rehabilitation procedures between countries, addressing the different cultural and language based differences. This may lead to an Europe wide increase of quality and better efficiency in hearing care. Also institutes will learn to cooperate across national borders and build on a shared competence. Motivated groups should be supported to make such networks and alliances, for which a strong presence into the new European FP7 program should be stimulated. This talk will discuss a number of successful Projects of the last years and directions for future European research.

SS03

Nano Ear: Aims, Application Process and Structure of the Consortium

Stöver, T.

Department of Otolaryngology, Medical University of Hannover, Carl-Neuberg-Straße 1, 30625 Hannover

Research activities have developed into an international enterprise, often combining expertise from various countries, disciplines and even research areas. To combine various research approaches in order to solve a multidisciplinary problem, usually national funding is neither sufficient nor available in most cases to finance this approach. The European Union offers research support. The recently evaluated NanoEar consortium is an example for a large multinational, multidisciplinary research enterprise focusing on the development of nanoparticle-based drug delivery, which creates a new approach for inner ear therapy. Within this project 23 partners from 11 countries including five industrial partners have been merged to address the scientific question to develop a nanoparticle-based drug delivery system. The total funding is more than 10 Mio. € over a period of four years. The presentation will refer to the preparation, the application, the evaluation as well as the scientific aims and the structure of the research consortium.

SS03

The EU-funded project HearCom; a mid-term review

Houtgast, T., Vlaming, M.

VU University medical center, Amsterdam, The Netherlands

HearCom is a European-funded project, with the full title "Hearing in the Communication Society". It is an Integrated Project within FP6, Information Society Technologies, including over 25 partners and a budget of about 8 million Eoro's. The project is coordinated by the present authors.

The over-all aim of the project is to improve the participation of vulnerable groups (most importantly, but not exclusively, hearing impaired persons) in the present society, which is so highly communication-oriented. To that end, we have identified four research area's, dealing with (1) hearing deficiencies, i.e. the development of relevant hearing tests, (2) adverse conditions, the interaction of room acoustics and telecom systems with hearing impairment, (3) rehabilitation, primarily concerned with hearing aids, and (4) assistive devices, i.e., on the use of modern technologies to improve communication.

This 54-months program is now halfway, and we will present an overview of the results obtained so far. Also, the over-all result and impact as expected from this project will be discussed, not only in terms of research achievements, but also including aspects of commercialization and contributions on standards.

See also www.HearCom.eu

SS03

Education in Audiology in Europe

Verschuure, H.

Erasmus MC, Rotterdam, the Netherlands / EFAS

At the foundation of EFAS in 1992/1993 working groups were formed to investigate the requirements to establish an approach to Audiology that would allow people to move around Europe, both as patients and as professionals. This included research and clinical work. Important in research is the funding of projects by the European Union and this subject will be covered in this panel by others.The clinical aspect of European cooperation was investigated by committees of EFAS and reports were presented at the EFAS congresses in Noordwijkerhout, the Netherlands (Verschuure and Schooneveld, 1995) and Prague, Czech Republic (Kiessling, 1997). The conclusion was that services were to a great extent similarly available in all countries within delivery systems that were greatly different by personnel with an education differing in background, length and developed skills and competencies. It was therefore decided to develop a curriculum for a general audiologist with possibilities for differentiation and specialization.The curriculum was developed in a meeting of country representatives in Bad Rauischholzhausen, Germany in 1998, discussed at the EFAS congress in Oulu, Finland (1999) and accepted at the congress in Bordeaux, France (2001). It was also largely accepted by the International Society of Audiology in Phoenix, USA in 2004.It seems appropriate after six years to see what the impact of this curriculum has been and how the situation in Europe has changed. This is important in view of attempts in research to develop a general battery of tests that can be used in clinics in all European countries.A questionnaire was sent to the EFAS representatives in all member states. The results will be discussed with focus on the impact of the curriculum on the educational models. The first impression is that the impact has been rather limited in most countries.

SS03

Future needs for European hearing research

Moore, D. R.

Medical Research Council Institute of Hearing Research

It is appropriate to note in Heidelberg, from where Helmholtz's 'On the Sensation of Tone' was published in 1863, that European hearing research has a long and rich tradition of discovery. In modern times, however, the balance of influence has crossed the Atlantic. Nevertheless, European research continues to be very strong in many areas, and leads the world in applied psychoacoustics and auditory prostheses, among others. I will argue that European hearing research needs to focus on its strengths and to develop a culture of 'effective natural cooperation'. One of the great strengths, and responsibilities, of our community is our system of largely nationalised health services. This provides opportunities for translational research on a large and well-funded scale. Public health commissioners seek an evidence base that, in my own research field of children's auditory processing disorder (APD), contrasts sharply with practice in the US. There, clinical practice has been converted into diagnostic and treatment practices that lack an evidence base. Our own, government-sponsored research into APD offers an alternative, population-based assessment. Our intention is to use this as a conduit for trans-European collaboration that could produce scientifically valid, tangible and cutting-edge results. But we must beware of artificial collaborations, made primarily to extract Euros from our EU paymasters. The first question to ask in planning any research collaboration is 'who do I need to work with?' This is what I mean by 'natural cooperation'. By focussing our efforts, and by interacting in meetings such as this, the chances of that 'who' being another member of the EU are, of course, greatly enhanced. A current venture to form a new audiological research core in Europe promises further to promote interactions thereby leading to genuine cooperation.

SS04

Childhood hearing loss from a clinician's perspective including early detection, diagnostics, treatment and perspectives

Ramos Macias, A.

Las Palmas, Gran Canaria, Spain

SS04

Paediatric Cochlear Implantation in the First and in the Second Year of Life:

a Comparative Study

Lesinski-Schiedat, A., Illg, A., Büchner, A., Lenarz, T.

Department of Otolaryngology, Medical University of Hannover, Carl-Neuberg-Straße 1, 30625 Hannover

Background: Successful outcomes of cochlear implantation in children have led to a gradual reduction in the age at which implantation is performed. Now that newborn hearing screening (NHS) and a reliable audiological diagnostic procedure are well established, the question has been raised as to whether implantation before the age of 1 is effective and safe.

Material and method: The study included 27 children implanted before the age of 1 (group 1) and 89 children implanted between the ages of 1 and 2 (group 2). Patient-related data were analysed with respect to individual anamnesis, implantation, rehabilitation and speech understanding.

Results: Irrespective of the children's age, the incidence of surgical or anaesthesiological complications did not increase. After two years, group 1 demonstrated better results in terms of development of hearing and speech understanding. These results correlated more closely with the children's actual age than with the length of time in rehabilitation.

Conclusion: This study revealed that children implanted before the age of 1 were subjected to no additional risks and showed superior development of speech understanding. Cochlear implantation should therefore be performed in very young children identified as suffering from profound bilateral hearing loss.

SS04

The Genetics of Hearing Loss in Childhood

Cremers, C.W.R.J.

Radboud University Nijmegen Medical Centre, Department of Otorhinolaryngology, 6500 HB Nijmegen

In the last decades the so called acquired cases of profound childhood deafness like bacterial meningitis, rubella embryopathy and bloodgroup antagonism have become less frequent, so the relative incidence of genetic causes has increased to over 50%.

In early childhood the genetic causes have been split up in syndromic and non-syndromic. About 450 genetic syndromes with hearing impairment as a feature have been reported. About 10 of these 450 are expected to be diagnosed more frequently. The non-syndromic ones are nominated as DFNA, DFNB, DFN in case gene-linkage has been reached. DFN means deafness and the addition A means autosomal dominant and B autosomal recessive inheritance. Without any addition DFN refers to X-linked hearing impairment. Hereditary non-syndromic profound childhood deafness has usually an autosomal recessive inheritance. DFNB1 (Cx26) is by far the most frequent with a frequency between 10 to 50% in the population depending of the geographic area. Mutationanalysis is in most centres available. Mutations of DFNB2 (MyO7A) may be traced with the micro-array for USH IB (MyO7A). Mutations for DFNB4 like Pendred Syndrome and EVA-Syndrome may be asked for in case of widened vestibular aquaducts on CT scanning of the petrous bones.

Autosomal dominant inherited non-syndromic hearing impairment in childhood (DFNA) is usually moderate and may be progressive. Low frequency hearing impairment or midfrequency hearing impairment may guide to a specific DFNA-type and so the opportunity for mutation analysis. The heterogenety of hereditary hearing impairment in childhood is so large (DFNB 1-67, DFNA 1-54), that in case the clinical presentation is still non-symdromic, specific screening tests for mutation analysis will be needed. Therefore a micro-array for Usher sydnrome (deaf blindness), in early childhood still presenting as non-syndromic, has been made available. In due time this may become available for DFNB-types excluded DFNB1.

Mutation analysis in children for a presumed DFNB-etiology starts with a search for DFNB1 (Cx26) and in addition in case CT-scanning has shown widened vestbular aquaducts with a search for mutations of DFNB 4 and Pendred-EVA-syndrome. In case the family history suggests a DFNA-type specific audometric configuration may guide to a specific mutation analysis to be asked for.

SS04

Newborn hearing screening and beyond: the state-of-the-art in Europe

Grandori, F.

Institute of Biomedical Engineering, National Research Council

Milan, Italy - ferdinando.grandori@polimi.it

Early identification of hearing impairment has become the focus of the health care systems in the vast majority of the developed countries in the world, as well as in an increasing number of developing areas.

During the past decade or so, this was made possible thanks to many concurrent factors:

- development of technology for screening, diagnosis and audiological equipment;

- development of strategies and methods for early intervention;

- position statements from influential institutions;

- legislation from national health authorities;

- advocacy from influential entities;

- benefits of early intervention from well established newborn hearing screening programs.

However, the implementation of a successful early hearing detection and intervention program, national or regional, in too many sites is still a matter of how “effective” is the initiative of a few highly concerned and motivated individuals.

A few interpretations will be provided to explain why some not-negligible areas or countries are still behind.

An issue to be raised here is the still relatively poor importance given to hearing impairment in several diverse cultures. Examples will be made to provide evidence of this aspect.

The rest of the lecture will be focused on the following issues:

- The current situation in the Western countries, with emphasis on the European area, of integrated systems of early detection and intervention of hearing loss in newborns and infants (surveillance). The situation will be discussed mainly in relation to differences and similarities among the national programs. Pros and cons between bottom-up or top-down approach will be also discussed.

- The main results of a survey on EHDI programs conducted on a representative set of countries worldwide by the International Study Group on Childhood Hearing (IGCH). This initiative parallels, and has been coordinated with, the surveys of the EHDI Team, from Center for Disease Control and Prevention, National Center for Birth Defects and Developmental Disabilities.

- How to measure effectively the outcomes of EHDI:

  o of the program itself (technicalities)

  o from the side of the baby (maturation and development)

- The future:

  o Surveillance (acquired/late onset HI)

  o UNHS and EHDI in developing areas

SS04

Principles of genetics in hearing loss

Kubisch, C.

Institute of Human Genetics, University of Cologne, Kerpener Strasse 34, 50931 Cologne, Germany, email: christian.kubisch@uk-koeln.de

Hereditary hearing loss ranks among the most common disorders in man and means a major burden for the affected individual, his family, and the society in general. Whereas the congenital and childhood forms of inherited hearing impairment are most often transmitted in a Mendelian pattern, i. e. are caused by a genetic alteration of a single gene in the respective family, the late-onset forms of hereditary hearing loss are multifactorial diseases caused by a combination of environmental risk factors together with genetic susceptibility variants in several genes. The correct diagnosis of a distinct form of hereditary hearing loss is complicated by an extraordinary genetic (locus) heterogeneity and a pronounced clinical variability. Nevertheless, the molecular elucidation of a large number of monogenic forms of hearing loss (both syndromic and non-syndromic) enabled us to improve the diagnosis and genetic counselling of affected families. Furthermore, these results led to a very much improved understanding of the molecular physiology of hearing and the pathophysiology of deafness. In contrast, the molecular nature of susceptibility genes in human presbyacusis and other complex inherited forms of hearing impairment is still elusive. However, significant improvements in genotyping technologies and our knowledge about the human genome and its variability now enables us to comprehensively study the genetic factors underlying these common disorders and will certainly be successful in the nearer future.

SS05

Age-related hearing loss – epidemiological and etiological aspects

Rosenhall, U.

Department of Audiology, Karolinska University Hospital/Department of Clinical Neuroscience, Karolinska institute, Stockholm, Sweden

Age-related hearing loss (ARHL), belongs to one of the three most frequently reported chronic health problems in old age, and is also the most prevalent cause of hearing loss. There are many epidemiological studies from countries, from North America, Australia and Japan. Recently, interesting results from recently industrialized countries have been available. The results of the investigations from western countries coincide reasonably well. The unscreened studies are fairly similar, but a difference of up to 10 dB or more at some frequencies exists. The screened studies also coincide rather well, with some variability. The unscreened populations have 5-15 dB poorer threshold values than the screened, especially pronounced in the high frequencies.

Gender differences have been observed in most studies. Elderly women have generally better hearing than men of the same age. Women have better threshold values at 2-8 kHz than men, with a difference of up to 20 dB at 4 kHz. In the low frequency area there is a tendency for women to present with somewhat poorer thresholds than men. Extrinsic ototraumatic factors, above all exposure to noise, differ between genders and are likely to be responsible for at least part of the difference. However, results regarding gender differences have been somewhat contradictory. In one study it has been reported that the male excess of hearing loss remained statistically significant after adjusting for age, education, noise exposure, and occupation. No significant gender difference has been found in animal studies.

Exposure to noise is the most important extraneous noxious factor that affects the hearing in old age, above all for men. Occupational exposure to extensive noise is of considerable importance, but also every-day noise exposure. The effect of noise is equivocal. The interactions between noise-induced hearing loss (NIHL) and ARHL are complex, difficult to determine, and poorly understood. One important issue that has been discussed is if there is increased or decreased sensitivity to noise with age. The traditional model to assess NIHL in older persons assumes that ARHL adds to the permanent noise-induced threshold shift. A basically additive model is embraced by ISO 1999. However, this model has been challenged. It has been proposed that the additive model overestimates, as well as underestimates, the interaction between noise and ageing.

Hearing loss in elderly people can also be related to ototraumatic events other than noise. Such factors include influence from ototoxic agents and environmental ototoxic insults, smoking, head trauma, alcohol abuse. Health factors e.g. otological diseases and cardiovascular disorders have been related to the presence of ARHL. Other factors that interfere with the hearing capacity in old age are socio-economic state, level of education, and the state of health.

Quality of life depends to a large extent on communication with other people, and the auditory system is the most important link in communication. ARHL has often a devastating effect on the social life of many elderly people. One of the most important tasks for the audiological services is to alleviate these negative effects.

SS05

Noise-induced hearing loss as a complex disorder influenced by environmental and genetic factors

Sliwinska-Kowalska, M.

Nofer Institute of Occupational Medicine, Lodz, Poland

Department of Environmental Otolaryngology, Medical University of Lodz. Poland

e-mail: marsliw@imp.lodz.pl

Noise-induced hearing loss (NIHL) is the second most common form of sensorineural hearing loss in adults, after presbyacusis. Approximately 25-30 million workers in Europe and 30 million workers in the US work in an environment with excessive noise levels. This number should be adjusted for a large population of individuals exposed to environmental noise, military noise and during the leisure activities. Besides well know parameters of noise contributing to occupational NIHL, such as the equivalent level of exposure to noise (LeqA) and years of exposure, some other factors may play a role. They include i.e. impulsiveness of noise (impulse noise is more harmful than steady-state at the same equivalent level), exposure paradigm (breaks in noise exposure allow for the recovery), occupational exposures to certain chemicals, i.e. organic solvents, asphyxiants and heavy metals, co-exposure to noise and vibration, ototoxic drugs (aminoglycosides, cis-platin and others), and smoking. Special care should be taken for individuals exposed to chemical substances, as it was lately shown for organic solvents.

Organic solvents are frequent contaminants of atmoshperes in industry, including paint and lacquer factories, dockyards, printing industry, plants manufacturing yachts, furniture, plastic, fibres, rubber tires and several other products. They have detrimental effects on both – peripheral and central part of the auditory pathway. A synergistic effect occurs in case of combined exposure to noise and solvents and this significantly increases the odds ratio of developing hearing loss. Thus, awareness should be raised among occupational physicians and decision makers that in solvent alone and combined with noise exposures, the current limits and hearing conservation programmes might be inadequate.

Remarkably, the individual susceptibility to NIHL varies greatly, and this inter-individual variation is due to an interaction of environmental factors and susceptibility genes. It has been demonstrated that mouse strains exhibiting age-related hearing loss are more susceptible to noise than other strains, while some knockout mice (SOD1-/, GPX1-/-, PMCA2-/- and CDH23+/-) were more sensitive to noise than their wild-type littermates. Very little is known about hereditary of NIHL in humans. An increased susceptibility to NIHL may rely on the Single Nucleotide Polymorphisms (SNPs) of several genes, including the groups of oxidative stress genes, potassium ions recycling genes, monogenic deafness genes and mitochondrial genes. Recent association studies indicate that SNPs in some potassium recycling genes - GJB2 (Cx26), GJB6 (Cx30), KCNQ1, KCNQ4 and KCNJ10 - may play an important role in determining the individual susceptibility to NIHL.

Identifying new environmental hazards and looking for intrinsic risk factors of developing NIHL, as well as more effective methods of prevention and medical treatment could have a beneficial impact both on health and economics.

SS05

The value of otoacoustic emissions in the evaluation of noise-induced hearing damage

Ceranic, B.

Consultant in Audiology & Neuro-otology, Department of Audiology, St. George's Hospital, London

The cochlea is the site of the most extensive noise-induced changes within the auditory system and, therefore, otoacoustic emissions (OAEs), as a by-product of the cochlear (outer hair cells - OHC) activity, can provide valuable information on noise-induced damage.

OAE recording techniques are simple, non-invasive, they provide objective information and they are available in routine clinical practice.

The following application of OAEs in the evaluation of noise-induced effects will be discussed:

- The detection of early noise-induced change, even before any notable change in audiometric thresholds, as OHCs seem to be particularly vulnerable to noise.

- Intra-individual monitoring of subtle changes in the cochlear integrity following noise exposure. Although there is a high inter-individual variability, OAEs display a remarkable intra-individual stability, which makes them very valuable for this application.

- OAEs may also provide a glimpse into functional status of the OHCs, with a possible application in the assessment of noise-induced tinnitus and hyperacusis.

- The application of OAEs in the evaluation of the medial olivocochlear (MOC) system, which may be implicated in the physiological protection mechanism against noise and, therefore, the efficacy of the MOC could be considered a potential factor of inter-individual susceptibility to the damaging effect of noise. The MOC system may also be of relevance in developing tinnitus and hyperacusis.

SS05

Tinnitus in aging population

Mazurek, B., Szczepek, A.

Tinnitus Center, Charité Universitätsmedizin Berlin, Germany

Hearing loss is a very frequent health problem of the aging population. Difficulties in hearing can be amplified by an inability to filter a background noise, trouble with spatial hearing and by tinnitus, ultimately decreasing a quality of life. To design a cure, one has to understand the mechanism. Discussed here will be main pathological ways leading to age-related hearing loss (AHL) and tinnitus in context of aging biology. Some of the important causes of AHL are partial or total destruction of hair cells and neurotransmitter signaling. Tinnitus can affect auditory peripheral (outer and inner hair cells) or/and central system (cochlear nucleus, superior olivary complex, inferior colliculus, medial geniculate nucleus and the primary and secondary auditory cortex). One of the accepted definitions presents tinnitus as a lack of equilibrium between auditory peripheral and central checkpoints induced by either damage to hair cells or by changes in neurotransmitter release or alteration in their post-synaptic effects. These pathological changes usually intensify with age. Of special importance are changes in glutamate, dopamine, GABA, acetylcholine and serotonin networks. For example, dopamine receptors are downregulated during aging, which could possibly lead to tinnitus. Progressive changes in synthesis, exocytosis and signaling of dopamine were observed in experimental old animals. Similar changes were documented for GABA, whereas GABA-receptors were overexpressed with age, suggestive of compensatory mechanisms. The diminished synthesis and release of GABA could lead to an increased action of glutamate, most likely resulting in tinnitus. In patients suffering from Alzheimer disease (often associated with a hearing loss), a significant reduction of acetylcholine receptors accompanied by serotonin gene polymorphism was documented. Lastly, malfunction in the serotonin network leading to loss of auditory filter function could either generate or habituate already existing tinnitus.

SS06

Implantable hearing systems: Common denominators and future developments - a clinical perspective

Häusler, R. , Stieger, C., Kompis, M.

Department of ENT, Head and Neck Surgery, Inselspital, University of Berne, Switzerland

Implantable hearing systems are a dynamic area of development. When compared to conventional hearing aids, implantable systems hold the promise of substantial improvements regarding sound quality, speech recognition, sound distorsion, reduced feedback, better cosmetic appearance and less discomfort due to absence of ear canal occlusion. The most important component of an implantable hearing system is the output transducer – the equivalent of the loudspeaker in conventional hearing aids – providing a direct mechanical interface to the human ear. The majority of today's available implantable hearing systems are only partially implantable with an implanted mechanical interface and an externally worn microphone and energy source, the information being transmitted by a percutaneous connector (BAHA, DACS) or by a transcutaneous coil system (MED EL Vibrant Sound Bridge, DDHS Sound tech. Classical MET Otologics, new transcutaneous DACS). The coupling to functional ear structures is usually on the level of the ossicles, the MED EL Vibrant Soundbridge equipped with a floating mass transducer can alternatively be positioned directly to the mem¬brane of the round window. The DACS system is up to now the only one which is directly coupled to the inner ear liquid on the principle of a power driven stapes prosthesis. Latest developments are fully implantable systems including the energy source and the microphone such as the Carina and the Envoy. In these systems an accumulator is charged by a transcutaneous external energy source. The main characteristics of the presently available implantable hearing systems are presented and various advantages and problems with respect to indication and the surgical implantation procedure are discussed. A catalogue of requirements for implantable hearing systems is presented.

SS06

Are middle ear implants better than conventional hearing aids?

Snik, A. , Noten, J., Cremers, C.

ENT department, University Medical Centre St. Radboud, Nijmegen, the Netherlands

Introduction: Several studied suggested that patients' performance with middle ear implants (MEI) is superior to that with conventional devices (CHA). However, these studies comprised mainly dissatisfied CHA users; this might have biased the results. Therefore, we compared results of 32 middle ear implant users with a reference group of 52 CHA users. Inclusion criteria: experienced digital hearing aid users younger than 70 years, no air-bone gap, flat audiogram or mildly sloping (<= 10 dB/octave from 0.5 to 4 kHz).

Method: Speech perception was tested at least 4 weeks after final fine-tuning of the hearing devices (MEI or CHA). From the aided sound-field audiogram, the score at 65 dB SPL was determined.

Results: MEI patients systematically scored worse than CHA users, in percentages: 6% worse speech recognition for patients with 50 dB HL hearing loss increasing to 36% for patients with 70 dB HL hearing loss. Subjective data gathered in a sub sample of MEI users were also poorer than CHA data from a large reference group.

A probable cause for the difference is the limited maximum output of MEIs.

Conclusion: The commercially available MEIs are effective hearing aids with limited capacity compared to CHA. Nevertheless, for patients with hearing loss up to approx. 60 dB HL, who cannot wear CHAs, MEIs are already an indispensable new solution

SS06

Benefits of objective measures in cochlear implants

Burdo, S.

Audiovestibology Varese Italy
http://www.audiologia.it

Cochlear implants represent today an important and widespread reality and for this reason the objectives tools used to evaluate CI recipients should be a routine service in the clinical field.

In this communication we will not consider morphological tests like CT scan or MRI.

To understand and to correctly analyse the results of audiological objective measures one should keep in mind that the CI is an artificial cochlea and the electrical potentials must therefore be classified by the different stations of the auditory pathways.

The objectives measures of the natural cochlea are acoustic otoemissions and cochlear microphonics and such tools are useful but not an essential prerequisite, because information about the receptor may be inferred from other tests.

In an implantee instead, checking the functionality of the device is fundamental because any failure, even a soft one, may alter the response of the higher stations of the auditory pathway.

The three tests to used to check CI functionality are impedance telemetry, A.E.V. (Averaged Electrical Voltages) and Objective Microphone Evaluation (OME). All three tests are crucial to obtain an overall evaluation because they complete one another.

The second station is the acoustic nerve, which can be evaluated acoustically by means of ElectroCOchleoGraphy (ECOhG), and the electric equivalent is the ECAP (Electrical Compound Auditory Potential).

Upwards along the pathway, the potential that can be recorded are the brainstem response (ABR acoustically and EABR electrically), the Middle and Cortical responses.

For many aspects the acoustically and the electrical responses are similar, but some differences are to be mentioned, like the possibility to elicit the electrical brainstem response stimulating all the electrodes and not only the basal turn ones.

The main drawback in evaluating the retrocochlear pathway through a cochlear implant is the presence of an important electrical artifact and that's why a for that particular strategy is needed to improve the SNR of the response, because common tools like the averaging are not sufficient.

Therefore a complete evaluation of the auditory apparatus even for an implantee is today possible.

By means of audiological objectives measures we can:

- identify the system failures and their influence on the hearing performances;
- identify a new pathology that can affect the patient after implantation;
- obtain an objective fitting of the device;
- study the maturation of the auditory apparatus as a consequence of electrical stimulation;
- analyze clinical results.

SS06

Speech Processing for Cochlear Implants and Bimodal Stimulation

McDermott, H.J.

Department of Otolaryngology, The University of Melbourne, Australia

BACKGROUND: An increasing number of cochlear implant (CI) recipients have usable acoustic hearing in one or both ears post-operatively. Several recent studies have shown that such people usually benefit from bimodal stimulation in comparison with separate use of either the CI or an acoustic hearing aid (HA). In general, the different devices function autonomously and are fitted to each user independently. However, future improvements in performance are likely if the acoustic and electric modes of stimulation are designed to provide compatible and complementary information.

AIMS: Previous research has related the pitch perceived with electric stimulation to that perceived acoustically. Although providing compatible pitch sensations may be beneficial with bimodal stimulation, it is also important to ensure that loudness is perceived appropriately via each mode of stimulation. The present study aimed to investigate loudness perception in CI subjects who had usable acoustic hearing.

METHOD: Eight subjects provided loudness estimates for a band of noise presented at 10 levels spanning the dynamic range (DR) of their acoustic hearing. Subsequently, the levels of the same noise that corresponded to loudness categories of 'soft,' 'comfortable,' and 'loud but OK' were determined when the subjects listened via their CIs.

RESULTS: There was a wide range of DRs across subjects for the acoustically presented signal. On average, the level ratio between the 'loud but OK' and 'soft' categories was about 15 dB. In contrast, CI sound processors are typically programmed for users such that the DR for acoustic input signals is approximately constant (e.g., 35 dB).

CONCLUSIONS: To optimise loudness perception with bimodal stimulation, amplitude compression functions in HAs should be programmed individually so that the acoustic signals are perceived appropriately relative to the electric stimuli delivered by the CI.

SS06

Children with Cochlear Implants: Bilateral Implantation

Zarowski, A., Jans, M., Theuwis, L., Somers, Th., Offeciers, F.E.

University ENT Department, AZ St. Augustinus, Antwerp, Belgium

Introduction: Bilateral cochlear implantation (CIBIL) in post-lingual adults has proven to effectively resolve the head shadow problem, increase the ease of hearing and improve sound localisation and speech understanding, especially in noise. Literature data on paediatric patients is however scarce and the question arises concerning the ability for processing of the binaural information by congenitally and peri-lingually deaf children. Recent reports [1,2] show a possibility for existence of a critical period for CIBIL in children.

Objectives: 1.) To document the time course of development of the auditory and language skills of children bilaterally implanted at our clinic. 2.) To evaluate the influence of the age at implantation and the time interval between the implantations on the magnitude of improvement in auditory performance. 3.) To study the binaural cues that are effectively conveyed by the current cochlear implants (CI's).

Material and Methods: At our department 53 patients (including 37 children) have received bilateral CI's since 1997. 10 children have been chosen for this longitudinal study and followed for at least 2 years. All children have been implanted non-simultaneously with the Nucleus-Nucleus or the Laura-Nucleus CI combinations. Children included in the study were implanted at different ages (ranging from 15 to 129 months for the first implant, and from 51 to 157 months for the 2nd implant) and with different intervals between the first and the second implantations (range: from 28 to 106 months). At pre-defined time intervals extensive audiological evaluation was performed. The test battery comprised the speech understanding tests (CVC monosyllabic words, NVA-list in quiet and at +10dB S/N speech noise), localization tests, binaural summation tests, detection of binaural beats and binaural masking level difference for tones.

Results: 1.) The maximum speech discrimination with the first implant remained stable after implantation of the 2nd CI. 2.) The average maximal speech understanding results with the 2nd implant only, obtained at 3 months post-operatively, was 57% (monosyllabic CVC open-set identification task in quiet). 3.) The 2nd CI achieved performance at a level comparable to the first one after approximately 18 months. 4.) During the observation period there was continuous improvement of the speech understanding results measured in the CIBIL condition owing to the improvement of the results with the second CI. A ceiling effect is expected to occur. 5.) Multiple regression analysis showed that with only 2 independent parameters - the age at the first CI and the age at the second CI – we were able to predict 72% of the variability of the results after bilateral implantation. 6.) Additional benefit in speech discrimination evaluated in the second year after bilateral (2nd) implantation (measured as the improvement in the maximal phonemic score with both implants relative to the best mono-aural condition) disappeared in children who received the 2nd implant after the age of 10 to 12 years. 7.) The only binaural cues that are effectively used by CIBIL children are the intensity cues.

Conclusions: 1.) Contrary to what had been reported before, the results of speech understanding obtained with the 2nd CI do not differ significantly from the results obtained with the first one. The time needed for the 2nd CI to approach the results of the first one is approximately 18 months.

2.) The average maximal speech understanding results at 3 month post-operatively obtained in the mono-aural condition with the 2nd CI only were much better than the matched results obtained with the first CI. This indicates that the first CI primes the central auditory system in such a way that the subsequent input from the 2nd CI is integrated in a faster and a more efficient way.

3.) In our group there seems to exist a critical period for obtaining additional benefits in speech understanding with bilateral implantations as compared to unilateral implantations. Children implanted with the 2nd CI after the age of 10 to 12 years tend to show no additional benefits in speech understanding. Therefore bilateral cochlear implantation should be performed at the earliest possible age and with the shortest possible time interval.

Corresponding author:

Dr. A. Zarowski

University ENT Department, AZ St. Augustinus

Oosterveldlaan 24; B-2610 WILRIJK / BELGIUM

tel.: +32 3 443 36 19; Andrzej.Zarowski@GVAgroup.be

[1] Sharma A, Dorman M, Spahr A; A sensitive period for the development of the central auditory system in children with cochlear implants: implications for age of implantation. Ear Hear. 2002 Dec;23(6):532-9.
[2] Sharma A, Dorman M, Kral A; The influence of a sensitive period on central auditory development in children with unilateral and bilateral cochlear implants. Hear Res. 2005 May;203(1-2):134-43.

SS07

Sounds towards the tympanic membrane

Kiessling, J.

Dept. of Audiology, Justus-Liebig University Giessen, Germany

The acoustic coupling of the hearing aid to the outer ear is well-known as one of the most important factors for its performance. Therefore, appropriate impedance matching, venting and filtering are considered as state-of-the art of modern hearing aid fitting. Nevertheless most development and fitting resources went into hearing aid hardware and software in the past. This trend has been reversed by the rediscovery of open fittings made possible by novel feedback suppression algorithms. Totally open fittings using either off-the-shelf silicone eartips or individual open earmolds in conjunction with micro tubings became accessible for the majority of hearing aid candidates. This trend also initiated new developments in ITC venting, e.g. specially shaped venting systems or IROS solutions aiming at optimization of the vent dimensions. Whereas open BTE fittings have proven to be a major step forward in terms of wearing comfort and sound quality open ITC solutions did not make this breakthrough yet. Recently most manufactures introduced devices with external receivers combining the benefits of open solutions with broader frequency response, fewer resonances, and possibly lower gain requirement. Furthermore, it is frequently argued that the extended distance between microphone and receiver would create less feedback. These advantages are compromised by the fact that external receivers may have a higher repair rate and are unsuitable for small ear canals. Today open products with external receivers are fairly successful on the market, but it remains to be seen whether this is due to the benefits of external receivers or just a bonus for the most modern technology. Hearing aids with external receivers actually have the potential to provide more gain in the high-frequency range beyond 6 kHz. Clinical studies, however, have shown that it is difficult to prove significant extra benefit due to high frequency emphasis. Probably specific candidature criteria have to be taken into account.

SS07

Compensation of hearing deficiencies in the inner ear

Hohmann, V.

Universität Oldenburg, Medizinische Physik

The cochlea acts as a non-linear spectro-temporal analyzer that codes the frequency-distribution of the incoming acoustic energy (frequency-to-place transformation). The nonlinearity in the cochlear response to sound is mediated by the outer haircells, which provide a compressive saturating gain characteristics, i.e., a high gain at low input levels that decreases with level. The frequency selectivity of this 'cochlear amplifier' is higher than that of the passive cochlear resonant response, i.e., full gain and compression is applied to prominent spectral peaks only. The maximum gain provided by the cochlear amplifier is generally sought to be reduced in cochlear hearing loss due to a loss of outer haircell function. It is associated with an increased threshold of hearing (loss of sensitivity), a reduced dynamic range between threshold and uncomfortable level ('Recruitment') and a reduction in frequency selectivity. In terms of information processing, the latter effect indicates a loss of channel information capacity, because the waveforms at the different places along the cochlear partition have a stronger correlation than in the healthy cochlea. This means in practice that the response pattern of the healthy cochlea cannot be restored regardless of the type of pre-processing. Adopting the information-theoretic viewpoint, signal processing in hearing aids relies as a consequence of the reduced channel capacity on selecting the relevant information to be transferred through the impaired cochlea. An efficient way to select the relevant information is to enhance speech components by noise reduction (cf. the contribution by J. Wouters to this session). Another means to selecting relevant components is to simulate the cochlear amplifier, in particular its high frequency selectivity. Also, the distinction of relevant and irrelevant components might depend on the actual acoustic scene, emphasizing the need for an intelligent environment classification. This contribution discusses consequences of a reduced channel capacity and possible rehabilitation schemes.

SS07

Hearing instruments - The use of both ears

Wouters, J.

Dept. of Neurosciences, K.U.Leuven

The intrinsic beyond-amplification aspects of hearing loss can not fully be circumvented in modern hearing aids. Therefore, preprocessing of the input signals is important and aims at the presentation of a signal that is clearer or easier to understand, to further hearing aid stages. Multi-microphone configurations and additional (adaptive) signal processing in modern hearing aids have been shown to improve speech reception in a number of (some but not all) listening conditions.

However, it has been confirmed also in the last few years that improvements in one domain of perception (e.g. speech intelligibility) may result in decrease of performance in another dimension (e.g. localization). With the advent of bilaterally linked hearing instruments there is an increased interest in binaural signal processing schemes to allow more general improvements.

This contribution will report on recent advances resulting in enhancement of speech understanding in adverse listening environments combined with preservation of directional hearing with binaural adaptive signal processing on 2, 3, 4 (or more) microphone inputs. These binaural preprocessing schemes can equally well be applied in bilateral cochlear implants or bimodal bilateral systems.

SS07

The fitting process of complex hearing aids

Dreschler, W.A.

AMC Amsterdam, NL

The fitting of modern hearing aids is becoming increasingly complex, because the hearing aid is expected to adapt to different acoustical environments, either under user control or automatically. This requires more refined and elaborate fitting techniques. Non-linear prescription rules provide a good starting point but in many cases a well-structured fine tuning process is required to improve the “first-fit” parameters based on user experiences in daily life. This presentation will focus on four approaches that can be used here:

• Interactive fitting strategies using multi-directional pattern search techniques allow a multi-dimensional approach in which the user can optimise a number of signal-processing parameters interactively for specific listening conditions.

• Well-structured sets of background noises, recorded on CD or DVD to simulate specific sound environments that allow a better tailoring of the hearing aid settings towards specific background noises and listening situations.

• Data-logging techniques to receive detailed feedback about the use of different settings in daily use during a trial period.

• Trainable hearing aids that may facilitate a more direct approach if the subject will be allowed to control the most important fitting parameters in his/her own acoustical environment.

Each approach has specific advantages and disadvantages as well as limitations with respect to the practical use (e.g. with respect to the time available for fine-tuning). However, it will be argued that fine-tuning is worthwhile and generic tools should become available to optimise the use of high-level technology in modern hearing aids.

SS07

Subjective and objective evaluation methods of complex hearing aids

Holube, I., Fredelake, S., Hansen, M.

Institute of Hearing Technology and Audiology, University of Applied Sciences Oldenburg/Ostfriesland/Wilhelmshaven, Oldenburg, Germany

Background: Hearing aids and their components are evaluated with different methods at several stages during their development. The evaluations are done by the manufacturers themselves as well as by external research and clinically oriented partners. Electroacoustical measurements based on current standards do not reflect the abilities of complex hearing aids. Therefore, new objective methods which reflect as much as possible subjective judgements by patients should be applied as evaluation methods for today’s signal processing algorithms as they are crucial for the success of the devices.

Methods: Subjective evaluation methods include speech intelligibility tests, sound quality judgements and questionnaires. Objective measures are based on a comparison of the output of the hearing aid to its input. They determine primarily the effect of compression and noise reduction algorithms. Within this study, those algorithms were implemented on a PC and different evaluation tools were applied.

Results: The comparison between objective and subjective evaluation methods shows a dependency between most of them. The highest correlation was found for the dynamic compression algorithm under controlled laboratory conditions. Subjective and objective assessments of noise reduction algorithms vary and depend strongly on the focus of the subjective rating, e.g. speech quality vs. noisiness. In addition, subjective judgements are influenced by the hearing loss which is not yet included in all objective methods. Own results are compared to findings from other research groups.

Conclusions: New evaluation tools are necessary for the analysis of complex hearing aids. Several reasonable approaches have been proposed by different research groups which can be applied under certain conditions. Still under discussion is the transfer of the results in the laboratory to real world environments.

[Supported by AGIP/EFRE]

SS08

Conductive Hearing Loss

Quaranta, N.

Otolaryngology Clinic “G. Lugli”, University of Bari, Italy

The diagnosis of conductive hearing loss is based on otoscopy and audiological tests. During the presentation, basic concepts of middle ear physiopathology will be presented as well as the main audiological test used in clinical practice. Tuning fork tests, impedence audiometry and air- and bone-conduction audiometry lead the clinician to the right definition of hearing threshold an to the diagnosis. The definition of the bone-conduction thresholds in particular cases will be also discussed.

SS08

OAE latency and tuning: implications for cochlear models and diagnostic perspectives

Moleti, A. (1), Sisto R. (2)

(1) University of Roma ‘Tor Vergata’, Physics Department, Roma, Italy

(2) ISPESL, Occupational Hygiene Department, Monteporzio Catone (Roma) Italy

BACKGROUND: The experimental relation between the OAE latency and frequency is due to the tonotopic nature of the cochlear geometry and to the bandwidth of the cochlear filter. Indeed, transmission line cochlear models predict that the OAE latency is dependent on the slowing down of each traveling wave frequency component near its tonotopic place, which is more pronounced for high-Q resonances. Model-dependent methods have been proposed to get objective estimates of the tuning curve from OAE latency measurements. As the cochlear filter is associated with the active and nonlinear feedback mechanism mediated by the OHCs, its quality factor is a function of the stimulus level and of the OHC functionality. Therefore, a study of the OAE latency as a function of frequency and stimulus level is important to study the nonlinear behavior of the cochlear amplifier.

METHODS: 280 TEOAE waveforms from 10 young subjects were recorded for different levels of the click stimulus, from 60 to 90 dB, using both linear and nonlinear acquisition paradigms. TEOAEs were time-frequency analyzed using a wavelet technique, getting a measure of the TEOAE latency as a function of frequency. The TEOAE phase-gradient delay was also evaluated and compared with the wavelet latency estimate. A simple 1-d transmission line cochlear model was used to provide the theoretical relation between cochlear delay and tuning.

RESULTS AND CONCLUSIONS: The experimental latency-frequency relation is well represented by a power law, with longer latency and steeper slope at lower stimulus levels. The tuning curve estimates confirm that the quality factor of the cochlear filter increases with frequency and decreases with increasing stimulus level. The quantitative analysis of these results is model-dependent, thus more experimental data are needed to help developing reliable models, which are necessary to open new perspectives for the objective diagnostics of the cochlear filter.

SS08

Transient and steady-state auditory responses

Mühler, R.

Otto-von-Guericke-University Magdeburg, Germany,
Department of Experimental Audiology

For many decades the history of objective methods in audiology is closely connected with transient auditory evoked responses. However, beginning in the last decade of the 20th century, auditory steady-state responses have attracted more and more notice. A short survey of the fundamentals of transient and steady-state auditory evoked responses is given, pointing out the significant differences in stimulation, recording and response detection.

Auditory steady-state responses (ASSR) may theoretically be recorded more quickly and recognized more objectively than the more widely accepted auditory brainstem responses (ABR) or cortical electric response audiometry (CERA). Additionally, ASSR may provide a more frequency-specific assessment of hearing than the ABR because the amplitude modulated tones used to elicit ASSRs have a narrower spectral representation.

However, for most applications, a major drawback of ABR and ASSR is their low amplitude relative to the physiological background noise resulting in a poor signal-to-noise ratio (SNR). Thus the uncertainties and failures that have occurred both in research and clinical application of transient and steady-state responses may be attributed to the variable influence of the residual background noise.

Clinical data and simulations are presented, clarifying the particular importance of reliable estimates of residual noise in recordings of ABR as well as ASSR.

SS08

Loudness scaling

Brand, T.

University of Oldenburg

The assessment of loudness functions using the method of categorical loudness scaling provides the audiologist with additional information about the patient's hearing performance that is not present in the pure tone audiogram. For example, the shape of the loudness function at intermediate loudness can hardly be estimated from the pure tone audiogram. This additional information can be used for clinical diagnostics as well as for hearing instrument fitting.

Unfortunately, the existing procedures for categorical loudness scaling do not generate comparable results. Furthermore, some procedures appear not optimal with respect to accuracy and reproducibility. Such shortcomings led to fundamental criticism about categorical loudness procedures as such (e.g. Elberling, 1999). However, many of the arguments against categorical loudness scaling are due to problems of the applied procedures and could be solved using an adequate stimulus placement, appropriate model loudness function and a sufficient number of loudness categories and stimuli. An example of such a procedure is described in the reference procedure ACALOS (Adaptive CAtegorical LOudness Scaling, Brand and Hohmann, 2002) of the relatively new ISO 16832 standard.

However, the validity of the method is still limited by the complex psychological factors of loudness judgments and statistical constraints. If this is kept in mind by the audiologist, over-interpretations of the results of categorical loudness scaling can be avoided.

Brand T, Hohmann V (2002) An adaptive procedure for categorical loudness scaling. J Acoust Soc Am, 112, p 1597-1604.

Elberling C (1999) Loudness scaling revisited. J Am Acad Audiol, 10, p 248-260.

ISO 16832 (2006) "Acoustics – Loudness scaling by means of categories"

SS08

Speech audiometry

Hagerman, B.

Laboratory for Hearing Technology, Karolinska Institutet, Stockholm, Sweden

The Bell Laboratories in USA were pioneers in their work to develop speech audiometric methods in the 1920-ies. However, the aim at that time was to test communication links rather than testing hearing impairment. In audiology there are two main purposes of speech audiometry. One is topic diagnosis, i.e. to answer the question “Where is the damage located?” and the other is functional diagnosis, e.g. to answer the questions “Which ear is best?” or “How does the patient manage to recognise speech with and without hearing aids (or cochlear implants)?” Speech audiometry is not very well suited to be used for topic diagnosis. Its validity in this respect is thus rather poor. Also the reliability of speech audiometry is poor. To get a statistical significant difference between two speech recognition scores, each obtained with 50-word list, a difference of 10 to 20 percentage units is needed. The greatest difference is needed for scores between 30 and 70%. Since the reliability is related to the number of items scored, it is very time consuming to measure whole speech recognition curves with reliable results. Simulations of the variability of such measurements will be shown. Another drawback with speech audiometry is that it is usually performed under conditions that the patient will never meet in everyday situations, neither without nor with hearing aid. For example, the maximum speech recognition uses to be measured at a higher than normal level but still not with a frequency response similar to a hearing aid. It is important to develop speech audiometric methods that are clearly designed for their specific purposes. Since speech recognition is the most important task for our hearing organ speech audiometry is still needed at the hearing clinics despite the drawbacks mentioned.

SS08

Binaural hearing and auditory functioning.

Dreschler, W.A.

Amsterdam, NL

This presentation focuses on binaural hearing in relation to the auditory functioning in complex daily situations rather than on the use of binaural tests for the diagnosis of central auditory pathology. Theoretically, the use of interaural cues of intensity and phase can be tested with several headphone tests. These will be helpful for diagnosing the reasons why certain aspects of binaural co-operation may be impaired.

With respect to auditory functioning, free-field tests on speech perception with separated sound sources and tests on horizontal localization are more relevant. This presentation will review several tests in this area as well as their application in assessing the benefit of a bilateral fitting with hearing aids.

Finally, there are several aspect of spatial hearing, based on binaural hearing, that are relevant for auditory functioning in daily life, but that are not covered by existing clinical tests. Possible solutions will be discussed.

SS09

Preservation and regeneration of the auditory system

Knipper, M. (1), Stöver, T. (2), Löwenheim, H. (1), Senn, P. (3), Walsh, R.P. (1)

(1) Department of Otolaryngology, University of Tübingen

(2) Department of Otolaryngology, Medical University of Hannover

(3) Department of Otolaryngology, Bern

The auditory system is a structurally and physiologically highly specialized sense. At present hair cell and following spiral ganglion cell loss presents the anatomical basis for hearing loss either due to genetic, age or with causes. In order to preserve and/or regenerate the cellular and physiological components of the auditory system various strategies are been followed at present by various groups. In a presentation combining four main aspects of this work the potential use of stem cells for preservation and regeneration of the auditory system, the differential distribution of stem cells in the auditory and vestibular organ of the inner ear, the potential of growth factors for regeneration of the auditory system and the potential of growth factors for preservation of the auditory system will be presented and discussed by experts in field.

SS09

Molecular mechanism in the regenerative biology of hearing

Löwenheim, H.

Hearing Research Center, Department of Otolaryngology - Head & Neck Surgery, University of Tübingen Medical Center, Elfriede Aulhorn Strasse 5, 72076 Tübingen, Germany

The neurosensory cells of the organ of Corti have a limited life span that may be further reduced by environmental insults. One strategy was trying to understand regeneration in the avian ear, and to transfer this knowledge to mammals to substitute for what may be missing there. Another strategy was to apply growth factors and cytokines with the hope to find a molecule with a regenerative effect. Unfortunately, both strategies failed.

An emerging strategy is to investigate the cellular and molecular basis of hair cell proliferation and differentiation in the organ of Corti. The induction of terminal differentiation is regulated by a class of cell cycle proteins designated as Cip/Kip cyclin-dependent kinase inhibitors (CKIs). Among other functions, they have been implicated to induce cell cycle exit during development and to maintain cells in a terminally differentiated state. In the organ of Corti the expression of the Cip/Kip CKI-family protein (p27Kip1) proved to be conserved to supporting cells at embryonic and adult stages. Disruption of the p27Kip1 gene allows for continued cell divisions in the organ of Corti in mice. Assuming that the inability of supporting cell to proliferate is the primary limiting factor for the initiation of hair cell regeneration, then a crucial question in the regenerative process may be solved. This implicates, if proliferation of supporting cells in the organ of Corti can be turned on by the inhibition of the cell-cycle inhibitor p27Kip1, hearing may be restored in cases of sensorineural hearing impairment caused by hair cell loss

SS09

Stem cells in the auditory and vestibular organs of the inner ear

Senn, P. (1), Oshima, K. (2), Teo, D. (2), Grimm, C. (2), Heller, S. (2)

(1) Department of Otolaryngology, Head & Neck Surgery, University of Berne, Inselspital, Freiburgstrasse, 3010 Bern, Switzerland

(2) Departments of Otolaryngology, Head & Neck Surgery and Molecular & Cellular Physiology, Stanford University School of Medicine, 801 Welch Road, Stanford, CA, USA

Adult stem cells within many mature organs, such as blood, gut or skin are responsible for the replenishment of lost cells and therefore guaranteeing long-term morphology and functionality of an organ. But, adult stem cells have also been found in tissues with a minimal turnover such as brain, heart and of particular interest to us, the inner ear. Recent studies have shown that adult stem cells of the inner ear are pluripotent and capable to generate inner ear cell types. Unfortunately, adult inner ear stem cells do not naturally have the potential to sufficiently replenish lost hair cells in mammals. Especially in the adult mammalian cochlea, no regenerative capacity has been found, which is the main reason for the permanence of hearing loss. Adult mammalian vestibular organs, in contrast, replace a minimal number of lost hair cells throughout life. New findings indicate that the lack of regenerative capacity in the adult mammalian cochlea is either a result of an early postnatal loss of stem cells or diminishment of stem cell features of maturing cochlear cells. In comparison to the cochlea, vestibular organs have been found to retain a population of stem cells into adulthood. Such adult inner ear stem cells might be useful for future therapies of inner ear disorders including hearing loss. Additionally, adult stem cells from non-inner ear organs and embryonic stem cells could play a role in future inner ear therapies, because these cells have been found to be capable to generate inner ear cell types as well.

SS09

The potential of growth factors for regeneration of the auditory system

Stöver, T., Scheper, V., Wefstedt, P., Lenarz, T.

Department of Otolaryngology, Medical University of Hannover, Carl-Neuberg-Straße 1, 30625 Hannover

The auditory system requires growth factors like neurotrophic factors to develop, maintain and potentially restore structural cellular integrity as well as functionability of a system. BDNF and GDNF were demonstrated by our group as an important growth factor to induce survival and regrowth of cultured auditory neurons. In addition supporting physiological conditions as electrical stimulation or application of other factors like erythropoetin or dexamethasone were examined in order to determine additional neurotrophic/outgrowth effects on spiral ganglion cells of the cochlear. In addition in-vivo experiments were performed to determine the combined effect of electrical stimulation plus neurotrophic factor application for structural and physiological integrity of the acoustic nerve/spiral ganglion cells. Here data indicate that the combined effect of electrical stimulation plus neurotrophic factor application is more beneficial than either of the interventions by itself.

The presented data will discuss present concepts of growth factor related regeneration of the auditory system as part of regenerative strategies to develop future inner ear therapies.

SS09

The potential of growth factors for preservation of the auditory system

Panford-Walsh, R., Singer, W., Rüttiger, L., Knipper, M.

University of Tübingen, Molecular Neurobiology, Hearing Research Centre, THRC, Elfriede-Aulhornstr. 5, 72076 Tübingen, Germany

The role of neurotrophic factors in the survival of embryonic neurons in the auditory system is well described. The deletion of NT-3 and BDNF during embryonal and early postnatal development leads to significant hearing loss. Despite several studies supporting an early protective role of trophic factors via electrical or sensory activity, very little is known about the function of neurotrophins in the adult auditory system. Sensory-driven neuronal activity shapes developing circuits in sensory systems using the same key molecules and gene cascades up- and downstream of a BDNF /trkB /GABA cascade. Several studies indicate that normal BDNF levels are required for preservation of normal hearing, while pathological alterations of BDNF levels is associated with malperception or hearing loss. BDNF may thus play a role for experience mediated plasticity changes and maladaptive plasticity changes during normal hearing, injury or age-related hearing disorders. Current data are discussed in the context of the potential use of growth factors for the therapeutic preservation of a healthy auditory system. Acknowledgements: This work was supported by the Deutsche Forschungsgemeinschaft Kni 316/3-2 and Fortüne 816-0-0.

SS10

The "Auditory Profile": proposal from the European HEARCOM project

Dreschler (1), W.A., Kollmeier, B. (2)

(1) AMC Amsterdam, NL

(2) Medizinische Physik, Universität Oldenburg & Kompetenzzentrum HörTech, D-26111 Oldenburg, Germany

Objective. Within the EU-project HearCom (1) important goals are: characterisation of auditory communication problems and standardisation of audiological test methods.

Material and method. Consensus has been reached about a standardised battery of audiological tests that – in addition to the pure-tone audiogram - can be applied to characterise the residual capacities of the hearing-impaired subject in an Auditory Profile.

The components of the auditory profile focus on loudness perception, frequency resolution, temporal resolution, speech perception in noise, binaural functioning, effort, and cognition.

Results. The composition of the auditory profile will be discussed based on first experiments in separate areas. The full battery of tests will be validated in an international multi-centre study.

Conclusion. International consensus is growing for a broad battery of audiological tests to characterise the residual capacities of the impaired ear. The implementation of the tests on an uniform software platform will facilitate the clinical application. Here it is our ambition to set a European standard in Audiology.

(1) This part of the HEARCOM project was conducted in co-operation with the research groups of VUMC (NL), Linköping (SE), ISVR (UK), Oldenburg, (D), and AMC (NL).

SS10

Binaural psychoacoustics in hearing impaired listeners

Akeroyd, M.A., Gatehouse, S.

MRC Institute of Hearing Research, (Scottish Section)
Glasgow Royal Infirmary, Glasgow.

Measures of binaural psychoacoustics in SNHL, such as the masking level difference, although they show on average deficits from values from normally hearing listeners, the overlap between populations is large. In constrained circumstances, one can identify significant relationships between measures of performance on speech identification procedures and measures of binaural psychoacoustics, though these have not yet been shown to our knowledge to generalize to reports of hearing difficulties in everyday listening. We hypothesize that part of the reason for this disassociation is the concentration on largely static listening circumstances in traditional binaural psychoacoustic procedures.

We have implemented a “dynamic” masking level difference paradigm during which the interaural correlation of the masking noise varies across time. When a dynamic masking level difference parameter is derived, this does show significant relationships with aspects of a hearing disability inventory (the SSQ) which are not revealed by the static measures. Furthermore, the subscales from the SSQ which correlate with the dynamic MLD are primarily those which load on listening circumstances which are both perceptually and acoustically complex.

We suggest that over-concentration on static listening circumstances which might be convenient for laboratory investigation can obscure relationships with real world listening.

SS10

Recognition of complex temporal envelopes in normal-hearing listeners and cochlear implantees

Ardoint, M., Gorea, A., Debruille, X., Pressnitzer, D., Lorenzi, C.

Université Paris Descartes, CNRS, ENS/DEC

Speech intelligibility of young normal-hearing listeners is extremely robust to an increase in speech rate or in other words, when speech is submitted to time compression. However, this form of “perceptual constancy” for temporally-compressed speech is reduced or abolished in elderly listeners with normal hearing, hearing-impaired listeners and more to the heart of the present study, cochlear implantees (e.g., Fu, Galvin & Wang, 2001). Cochlear implants convey mostly temporal envelope information; thus, the poorer-than-normal capacities of cochlear implantees to recognize temporally compressed speech might result from an impairment in the ability to follow temporal-envelope patterns when the latter are compressed in time.

The ability to recognize complex temporal-envelope patterns submitted to temporal compression is assessed cochlear implantees and normal-hearing listeners using an XAB, matching-to-sample-procedure. X, the reference stimulus, is obtained by applying the sum of two, inharmonically related, sinusoids to a white noise carrier. A and B are obtained by multiplying the frequency of each modulation component of X by the same time compression factor, a. For each trial, A or B is a time-reversed rendering of X, and the listeners’ task is to choose which of the two is matched by X.

Overall, the results indicate that in both group of listeners, recognition performance degrades continuously and similarly as a function of a. These results indicate that the ability to perceive time-compressed patterns per se is not degraded by the speech processor of current cochlear implants.

These preliminary data suggest that the poorer-than-normal recognition of time-compressed speech (as produced by rapid speakers) reported previously in implantees is imputable to limited access to speech redundancy (a consequence of poor reception of spectral and fine structure cues) rather than to abnormal temporal-envelope processing.

Fu, Q-J., Galvin, J.J, & Wang, X. 2001. Recognition of time-distorted sentences by normal-hearing and cochlear-implant listeners. J Acoust Soc Am, 109, 379-384.

SS10

Recognition of complex temporal envelopes in normal-hearing listeners and cochlear implantees

Ardoint, M., Gorea, A., Debruille, X., Pressnitzer, D., Lorenzi, C.

Université Paris Descartes, CNRS, ENS/DEC

Speech intelligibility of young normal-hearing listeners is extremely robust to an increase in speech rate or in other words, when speech is submitted to time compression. However, this form of "perceptual constancy" for temporally-compressed speech is reduced or abolished in elderly listeners with normal hearing, hearing-impaired listeners and more to the heart of the present study, cochlear implantees (e.g., Fu, Galvin & Wang, 2001). Cochlear implants convey mostly temporal envelope information; thus, the poorer-than-normal capacities of cochlear implantees to recognize temporally compressed speech might result from an impairment in the ability to follow temporal-envelope patterns when the latter are compressed in time.

The ability to recognize complex temporal-envelope patterns submitted to temporal compression is assessed cochlear implantees and normal-hearing listeners using an XAB, matching-to-sample-procedure. X, the reference stimulus, is obtained by applying the sum of two, inharmonically related, sinusoids to a white noise carrier. A and B are obtained by multiplying the frequency of each modulation component of X by the same time compression factor, a. For each trial, A or B is a time-reversed rendering of X, and the listeners' task is to choose which of the two is matched by X.

Overall, the results indicate that in both group of listeners, recognition performance degrades continuously and similarly as a function of a. These results indicate that the ability to perceive time-compressed patterns per se is not degraded by the speech processor of current cochlear implants.

These preliminary data suggest that the poorer-than-normal recognition of time-compressed speech (as produced by rapid speakers) reported previously in implantees is imputable to limited access to speech redundancy (a consequence of poor reception of spectral and fine structure cues) rather than to abnormal temporal-envelope processing.

Fu, Q-J., Galvin, J.J, & Wang, X. 2001. Recognition of time-distorted sentences by normal-hearing and cochlear-implant listeners. J Acoust Soc Am, 109, 379-384.

SS10

The representation of intensity and periodicity in the human brain, as revealed by functional MRI and MEG

Uppenkamp, S. (1), Ernst, S.M.A. (1), Gutschalk, A. (2), Rupp, A. (2)

(1) Medizinische Physik, Institut für Physik, Universität Oldenburg

(2) Sektion Biomagnetismus, Neurologische Klinik, Universität Heidelberg

Psychoacoustical masking has been widely used to study peripheral and central auditory processing. It is, however, still not completely understood how the physical intensity is exactly transformed into the sensation of loudness and partial loudness/audibility of a signal in a masker. Functional magnetic resonance imaging (fMRI) was used to investigate the representation of changes of level and signal-to-noise ratio (S/N) in human auditory cortex.

Tonal melodies were presented in masking noise for S/N from -18 dB to 24 dB. Functional MRI data were acquired with a 1.5 Tesla MRI system using a sparse imaging paradigm with clustered volume acquisition to separate acoustic stimulation and scanner noise in time. Twenty-one axial slices were acquired covering most of the cortex, including the whole of the temporal lobes.

For small S/N the overall sound level is nearly constant, but the audibility of the tone varies with S/N. For S/N of 0 dB and above, the tone is always clearly audible, and the perceived change is mainly an increase of overall level. This perceptual separation of two effects is reflected by a spatial dissociation of the respective activation in auditory cortex. With fMRI, brain regions mainly sensitive to level changes were found in Planum temporale (PT), while those regions mainly sensitive to S/N changes were located in lateral Heschl's gyrus (HG), with only sparse overlap between these regions. A similar result was previously found in a magnetoencephalographic study on the relationship between the sustained field in auditory cortex and the perception of periodic sounds. Two separate sources were isolated adjacent to primary auditory cortex: One, located in lateral HG, was particularly sensitive to regularity and largely insensitive to sound level. The second, located just posterior to the first in PT, was particularly sensitive to sound level and largely insensitive to regularity.

This double dissociation of the respective regions sensitive to pitch and loudness indicates a different coding mechanism for the overall intensity and the audibility of periodic signals. The audibility of a tone in noise appears to be determined by the overall pitch strength.

TT01

Aktuelle Entwicklungen auf dem Hörgerätesektor

Bayer, E.

Feichtmayrstr. 19, 80992 München

Bei jeder Hörgeräteversorgung stehen wir Hörgeräteakustiker vor der Aufgabe, die bei unseren Kunden noch vorhandene (Rest-)Hörfähigkeit mit all ihren Funktionen technisch optimiert zu unterstützen. Eine Hörminderung ist jedoch immer mehr als eine reine auditive Leistungsminderung, weshalb wir auch die mit jeder Hörstörung einhergehenden Negativ-Auswirkungen auf die Persönlichkeit des Betroffenen zu betrachten und zu minimieren haben.

Seit dem Erscheinen der ersten digitalen Hörgeräte Mitte der 90er Jahre verändert sich das Image unserer Hörgeräte: es verliert kontinuierlich sein Stigma und die Integration in unsere technische Kommunikationsumgebung gelingt zunehmend.

Grundlage der gestiegenen fachlichen Ansprüche stellt das (Basis-)Wissen über die Möglichkeiten, bzw. speziell um die Grenzen unserer technischen „Einheiten“ dar. Dies bedeutet generell,

• dass primär der Mensch im Mittelpunkt jeder Versorgung zu stehen hat,

• und dass wir für eine Versorgung Verantwortlichen, gerade deshalb uns von manch einer vertrauten und traditionell begründeten Versorgungsdogmatik zu lösen haben.

Im Rahmen des Vortrags werden daher folgende Themenbereiche angesprochen:

• (Power-)Hörsysteme: Features und Einsatzbereich

• Der Hörer im Gehörgang: Rück- oder Fortschritt?

• Primär- oder Sekundärzellen?

• „Offen“ mit dünnem Schallschlauch: Dominiert Ästhetik die Audiologie?

• Individuelle Otoplastik vs. Konfektionsware

• Die „offene Power-Otoplastik“

• (Derzeitige) Grenzen bei der Dokumentation des „Hörerfolgs“.

TT01

Charakterisierung von Hörgeräten

Holube, I.

University of Applied Sciences
Oldenburg/Ostfriesland/Wilhelmshaven,Oldenburg

Hörgeräte können nach verschiedenen Kriterien in Klassen eingeteilt werden. Diese Klassen sind z.B. die Bauform oder die Ausstattung (Bedienelemente, Signalverarbeitungsalgorithmen) oder sie richten sich nach dem Hörverlustgrad, der durch ein Hörgerät versorgt werden kann (z.B. High-Power Geräte). Vielfach ist es jedoch wünschenswert, neben diesen äußerlichen Unterschieden und den Angaben des Herstellers auch subjektive und objektive Bewertungskriterien heranzuziehen. Subjektive Bewertungskriterien sind das Ergebnis einer Evaluation der Geräte durch Probanden bzw. Patienten, wobei Sprachverständlichkeitstests und subjektive Einschätzungen eine wesentliche Rolle spielen. Objektive Bewertungskriterien können dagegen z.B. durch entsprechende messtechnische Untersuchungen erfasst werden. Die bisherige standardisierte Messtechnik reicht jedoch zur Charakterisierung moderner nichtlinear Hörgeräte nicht mehr aus. Sie orientiert sich an den technischen Möglichkeiten analoger Hörgeräte und ist deshalb im Wesentlichen auf die Bestimmung von Ausgangspegel, Verstärkung und der Parameter typischer AGC-Schaltungen mit Hilfe von Sinustönen oder Rauschsignalen beschränkt. Dabei stellt sich insbesondere die Frage, wie neuartige Algorithmen (z.B. Störgeräuschreduktionsverfahren) zu bewerten sind und welchen Nutzen Hörgeräteträger daraus ziehen können. Zur Zeit werden verschiedene Ansätze zur Erfassung der modernen Hörgeräteeigenschaften verfolgt. Dazu gehört ein von einer Arbeitsgruppe der European Hearing Instrument Manufacturer Association (EHIMA) entwickeltes, auf der Pegelverteilung des Testssignals beruhendes Verfahren, das ein internationales Sprach-Testsignal verwendet und Hörgeräte in der jeweiligen Programmierung auf ein Audiogramm bezüglich seiner Verstärkung überprüft. Andere Kriterien sind z.B. das effektive Kompressionsverhältnis, die Modulationstransferfunktion oder das S/N-Maß nach Hagerman und Olofsson. In dem Vortrag werden verschiedene aktuelle und möglicherweise zukünftige Methoden zur Charakterisierung von Hörgeräten vorgestellt und anhand von Beispielen erläutert.

TT01

Auswirkungen von Schallschlauch-und Ventdimensionen auf Frequenzgang und Okklusion

Bertges Reber, M.

Bernafon AG, Bern Schweiz

Hörgeräte anpassen heisst nicht im Dunkeln fischen und hoffen, dass es klappt Die verschiedenen Anpassprogramme der Hörgerätehersteller liefern heute detaillierte Voreinstellungen und Änderungsvorschläge. Man sollte sich aber über deren individuellen Limitierungen und Grenzen bewusst sein.

Unabhängig dazu ist eine kundengerechte Beratung im vorab entscheidend über ein erfolgreiche Anpassung. Welches Hörsystem ist für welche Ansprüche am besten geeignet? Welche besonderen Bedürfnisse des Kunden müssen berücksichtigt werden?

Besonderes Augenmerk sollte hierbei auf Anforderungen bei binauralen Anpassungen gelegt werden 1 damit fachgerechte Anpasskorrekturen möglich bleiben. Während der Anpassung treten ab und zu „unerwartete“ Messergebnisse oder Kundenrückmeldungen auf, nicht nur zu Verschlusseffekten.

Der Ursprung dieser Probleme ist nicht immer ganz einfach zu eruieren. Einige Aspekte der Hörgeräteanpssung mit erhöhtem Problempotential werden praxisrelevant neu durchleuchtet:

• Der Einfluss verschiedener Schallschlauchdurchmesser verändert Anpassungsoptionen zum Teil drastisch. Vor allem die heute erhältlichen Dünnen Schallschläuche mit verschiedenen Durchmessern reduzieren die Leistung der Hörgeräte massiv.

• Ebenso die Vielzahl von Ohrpassstücken, welche sich lohnen etwas näher zu betrachten. Denn Form und Grösse haben einen entscheidenden Einfluss auf die Kundenakzeptanz.

• Betrachtet man z.B. bei Standard Silicon Domes 2, so lassen sich auch hier verschiedene Venteffekte abbilden. Vom Open Dome bis zur geschlossenen Individualotoplastik können die Wirkung der Okklusionseffekte über die akustische Masse erklärt werden.

• Das Zusammentreffen von verstärktem und unverstärktem Schall am Trommelfell führt zu ungewünschten Klangartefakten. Dies tritt vor allem bei offenen Versorgungen auf.

Mit dieser Mischung aus Theorie und Praxis zeigt sich ein Weg zur Entmystifizierung 3,4 der Hörgeräteanpassung.

1 Jespersen et al (2006) The Occlusion effect in unilateral versus bilateral hearing aids; J Am Acad Audiol 17: 763-773

2 Kiessling et al (2005) Occlusion Effect of Earmolds with Different Venting Systems. J Am Acad Audiol 16:237-249

3 Carle et al. (2002) Observation on the relations among occlusion effect, compliance and vent size J Am Acad Audiol 13: 25-37

4 Bertges Reber, Grenzen der wirklich offenen Anpassung Hörakustik 9/2005 S.10-13 und
Bounderies of real open Fittings: Clinical Experiences, Feb 2006, Hearing review

TT01

Die ISO-Norm zur kategorialen Lautheitsskalierung und deren Anwendung für die Hörgeräteanpassung und -kontrolle

Kinkel, M.

KIND Hörgeräte, Kokenhorststr. 3-5, D-30938 Burgwedel

Die kategoriale Lautheitsskalierung dient der Messung der Hörfähigkeit über den gesamten Hördynamikbereich. Neben dem Einsatz in der Diagnostik bietet sich besonders der Einsatz in der Hörgeräteversorgung an, da die Ergebnisse der Skalierung besonders Informationen über die Hörfähigkeit und den Verstärkungsbedarf im überschwelligen Bereich liefern. In den letzten Jahrzehnten wurden etliche Messverfahren für die Lautheitsskalierung vorgestellt. Da die Ergebnisse der Skalierung jedoch von der genauen Messmethodik nicht unerheblich beeinflusst werden, konnten die Ergebnisse verschiedener Verfahren oft nicht verglichen oder übertragen werden. Die kürzlich veröffentlichte ISO 16832 „Acoustics – Loudness scaling by means of categories“ beschreibt die wichtigsten Anforderungen an die Durchführung der Messung und erläutert ein beispielhaftes Messverfahren im Detail und soll zu einer Vereinheitlichung der Verfahren beitragen. Dieser Beitrag stellt die wichtigsten Inhalte der ISO 16832 dar und zeigt die Einsatzmöglichkeiten vor allem im Rahmen der Hörgeräteanpassung und –kontrolle auf.

TT01

Datalogging - ein wirkungsvolles Instrument für die Hörgerätefeinanpassung und die Kundenberatung

Tchorz, J.

University of Applied Sciences Lübeck

Datalogging-Funktionen haben sich mittlerweile in vielen Hörgerätemodellen verschiedener Hersteller etabliert. Dabei werden Informationen zu den individuellen Hörsituationen und der Bedienung durch den Hörgeräteträger im Gerät aufgezeichnet. Diese Informationen stehen dem Hörgeräteakustiker beim nächsten Anpasstermin zur Verfügung. Sie sollen zu einer besseren Beratung und Anpassung der Hörgeräte auf die jeweiligen Kundenbedürfnisse beitragen. Gerade die Informationen über die Hörumgebung des einzelnen Kunden können hier sehr wertvoll sein. Zugrunde liegt hier eine automatische Klassifikation der akustischen Umgebung, die beispielsweise in die Klassen „ruhige Umgebung“, „Sprache in Störlärm“, „Störlärm“ oder „Musik“ eingeteilt werden kann. Während Informationen zur Bedienung der Hörgeräte (z.B. Programmwahl, Lautstärkeeinstellung, Tragedauer) unmittelbar zur Verfügung stehen und sehr einfach zu „loggen“ sind, ist die automatische Klassifikation der akustischen Umgebung alles andere als trivial. Im Vortrag werden Ergebnisse einer Studie vorgestellt, in der die „Treffsicherheit“ der automatischen Klassifikation der Hörumgebungen durch Hörgeräte mit Datalogging-Funktionen untersucht wird. Dazu wurden umfangreiche Soundparcours erstellt, welche die Vielfalt möglicher akustischer Alltagssituationen widerspiegeln. Neben der Klassifikation verschiedener Situationen wurde der Einfluss des Präsentationspegels und des Signal-Rauschabstandes auf die Klassifikationsleistung untersucht.

TT02

Applications of OAE in the prediction of hearing threshold

Probst, R.

Dept. of ORL, University Hospital, Zürich, Switzerland

The important point of otoacoustic emission (OAE) use in diagnostics is their specificity to the cochlear function, and the possibility of a quick and objective test. However, OAEs are not a particularly good tool for quantification. Nevertheless, a way to measure hearing thresholds objectively by the use of OAEs has been sought since their detection, but without convincing clinical success.

The presence or absence of transient evoked OAEs (TEOAE) allow a relatively sharp categorization of ears into two groups, those with emissions having a hearing threshold better than about 35 dB HL in the frequency range of 1-4 kHz, and those without emissions having a hearing loss of about 35 dB HL or more. This threshold of 35 dB HL is important for screening purposes. A further prediction of thresholds by TEOAEs is not apparent. The levels of TEOAEs are not useful to predict audiometric pure tone thresholds and the thresholds of TEOAEs were measured only rarely.

In contrast, thresholds of distortion product OAEs (DPOAE) have been measured in vast populations of adults with normal hearing and hearing loss. A significant correlation between the pure tone thresholds and the DPOAE thresholds exists for hearing losses up to about 50 dB HL. However, the prediction of individual thresholds is hampered severely by standard deviations of typically 10 dB and individual deviations of up to 40 dB. In addition, only limited data exists about smaller children.

Even though the peripheral processing defines a common basis for the thresholds of OAEs and pure tone hearing, the conditions of the tests are clearly different in many aspects including stimulus frequency, durations, levels, and response measurement. Moreover, assessment of higher hearing losses is not possible. OAE can provide indications and categorizations of hearing thresholds in the hearing ranges of 0 to about 40 dB HL.

TT02

Auditory Brainstem Evoked Potentials in Objective Audiometric Assessment

Pratt, H.

Evoked Potentials Laboratory, Technion – Israel Institute of Technology, Haifa 32000, Israel

The principle of objective audiometry is to record the physiological manifestation of auditory system activation by sound, to assess auditory sensitivity. The challenge in objective audiometry is to select the optimal physiological signal that provides as much information on hearing under constraints of time, invasiveness, sensitivity and specificity. The typical patients requiring objective audiometry are difficult-to-test and non-cooperative adults, neonates and infants and the information sought is typically threshold at different frequencies and site of lesion. The arsenal of non-invasive electrophysiological tests of auditory sensitivity includes auditory brainstem evoked potentials (ABRs), middle-latency (MLRs) and their high stimulus rate combination of steady-state responses (SSRs), in addition to the more labile long latency evoked potentials.

Comparing the various candidates for objective audiometry, ABRs stand out in having the smallest intersubject variability, being the least affected by vigilance and sedation and in having the smallest difference between their detection threshold and the behavioral thresholds to the evoking stimulus. They are the manifestation of the physiological response of the sections along the auditory pathway that are most often affected in hearing loss – the cochlea and cerebello-pontine angle. ABRs, therefore, stand the best chance to directly detect and locate impairments. In addition, ABR latencies are sensitive to audiogram shape and to conductive hearing loss, and thus provide information in addition to detection threshold. The main limitation of ABRs is their inferior frequency specificity compared to other objective methods.

ABRs are best utilized if recorded in response to decreasing click intensities until detection threshold is estimated, and their peak latencies measured to determine normalcy. Then, latency prolongations are attributed to either high-tone hearing loss or conductive hearing loss, depending on other clinical evidence such as otoscopy and tympanometry. Time permitting, additional, more frequency-specific methods such as pure tone ABRs or steady-state potentials can be utilized to better define auditory sensitivity.

TT02

Prediction of the audiogram using Auditory Steady-State Evoked Responses

Attias, J.

Department of Communication Disorders, University of Haifa, Haifa, Israel

The goal of objective audiometry is to obtain a pure-tone audiogram without requiring behavioral responses from the subject. Objective methods to assesses hearing include mainly the auditory brain-stem response (ABR) and otoacoustic emissions (OAE). The major drawbacks of the ABR to clicks are poor frequency specificity and their absence in cases of severe-profound hearing losses. Only the presence of OAEs are indicative of normal cochlear functioning while their absence may not have any clinical relevance for the prediction of the severity or the hearing loss or the audiometric configuration. Owing to these limitations, the auditory steady state responses (ASSR) have emerged as an attractive means of objectively estimating the audiogram. ASSR are evoked to amplitude or and frequency modulated pure tones and thus combining frequency-specificity and high level of stimulation. In addition, since multiple carriers stimuli can be presented simultaneously to each ear, the time-test can be reduced remarkably.

The efficacy of the ASSR in predicting the air and bone conduction audiograms in children (and adults) without and with variety types of hearing losses especially candidates for cochlear implants will be presented. In addition, the application of the ASSR in objective fitting of hearing aids in small children will be also demonstrated. The overall findings strongly indicate that ASSR may serve as a valuable audiometric clinical tool for assessing hearing thresholds both in air and bone-conduction, at low and high frequencies and for a maximal wide range of severities. Its appropriate application in infants and small children may urge the early auditory rehabilitation.

TT02

Prediction of the audiogram in adults and older children using the N1-P2 long latency response – accuracy and speed of testing

Lightfoot, G.

Royal Liverpool University Hospital, Liverpool, UK

The use of the late cortical N1-P2 response complex as a means of providing an objective estimate of audiometric thresholds was the subject of many research studies in the 1960's and 1970's until the discovery of the auditory brainstem response (ABR). More recently, the clinical utility of auditory steady-state responses (ASSR) testing has been investigated. All three techniques are capable of reasonable to good accuracy if the test technique and subject status are appropriate, yet they have different advantages and disadvantages. Conversely, poor results may be obtained if the test method is not ideal or if the age or conditioning of the subject is inappropriate.

This paper will review the strengths and weaknesses of Cortical Evoked Response Audiometry (CERA), based on the N1-P2 response, in contrast to ABR and ASSR tests. The results of a recent study will be presented.

The main findings were:

establishing 6 thresholds (3 frequencies in each ear) took on average 20.6 minutes;

the mean error in the CERA threshold estimate was 6.5 dB, with no significant effect of frequency;

after correcting for this bias, 94% of individual threshold estimates were within 15 dB of the behavioural threshold and 80% were within 10 dB.

The CERA test is therefore at least as accurate and quick as ABR or ASSR tests and has superb frequency specificity. The chief limitation is that it cannot be used with neonates or younger children.

TT03

Entwicklung der Cochlear Implant-Anpassung

Battmer, R.D.

MHH

Voraussetzung für eine erfolgreiche Rehabilitation nach einer Cochlea-Implantation ist die Anpassung des Sprachprozessors. Sie wird heute bei allen Systemen mittels einer speziellen Computerhard- und software durchgeführt.

Anpassung bedeutet die elektrischen Stromstärken für die vorhandenen Kanäle zu ermitteln, bei denen gerade eben ein Höreindruck (Hörschwelle) bzw. eine für den Patienten gerade noch nicht unangenehme Lautheit (Unbehaglichkeitsschwelle) erzielt wird, sowie, bei Mehrkanalsystemen die Zuordnung von Elektrodenkanälen zu Frequenzbereichen. Dieses gilt heute wie vor 25 Jahren als die ersten Implantate ihren Weg in die Kliniken fanden.

Bei den meisten Sprachprozessoren wurden die Hörschwellen damals mit dem Schraubenzieher eingestellt (z.B. House, 3M, Banfai) und die Frequenzzuordnung war simple, da es sich um Einkanalsysteme handelte. Anders das erste Nucleussystem: es verfügte bereits 1981 nicht nur über 22 Kanäle; der Sprachprozessor ließ sich bereits damals über ein Computersystem (CPM) einstellen.

Heute ist das für alle modernen Implantatsysteme selbstverständlich; damit sind andere Aspekte der Anpassung in den Vordergrund gerückt: Sie lassen sich über Softwareänderungen integrieren und werden damit allen Nutzern schnell zugänglich.

TT03

CI-Anpassung bei Erwachsenen: Real Life Fitting

Wesarg, T.

Klinik für Hals-, Nasen- und Ohrenheilkunde,
Universitätsklinikum Freiburg

In diesem Beitrag werden die Ziele und die typische Vorgehensweise bei der Anpassung der Sprachprozessoren von Cochleaimplantat (CI)-Systemen bei Erwachsenen sowie mögliche Vorgehensweisen in problematischen Fällen vorgestellt.

Hinsichtlich des Zeitpunktes der Anpassung wird zwischen der Erstanpassung und den Folgeanpassungen unterschieden. Das Hauptziel der Erstanpassung besteht darin, dem CI-Träger ein individuelles, angenehm lautes Hörprogramm zu erstellen. Hierfür sind die Bestimmung der Hörschwellen und der Reizstärken angenehmer Lautheit an den aktiven Elektroden bzw. Kanälen notwendig. Die Einstellung muss u.a. die Lautheitssummation berücksichtigen sowie eventuell auftretende Nebenwirkungen ausschließen.

Das wesentliche Ziel der Folgeanpassungen ist die Erstellung von Hörprogrammen, die dem CI-Träger sowohl ein angenehm lautes Hören als auch ein möglichst gutes Sprachverständnis sowie einen möglichst angenehmen Klang in verschiedenen Hörsituationen ermöglichen. Bei den Folgeanpassungen wird neben der Bestimmung der Hörschwellen und der Reizstärken angenehmer Lautheit ein Lautheitsabgleich dieser Reizstärken mittels Balancing und Sweeping durchgeführt. Weiterhin werden verschiedene Methoden der Feinanpassung wie z.B. die frequenzspezifische Absenkung der Verstärkung oder die Variation der Steilheit der Amplitudenwachstumsfunktion angewendet.

Während die prinzipielle Vorgehensweise der Anpassung von erwachsenen CI-Trägern fast unabhängig vom Typ des CI-Systems ist, variieren die anpasstechnischen Möglichkeiten zur Lösung von Problemen wie z.B. die Vermeidung der Fazialisstimulation, zur Feinanpassung sowie zur Erstellung von Hörprogrammen für verschiedene Nutz-/Störschallsituationen z.T. erheblich zwischen den verschiedenen CI-Systemen.

Bisher werden sowohl Erstanpassung als auch Folgeanpassungen von CI-Trägern in weitgehend ruhigen Räumen durchgeführt. Die Mehrzahl der erwachsenen CI-Träger muss und möchte im "wirklichen Leben" auch in verschiedenen Hörsituationen mit Störlärm im Hintergrund zurechtkommen. Zur unmittelbaren Einbindung dieser Hörsituationen in die Anpassung bietet sich das Konzept des "Real Life Fitting" an, welches von der Firma Audiocare (Pratteln, Schweiz) entwickelt und in einer Software implementiert wurde. Möglichkeiten und erste Ergebnisse zur Anwendung des Real Life Fitting im Rahmen der CI-Anpassung werden diskutiert.

TT03

CI-Anpassung bei Kindern: Unterstützung durch ECAP

Dillier, N.

Labor für Experimentelle Audiologie, ORL-Klinik,
Universitätsspital Zürich, Schweiz

Moderne Implantaten erlauben neben der mehrkanaligen Stimulation auch die Messung von Elektroden- und Implantatseigenschaften sowie die Ableitung neuraler Reizantworten (NRT, neurale Reizantwort-Telemeterie bzw. ECAP, electrically evoked compund action potentials). Die Uebermittlung der Messdaten erfolgt telemetrisch durch die intakte Haut. Zur Messung werden ausser dem standardmässigen Programmierungssystem (PC mit Spezialinterface) und einem Sprachprozessor nur eine entsprechende Software benötigt.

Die entsprechenden neuralen Reizantworten (oder Nervenantworten) werden am Bildschirm dargestellt und können anschliessend ausgewertet werden. Die Form und Grösse der Antwort sind abhängig von den Reiz- und Messbedingungen. ECAP-Messungen können ohne grösseren Aufwand intraoperativ durchgeführt werden. Sie bieten neben dem Nachweis der neuralen Aktivität auch den Vorteil der kompletten Funktionsüberprüfung des Implantats. Die Zunahme des neuralen Summenaktionspotentials mit steigender Reizstärke (SL, Stimulus-Level) korrespondiert mit der postoperativen subjektiven Lautheitswahrnehmung (von sehr leise bis angenehm laut). Daraus kann eine NRT-Schwelle gefunden werden, welche meist etwa in der Mitte zwischen den späteren T- und C-Werten liegt. Damit kann die Programmierung des Sprachprozessors für Kleinkinder voreingestellt und der Anpassprozessor unterstützt und optimiert werden.

TT03

Stapediusreflexmessung zur Anpassung von Cochlea Implantaten

Stephan, K.

Innsbruck Medical University, Dept. Hearing, Speech and Voice Disorders, Innsbruck, Austria

Durch die Entwicklung der letzten Jahre, Kinder möglichst früh mit Cochlea Implantaten (CI) zu versorgen, werden auch an die Anpassung von CI neue Anforderungen gestellt. Dadurch dass sehr junge Kinder meist keine Angaben über Höreindrücke bei elektrischer Stimulation über CI machen können und auch auf starke elektrische Stimulation oft nicht reagieren, stellt die Anpassung von CI eine echte Herausforderung dar.

Aufgrund von Studien von unterschiedlichen Forschergruppen konnte nachgewiesen werden, dass die postoperativ gemessene Stapediusreflexschwelle bei elektrischer Stimulation über CI (ESRT) gut mit der psychoakustischen Größe für ‚Maximal angenehme Lautheit' (MCL, c-level bzw. m-level) korreliert. Die Messung des ESRT stellt somit ein ‚objektives Verfahren' zur Abschätzung dieser Zielgröße der CI-Anpassung dar.

Üblicherweise beruht der postoperative Nachweis des Stapediusreflexes auf der Messung der akustischen Impedanz des ipsi- oder contralateralen Ohres. Daher ist für die Durchführung der Stapediusreflexmessung eine normale Mittelohrfunktion sowie eine normale Funktion des Reflexbogens Voraussetzung. Zusätzlich ist ein entsprechendes Maß an passiver Kooperation von seiten des Patienten erforderlich.

Aus der Erfahrung von über 10 Jahren zeigte sich, dass die Messung des ESRT eine wertvolle Hilfe bei der Anpassung von CI bei nicht kooperativen Patienten sowie bei Patienten mit mangelnder Hörerfahrung darstellt. Möglichkeiten und Grenzen der Stapediusreflexmessung bei elektrischer Stimulation über CI werden im Hinblick auf die klinische Routineanwendung im Rahmen dieses Tutoriums besprochen.

TT03

Bilaterale CI-Anpassung

Brill, S.

HNO-Klinik, Universität Würzburg

TT03

Cochlear Implant and hearing aid using electro-acoustic stimulation (EAS)

Böhm, M. (1), Pesch., J. (2), Battmer, R. D. (1), Büchner, A. (1), Lenarz, T. (1)

(1) Klinik und Poliklinik für Hals-Nasen-Ohrenheilkunde, Medizinische Hochschule Hannover

(2) Cochlear GmbH

Multichannel cochlear implants have been highly successful in restoring speech understanding to individuals with severe-to-profound hearing loss. Patients with high-frequency-loss but at the same time residual low-frequency hearing and relatively good speech perception abilities were no candidates for cochlear implantation in the past. Although trials with these patients had been done to restore the high-frequency hearing loss with short electrode arrays, the outcome had been very poor. The new Hybrid L electrode array of Cochlear promises the preservation of residual hearing after implantation and better speech understanding due to its length. Its outcome is now to be evaluated.

Therefore 21 patients are implanted through the round window with a 22 electrode array of 15mm length. They are fitted with a Freedom speech processor for high frequencies and an ITE Phonak Valeo hearing aid for low frequencies. Until now 9 subjects are at least at 3 month post implantation. They show improved speech understanding in Monosyllabic words of 20% postop when using electro-acoustic stimulation in comparison to conventional hearing aids preop. In an adaptive speech test in noise they gain an improvement of 8dB in comparison to the preop results. Currently CI and ITE are separate systems. Therefore special attentiveness is necessary during the fitting procedure. As the Freedom speech processor is fitted with Custom Sound and the ITE with a special hearing aid software it is necessary to match both systems, e.g. concerning the frequency allocation table, the loudness balancing etc. Special techniques are used therefore.

The first results showed an advantage of the electro-acoustic stimulation. The combined stimulation also gains good acceptance by the patients. To make the fitting of both systems more comfortable in the future a special fitting software as well as a combined speech processor for both electro and acoustic stimulation needs to be developed.

TT03

Anpassmethoden für Cochlea-Implantate

Baumann, U.

Klinikum der J.W. Goethe Universität Frankfurt/Zentrum der HNO-Heilkunde

Aufgrund der Ausweitung der Indikationskriterien für die CI-Versorgung werden zunehmen Patienten mit teilweise funktionellem Restgehör auf dem Gegenohr implantiert. Viele Patienten benutzen nach der Anpassung des CI-Sprachprozessors das Hörgerät auf der Gegenseite weiter. Zahlreiche Studien konnten mittlerweile belegen, dass ein zusätzlich zum Cochlea Implantat getragenes Hörgerät nicht nur das Sprachverstehen mit und ohne Hörgerät, sondern auch die Abbildung von Musik verbessert (Baumann & Seeber, 2001, Kong et al., 2005). In einigen Fällen wurde über eine Verbesserung der akustischen Lokalisation berichtet (Seeber et al., 2004). Man vermutet, dass die über die Hörgeräte-Seite vermittelte Kontur des Sprach-Grundfrequenzverlaufes den zentralen Trennungsprozess zwischen Sprache und Störgeräusch nachhaltig unterstützt (Chang et al., 2006). Diese Vorteile erschließen sich in vielen Fällen nicht unmittelbar nach der Erstanpassung des CI-Sprachprozessors, so dass von Lern- und Akklimatisations-Vorgängen bei der bimodalen Versorgung ausgegangen werden muss. Selten kann auch ein störender Einfluss des zusätzlich getragenen Hörgerätes beobachtet werden.

Das Tutorial „Anpassmethoden bei der bimodalen Versorgung“ gibt einen Überblick über die psychoakustischen Grundlagen der modal seitendifferenten Reizung des Hörorganes und stellt wichtige Effekte bei der binauralen Anpassung von Hörsystemen vor. Es werden hierbei verschiedene Vorschläge speziell zur bimodalen Anpassung von CI und Hörgerät diskutiert. Besondere Berücksichtigung sollte bei der bimodalen Anpassung der Effekt der binauralen Lautheitssummation sowie die Erkennung von so genannten „Dead Region“ Zonen des hörgeräte-versorgten Ohres finden. Anhand von Fallbeispielen wird der Einsatz von Verfahren zur Skalierung der Lautstärke erläutert. Vielfach ist die Erarbeitung eines besonderen Konzeptes zur Rehabilitation erforderlich, welches die bei der bimodalen Versorgung auftretenden Akklimatisations-Effekte in ausreichender Weise berücksichtigt.

Baumann, U., Seeber, B.U. (2001) Bimodale Versorgung mit Cochlea-Implantat und Hörgerät: Verbesserung von Sprachverständnis und Lokalisation. In: Westhofen, M., Döring, W.H. (eds) Zeitschrift für Audiologie, Suppl. IV, Median Verlag, pp 36-39

Chang, J.E., Bai, J.Y., Zeng, F.G. (2006) Unintelligible low-frequency sound enhances simulated cochlear-implant speech recognition in noise. IEEE Trans. Biomed. Eng. 53:2598-2601

Kong, Y.Y., Stickney, G.S., Zeng, F.G. (2005) Speech and melody recognition in binaurally combined acoustic and electric hearing. The Journal of the Acoustical Society of America 117:1351-1361

Seeber, B.U., Baumann, U., Fastl, H. (2004) Localization ability with bimodal hearing aids and bilateral cochlear implants. JASA 116:1698-1709

TT03

Slow cortical responses in cochlear implant recipients

Hoth, S.

Univ.-HNO-Klinik Heidelberg, Germany

The adjustment and fitting of cochlear implant (CI) speech processors is based on the knowledge of the lower and upper limits (T- and C-level) for the electrical stimulus strength. These data are usually acquired from subjective classification of the patient. In case of non-reliable patient responses, objective methods are necessary. Especially for the estimation of correct T-levels, auditory evoked potentials (AEP) can be applied, since they allow the determination of response threshold in a frequency-specific manner. From the AEP of different latencies, the late cortical responses can be registered nearly without artifact contamination. They have been examined in patients equipped with different CI-systems. In all cases, clear responses and a clearly discernible thresholds transition could be detected. Making use of acoustical stimulation in free sound field, the subjective hearing threshold and the T-levels of electrical stimulation can be verified. Based on the fact that the late responses are generated in the primary auditory cortex, their assessment allows a nearly integral functional control of the aided hearing system. At least in juvenile and adult patients no problems arise from maturation or attentional effects. The applicability in young children remains to be explored.

Hoth S (1998) Die Messung später elektrisch evozierter Potentiale des auditorischen Systems bei CI-Patienten. HNO 46: 739-747

TT03

Audiometrische Kontrollen

Müller-Deile, J.

Christian-Albrechts-Universität zu Kiel, Kiel

Die Qualität der Cochlear Implant Versorgung wird ganz wesentlich durch die postoperative Basistherapie bestimmt. Um den Verlauf der Habilitation bei Kindern, beziehungsweise Rehabilitation bei Erwachsenen zu evaluieren und zu dokumentieren, führen wir regelmäßige Kontrolluntersuchungen durch. Sie erlauben uns auch den Verlauf der Folgetherapie den Bedürfnissen der einzelnen Patienten anzupassen. Diese Untersuchungen erfolgen im ersten Jahr nach der Erstanpassung vierteljährlich, dann einmal im Halbjahr und ab dem dritten Jahr lebensbegleitend jährlich.

Sie beinhalten eine ohrenärztliche Untersuchung und allgemeine Beratungen, audiometrische und phoniatrische Untersuchungen zur Dokumentation des Hör-, Sprech- und Sprachstatus und die Überprüfungen der Sprachprozessoranpassung sowie technische Kontrollen des Systems. Eine umfangreiche Evaluation und Dokumentation des Therapieverlaufs ist Grundlage der Qualitätssicherung der gesamten Cochlear Implant Versorgung. Dabei erfolgen die audio-logischen Untersuchungen auf unterschiedlichen Ebenen der auditorischen Verarbeitung. Die Ergebnisse werden für Kinder und Erwachsene in den jeweiligen CI-Pofilen übersichtlich zusammengefasst. Bei Kindern setzen wir die von dem Arbeitskreis „CI-Kinderteste“ erarbeitete Untersuchungsbatterie ein.

Zur Überprüfung und Optimierung der erstellten Programme ist die Bestimmung des Hörfeldes nützlich.

Auch Sprachteste sowohl in Ruhe als auch im Störgeräusch können Möglichkeiten zur Optimierung der Sprachprozessorprogramme aufzeigen. Zum Beispiel lassen sich mit dem Kieler Logatom-Test Hinweise auf Probleme in der Zuordnung der Frequenzbänder zu den Elektroden aufdecken, aber auch Informationen für das logopädische Hörtraining gewinnen.

Die Messung der Diskriminationsfunktionen mit dem traditionellen Freiburger Sprachverständlichkeits Test werden zur Beurteilung der Sprachverständlichkeit in Ruhe gezogen.

Einen besseren Eindruck vom Kommunikationsvermögen der Cochlear Implant Patienten in realen, alltagsrelevanten Hörsituationen erhält man durch die sprachaudiometrischen Untersuchungen im Störgeräusch. Hier hat sich bei Erwachsenen die adaptive Schwellenbestimmung mit dem Oldenburger Satztest bewährt.

Eine quantitative Erfassung des subjektiven Versorgungserfolgs führen wir mit einer rechner-gestützten systematischen Befragung an Hand der auch bei der Hörgeräteversorgung erfolgreich eingesetzten standardisierten Fragebögen durch. Hierzu nutzen wir das Oldenburger Inventar und das von Kießling ins Deutsche übertragene Göteborger Profil.

TT03

Technische Kontrollen des CI-Systems

Battmer, R.D.

MHH

Das folgenschwerste technische Problem bei der CI-Versorgung ist der Implantat¬ausfall. Es wird verständlicher, wenn man die Tatsache berücksichtigt, daß Cochlea Implantate technische Systeme sind. Diese können trotz aller Kontrolle fehlerhaft sein, Fehler entwickeln oder ganz ausfallen. Darüber muß und wird jeder Patient (oder die Eltern von CI-Kindern) vor der Implantation aufgeklärt.

Neue Implantatsysteme werden zunächst immer mit Erwachsenen getestet, um möglichen Schaden zu begrenzen und um ein möglichst umfangreiches Feedback zu erhalten. Die entscheidenden Ursachen von Implantat¬ausfällen wurden allerdings erst bei der Versorgung von Kindern entdeckt (Beispiele: Nucleus-Antennenbrüche, Clarion - Gehäusebrüche) und waren zumeist Folge des unterschiedlichen Verhaltens von Erwachsen und Kindern.

Ein Implantatausfall läßt sich folgendermaßen definieren:

Das Implantat kann die spezifizierte Funktion nicht mehr ausführen, wobei sich der Ausfall abstufen läßt in:

- Totaler Ausfall, der den kompletten Verlust des klinischen Nutzens zur Folge und in

- Abweichungen von den technischen Spezifikationen, die nicht zum Verlust des klinischen Nutzens führen.

Für die Verifizierung eines Implantatausfalls sind heranzuziehen :

- die Telemetrie des Implantates, die Elektrodenimpedanzen und elektrische Schaltkreise überprüft, und

- der Integritätstest, bei dem durch Ableitung von Oberflächenpotentialen die Gesamtfunktion des Implantates überprüft wird.

Schließlich müssen ggf. medizinischen Ursachen abgegrenzt werden, wobei mittels elektrisch evozierter Potentiale (E-Bera) und Stapediusreflexmessung Aussagen über die Funktion der weiterführenden auditorischen Bahnen getroffen werden können.

Diese verschiedenen Methoden erfordern neben qualifiziertem Personal auch einen erheblichen apparativen Aufwand. Insbesondere die Überprüfung der Funktion der nachgeschalteten auditorischen Bahnen kann nicht durch die Hersteller geleistet, sondern muß von der implantierenden Klinik durchgeführt werden.

TT04

Aetio-pathophysiology of Ménière's disease with a particular reference to

the association with migraine and the effect of noise

Ceranic, B.

Department of Audiology, St. George's Hospital, London

e-mail: borka.ceranic@stgeorges.nhs.uk

Despite extensive research and technological advances, the aetio-pathophysiology of Ménière's disease (MD) remains obscure. A number of factors have been proposed to be implicated in MD, including autonomic nervous system imbalance, endocrine disturbances, vascular irregularities, dietary factors, psychological (stress/anxiety) states, allergic phenomena, autoimmune causes, viral conditions, traumatic events or genetic abnormalities.

MD is a condition with the manifestations of a dysfunctional labyrinth, with acute episodes and periods of remissions. However, the underlying mechanism of an acute episode, which is the hallmark of MD and which seems to reflect the state of auditory and vestibular excitation, is still not understood.

According to the current widely accepted view, endolymphatic hydrops (EH) is the fundamental abnormality underlying MD. There is a hypothetical view that a rupture/increased permeability of the membranes lining the endolymphatic space, and a subsequent intermixing of labyrinthine fluids and potassium intoxication, leads to an attack. Although the evidence of EH exists, its essential role has been questioned and a view that EH may be an epiphenomenon has been put forward.

An intriguing clinical feature of MD is its frequent association with migraine and similar symptoms may occur in either condition, as it has been observed in our 120 patients with MD. Furthermore, the presence of overlapping symptoms in some patients can make difficult to distinguish whether presenting symptoms are of Menière's disease or migraine. The possibility that MD and migraine may have a common background has been considered. This may have important implications for pharmacological treatment of patients with MD and associated migraine.

Another interesting pathophysiological aspect of MD is the effect of noise. Oversensitivity to noise, auditory (loudness discomfort) and vestibular (Tullio phenomenon), have been reported by some patients. There is also a possibility of noise-induced MD. These noise-related phenomena may have medico-legal implications.

TT04

Can Ménière's disease be diagnosed objectively?

Wit, H. P. Kingma, C.M., Hof-Duin, N.J.

Department of ENT/Audiology

University Medical Center Groningen

P.O. Box 30.001

9700 RB Groningen-NL

e-mail: h.p.wit@med.umcg.nl

Since almost 70 years ago, bulging of the Reissner's membrane was seen in Ménière's patients and it is generally accepted that endolymphatic hydrops is the cause of the complaints of patients suffering from Ménière's disease.

Up to now, it has not been possible to diagnose endolymphatic hydrops in living humans, although the results of magnetic resonance imaging studies of the temporal bones of human cadavers, as well as of the living humans and guinea pigs, are promising.

Three test techniques that may identify pathology in patients with endolymphatic hydrops will be discussed:

- Vestibular evoked myogenic potentials (VEMP)

- Cochlear hydrops analysis masking procedure (CHAMP) and

- Low Frequency Biasing.

All three techniques have been evaluated in a large group of Ménière's patients in our clinic. The results were compared with those from patients with sensorineural hearing loss of different pathologies, not diagnosed with Ménière's disease.

TT04

How can we prove an endolymphatic hydrops?

Scholz, G.

Charité Berlin

Since the initial description of Ménière's disease (MD) in 1861 until now, it has been very difficult to make a clear diagnosis of MD. With the possibility of obtaining a reliable evidence of an endolymphatic hydrops (EH), this problem could be easier to resolve.

We have conducted a study to evaluate a new non-invasive and objective technique to detect an EH using the modulation of low-frequency biased DPOAEs (LFDP). Twenty patients suffering from unilateral MD were tested and the modulation index (MI) was compared with results in the control group, consisting of the subjects with normal hearing, matched for age and gender. The MI was significantly lower ($p<0.05$) in subjects with MD.

Electrocochleography (ECoG) is another, widely used technique to determine an EH. We have examined 50 adults with MD (stage 1+2, AAO-HNS) in a follow-up study in 2006, using the pure tone audiometry, impedancemetry, LFDP and ECoG. All tests were carried out the same day. The results were unexpected: In only 33 of 50 cases both ECoG and LFDP could be analysed. In only 12/33 cases pathological findings were confirmed by both methods. Considering ECoG alone, only 45 % of the patients had a positive finding corresponding to the course that disease usually takes.

Accordingly, it seems difficult to prove EH in all cases and it was concluded that an experienced doctor can make the best diagnosis of MD by a careful case history.

TT04

Clinical aspects and treatment of Ménière's disease

Dauman, R.

Department of Audiology/ENT

University Pellegrin Hospital of Bordeaux

e-mail: rene.dauman@audio.u-bordeaux2.fr

Ménière's disease (MD) is an idiopathic inner ear disorder characterized by recurring attacks of spontaneous vertigo, associated with fluctuating hearing loss, tinnitus, and pressure in the affected ear. Measuring the effects of MD on patients is difficult because it is an intermittent disorder with symptoms that vary in intensity from day to day and change in character over time. The vertigo attacks are often incapacitating and may lead to chronic vestibular dysfunction. In the early stages, vertigo attacks are typically infrequent, but severe, and the hearing returns toward normal after the vertigo spell subsides. The unpredictability of vertigo attacks contributes to additional stress, which may further exacerbate the condition. In the later stages, vertigo intensity decreases, hearing remains poor, unsteadiness increases, and tinnitus may be at the foreground. There is a great variability in this typical clinical picture between patients, with some having prompt remission, while others have a progressively worsening experience with unrelenting vertigo.

The ideal treatment for MD remains uncertain. There is a general agreement that a conservative regimen consisting of reduced dietary sodium intake, education about the disorder, and use of a diuretic should be used initially. It is usually considered that for about 70% of patients the vertigo attacks diminish with time; about 30% have unrelenting vertigo despite medical therapy and may require substantial use of health care resources to control their symptoms.

Separating the effect of therapy from the cyclical natural history of MD poses difficulties for all studies of this disorder. A control group is vital to contrast the treatment effect against spontaneous improvement. Several recent randomized, double-blind, placebo-controlled clinical trials suggest that the Meniett device – which applies pressure pulses through a ventilation tube to the middle ear – is safe and effective in the short term. Some aspects of the results in the control group will be discussed here.

The final part of the tutorial will be dedicated to the analysis of the effects of endolymphatic sac surgery, which has been a controversial but non destructive option for patients with unrelenting vertigo despite medical therapy. A retrospective study on 90 MD patients, who underwent endolymphatic sac surgery between 1986 and 2004 in our department, was carried out on the basis of a quality-of-life questionnaire.

O001

Trainingseffekte und Listenäquivalenz des Freiburger Einsilbertests im Störschall

Hoppe, U., Mallinger, E., Digeser, F.

University of Erlangen-Nuremberg, Erlangen

Hintergrund: Der Freiburger Sprachverständlichkeitstest (FST) wurde vor mehr als 50 Jahren von Hahlbrock erstmalig vorgestellt. Obwohl der Test in der Zwischenzeit oftmals kritisiert wurde, gilt er heute als der am meisten angewandte Sprachverständlichkeitstest in der Praxis. Besonders attraktiv für den Anwender ist die rasche und einfache Durchführbarkeit. Als wichtigste Nachteile wurden unzureichende Listenäquivalenz, ergebnisverfälschende Trainingseffekte und Probleme bei der Anwendung im Störgeräusch wegen eines fehlenden Ankündigungssignales genannt [1]. In der aktuellen Studie wurde die Anwendbarkeit des FST für Sprachverständlichkeitsmessungen im Störgeräusch untersucht. Hierzu wurde das Sprachverständnis bei Normalhörigen bei festem Signal-Rausch-Verhältnis für alle Testwörter des Freiburger Tests bestimmt.

Methoden: Insgesamt nahmen zwanzig junge gesunde Erwachsene (10 Männer, 10 Frauen) an der Studie teil. Die Einsilber wurden im freien Schallfeld bei einem Pegel von 65 dB präsentiert. Als Störgeräusch wurde das auf der Test-CD enthaltene sprachverdeckende Rauschen verwendet. Die Probanden waren nicht vertraut mit dem Freiburger Test. Der FST wurde in drei unterschiedlichen Versionen getestet: 1. Einsilber allein (standard), 2. Einsilber in dreifacher Wiederholung als ‚Dreinsilber-Präsentation' (dreinsilber) und 3. Einsilber mit einem kurzen Ankündigungston von 500 Hz (beep). Die Probanden wurden an zwei Sitzungen mit einem Abstand von einer Woche getestet. Alle Probanden führten den Test in der Standardversion entweder am ersten oder am zweiten Termin durch. Am anderen Tag wurde entweder die Version ‚beep' oder ‚dreinsilber' getestet. Um Trainingseffekte bei kurzzeitiger Wiederholung zu überprüfen, wurden an einem Tag jeweils alle 400 Wörter in derselben Version mit einem Abstand von max. einer Stunde erneut getestet. Die Reihenfolge der Testwörter war randomisiert. Die Testergebnisse wurden hinsichtlich der Präsentationsversion, der Trainingseffekte und der Listenäquivalenz analysiert.

Ergebnisse: Die mittleren Erkennungsraten lagen bei 53%±32% für die Standardversion, 66%±31% für die Dreinsilberdarbietung und 49%±33% für die Beep-Version. An einem Tag erhöhte sich die Erkennungsrate vom ersten zum zweiten Test zwischen 3,6% und 5,1%. Offline konnte eine listenabhängige Auswertung durchgeführt werden. Für die Standardversion des FST variieren die mittleren Erkennungsraten der 20-item-Listen zwischen 45% und 62%. Für die Listen 3,8,15 und 17 lagen die mittleren Erkennungsraten über 60 %. Die Listen 1, 12 und 14 lagen die Erkennungsraten unterhalb von 47%.

Schlussfolgerungen: Die Fehler zwischen den unterschiedlichen Listen liegen innerhalb der zu erwartenden statistischen Fehlergrenzen, die bei 20 item Tests zu erwarten sind. Obwohl auch in dieser Studie die Listenausgewogenheit unbefriedigend blieb, unterscheiden sich die Ergebnisse zu früheren Untersuchungen bei schwerhörigen Probanden. Die beobachteten Trainingseffekte des Tests liegen unter denen, die in früheren Arbeiten beschrieben wurden.

[1] J. Kießling: Moderne Verfahren der Sprachaudiometrie, Laryngo-Rhino-Otol, 79: 633-635, 2000

O002

Überprüfung von Hörgeräteversorgungen mit dem Basler Satztest

Kompis, M., Krebs,M. , Bertges Reber, M., Häusler, R.

Department of ENT, Head and Neck Surgery, University of Bern, Switzerland

Hintergrund: Vor rund einer Dekade haben Tschopp et al. eine deutsche Version des Speech Reception in Noise (SPIN) Tests entwickelt. Dieser adaptive Sprachverständnistest im Störgeräusch wird in der Schweiz als „Basler Satztest“ routinemässig zur Überprüfung von Hörgeräteanpassungen verwendet. In dieser Studie wird die Reproduzierbarkeit der Resultate des Basler Satztests und die Voraussetzungen, welche die Patienten zu seiner Durchführung mitbringen müssen, untersucht.

Patienten und Methode: Bei 134 erwachsenen Patienten wurde eine Hörgeräteneuversorgung mit dem Basler Satztest überprüft. Es wurden jeweils 2 Testlisten mit- und 2 Testlisten ohne Hörgerät verwendet, die Reihenfolge der Messungen und die verwendeten Listen wurden systematisch variiert.

Ergebnisse: Bei 100 Patienten konnten die Tests durchgeführt werden, bei 34 Patienten war das Sprachverstehen zu schlecht, so dass der adaptive Basler Satztest nicht konvergierte. Die Grenze der Luftleitungshörschwelle zwischen den beiden Gruppen lag ungefähr bei 50 und 70 dB (500 – 4000 Hz). Aus den Daten der 100 erfolgreich durchgeführten Messreihen wurde ein statistisches Modell erzeugt, welches die Beurteilung eines Resultats als Funktion der gemessenen Verbesserung und der Anzahl der Testwiederholungen erlaubt. Das Modell zeigt beispielsweise, dass eine Verbesserung des Signal-Stör-Abstandes um +2 dB, gemessen mit nur einer Testliste in rund 78 % aller Fälle einer tatsächlichen Verbesserung durch die Hörgeräteversorgung entspricht, in 22 % aber einer Verschlechterung. Für je 2 Testlisten mit und ohne Hörgeräte betragen diese Wahrscheinlichkeiten ca. 86 % bzw. 14 %.

Diskussion: Mit dem Basler Satztest kann die Verbesserung des Sprachverstehens durch eine Hörgeräteversorgung bei Patienten mit leichtem bis mittelgradigem Hörverlust überprüft werden. Vor allem bei kleinen Verbesserungen oder Verschlechterungen des Signalstörabstandes sollte bei der Interpretation die häufig nicht vernachlässigbare Streuung der Messresultate berücksichtigt werden.

O003

Sprachverstehen vor Hintergrundlärm bei hochgradig asymmetrischer Innenohrschwerhörigkeit nach Hörsturz

Bedeshem, C., Pfister, M., Zenner, H.P., Plontke, S.K.

Universitätsklinik für Hals-, Nasen- und Ohrenheilkunde, Kopf- und Hals-Chirurgie und Hörforschungszentrum Tübingen

Einleitung: Patienten mit hochgradig asymmetrischer Innenohrschwerhörigkeit leiden häufig unter Problemen des Sprachverständnisses in schwierigen Hörsituationen insbesondere vor Hintergrundlärm. Ziel dieser Untersuchungen war es, zu charakterisieren, ab welchem Hörvermögen das geschädigte Ohr wesentlich zum Sprachverstehen vor Hintergrundlärm beitragen kann.

Methode: Bei bislang 22 Patienten mit asymmetrischer Schwerhörigkeit (4-PTA(0,5-3kHZ)≥50dB HL) bei Zustand nach Hörsturz (6 bis 98 Monate nach dem Ereignis) und Normalhörigkeit auf dem Gegenohr wurde das Sprachverstehen mit Hilfe des Oldenburger Satztestes (OLSA) untersucht. Dabei wurden das Sprachsignal immer von vorn (0 Grad) und das Störgeräusch (65 dB SPL) aus vier Richtungen (0, 90 (rechts), 180, 270 Grad) präsentiert. Die Differenz von Sprach- und Störsignal (∆S/N) im OLSA wurde unter Berücksichtigung der Hörschwelle des betroffenen Ohres im Reintonaudiogramm mit den Ergebnissen von bisher 11 normalhörigen Probanden verglichen.

Ergebnisse: In allen vier Testsituationen zeigte sich ein im Mittel schlechteres ∆S/N für die einseitig schwerhörigen Patienten (Wilcoxon-Test SoNo:p 0,0002, SoN180:p 0,0089, SoN krank/gesund:p<0,0001). Dieser Effekt war am deutlichsten ausgeprägt bei der Applikation des Störlärmes auf das gesunde Ohr (Median Patienten/Probanden SoNgesund -2,3dB/-10,9dB, SoNkrank -6,7dB/-10,3dB, SoN180 –5,1dB/-8,2dB, SoNo -3,6dB/-5,7dB) . Die größte Variabilität des ∆S/N im OLSA wurde bei den Patienten im Störschall von hinten (180 Grad) beobachtet (Interquartilsabstand Patienten/Probanden 4,94 dB/2,3 dB).

Die 4-PTA des Tonaudiogramms korrelierte nach Spearman mit den OLSA Ergebnissen im Störschall von vorne (SoNo, rs 0,6), Störschall auf das gesunde Ohr (rs 0,7), Störschall auf das kranke Ohr (rs 0,8), weniger von hinten (rs 0,36).

Schlussfolgerungen: Auf der Basis dieser bisherigen Untersuchungen an Patienten mit einer 4-PTA >50 dB HL im Tonaudiogramm kann vermutet werden, dass das kranke Ohr spätestens ab diesem Hörverlust von ≥50 dB HL nicht wesentlich zum Sprachverstehen vor Hintergrundlärm beiträgt. In weiteren Untersuchungen sollen auch Patienten mit geringergradigen Hörverlusten eingeschlossen werden. Die Ergebnisse zeigten außerdem eine starke interindividuelle Streuung des Sprachverständnisses vor Hintergrundlärm bei ähnlichem Hörverlust im Reintonaudiogramm. Hier erscheint es sinnvoll, andere Einflussgrößen wie z.B. Alter und Zeit nach dem Hörsturz gesondert zu berücksichtigen.

Korrespondenz: Priv.-Doz. Dr. med. Stefan Plontke (Stefan.Plontke@uni-tuebingen.de)

O004

Anwendung des „Oldenburger Satztests (OLSA)“ zum Nachweis der Effizienz einer bilateralen Versorgung bei Patienten mit Cochlea-Implantaten und/oder Hörgeräten

Döring, W.H., Dujardin, H., Thürmer, C., Westhofen, M.

HNO-Klinik, Universitätsklinikum Aachen

Unilateral implantierte oder mit einem Hörgerät versorgte Patienten haben erhebliche Probleme, Sprache im Störschall zu verstehen, während sie in ruhiger Umgebung sehr gute Verstehensleistungen erreichen können. Wenn diese Patienten ein zweites Gerät auf der Gegenseite erhalten, müssen sie erst lernen, die durch die Hörhilfen veränderten Schallmerkmale binaural auszuwerten und so die Fähigkeiten des Richtungshören und des Sprachverstehens im Störschall zu verbessern. Es ist jedoch noch weitgehend unklar, wie schnell und bis zu welchem Grad sich diese Fähigkeiten entwickeln können und von welchen biologischen und technischen Faktoren sie hauptsächlich abhängen.

In einer laufenden Studie werden bei Cochlea-Implantat- und Hörgeräte-Patienten nach der Anpassung der zweiten Seite in regelmäßigen Abständen (1, 3, 6, 12, 18 u. 24 Monate) die monauralen und binauralen Hörleistungen (Richtungshören, Sprachverstehen im Störschall) gemessen und in ihrem Verlauf ausgewertet, um die Entwicklung der binauralen Hörfähigkeit im Einzelfall erfassen zu können.

Neben dem Sprachverstehen in Ruhe mit dem Freiburger Sprachtest wird das Sprachverstehen im Störschall mit dem Oldenburger Satztest bei monauraler und binauraler Versorgung für die folgenden Beschallungssituationen getestet: Sprache und Störschall von vorne (S0N0) sowie Sprache von vorne und Störschall von rechts (S0Nre) bzw. von links (S0Nli). Auswerteparameter sind das kritische Signal-Rauschverhältnis für 50% Verständlichkeit (SNR50) und der Verständlichkeitsgewinn ILD (Intelligibility level difference) durch die räumliche Trennung von Sprach- und Störschall. Aus der Differenz der Ergebnisse mit nur einer Hörhilfe auf dem erstversorgten bzw. besseren Ohr und den Ergebnissen mit beiden Hörhilfen wird ein Maß für den Hörgewinn durch die zweite, zusätzliche Hörhilfe abgeleitet.

Die bisher vorliegenden Ergebnisse von 25 erwachsenen Patienten aus der laufenden Untersuchung werden im Hinblick auf ihre individuellen Voraussetzungen diskutiert. Die bilaterale Versorgung brachte einen nachweisbaren binauralen Hörgewinn beim Sprachverstehen im Störschall von bis zu 6 dB für das SNR50 und bis zu 10 dB für die ILD. Darüber hinaus berichteten fast alle Patienten über eine wesentliche Erleichterung des Zuhörens im Sinne einer geringeren Höranstrengung. Der subjektive Hörgewinn aus der Sicht des Patienten war in einigen Fällen deutlich höher als die mit den audiometrischen Tests nachweisbare Effizienz der bilateralen Versorgung.

O006

Bestimmung der Sprachverständlichkeit im Störgeräusch für Freifeld-Bedingungen in unterschiedlichen Wiedergaberäumen

Müller, A. (1), Brand, T. (1), Kallinger, M. (2), Mertins, A. (3), Kollmeier, B. (1)

(1) University of Oldenburg

(2) Fraunhofer Institute for Integrated Circuits

(3) University of Lübeck

Ein entscheidender Aspekt für das Sprachverstehen im Störgeräusch ist das binaurale Gehör. Bei Normalhörenden zeigte sich, dass die Sprachverständlichkeit durch eine räumliche Trennung von Nutz- und Störsignal verbessert wird. Normalhörende sind in der Lage, durch das Ausnutzen binauraler Prozesse die Sprache vom Störgeräusch zu trennen und so die Sprachverständlichkeit im Störgeräusch zu verbessern („Cocktail Party Effekt“). Schwerhörende haben in geräuschvollen Umgebungen Schwierigkeiten, die Sprache vom Störgeräusch zu trennen.

Es gibt verschiedene Methoden, die Sprachverständlichkeit in räumlichen Nutz-Störschall-Situationen zu messen (z. B. Speech Reception Threshold (SRT), Intelligibility Level Difference (ILD), Binaural Intelligibility Level Difference (BILD)). Die Verwendung von Kopfhörern grenzt die Messmöglichkeiten bei Schwerhörigen ein, da Messungen mit Hörgeräten nicht möglich sind. Daher wurde in dieser Studie die Sprachverständlichkeit im Freifeld in verschiedenen räumlichen Nutz-Störschall-Situationen in raumakustisch unterschiedlichen Wiedergaberäumen gemessen.

Unter der Annahme von Freifeldbedingungen werden die verschiedenen Techniken im Hinblick auf vergleichbare Messungen mit und ohne Hörgeräte untersucht. Der Schwerpunkt dabei ist, dass die Sprachverständlichkeitsmessungen bei Normalhörenden und Schwerhörenden im Freifeld weitestgehend unabhängig von den raumakustischen Eigenschaften des Wiedergaberaumes sein sollen.

Die maximale ILD bisheriger Studien beträgt 15dB bei der räumlichen Trennung von Nutz- und Störsignal im reflexionsarmen Raum für Normalhörende. Die beste Sprachverständlichkeit wurde für Azimute außerhalb der interauralen Achse (Störgeräuschquelle: -100°, 125°) erreicht. Die Ergebnisse dieser Studie für Normalhörende sind mit den Daten der Kopfhörermessungen von Beutelmann und Brand (2006) vergleichbar. Messungen mit Schwerhörenden und Hörgeräten sind geplant. Des Weiteren soll die Vorhersage mit dem Modell von Beutelmann und Brand (2006) zeigen, inwieweit die Sprachverständlichkeit für Freifeldmessungen bei Normal- und Schwerhörenden vorhergesagt werden kann.

P01

Prediction of speech intelligibility in fluctuating noise

Meyer, R., Brand, T.

Carl von Ossietzky Universität Oldenburg, Medical Physics

Speech intelligibility in fluctuating noise is a very useful diagnostical measure, since speech reception thresholds show larger variations between different listeners than for stationary noise. Predictors of speech intelligibility for hearing impaired listeners can be a very important tool in audiology because they can indicate clinical relevant discrepancies between measured intelligibility values and performance that can be expected from the pure ton audiogram.

In silence and in stationary noise the speech intelligibility index (SII) is a usable predictor for speech intelligibility. Rhebergen et al. (2005) proposed an extension to the SII for fluctuating noises. Their basic idea was to split the noise signal in a given speech-in-noise situation into short term windows and to calculate the SII for each window. An overall SII is calculated by taking the mean over all SII values. One constraint in this extension is that only the noise was assumed to be fluctuating, the speech was modelled as a non fluctuating noise with a speech-like long-term spectrum. Dropping this constraint gives a more realistic simulation of the given hearing situation, because a speech pause in a noise pause should not give any benefit in intelligibility. On the other hand the SII was originally not developed for very short time-windows, which may possibly result in inappropriate predictions.

The consequences of different approaches to model fluctuations of the speech signal was investigated and compared with the results speech reception thresholds determined with the Oldenburg sentence test from 113 subjects. For stationary noise the correlation is r=0.59 (non fluctuating speech) and r=61 (fluctuating speech). For fluctuating noise the correlation is r=0.70 (both non fluctuating and fluctuating speech).

P02

Hörgerätekontrolle in der HNO-Arztpraxis mit Tonschwellen-, Sprach-Audiogramm und Lautheitsskalierung, falls notwendig Korrektur der auffälligen Parameter.

Müller-Kortkamp, C. K. M. (1), Moser, L. M. (2)

(1) Soltau

(2) ehemals Julius-Maximilians Universität Würzburg, HNO-Klinik

In einer HNO-Ärztlichen Praxis wurden eine große Anzahl von Hörgeräten, die von den Patienten der Praxis getragen wurden, mit Tonschwellen-, Sprach-Audiogramm und Lautheitsskalierung überprüft. In vielen Fällen war es notwendig die Parameter der Hörgeräte zu ändern. In nicht wenigen Fällen mußte ein besseres Hörgerät gewählt werden.

P03

Improvement of speech intelligibility by audio hearing systems

Seidler, H.

TU Dresden

All hearing aids and cochlea implants have algorithm to improve the speech intelligibility. The idea is to share human speech and noise and to find different ratings. The result should be easier to understand by impaired people.

On the market there are big efforts to recognize speech and to separate it from noise. In this field we can notice a remarkable progress in the last years. But the reverberant sound in rooms or noise from same direction like the signal need a lot of work to suppress them effective.

The simplest way seems to be to gets the original speech signal direct from the source and to processes it individual in hearing devices. Such systems exist for a long time. And they are also developed.

Induction loop systems for hearing aid users are well known in churches, cinemas, theatres and conference rooms. Other possibilities are wireless infrared or HF systems. But the available systems are very different in costs and benefit for management and clients. Always it is easy to get an improvement of speech intelligibility. If these systems are used the hearing can be more relaxed and self-evident.

The presentation will show the level of most used external audio hearing systems, their possibilities to improve the signal to noise ratio and the benefit for hearing aid or cochlear implant users.

O006

Neural adaptation and the recovery function: Some insights from a simple mathematical model

Lai, W., Dillier, N.

ENT Department, University Hospital, CH-8091 Zürich, Switzerland

A greater knowledge of the temporal aspects of the response of the auditory nerve to electrical stimulation is important for understanding how signal processing strategies could be improved in transmitting sound information to the cochlear implant. Neural adaptation measures using NRT demonstrate how the compound action potential eventually settles down over time to a lower constant value (Dillier et al, 2005). Furthermore, the response amplitudes initially had an oscillatory character which then eventually changed to a stochastic one.

Methods: The primary candidate for explaining the adaptation is the recovery function. A first order model of neural adaptation based on the recovery function alone was then constructed and tested.

Results: The model successfully reproduced the reduction in the response amplitude, but the oscillatory character of the response amplitudes could not be reproduced.

When constructing the model, a number of assumptions and simplifications had to be made. One such assumption was that the recovery function time constant would always be the same. The basic premise of basing the model on the recovery function was probably justified. However, other assumptions such as the invariability of the recovery function time constant was probably incorrect.

Subsequent recovery function measurements with different numbers (1 to 5) of preceding maskers showed that the time constant was not always the same.

Conclusion: A better understanding of the way the recovery function's time constant changes with preceding stimulation needs to be accounted for when developing models of the auditory nerve.

This work was supported by a research grant from Cochlear AG, Basel and research grant 320000-110043 from the Swiss National Science Foundation.

Dillier N, Lai WK, Battmer RD, Pesch J, Killian M (2005). Measurements of neural adaptation effects dependent on rate of stimulation, Poster presented at Conference on Implantable Auditory Prostheses, Asilomar.

O007

Influence of active electrode location and electrode configuration on the electrical excitation fields in cochlear implant stimulation

Tognola, G. (1), Federica, S. (1), Parazzini, M. (1), Alessia, P. (1, 2), Ravazzani, P. (1), Grandori, F. (1)

(1) Istituto di Ingegneria Biomedica CNR, Milan, Italy

(2) Dipartimento di Bioingegneria, Politecnico di Milano, Milan, Italy

Stimulation parameters, such as electrode configuration, affect, through the generated electric field, the electrical neural stimulation in the implanted cochlea. For example, it is well known that currents levels required to elicit threshold (T) listening levels varied with electrode configuration and basal to apical location of the active electrode. Knowledge of the relationship between the stimulation parameters and the electric excitation field in the implanted cochlea is crucial to develop more efficient and spatially focused excitations neural tissues. Aim of this study is the quantitative comparison, through numerical simulations, of the spread of excitation field in cochlear tissues around the electrode array across different stimulation parameters.

Electric excitation field distribution in the cochlea was simulated by 3D modeling a true human cochlea and electrode array. Excitation fields were obtained by varying electrode configuration (monopolar, bipolar, and common ground) and location of the active electrode (i.e., basal, medial, or apical). For each tested configuration, the peak value of the excitation field and spatial spread of suprathreshold field were calculated.

Results showed that the peak of the excitation field varied not only with electrode configuration but also with location of the active electrode. The peak increased from bipolar to monopolar configuration (in monopolar configuration the peak was about two times greater than that in bipolar configuration) and from basal to apical location of the active electrode. The spread of suprathreshold field increased from apex to base and from bipolar to monopolar configuration. Also, simulations revealed the presence of quite high excitation further away from the active electrode, which could create some interferences. Results were in agreement with current clinical and physiological knowledge on the relationship between cochlear electrical stimulation and excitation thresholds. The proposed approach is useful to provide the excitation profiles inside the cochlea and in the design of new electrode arrays.

O008

Clinical application of an automatic system to record and analyze electrically evoked compound action potentials in cochlear implant patients

Gärtner, L., Büchner, A., Battmer, R.D., Lenarz, T.

Medical University of Hannover, Department of Otolaryngology, Hannover, Germany

Meanwhile all important manufacturers of cochlear implants offer the possibility to measure electrically evoked action potentials by means of the inserted electrode. It is desirable to find a correlation between these measurement outcomes and programming parameters of the patient map to facilitate the fitting procedure.

On 9 adult subjects, all implanted with a Nucleus RE-24 CA cochlear implant, NRT (Neural Response Telemetry) was performed and analyzed automatically by Cochlears CustomSoundEP software. Measurements were done on 14 electrodes intraoperatively and postoperatively during the first week of initial fitting on each of the 22 electrodes. MAPs were made based on these NRT measurements and/or with the conventional behavioral approach. At the end of the week map parameters T and C were compared to the TNRT values from the automatically performed NRT measurements.

Postoperatively measured TNRT values derived by the automatic system correspond to C parameters with a mean correlation coefficient of r=0,75 and to T parameters with r=0,66. The correlation is weaker in case of intraoperatively measued TNRT values.

The automatic systems delivers good clues for programming the speech processor. This is important especially when subjects are little children who cannot give feedback to the programming audiologist.

O009

SmartNRI: algorithm and mathematical basis

Arnold, L., Boyle, P.

Advanced Bionics Europe, Rixheim, France

Background: Modern cochlear implants support objective measurements such as Neural Response Imaging (NRI) to complement behavioural measures. However, the overlap of stimulus artefact and noise with neural response sometimes makes it difficult to determine whether a neural component is present.

Aims: To validate a new algorithm developed: to automatically determine if a neural response is present and to more reliably obtain the thresholds.

Methods: It is assumed that any NRI measurement consists of: neural response, noise, residual artefact. A principle component analysis approach is taken to reduce the noise. The artefact can be accurately represented by a parametric model. Any de-noised NRI recording can be compared to the artefact model. If a significant difference is observed, the NRI measurement is said to contain a neural response. A specific metric is defined, the "Strength of Response" (SOR), to quantify how far a measurement deviates from the artefact model. A trace is assumed to contain a neural response if its SOR exceeds a criterion value. The method was validated by comparing the auto-detection to clinicians' assessment. The detection principle was incorporated into an automated algorithm for NRI threshold estimation.

Results: The algorithm mathematical basis will be presented. The criterion value was determined by measuring the SOR for 410 measurements obtained below psychophysical threshold (assumed to contain only artefact and noise). The SOR was always below 27. The reliability of using this value as a criterion was confirmed by another set of recordings classified as "responses" or "no responses" by five clinicians. Using the criterion value resulted in a 100% correct classification of the measurements labelled as "responses". Only one false positive was found.

Conclusions: This new system removes the subjective element from the interpretation of NRI and provides a faster, wholly objective system likely to be of great benefit to clinicians.

O010

The Audiovisual Noise Indicator – an appropriate instrument to reduce noise in classrooms.

Pilgramm, M., Lebisch, H., Hanel, J.

Tinnituszentrum Detmold, Schulpsychologischer Dienst Detmold

The persistent affairs over a longer period at the Tinnituszentrum Detmold clearly show:

- the number of pupils with hearing impairments is increasing

- the number of young people suffering from Tinnitus is increasing

- more and more teachers complain about increasing hyperacusis going along with vocal overstressing

The Audiovisual Noise Indicator is one possibility to antagonise this development.

The device is similar to a traffic light and evaluates the surrounding average noise level with a green, yellow or red signal.

Additionally, the red light can trigger a sound signal.

In September 2006 we provided 14 primary schools in Detmold with one Audiovisual Noise Indicator each. All relevant teachers and pupils have received a pedagogic introduction to the Audiovisual Noise Indicator.

After 10 weeks (November 2006) and after 26 weeks (February 2007) of active testing in class, the practical experiences were collected with a questionnaire.

The results are:

- pupils and teachers show an increasing awareness of noise

- almost all pupils have a positive attitude towards the use of Audiovisual Noise Indicators

- the teaching atmosphere is consistently sensed more enjoyably

- the majority of pupils and teachers regard the Audiovisual Noise Indicator as independent observer, who points to the noise

- most of the schools want to continue the use Audiovisual Noise Indicators

- vocal overstressing of the teachers is declining

- the use and the periods of use depend on the work phase

- many heads of school are demanding to take the Audiovisual Noise Indicator into the standard equipment of a school

After 6 month of field-testing, the use of Audiovisual Noise Indicators has proven its value.

Further investigations will show, if the pupils school achievements improve with the use of Audiovisual Noise Indicators.

O010

The characteristics of tinnitus patients with normal hearing threshold in our Tinnitus Clinic

Bartnik, G., Raj-Koziak, D., Fabijanska, A., Karpiesz, L., Borawska, B.

Institute of Physiology and Pathology of Hearing, Warsaw, Poland

The purpose of this study was to characterize tinnitus patients with normal hearing in regard to following: (1) the epidemiological occurrence of tinnitus, (2) their audiological profile (results of the audiological tests).

The material consists of 400 tinnitus patients with normal hearing threshold (<25 dB HL), normal middle ear function (Type A tympanograms and acoustic reflexes present at normal limits), ABR latencies within normal limits, and to rule out any history of head or neck injury. All participants had a constant, subjective tinnitus for at least 6 months prior to their enrolment in this study.

The suspected aetiology associated with the onset of tinnitus was most often stress, noise exposure and viral infection. About 75 % of patients demonstrated subtle changes in their DPOAEs that otherwise remained undetected in the pure–tone audiogram. In addition, there was a correlation between tinnitus pitch and the abnormal value of DPOAE for the cases with tinnitus pitch located in the range of DP-frequencies.

These findings suggest that pathology represented among tinnitus patients with normal hearing threshold and responsible for tinnitus origin is consistent at the level of cochlea and can be indicated by DPOAEs. The relation between perceived tinnitus pitch and the frequencies of the abnormal level of DPOAE seems to confirm that suggestion.

O011

Research on otoacoustic emission responses in patients suffering from tinnitus

Kulak Kayikci, M.E., Belgin, E.

Hacettepe University, Faculty of Medicine, ENT DPT Audiology&Speech Pathology Unit

Since tinnitus is a phantom auditory perception and is generally heard only by the patient himself, determining the psychoacustic parameters of tinnitus is a subjective method often used. Not only the difficulty of determining the correlation between the intensity of annoyance but also the lack of diagnostic and therapeutic support to the clinician, have lead towards studies that objectively evaluate the tinnitus. This study has been done at Hacettepe University, Medical Faculty, Ear-Nose-Throat Department, Audiology and Speech Pathology Unit. This study aims to investigate if the results of otoacoustic emission (OAE) measures are in accordance with the subjectively determined tinnitus frequency and if any difference exists in OAE responses between the two groups. There are two groups both having 15 subjects. First group consists of subjects having normal otologic examination results without hearing loss but suffering from tinnitus. The second group is the control group. After determining the hearing thresholds, including high frequencies for both groups, OAE responses have been recorded. For the first group the tinnitus frequency and intensity have been subjectively determined. It has been found that in these subjects there is a positive relationship between the tinnitus frequency measured subjectively at left ear and the distortion product otoacoustic emission (DPOAE) measures. No difference has been found in the spontaneous otoacoustic emission (SOAE) measures between the two groups. Transient evoked otoacoustic emission (TEOAE) and DPOAE amplitude measures at some frequencies are lower for the first group. Therefore, it is assumed that tinnitus affects cochlea and thus causes OAE measures to be different from normal.

O012

Auditory attention and tinnitus: the objective determination of tinnitus decompensation

Delb, W. (1), Fen Low, Y. (1, 2), Corona-Strauss, F.I. (1), Strauss, D.J. (2)

(1) Computational Diagnostics and Biocybernetics Unit, University of Saarland, Homburg/Saar

(2) University of Applied Sciences, Saarbrücken

Background: In previous studies we showed that decompensated tinnitus patients differ significantly from compensated tinnitus subjects in the amplitude as well as the synchronisation stability of late auditory evoked potentials. According to the neurophysiological tinnitus model of Jastreboff and Hazell one major difference between decompensated and compensated tinnitus patients is that decompensated tinnitus patients shift their (subconcious) attention to the tinnitus signal as a results of dyfunctional emotional associations with the tinnitus signal. Therefore we were interested to look at the possibility that this difference in synchronization stability is due to an attentional bias in direction of the tinnitus. If neural synchronization stability could be changed by changing the attentional focus in healthy persons there would be evidence that the difference in neural synchronization stability between compensated and decompensated tinnitus patients is due to an attentional focus to the tinntus signal.

Methods: 10 voluntees entered the study. Late auditory evoked responses were obtained. We delivered 3 pure tones of 40ms each in random order to the right ear. Meanwhile the left ear was presented with music that served as a distractor. Subjects were required to pay attention to a target tone within the pured tones applied for the first 10 minutes. After that the subjects were told to ignore the stimulus. During that procedure single sweeps of late auditory responses were recorded and the synchronization stability was calculated.

Results: Similar to the difference in synchronization stability between compensated and decompensated tinnitus patients synchronization stability changed significantly (Wilcoxon Test) when the attentional focus was drawn away from the target stimulus. This change occured in the time interval between 100 and 200 ms.

Conclusion: Our results give evidence that the difference in synchronisation stability in late auditory evoked potentials (N1, P2) between compensated and decompensated tinnitus patients is due to the attentional focus to the tinnitus signal. As this attentional bias can therefore be shown objectively and in real time, it might be the basis of a therapeutic neurofeedback system.

DJ Strauss, W Delb, R D'Amelio, P Falkai: Neural synchronization stability in tinnitus decompensation. Proceedings of the 2nd Int. IEEE EMBS conference Arlington, USA, pp. 186-189.

P04

QoL perception: Comparison between tinnitus patients and their relatives (Preliminary results)

Oliveira, V., Meneses, R.F.

ESTSP - Polithecnic institute - Porto/Portugal

Background/aims: Tinnitus is a very common problem and very distressing to some patients. In fact, research shows that the Quality of Life (QoL) of tinnitus patients is worse than that of the general population.

Additionally, the literature indicates that there is divergence between patients and relatives as far as QoL perception is concerned. Tinnitus patients often consider that their relatives don't pay them enough attention and don't value their tinnitus. This can worsen the tinnitus perception and related complaints. All this can be even worse if the patients don't have social support.

Consequently, the aim of the present study was to compare the QoL perception between patients and their relatives.

Methods: To do so, the QOL of adults with tinnitus complaints is being assessed by themselves and by their relatives or caregivers, who come with them to an ENT clinic. A socio-demographic and clinical questionnaire and the Portuguese version of the SF-36v2 are being used.

Results Currently, we have only 19 pairs of protocols. So far, the results indicate that the QoL perceived by the patients is worse than that reported by their relatives (T test p=0,000 in all SF-36 dimension scales).

Conclusions These results are different from the ones found in the literature. Although the sample is very small, the results suggest it is important to include the patients' relatives in the therapeutic procedures.

Andersson, G., Baguley, D. M., McKenna, L., & McFerran, D. (2005). Tinnitus: A multidisciplinary approach. London: Whurr Publishers.
Gil, Z., Abergel, A., Spektor, S., Khafif, A., & Fliss, D. M. (2004). Patient, caregiver, and surgeon perception of quality of life following anterior skull base surgery. Archives of Otolaryngology-Head and Neck Surgery, 130 (11), 1276-1281.
Holgers, K-M., Zöger S., & Svedlund, L. (2005). Predictive factors for development of severe tinnitus suffering-further characterization. International Journal of Audiology, 44, 584-592.
Kennedy, V., Wilson, C., & Stephens, D. (2004). Quality of life and tinnitus. Audiological Medicine, 2, 29-40.
Oliveira, V., & Meneses, R. (2006a). Qualidade de Vida/Estado de Saúde em sujeitos com queixas de acufenos: Comparação entre doentes e acompanhantes. In I. Leal, J. L. P. Ribeiro, & S. N. Jesus (Eds.), Actas do 6º Congresso Nacional de Psicologia da Saúde (pp. 127-132). Lisboa:
Oliveira, A. V., & Trigueiros-Cunha, N. (2002). Avaliação Psicológica de doentes com acufenos: Resultados de uma população de doentes de uma consulta de O.R.L.. Revista Portuguesa de ORL, 40 (3), 219-236.
Sweetow, R. W. (1989) Adjunctive approaches to tinnitus-patient management. In J. Vernon (Ed.) Tinnitus 1989 – A review of current knowledge and treatment therapy, The Hearing Journal (Special Issue), 42 (11), 38-43.
Wilson, K. A., Dowling, A. J., Abdolell, M., & Tannock, I. F. (2000). Perception of quality of life by patients, partners and treating physicians. Quality of Life Research, 9, 1041-1052.

P05

Our experience with tinnitus workshop

Geczy, B.B., Vatovec, J.

University Department of Otorhinolaryngology and Cervicofacial SurgeryZaloska 2, Clinical Center, Ljubljana

Background: tinnitus is a sensation of hearing in the absence of external sound. Approximately 10 % of adult population experience prolonged tinnitus, although only 1-2 % seeks professional help because of severe annoyance. Two thirds of the population with tinnitus also has hearing impairment. Jastreboff´s neurophysiologic model of tinnitus describes that the connections between the auditory pathways and the limbic system define the way how the tinnitus is perceived. The severity of tinnitus depends on the emotional reaction of the patient and not on the loudness of tinnitus. It is measured by tinnitus questionnaires which offer a new approach to the treatment and retraining methods for tinnitus. Our patients learn the bases of the tinnitus retraining therapy on tinnitus workshop conducted by audiologist and psychologist.

The aim of our study was to evaluate the effects of the tinnitus workshop for our patients with severe, annoying tinnitus.

Patients and methods: 40 patients regularly attended the workshops and the authors evaluated the difference in the answers about handicapped daily activities before and after workshops. Tinnitus questionnary consisting of 10 questions and hospital anxiety and depression scale (HADS) were used.

Results: The improvement of the tinnitus severity after 12 workshops was statistically significant ($p < 0.05$).

Conclusion: The major risk factors for developing severe tinnitus in the patients who attended our workshops were noise induced stress and anxious-depressive disorders. The results confirm that the most affected are patients with difficulties in coping with stress and that tinnitus workshops can contribute to the treatment of the most handicapped tinnitus patients.

P06

Effects of Prolonged Gacyclidine Intracochlear Perfusion on cochlear function and histology in Guinea Pigs

Wenzel, G.I. (1), Lim, H.H. (1), Warnecke, A. (1) , Stoever, T. (1), Lobl, Th. (2), Schloss, J. (2), Schwab, B. (1), Lenarz, Th. (1)

(1) Hals-Nasen-Ohrenklinik der Medizinischen Hochschule Hannover

(2) NeuroSystec

Introduction: Gacyclidine is a highly specific NMDA receptor antagonist with neuroprotective properties. In animal studies, administration of gacyclidine (adsorbed to Gelfoam) into the round window niche as well as a bolus injection suppressed salicylate-induced tinnitus. Since one method for tinnitus treatment in humans could be a chronic intracochlear perfusion and the majority of candidates for this would be hearing patients, we sought to assess whether prolonged administration of gacyclidine would compromise hearing performance in an animal model.

Methods: Guinea pigs were implanted with osmotic pumps that delivered either 0.5µL/h of 0.3 mM gacyclidine and or Ringer solution (control group) for 9 days via a catheter inserted through the round window membrane. The concentration and rate of drug delivery were selected to provide a dose that was substantially higher than is expected for tinnitus control in humans. Frequency-specific ABRs (1-40 kHz, 10-80 dB SPL in 10dB steps) were recorded before implantation and compared with those obtained after drug administration. After the last ABR recording the animals were sacrificed, the cochleae harvested, fixed in 4% PFA and stained with Rhodamine-Phalloidin. Whole mount preparations were then analyzed under fluorescent microscopy.

Results: No significant changes in ABR thresholds were observed suggesting that prolonged administration of gacyclidine for tinnitus treatment should be safe in terms of hearing preservation. There were no significant differences in hair cell loss between gacyclidine or Ringer infused ears and contralateral ears ($p<0.05$).

Conclusions: Prolonged intracochlear administration of gacyclidine for tinnitus treatment seems to be safe in terms of hearing preservation and hair cell loss in guinea pigs.

Further studies investigating the toxicological effects of different dosages and durations are under way to ensure the safety of the drug for long-term human use and to warrant clinical trials.

O013

Corticosteroids and cochlear implantation – useful treatment to reduce electrode insertion trauma? Results from CAP- measurements of cochlear-implanted guinea pigs

Tillein, J. (1, 5), Ye, Q. (4), Kiefer, J. (3), Gstoettner, W. (2), Braun, S. (1, 2, 5)

(1) Dept.of Sensory Physiology II

(2) Dep. of ENT J.W.Goethe University, Theodor-Stern-Kai 7, 60590 Frankfurt am Main, Germany

(3)Technical University Munich, ENT Dept., Germany

(4) Dept. of Otolaryngology Fujian Provincial Hospital, Fuzhou, China

(5) MedEl Innsbruck Austria

Preservation of residual hearing is particularly important for patients with combined electric-acoustic stimulation (EAS). Corticosteroids are widely used clinically to treat a number of hearing disabilities like sudden hearing loss. Prevention of noise trauma (Takemura et al 2004) and ototoxicity (Himeno et al 2002) have been demonstrated in animal experiments. Administration of corticosteroid resulted in a reduction of electrode impedance pointing to a reduction of tissue growth around the electrode (de Ceulaer et al 2003). This suggested the application of steroids also in EAS patients in order to reduce insertion trauma and preserve residual hearing (Kiefer et al 2005).

A systematic evaluation of the efficacy of corticosteroids relating to permanent cochlear implantation has hitherto not been conducted. The present study therefore addressed the question whether steroids administered to the cochlea improve hearing preservation after implantation.

Three groups of guinea pigs were implanted with electrodes (supplied by MED-EL) through a cochleostomy in the basal turn of one cochlea. Either 3µl of triamcinolone, dexamethasone or artificial perilymph (AP) was infused with a micro-syringe directly before implantation. The other ears were treated equally (omitting implantation) and served as an additional control. By means of click-evoked CAP-measurements and frequency-specific CAP-audiograms recorded using RW-electrodes, hearing loss (HL) was measured before and after drug/AP application and during the following 3 months.

HL was most pronounced in implanted ears treated with AP. CAP-audiograms showed smaller threshold shifts at all frequency ranges for steroid-treated animals. Efficacy of dexamethasone was evident in the course of three weeks after implantation declining afterwards. For Triamcinolone a preservative effect was seen from day 7 and afterwards.

The results indicate that the two steroids reduce hearing loss caused by cochlear implantation even after a single application. Dexamethasone probably requires a repeated or sustained application to extend protection over a longer space of time.

Supported by DFG 161-2 & MED-EL.

deCeulaer et al., Otol Neurotol 2003;/24:/769_74.
Himeno et al , Hear Res. 2002 May;167(1-2):61-70.
Kiefer et al., Audiol Neurootol. 2005 May-Jun;10(3):134-44
Takemura et al., Hear Res. 2004 Oct;196(1-2):58-68.

O014

Neurotrophic effects of trangenic fibroblasts on neonatal spiral ganglion cells

Stöver, T., Warnecke, T., Wissel, K., Berkingali, N., Lenarz, T.

Department of Otolaryngology, Medical University of Hannover, Carl-Neuberg-Straße 1, 30625 Hannover

Introduction: Neurotrophic factors have been demonstrated to protect spiral ganglion cells from ototoxic trauma. In addition, cultured spiral ganglion cells derived from neonatal rats demonstrate neurite outgrowth in the presence of neurotrophic factors, especially brain-derived neurotrophic factor (BDNF). The aim of the study was to demonstrate the neurotrophic effect of transgenic fibroblasts expressing BDNF to induce neurite outgrowth of cultured spiral ganglion cells.

Materials and methods: Murine NIH-3T3 fibroblasts were transfected with a lentiviral vector containing a BDNF and GFP gene controlled by a tetracycline-driven promotor. All resulting fibroblast cells produced BDNF and GFP in the presence of tetracycline. Spiral ganglion cells were dissected from neonatal rats (P3-5) and cultured in a serum-free medium, serum-containing fibroblast medium or supernatant derived from fibroblast cultures. Spiral ganglion cells were cultured for 52 hours and then evaluated for spiral ganglion cell survival and neurite outgrowth.

Results: The highest number of survival in spiral ganglion cells and most advanced neurites were determined in cultures incubated with supernatant derived from transgenic fibroblasts. In comparison pure fibroblast media and serum-free media did only result in minor spiral ganglion cell survival. ELISA showed the presence of BDNF (produced by fibroblasts) in the supernatants derived from transgenic fibroblasts.

Conclusions: Our results demonstrated that trangenic fibroblasts secrete significant amounts of neurotrophic factor to the media where they can act on neural tissue, especially spiral ganglion cells. The results suggest a potential application of this technique alternative to fluid-based drug delivery to induce cochlear protection and inner ear regeneration

O015

Transient deafness in young candidates for cochlear implants

Attias, J. (1, 2), Raveh, E. (3)

(1) Department of Communication Disorders, University of Haifa, Haifa

(2) Institute for Audiology and Clinical Neurophysiology

(3) Department of Otorhinolaryngology, Schneider Children's Medical Center of Israel and Rabin Medical Center, Petah Tiqwa, affiliated with Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

This study describes 7 infants who were diagnosed with auditory neuropathy associated with severe to profound neural hearing loss shortly after birth. Unexpectedly, on repetition of the tests 7-12 months later, all infants showed full or partial recovery. The follow-up electrophysiological patterns were characterized by the appearance of wave I, followed by wave III and V, reflecting synchronization of auditory pathways and improvement in auditory nerve function. Some of the cases showed fluctuations both in behavioral and electrophysiological measures. Suspected causative or contributory factors were neonatal hyperbilirubinemia, hypoxia, ischemia, and central nervous system immaturity, alone or in combination.. These findings indicates that lack of an ABR does not necessarily mean no hearing AND that situation when AN exists can improve. Thus, clinicians should be made aware that although cochlear implants may yield better auditory performance if applied early, they should be considered a therapeutic option only after repeated measures prove persistent auditory neuropathy and no child should be considered for an implant until a behavioral measure of hearing is obtained.

O016

Estimation of abnormalities of Cochlear Implant electrode placement using Spread of Excitation measurement

Walkowiak, A., Kostek, B., Lorens, A., Obrycka, A., Wasowski, A., Skar¿yñski, H.

Institute of Physiology and Pathology of Hearing, Warsaw

Objectives: To evaluate possible dependence between Spread of Excitation measurement results and and electrode placement assessed by CT scans in Nucleus 24 implant user.

Method: Postoperative Spread of Excitation profiles recordings were made for electrode number 5, 10, 18. CT scans according to cochlear view techmique was performed for 2 selected patients.

Results: Abnormalities in implant electrode placement in the cochlea was found, accompanied by disturbed spread of excitation profiles.

Conclusions: A clear dependence between disturbance of Spread of Excitation profile and abnormalities in implant electrode placement for selected patient was confirmed. Further investigation in bigger group of Nucleus 24 implant users is planned to check if it is a general correlation.

A possible confirmation of mentioned correlation would provide an useful, objective tool to assess implant electrode position and placement and provide important information, crucial for speech processor fitting.

O017

Early Changes of Electrical Stapedius Reflex Threshold over Time in Patients Supplied with CI

Koci, V., Stephan, K.

Medical University Innsbruck

Background/aims: The measurement of postoperative electrical stapedius reflex thresholds (ESRT) provides a good predictor of comfort levels for the fitting of cochlear implants. In many cases, the ESRT values are directly used for setting comfort levels in the map of the speech processor. The aim of the present study was to evaluate the temporal development of ESRT in an early stage of implant use.

Methods: In a retrospective study, postoperative ESRT data from 16 unselected subjects supplied with MED-EL Combi40+ or Pulsar implant devices were analyzed. ESRT was determined for single channel stimulation using a well established test procedure in our department. The first ESRT data were collected approximately 4 weeks after switch-on of the implant. The change of ESRT over time was determined in the subsequent fitting sessions up to about one year of implant use.

Results: The change of ESRT values over time are largest in the first period of implant use. After about 6 months of implant use the levels tend to stabilize. In most cases, an increase of ESRT was observed while the overall channel profile remained almost unchanged. However, in some cases, also a decreasing trend and/ or a change in channel profiles was found.

Conclusions: Repeated measures in the early stage of implant use are necessary for the reliable estimation of comfort levels of the CI. Application of such objective measures is particularly important for CI fitting in very young children in order to provide appropriate electrical stimulation within the first months of implant use. Changes of stapedius reflex threshold over time cannot be generalized for all patients or for specific electrodes.

O018

CAEP measurement of sound discrimination of CI patients in noise

Igelmund, P. (1), Meister, H. (2), Brockhaus-Dumke, A. (3), Fürstenberg, D. (1), von Wedel, H. (1), Walger, M. (1, 2)

University of Cologne:

(1) ENT Department

(2) Jean-Uhrmacher-Institute for clinical ENT research

(3) Department of Psychiatry and Psychotherapy

Background/aims: For non-cooperative patients such as infants and patients with multiple handicaps, evaluation of hearing and understanding in noise with subjective audiological tests is difficult. Our project aims at establishing cortical auditory evoked potentials (CAEP), especially event-related potentials (ERP), as objective measures of auditory discrimination ability of cochlear implant (CI) patients in noise.

Methods: Acoustic signals (tonal and speech sounds) are presented to postlingually deafened CI patients in auditory discrimination tasks under different signal-to-noise ratios. CAEPs are recorded with two EEG systems: a 32 channel Neuroscan 32 (Neuroscan) and a 128 channel GES 250 (Electrical Geodesics). The electrophysiological results are compared to psychophysically ascertained discrimination abilities.

Results and Conclusions: CAEP recordings from CI patients are at risk to be contaminated by electrical artifacts resulting from the activity of the implant. Time-locked to the stimulus and outlasting it, these artifacts appear in the averaged recordings and may mask even late components of the biological responses. Multi-electrode recordings reveal the patient-specific spatial dispersion of the artifacts and, thus, allow the analysis of the CAEPs from selected, non-contaminated channels. The amplitudes and the spatial dispersion of the artifacts differ between the two EEG systems used in this study in accordance with the different properties of the electrodes and amplifiers. With both systems, we could identify obligatory and event-related potentials from all patients investigated so far. First results are presented and discussed.

Supported by the Marga und Walter Boll Stiftung and Cochlear Europe Ltd.

O019

Influences of syllabic compression on speech evoked potentials in Cochlear Implant users.

Wohlberedt, T., Digeser, F., Hessel, H., Hoppe, U.

ENT Clinic University of Erlangen, Erlangen

Background: Fitting of Cochlear Implants is usually based upon subjective statements of the patients about their auditory perception. Cortical Auditory Evoked Potentials (CAEP) are a well known method to get information about auditory perception without any cooperation of the subject. This paper describes speech evoked CAEP in cochlear implant listeners. In particular, the influence of syllabic compression was investigated for two consonant-vowel-syllables differing in the voicing of the consonant.

Methods: CAEP were recorded from ten cochlear implant listeners provided with a nucleus freedom implant. A sine burst and the natural syllables /ta/ and /da/ were used as stimuli for the CI implanted group, without and with activated acoustic preprocessing. Additionally, CAEP to the same speech and tone stimuli were derived in five normal hearing subjects serving as a reference group. All stimuli were presented at 60 dB SPL.

Results and Discussion: In all subjects CAEP could be reliably recorded and a clear N1-P2 complex was observed. In the CI group N1 and P2 latencies are significantly larger than those of the normal hearing group. While N1 amplitudes differ not significantly between the two groups P2 amplitude is decreased in the cochlear implant group. In all subjects the sine burst elicits earlier N1 and P2 components and larger N1 amplitudes than the spoken syllables.

The speech stimulus /ta/ elicits earlier N1 and P2 components than /da/ in both groups which can be explained by the different time-frequency properties of the voiced and unvoiced consonant, respectively. Latencies of both N1 and P2 decrease when syllabic compression is used, while N1 – P2 interpeak amplitude decreases. In summary, CAEP can be reliably recorded on CI users and a syllabic compression yields to significant changes in CAEP. These changes can be explained by a more spread activation along the electrode array as a result of the enhanced level. The study demonstrates that speech evoked CAEP are a candidate for objective evaluation of acoustic preprocessing algorithms. Furthermore, the study indicates different speech processing in CI listeners and in normal hearing listeners.

O020

Remote Fitting of Cochlear Implant System

Wasowski, A., Lorens, A., Obrycka, A., Putkiewicz, J., Skarzynski, H.

International Center of Hearing and Speech of the Institute of Physiology and Pathology of Hearing, Kajetany Mokra 17, 05-830 Nadarzyn, Poland

Objectives: Optimal fitting of cochlear implant system is necessary for implanted patients to obtain maximum possible hearing benefits. Fitting of the system usually requires frequent visits in cochlear implant center and repetitive fitting session.

Development of informatics and telecommunication technologies, especially the Internet, opens new possibilities. New internet communication and videoconferencing applications allows remote fitting with use of internet connection. This possibility may prove to be very useful in clinical practice.

The aim of this study was to assess usefulness and safeness of remote fitting via internet connection.

Methods: Material of the study consists of 19 adult cochlear implant users, implanted in the Institute of Physiology and Pathology of Hearing. The patient is connected to the clinical interface on distant computer. The specialist, using remote desktop application, takes control over distant computer, and performs fitting and electrical hearing tests. Patients satisfaction questionnaire is used for comparison of remote fitting and standard fitting methods.

Results: The setup for remote fitting and experiences of application of new technology was described. Patient's satisfaction, quality and time effectiveness of the new method were evaluated. Risk of using this technology, connected with danger of overstimulation, connection breakdowns etc. was also assessed.

Conclusions: Based on the results, remote cochlear implant system fitting seems to be a useful and safe technology, which could be used in clinical practice.

O021

Pilot Study of Remote Measurement and Fitting of Cochlear Implant Recipients

Wesarg, T. (1), Kröger, S. (1), Gerber, O. (1), Kind, H. (1), Reuss, S. (1), Roth, J. (1), Junge, F. (2), Novakovich, A. (2), Aschendorff, A. (1), Laszig, R. (1)

(1) Department of Otorhinolaryngology, University Hospital Freiburg

(2) Cochlear AG, Basel

The open fitting of hearing aids is still one of the highest demands of hearing impaired patients. Using modern and high sophisticated feedback management systems this has recently become available for a wide range of hearing losses. However, there is still some kind of acoustical and/or physical occlusion by the long silicon tube with a perforated earplug or external speaker to transmit the amplified sound into the ear canal.

The semi-implantable air conduction hearing aid system RetroX has shown to overcome this problem while using an implanted titanium tube for sound delivery. The very positive aspect of a high wearing comfort by the true open ear fitting on the one hand side leads to a limited amplification of low-frequency sound on the other side. To remain the effectiveness of the RetroX device also for those patients with a progressive or sudden hearing loss in the low-frequency range new concepts for the expansion of the fitting range will be shown and discussed. Measurements have been performed in-situ and on an artificial head with specific ear molds to allow higher low-frequency gain, with different speakers having an extended high-frequency characteristics and with a new two-loudspeaker concept.

O022

Simulation of modern signal processing strategies in cochlear implants

Bräcker, T. (1), Schulte, M. (2), Plotz, K. (3), Hohmann, V. (1)

(1) Carl-von-Ossietzky-Universität Oldenburg

(2) Hörzentrum Oldenburg GmbH

(3) CIC Oldenburg am Evangelischen Krankenhaus Oldenburg

With current coding strategies (ACE, CIS, SPEAK etc.) cochlear implant (CI) users achieve already good speech intelligibility in quiet. However, music perception and speech intelligibility in noise are still poor [1, 2]. The strategies used in current devices are based on the envelope information in different frequency bands.

Here, a new approach using not only the envelope information but also the fine structure information of a signal is evaluated. In previous studies it was shown that this new strategy leads to a better pitch discrimination [3]. The aim is to investigate, whether the additional transmission of fine structure information could have positive effects on speech intelligibility in noise and on music perception.

Based on the Gammatone filter bank [4] a CI-simulation was developed that translates the electrical stimulation into an acoustic signal. The signal processing of the simulation is based on the CIS+-strategy (Continuos Interleaved Sampling) and the FSP-strategy (Fine Structure Processing). For lower frequency bands FSP transmits the fine structure of a signal in addition to the envelope using the channel-specific sequences strategy.

Different sound signals were processed using our simulation and several audiological tests were carried out with normal hearing listeners. Subjective ratings and paired comparison tests were conducted in which subjects rated the sound quality and speech intelligibility with and without fine structure information.

As a result music signals with additional fine structure information were preferred to music signals with envelope information only. Preliminary results also indicate a positive effect of the transmitted fine structure on speech intelligibility in noise.

[1] McDermott, H.(2004): Music Perception with Cochlear Implants: A Review
Trends in Amplification, Vol.8, number 2, pp. 49-82
[2] Fu, Q. (2004): Noise Susceptibility of Cochlear Implant Users: The Role of Spectral Resolution and Smearing
JARO 6: pp 19-27
[3] Nobbe, A. et al.(2006): Vergleich einer Feinstruktur-Strategie mit der CIS+-Strategie bzgl. TonhÃ¶henunterscheidung bei MED-EL Benutzern
DGA 2006
[4] Hohmann, V.(2002): Frequency analysis and synthesis using a Gammatone filterbank
Acta Acoustica, Vol.88, pp. 433-442

O023

The New HarmonyTM Soundprocessor - Outcomes With The HiRes120 Speech Coding Strategy

Brendel, M. (1), Buechner, A. (1), Krueger, B. (1), Frohne-Buechner, C. (1, 2), Lenarz, T. (1)

(1) Medical University of Hannover, Department of Otolaryngology, Hannover, Germany

(2) Advanced Bionics GmbH, Hannover, German

Actual speech coding strategies are based on the number of stimulation sites, which is identical to the number of physical contacts. The new speech coding strategy HiRes120 uses the current steering technique and offers up to 120 different pitches to the Cochlear Implant (CI) user. HiRes120 is supported by the new sound processor HarmonyTM of Advanced Bionics.

11 adults participated in a five months study, where HiRes120 as well as the impact of the improved HarmonyTM processor with respect to speech understanding were evaluated. The test battery consisted of HSM sentence tests in several conditions, questionnaires concerning speech understanding, sound of music and handling of the processor. The participants used a HiRes90K or CII implant system, had a mean age of 58.1 years (38.2 to 79.3 years) and a mean duration of deafness of 5.1 years (0 to 25.3 years).

A second study group of 14 patients tested the HarmonyTM processor for one month with both strategies HiRes and HiRes120. The same test battery as for the first study group was used. They had a mean age of 55.1 years (25.1 to 79.3 years) and a mean duration of deafness of 5.0 years (0 to 26.0 years).

A total of 84 % preferred the HarmonyTM processor. The group can be seperated into preference for HiRes (24 %) and for HiRes120 (60 %) on the HarmonyTM. The speech test results for the HarmonyTM processor compared to their previous processor with HiRes showed a 7.7 % (1.6 % for the first study group, 11.6 % for the second study group) averaged increase in the HSM sentence test with 5 dB SNR competing talker.

The majority of the study participants wanted to change to the new HarmonyTM processor, because of better speech understanding in every day life, handling and improved battery life time.

O024

Bilateral cochlear implant

Morsnowski, A., Müller-Deile, J.

Department of Oto-Rhino-Laryngology, Head and Neck Surgery, Christian – Albrechts – University of Kiel, Germany

Introduction: Unilateral cochlear implantation offers patients the opportunity to achieve sufficient speech recognition in quiet. For these patients speech reception in noise and localisation are still challenging tasks. Bilateral implantation can enhance these issues significantly, but usually the patients have to learn to extract interaural properties and differences of the bilateral input.

Aim: Binaural and monaural performances of bilateral cochlear implant (CI) recipients were tested before and repeatedly after implantation of the second CI to characterise the progress of bilateral hearing capabilities.

Method: Speech recognition in noise is tested monaural and bilateral with the Oldenburg sentence test or the Oldenburg children rhyme test, depending on the performance and age of the patients. Signal (S) and noise (N) are presented from the front (S0N0) and from separated locations from left and right (S-45°N+45° , S+45°N-45°). The signal-to-noise-ratio is determined for which 50 % of the test items is achieved (SRT) with an adaptive procedure.

Localisation abilities are tested at three different levels of complexity: 1) Lateralisation is requested in a setting with three loudspeakers (in front, on left and right). 2) Localisation with seven loudspeakers in the frontal horizontal plane. 3) Localisation with twelve loudspeaker in the full horizontal plane. The task is more interesting for children with soft toy animals sitting on top of the loudspeaker and the children tell which animal speaks.

Results: First results of ongoing clinical monitoring are presented of 17 adults and 40 children with bilateral CI. The time between first and second implantation varies from 0 to 13 years. The bilateral hearing abilities show three types of progress: patients with binaural significant improvements shortly after implantation of second CI, those with improvements of slow progress and those with long remaining poor binaural performance.

O025

The relationship between tone- and speech-audiometry based assessments of hearing loss

Sukowski, H. (1), Brand, T. (1), Wagener, K. (2), Kollmeier, B. (1)

(1) Medizinische Physik, Universität Oldenburg

(2) Hörzentrum Oldenburg GmbH

The main basis for the assessment of a reduction in earning capacity (Minderung der Erwerbsfähigkeit, MdE) due to hearing loss in Germany is the “percentage hearing loss” based on the speech audiogram in silence (Königsteiner Merkblatt, 1996). In some cases the tone audiogram is used in addition to the speech test or as the only basis for the assessment.

This contribution deals with the questions whether it is fair to use the tone audiogram instead of the speech audiogram and - in case of significant differences between both approaches - how these differences could be explained and solved.

The percentage hearing losses based on the speech audiogram were computed for 31 adults with different kinds of hearing disorders using both parts of the Freiburg speech test as well as the combination of the Freiburg number test and the monosyllable rhyme test by v. Wallenberg and Kollmeier (1989). In addition, the percentage hearing losses based on the tone audiogram were calculated using the tables introduced by Röser (1973, 1980, Drei- und Vier-Frequenz-Tabelle).

As expected, the tone audiogram data result in a higher amount of percentage hearing loss than the speech audiogram data for most cases. However, the variability across subjects is very large, so that significant differences between the two approaches would significantly influence the assessment of a reduction in earning capacity in particular cases. A detailed analysis shows that listeners with large differences between tone- and speech-audiometric results are mainly characterised by relatively low speech reception thresholds in the Freiburg number test.

To investigate these findings in more detail, a further data set of 145 listeners is analysed in order to explain these discrepancies and to propose methods to overcome this problem.

[1] Königsteiner Merkblatt. Empfehlungen des Hauptverbandes der gewerblichen Berufsgenossenschaften für die Begutachtung der beruflichen Lärmschwerhörigkeit, 4. Auflage (1996). Hauptverband der gewerblichen Berufsgenossenschaften (Hrsg.), St. Augustin.

[2] v. Wallenberg E-L, Kollmeier B (1989) Sprachverständlichkeitsmessungen für die Audiologie mit einem Reimtest in deutscher Sprache: Erstellung und Evaluation von Testlisten. Audiologische Akustik 28 (2), 50-65.

[3] Röser D (1973) Das Tonaudiogramm als Grundlage für die MdE-Skala. Z. Laryngol. Rhinol. Otol. 52, 666-673.

[4] Röser D (1980) Schätzung des prozentualen Hörverlustes nach dem Tonaudiogramm. In: Kolloquium Berufliche Lärmschwerhörigkeit, Fragen der Begutachtung nach dem Königsteiner Merkblatt, Schriftenreihe des Hauptverbandes der gewerblichen Berufsgenossenschaften e.V., 91-97.

O026

The role of OAEs in monitoring NIHL in individuals

Helleman, H.W., Helleman, H.W., Jansen, N., Simis, Y.J.W., Dreschler, W.A.

AMC Amsterdam, The Netherlands

Otoacoustic emissions (OAEs) have been suggested as useful in monitoring noise-induced hearing loss (NIHL) because OAEs were more sensitive to so-called pre-clinical hearing loss, have better test-retest variability than the audiogram, or could be a predictor for future hearing loss.

Many of these expectations are based on cross-sectional studies, few have followed individuals over time. There is no evidence-based consensus on how to use OAEs in an individual hearing conservation programme. Our study serves as a starting point for longitudinal testing and is designed to determine the scope in which OAEs can be used to follow individuals over time.

Approximately 200 employees of a newspaper printing-office in the Netherlands were measured twice, with 13 months of noise exposure in between. The measurements consisted of both audiogram and OAEs. For 50 subjects the short-term test-retest variation has been determined and used to derive a measure for significant changes in both methods based on the standard error of measurement

Critical issues are the influence of background noise, duration of the test procedure, choice of stimulus parameters and a relatively large standard error of measurement. In some persons with (audiometrically) normal hearing OAEs turned out to be absent, while some persons with moderate hearing losses showed extraordinary strong emissions. Although low emissions might be indicative for future hearing loss, it should be noted that for these particular individuals it is impossible to further monitor their hearing with OAEs.

We believe that further longitudinal testing should confirm or reject whether OAEs can serve as predictors for hearing loss. In setting up such an experiment we have encountered issuses that may hamper the application of otoacoustic emissions. We think that the use of OAEs for the monitoring of NIHL in individuals is only allowed under severe restrictions that can be derived from longitudinal studies.

O027

Otoacoustic emissions as a test for mild hearing loss early detection

Sisto, R. (1), Moleti, A. (2)

(1) ISPESL, Occupational Hygiene Department, Monteporzio Catone (Roma) Italy

(2) University of Roma 'Tor Vergata', Physics Department, Roma, Italy

BACKGROUND: OAE techniques provide a great deal of information about the most delicate mechanism of the cochlear function, namely the active feedback mediated by the OHCs, which are typically the first part of the auditory system to be significantly af-fected by the exposure to important ototoxic agents, such as noise and drugs. Therefore, OAEs have been considered as a very promising tool to detect mild hearing loss in ex-posed subjects. The large inter-subject variability of the OAE levels makes it difficult to design OAE-based tests capable of directly evaluating the hearing threshold in a single subject. The aim of this work was at investigating the effectiveness of OAE-based tests for the detection of very low levels of noise-induced hearing loss.

METHODS: Audiometric and otoacoustic (TEOAE and DPOAE) data have been recorded in a population of 217 young workers (age: 18-35) exposed to different levels of industrial noise. All measurements have been performed, during routine occupational health surveillance, with a standard clinical apparatus and acquisition procedure, which can be easily used in the occupational safety practice.

RESULTS: The correlation between TEOAE SNR, DPOAE level and the audiometric threshold has been studied, investigating the intrinsic causes of the rather large inter-subject variability of the OAE levels. The data analysis has shown that, if both OAE data and audiometric data are averaged over a suitably large bandwidth, the correlation between DPOAE levels and audiometric hearing threshold is sufficient to design OAE-based diagnostic tests with good sensitivity and specificity also in a very mild hearing loss range, between 10 and 20dB.

CONCLUSIONS: DPOAE and, to a lesser extent, TEOAE levels are sensitive to mild hearing loss, and the investigation of their generation mechanism helps developing appropriate OAE-based tests for the early detection hearing impairment in exposed subjects.

O028

Changes in DPOAE and hearing threshold fine structure after noise-exposure

Janssen, T., Müller, J.

ENT-Department, Technical University Munich

Noise-overexposure is known to affect outer hair cell (OHC) function. The purpose of our study was to find out to what extent noise induced temporary hearing threshold shift (TTS) is reflected in distortion product otoacoustic emissions (DPOAEs).

15 normally hearing volunteers who were exposed to noise in a discotheque and 52 factory- workers exposed to industrial noise for one workday participated in the study. 17 office-workers served as control-group. High-resolution behavioural thresholds and DPOAE-grams (∆f =47 Hz) were measured between 3.5 and 4.5 kHz before and after noise exposure. Primary-tone level L2 was set to 30 and 20 dB SPL.

The discotheque group exhibited a high inter-individual variability in both absolute DPOAE-level and TTS. TTS ranged from -10 to 30 dB. Mean TTS across subjects and frequency was 14.2 dB, mean change in DPOAE-level was 12.9 dB. There was neither a significant correlation between TTS and change in DPOAE-level nor between TTS and absolute DPOAE-level. Roughness of the fine structures of both measures decreased with increasing TTS. In the factory-workers, both hearing threshold and DPOAE level slightly decreased after one workday by -1.1 dB and -0.9 dB, respectively. Whereas, in the office-workers, both measures increased by 1.6 and 0.3 dB. Significant difference ($p<0.05$) between both groups was found for pure-tone hearing thresholds and for DPOAEs.

Variability of susceptibility to noise-induced TTS known from psychoacoustic tests was reflected in the DPOAEs. DPOAEs and audiograms revealed reduced hearing capability in the factory workers even after just one workday. However, there was no indication for predicting cochlear vulnerability by means of the absolute DPOAE level. Since DPOAEs are an objective measure and its measuring time is far shorter than that needed to obtain behavioural thresholds, DPOAEs are suggested to be an alternative method to detect marginal changes in OHC function in occupational medicine.

O029

Implementation & Evaluation of an Internet Test to Screen for Hearing at Work.

de Laat, J.A.P.M.

Dept. Audiology, Leiden University Medical Center, Leiden, Netherlands

An automatic internet test to screen for hearing at work has been launched successfully in April 2007. This test is comparable with the national telephone and internet test to screen for hearing in aults, which has been designed successfully by colleagues of the Free University Medical Centre in Amsterdam, The Netherlands, and completed by more than 400.000 adults since a couple of years. The National Hearing Foundation in The Netherlands stimulate to develop and sustain these tests to make it possible to perform a hearing health care control yourself at home or maybe also at work, as is usual for other health care items, like blood pressure, body temperature, etc. The second reason for initialising these tests is to achieve a better awareness of the issue of good hearing and to rehabilitate patients in an earlier stage than today: only one third of the hearing impaired and possible hearing-aid users have been seen by hearing experts. These figures are suitable for the whole western world! The third reason is the notification of the unexpected growth of the number of people at work who complain of hearing damage, partly caused by exposition to loud noise at work but also by exposition to loud music at leisure time. Robert J. Ruben (New York) showed that communication disorders, with hearing impairment as most important factor, caused almost 2% deficit of the BNP. Apart from implementation & evaluation figures, also first results of this new test combined with results of a short questionnaire will be demonstrated.

O030

Hearing conservation

Russo, I.C.P.

Pontifícia Universidade Católica de São Paulo

Technological development has provided to the modern world more comfort, time saving and progress of the modern civilization. Nevertheless, our society is going to pay a high prize, by ignoring the auditory effects of noise and music high sound pressure levels exposure. In the last four decades leisure activities are becoming extremely noisy and dangerous.The use of personal stereos, MP3, in maximum volume control setting by youngsters is increasing all over the world and recently, the American Speech-Hearing-Language Association has divulged the results of ten models of personal stereos manufactured and commercialized in the US, measured at different volume control settings. At the maximum one, the sound levels ranged from 118 to 122 dB (A) and even at the minimum setting some of them reached sound pressure levels above the secure ones, according to Federal regulations. The aim of this paper is to introduce these data and inform professionals who work in Audiology about the importance of making the society and mostly the parents aware of the auditory and non auditory effects of the abuse of such equipments nowadays. Only this way, we can respect the human ear and its excellence and keep our quality of communication and life.

ASHA 2005 http//:www.asha.org.

O030a

Incidence of occupational noise-induced hearing loss in Poland in 1999–2006

Sulkowski, W.J. (1), Szymczak, W. (2)

(1) Department of Occupational Diseases

(2) Department of Environmental Epidemiology

Nofer Institute of Occupational Medicine, Lodz, Poland

e-mail: sulkowki@imp.lodz.pl

Introduction: Long-term and repeated exposure to high levels of noise causes every year hearing impairment in millions of workers throughout the world. Over 650 000 employees (of the total 5 million industrial workers) are at the risk of suffering this impairment in Poland. The aim of this study is to show the epidemiological data on the occurrence of occupational noise-induced hearing loss (ONIHL) in the years 1999–2006 (and partly in 1992–1998).

Methods: Individual files of patients with the established diagnosis of ONIHL were statistically analyzed taking account of the following data: workplace (industrial branch) and its geographic location, noise exposure duration, and the subject's age. The files were derived from the central state register, where the data on all cases of occupational diseases, certified all over the country each year, are collected and processed.

Results: The analysis revealed that ONIHL is the most widespread nosologic unit, amounting (in some years) to 25% of the total prevalence, as compared to other 26 acknowledged work-related diseases. Over 36 new cases of ONIHL per 100 000 employees were identified annually in the years 1992–1998. However, since the beginning of 1999 this rate significantly decreased to 20 cases per year. The highest incidence was found in the key branches of industry, e.g., coal mining, iron and steel, metallurgical and transport equipment production; the majority of cases were registered in the southern and western provinces, mainly in Silesia, a mining basin of Poland. Workers aged 50–59 years and exposed to noise for over 20 years formed the most affected group of the population.

Conclusions: Occupational noise-induced hearing loss still remains a leading occupational disease; the decrease in its rate observed since 1999 may result from the introduction of the national program of hearing preservation established in the same year. The program makes pre-employment and follow-up pure tone audiometry obligatory to assure early detection of noise-induced damage and curb its progress.

P07

Miniaturized dosimeter for an individualized prevention of hearing loss in the working environment and daily life

Müller, A., Witte H., Grosch, J.

Technische Universität Ilmenau

Introduction: At present, for prevention of hearing-loss, the usefulness of fixed and reproducible relations of psycho-physical stresses and resulting individual strains are generally underestimated. These relations are often hypothesized without prove. If proved, monitoring in the working environment and daily life is difficult.

The Concept: To support modern ergonomics, biomechatronics may provide adaptive miniaturized dosimeters. They will be used for evidence-based prevention of damage so that accumulating noise-dose effects can be avoided. The noise measuring systems presented will transform readings of the same external stresses for different individuals into a measure of individual strains. Future research on strain should concentrate on the simultaneous identification of measurements for disposition and the assessment of stresses by loading. Using the current progress in MEMS-technologies, biomechatronics enable the development of "Personalized Miniaturized Dosimeters (PMD)" for the prevention of noise-provoked damages in hearing.

The goal of the project is the development of procedures and a setup which allows precise quantification of individual stress and strain of an exposed employee. The focus is put on a miniaturized device with personalized adaption (e.g. CIC-sensor - completely in the canal) for each individual and high data resolution (e.g. wireless frontend) for precise and comprehensive determination of binaural noise exposure or strain.

P08

Development of a method to evaluate the influence of designed hearing protectors for classical orchestral musicians on perception and/or differentiation of sounds

Günter, J., Emmerich, E., Richter, F.

Institute of Neurophysiology, Klinikum of the Friedrich Schiller University Jena

In the last years it has been shown that performing of classical orchestral music holds the risk of hearing damage to the musicians since sound intensities of more than 100 dB SPL were produced and exposure exceeded the noise doses allowed in industry by more than 150 %. However, only a minority of professional musicians always uses designed hearing protectors. The majority dislikes them because they would disturb the perception of the sound while playing the instruments. Therefore we want to test, whether designed hearing protectors for musicians influence the localization of the sound, the perception of right versus out-of-tune tones. If such influences exist, we want to objectify them by AEPs and/or MMN.

The experiments are performed in 16 normal hearing musicians (aged 25-41 years, among them are 7 women). They play different instruments. The EEG is recorded from 32 electrodes (Brain Products GmbH, Germany). Stimuli are pure C-major piano chords, C^3 chords, and respective out of tune chords in a classical oddball paradigm with 4 trains per 200 single stimuli each. The out of tune chords are generated by a synthesizer. Adapted to previous studies (Emmerich et al., 2006), each participant listens to two trains of C-major chords and to two trains of C^3 chords. Parent and deviant stimuli are presented randomly in a 4:1 order and at randomized interstimulus intervals lasting from 2 to 6 sec. The stimulus intensity is set at 65 dB SPL and presentation is made in the free field mode.

Our results are relevant for discussing the acceptance of designed hearing protectors in professional classical orchestral musicians.

P09

Deterioration of frequency discrimination by contralateral noise in subjects with noise-induced hearing loss

Dörrie, M. (1), Bungert-Kahl, P. (1), Fuchs, M. (2), Meister, E.F. (3), Oeken, J. (4), Rübsamen, R. (1)

(1) Faculty of Biosciences, Pharmacy and Psychology, University of Leipzig, Leipzig

(2) Department of Otorhinolaryngology, Section of Phoniatrics and Audiology, University of Leipzig, Leipzig

(3) Department of Otorhinolaryngology, Clinical Center St.Georg, Leipzig

(4) Department of Otorhinolaryngology,Clinical Center Chemnitz, Academic teaching Hospital of the University of Dresden and Leipzig, Chemnitz

Partial lesions of the cochlea in adult experimental animals result in plastic changes of confound frequency representation in the contralateral auditory cortex, to the effect of an increased neural representation of frequencies corresponding to the 'edge frequency' of the lesion. Also in human subjects with cochlear damage, differences in monaural performance near the cut-off frequency of steep sloping high-frequency hearing loss are assumed to be the result of injury-induced neural reorganization. This might have consequences for human binaural hearing, which is known to improve speech perception in noisy environment (cocktail party effect). Theses situations cause difficulties for subjects with an occupational noise-induced hearing loss. We examined this by comparing monaural discrimination abilities at suprathreshold levels to the condition with an additional presentation of contralateral broad-band noise bursts.

Difference limens (DLs) for frequency, intensity and duration were measured in 18 male subjects (median age 63,5 years) with occupational noise-induced hearing loss. The tests were carried out at the audiogram cut-off frequency (COF) and in a frequency one octave below (NHF). The COF was defined as the test-frequency at the beginning of the slope with no elevated threshold (compared to a group of normal hearing subjects of the same age). Signals were presented 30 dB SL.

Compared to control subjects of the same age, frequecy DLs in presence of contralateral noise were significantly elevated at COF, but not at NHF, or under monaural conditions. No differences in the performance were found for intensity and duration discrimination.

The results show a binaural perceptual deficit of central origin, reflecting deficits in neural integration at the level of the cortex and/or feedback control mechanisms, i.e. via the medial olivocochlear bundle.

P10

Impact of impulsive noise after shooting on hearing assessment using Pure Tone Audiometry, High Frequency Audiometry and Otoacoustic Emissions registration.

Kantor, I., Jurkiewicz, D., Usowski, J., Rapiejko, P.

ENT Department of the Military Medical Institute in Warsaw. Poland

When we attempt to evaluate risk of noise and implement preventive actions of hearing organ damage it is predominantly important to evaluate influence of noise on humans in real life situations. It concern especially impulsive noise occurring during shooting. In cases of exposure to impulsive noise the only method of hearing organ evaluation is through the assessment of TTS (temporary Threshold shift).

The aim of the study was hearing assessment in soldiers' thus after exposure to impulsive noise during military shooting exercises. Hearing assessment was performed using Pure Tone Audiometry (PTA) for air conduction, High Frequency Audiometry (HFA) (ranges from 10 000 Hz to 16 000 Hz) and using Spontaneous Otoacoustic Emission (SOAE), Click Evoked Otoacoustic Emissions (TEOAE) and Distortion Products of Otoacoustic Emissions (DPOAE). Hearing assessment was performed before shooting and immediately after shooting with hearing protectors, after shooting without hearing protectors (up to 10 minutes after shooting). No statistically significant deviations was found for all examined frequencies in PTA, HFA and in Otoacoustic Emissions for right and left ear in tests done at the same time. TEOAE rise is a compared by lower results of threshold audiometry. It means that a negative correlation between TEOAE Otoemission results and PTA results is also characteristic.

Only connection of PTA, HFA and SOAE (evaluation of number of registered peaks before and after shooting) and TEOAE can help in early detection of hearing impairment caused by exposition to impulsive noise during shooting.

O031

International cross-validation of sentence intelligibility tests

Wagener, K.C. (1), Brand, T. (2), Kollmeier, B. (1, 2)

(1) Hörzentrum Oldenburg

(2) Universität Oldenburg, Abteilung Medizinische Physik

In audiology it is desirable to obtain similar results across sites when measuring in similar conditions also on an international scale. This aim is quite challenging with regard to speech intelligibility tests since different languages may highly influence comparability.

The European project HearCom (Hearing in the communication society, FP6–004171) tries to establish minimum quality requirements for speech intelligibility tests in order to reach highest comparability across European countries.

Within a multi-centre study sentence intelligibility was determined in different conditions: So- called everyday sentences (or Plomp type sentences) were used to determine binaural SRT in quiet (SRT: speech reception threshold, i.e. speech presentation level or signal-to-noise ratio that yields 50% intelligibility), monaural SRT in non-modulated speech shaped icra1 noise and in modulated speech shaped icra5-250 noise (modulations simulate one interfering talker). Syntactically fixed but semantically non predictive sentences ("Matrix test sentences") were used to determine binaural aspects of speech intelligibility like intelligibility level difference (ILD) and binaural intelligibility level difference (BILD). The measurements were performed both with normal-hearing and with hearing-impaired subjects in four different countries (Germany, Netherlands, Sweden, and UK) under comparable conditions.

This contribution will present the inter-language cross-validation analysis of reference data for the particular sentence tests as well as the inter-language analysis of the multi-centre study results.

The contributions of the Hearcom-Partners Amsterdam and Rotterdam (T. v. Esch, W. Dreschler, J. Lyzenga, T. Houtgast, J. Koopman), Linköping (B. Larsby, M. Hällgren), and Southampton (M. Lutman, S. Athalye) are gratefully acknowledged.

O032

Development of a speech in noise test (Matrix)

Koopman, J. (1) , Houben, R. (2) , Dreschler, W.A. (2), Verschuure, J. (1)

(1) Erasmus Medical University, Rotterdam

(2) AMC, Amsterdam

A closed speech in noise test has been developed recently in Dutch. Sentences are formed by concatenating five words (Name, Verb, Numeral, Adject, Noun), as proposed by Hagerman, 1982, Scand Audiol. 11:79-87, and Wagener et al., 2003. Int J Audiol. 42:10-7. Subjects have to reproduce the played sentence, by selecting 1 option out of 10 possibilities for each category. The material was optimised following two iterations. Firstly, the intelligibility of words was equalized by a maximum of +/- 3 dB (resulting in increment of the psuchometric curve of 1%/dB). Secondly, the intelligibility of sentences was optimised by equalizing the intelligibility in terms of SRT (resulting in an increment of the slope of the psychometric curve of 0.5%/dB). In the final stage, evaluation measurements for 45 normal hearing subjects indicated a high similarity between different lists and showed to be independent of being conducted in the Netherlands or in Flanders. Finally, the consistency of the SRT was assessed by seven normal hearing subjects, showing a benefit (learning effect) of 2.5 dB after the first 2 tests. The average test-retest variance of the first two measurements for each subject was 0.8 dB (including a small learning effect). The average variance of the consecutive 6 measurements for each subject was 0.5 dB. In addition, the outcome of open and closed sentence tests will be compared.

O033

Development of French speech materials for the assessment of speech intelligibility in noise

Boon, E., Luts, H., Wable, J., Wouters, J.

ExpORL, Dept. Neurosciences, K.U.Leuven / Leuven

Background: There is a high need for standardised French speech materials. No well-documented tests measurement of speech reception thresholds are available in French. Within the European HearCom project three types of speech materials are being developed for different languages including French. The digit triplet test is suited for hearing screening via the internet or the telephone. A closed-set sentence test, wherein 50 words are combined to semantically unpredictable sentences with a fixed syntactical structure, as well as an open-set sentence test consisting of predictable everyday sentences, are developed.

Methods: The speech materials are developed in three phases: selection, recording and evaluation. The evaluation phase consists of several steps. First, the speech materials need to be optimized in a way that each item and each list results in a similar score. Normative data need to be collected for a large group of normal-hearing subjects. A comparison is made between the scores for Francophone listeners of Belgium and France.

Results: The speech materials for the three types of tests are being optimized based on speech intelligibility tests with normal-hearing subjects. The development of the open-set sentence test is finished and mainly described in this report. The FIST (French Intelligibility Sentence Test) consists of 14 lists of 10 sentences. For adaptive speech audiometry in noise the SRT (Speech Reception Threshold) is -7.8dB and -7.1dB for French and Belgian listeners respectively. The average slope of the psychometric curve at the SRT is 20%/dB. The test-retest reliability is 1.1dB.

Conclusions: This study provides the first well-documented standardised French speech materials for speech intelligibility tests. Our results agree well with the normative values obtained for similar existing tests for other European languages. This will allow better across-language European comparison of speech understanding outcomes.

O034

Effect of telephone bandwidth on digit triplet test

Lutman, M.E., Phipps, H.L.

University of Southampton, Southampton, UK

Background/aims: Speech recognition in noise tests have been implemented over the telephone network in both the Netherlands and United Kingdom and have received over 0.5 million calls. The basis of both tests is recognition by the caller of digit triplets presented in a background on speech-shaped noise and use of the normal keypad to indicate the digits heard. Both tests run adaptively by modifying the signal-to-noise ratio (SNR) to find the point at which the participant is scoring 50% correct. Hence the score on the test is the SNR in dB. Results from both Dutch and English tests correspond closely, including showing that about 4 dB higher SNR is required when the test is run over the telephone network, compared to the identical test run using earphones in the laboratory. The aim of the present study was to measure how much of that 4 dB could be accounted for by the limited frequency bandwidth of the telephone network, which is specified from 300 to 3400 Hz.

Methods: Ten otologically normal subjects listened in the laboratory via TDH-50P earphones to the English digit triplets at a range of fixed SNR to establish the function relating percent correct recognition to SNR, under two filter conditions: unfiltered and telephone bandwidth. Logistic regression was used to estimate the 50% correct point on the function for each condition.

Results: Logistic regression gave mean SNR values for 50% correct triplet recognition of 12.0 and 10.8 dB respectively for unfiltered and filtered conditions.

Conclusions: Only 1.2 dB of the 4 dB difference between the unfiltered laboratory implementation and telephone network implementation of the English digit triplet test can be attributed to limited telephone frequency bandwidth. Other distortions within the network appear to degrade speech recognition scores to a greater extent.

O035

Cognitive aspects of speech recognition in noise

Larsby, B. (1), Hällgren, M. (1), Lyzenga, J. (2)

(1) Technical Audiology, INR, University Hospital, S-581 85 Linköping, Sweden.

(2) VU University Medical Center, ENT-Audiology, 1007MB Amsterdam, The Netherlands.

Background: When the auditory signal is limited and/or distorted, e.g. in difficult listening situations or because of a hearing impairment, speech comprehension becomes more cognitively demanding. Studies have shown a clear relationship between the individual's cognitive skills and many speech comprehension tasks. Three categories of skills that are critical; working-memory function, speed of verbal information processing, and phonological skill. The purpose of the present investigation is to find a simple cognitive test with high correlations to speech comprehension ability that can be used within the EU-project HearCom together with other hearing- and communication tests to define an individual's auditory profile.

Methods: In Linköping 21 subjects, aged 50-85 years and with bilateral sensorineural hearing impairments participated. In Amsterdam 28 subjects with ages between 44 and 83 years participated, of which 19 were normally hearing and 9 had bilateral sensorineural hearing impairments. Hagerman's speech test and the HINT were performed in Sweden using unmodulated and modulated speech-shaped noise. In the Netherlands, the VU98 speech tests using stationary and square-wave modulated noises were performed. A lexical-decision test, a reading-span task, and a text-reception task were also performed. Correlation analysis was carried out between speech recognition and the cognitive scores.

Results: Among the cognitive tests, the lexical-decision test, especially its recorded response times, showed the most significant correlations with speech recognition. This result will be further discussed in relation to age, degree of hearing impairment, noise type, and response criteria.

Conclusions: The lexical-decision test is recommended as a first choice for evaluation of cognitive abilities important for speech comprehension.

Thanks are due to The Swedish Council for Working Life and Social Research (FAS), to the EU-project HearCom, and to the subjects.

O036

Auditory Processing

van Esch, T., Sol, J., Dreschler, W.A.

AMC Amsterdam (NL), in cooperation with VUMC (NL), UH Linköping (SE), ISVR (UK) and Hörzentrum Oldenburg (DE)

Background: Within the EU-project HearCom, two important goals are:

1. Characterization of auditory communication problems of individual hearing-impaired people.

2. Standardization of, among others, audiological methods.

In this context a standardized battery of diagnostic tests will be developed. In addition to the audiogram, this battery will characterize the residual hearing capacities of hearing impaired persons in an 'Auditory Profile'. Spectral and temporal resolution will be components of the auditory profile, besides loudness function, speech perception in noise, binaural hearing, listening effort, and cognitive abilities.

Aims: In the present study, we investigated to which extend spectral and temporal resolution can be measured clinically with 'combination tests' that measure both spectral and temporal resolution simultaneously.

Methods: Two combination tests (referred to as 'tone test' (Larsby and Arlinger, 1998/1999) and 'sweep test' (Hilkhuysen et al, 2005)) were tested on test-retest reliability and learning effect, and compared to more conventional methods. Also, the obtained spectral and temporal resolutions were compared to speech perception in two different noises.

Results: We found that the tone test had less learning effect, was better related to conventional methods, had more relevance for speech perception, and was faster than the sweep test. However, the sweep test had better test-retest reliability.

Conclusions: Based on the results, we recommend to include the tone test in the Auditory Profile, and we changed the tone test slightly to improve test-retest reliability. Currently, the preliminary auditory profile tests are being validated in an international multi-center study.

Larsby B, Arlinger S (1998) A method for evaluating temporal, spectral and combined temporal-spectral resolution of hearing. Scand Audiol 27:3-12

Larsby B, Arlinger S (1999) Auditory temporal and spectral resolution in normal and impaired hearing. J Am Acad Audiol 10:198-210

Hilkhuysen GLM, Houtgast T, Lyzenga J (2005) Estimating cochlear-filter shapes, temporal-window width and compression from tone-sweep detection in spectral and temporal noise gaps. J Acoust Soc Am 117:2598-2599

O037

Development of speech understanding of adult Cochlear Implant recipients between 1984 and 2004

Rost, U., Strauß-Schier, A., Joseph, G., Büchner, A., Lenarz, T.

MHH, ENT Clinic & HZH

With the beginning of cochlear implantation in Hannover the speech development was tested by th mean of speech tests. Based on the results the quality of understanding was categorized in 3 performance classes. Because of the surgical and technical development a revision of the categories was necessary. Out of 2600 implanted patients 864 adult CI patients could be selected to revise the performance classes.

From 1984 until 2004 only the speech tracking test was used continously. The revision was based on the the application "only hearing with CI" using the speech tracking test. The method of analysing the categories will be demonstrated.

The comparison of the categiories dependent from time of implantation shows a significant improvement of speech understanding in all 3 classes. Category "good" is reached up to 1992 with only 20 words / min but in 2004 with over 65 words / min. With a feasibility of 80% the allocation to one of the 3 classes after 6 months of CI is still valid after 3 years.

The analyses of the results will be demonstrated dependent from the technical development. A future prospect will be presented for the expected complex development of the new CI systems.

O038

Learning to use grammar – past tense in the spoken narratives of children with cochlear implants at the hearing age of 2 to 5 years

Huttunen, K., Peltokorpi, S.

University of Oulu, Oulu

Background: Svirsky et al. (2002) have proposed that grammatical morphologic development in children using cochlear implants may be influenced by the perceptual prominence of the grammatical forms learned. Finnish is an agglutinative language in which grammatical relations are formed by adding suffixes to words. The perceptually rather salient vowel /i/ is the basic marker of past tense in Finnish. However, because word endings are in general less prominent (i.e., less audible), they may be challenging to perceive for children with hearing impairment.

Methods: Video-recorded narrative samples were collected annually from eleven children using a cochlear implant. Their implants were activated on average at the age of 3 years 2 months (range 2;1 to 4;10). Narratives were elicited using series of four pictures which the children were free to narrate with their preferred mode of communication. The use of tenses 2 to 5 years after implantation was compared with those from a similarly elicited set of narratives from a total of 37 hearing children (age range from 2 to 5 years).

Results: The percentage of children using past tense at least once in their short narratives increased along with their hearing age (being 50% at the hearing age of two, 55% at three, 73% at four, 91% at five). Among the six 2-year-old hearing children the use of past tense markers was just emerging, whereas all the 3-year-olds (N=8) used them quite frequently. In this small sample, children with cochlear implants used past tense in their narratives more often than the more salient present tense when 5 years had elapsed after implantation.

Conclusions: It may take several years after implantation before children can use past tense in their narratives in a consistent way.

Svirsky, M., Stallings, L., M., Lento, C. L., Ying, E., & Leonard, L. (2002). Grammatical morphologic development in pediatric cochlear implant users may be affected by the perceptual prominence of the relevant markers. Ann Otol Rhinol Laryngol Suppl, 111, 109 - 112.

O039

Localization abilities in bilaterally implanted children

van Deun, L. (1), van Wieringen, A. (1), Scherf, F. (2), Deggouj, N. (3), Desloovere, C. (4), Dhooge, I. (5), Offeciers, E. (6), van de Heyning, P. (2), Wouters, J. (1)

(1) ExpORL, Dept. Neurosciences, K.U.Leuven, Belgium

(2) Univ. Dept. ORL, Antwerp University Hospital, University of Antwerp, Belgium

(3) Service ORL, Clinique St-Luc-UCL Bruxelles, Belgium

(4) Dept. ORL, U.Z.Leuven, Belgium

(5) Dept. ORL, UGent, Belgium

(6) Dept. ORL, AZ St Augustinus, Wilrijk, Belgium

Background: Several tests of binaural hearing have been developed to determine the abilities of bilaterally implanted children to use binaural cues such as interaural time and level differences. These tests have been modified to the interest and attention span of young children and have been evaluated with large groups of normal-hearing children. In this study we focus on the sound localization test in free field that is administered to bilaterally implanted children.

Methods: The test setup consisted of a bow with 9 loudspeakers positioned in the frontal horizontal plane from -60° to +60°. The task was embedded in a telephone game with smurfs. Approximately 30 bilaterally implanted children between 4 and 15 years of age participated in this task.

Results: Mean absolute errors for the cochlear implanted children were between 9° and 50° (chance level = 44°). The best results were close to the results of young normal-hearing children (0°–21°). Results will be interpreted in the light of age at implantation, etiology of deafness and other factors influencing hearing impairment.

Conclusion: The results of the current experiment show that sound localization is possible for bilaterally cochlear implanted children, with some children performing almost as well as their normal-hearing peers.

This research is supported by the Research Foundation – Flanders.

O040

Brain activation patterns during auditory processing in children with right versus left Cochlear Implants

Henkin, Y. (1,2), Attali, O. (1), Yaar-Sofer, Y. (1,2), Hildesheimer, M. (1,2), Kishon-Rabin, L. (1)

(1) Department of Communication Disorders, Sackler Faculty of Medicine, Tel-Aviv University, Tel Aviv, Israel

(2) Speech and Hearing Center, Chaim Sheba Medical Center, Tel Hashomer, Israel

Preliminary findings in a small group of children with cochlear implants (CI) showed that during speech processing children with right CI exhibited similar activation patterns to those of normal hearing subjects (i.e. bilateral temporal lobe) whereas children with left CI exhibited enhanced ipsilateral temporal lobe activation (Henkin et al., 2004). The objective of the present study was to further substantiate this notion by evaluating the time-course and brain structures involved in auditory processing of linguistic and musical stimuli in a group of prelingually deafened children with right versus left CI. A group of children implanted with the Nucleus 24 CI prior to the age of 48 months, which were using their implants for at least four years, and a group of normal hearing age-matched controls, participated in the study. Auditory event-related potentials (AERPs) were recorded while subjects performed oddball discrimination tasks consisting of musical and speech stimuli with increasing acoustic/phonetic difficulty. The low-resolution electromagnetic tomography (LORETA) algorithm was used to compute the 3-dimensional current density distribution which generated the P3 potential to target stimuli. The effect of side of CI and task on the characteristics of the P3 potential (i.e. latency, amplitude, scalp distribution) and on current density distribution will be reported. These data may contribute to the better understanding of the reorganization of the brain of hearing-impaired individuals who gained some of the auditory capabilities via a CI, and may contribute to decision making regarding ear of implantation.

O041

Estimation of Speech Perception with the CI from preoperative Data

Joseph, G., Büchner, A., Battmer, R.D., Lenarz, T.

Medical University of Hannover, Department of Otolaryngology, Hannover, Germany

Director: Prof. Dr. med. Th. Lenarz

The computation of possible postoperative speech perception with the CI can be important for the rehabilitation plan, for the expectations of the patient and also for quality control. For the development of a classification function a collective was selected by the conditions: age > 18 years, first language German, no additional handicaps, no bilateral CI and only implant types Nucleus24 or Advanced Bionics HighFocus. For 242 patients we found the complete set of preoperative data: duration of deafness in the ipsilateral and the kontralateral ear, promontorium test ipsilateral, audiogram of both sides, Freiburger monosyllables and numbers preoperative. This collective was divided into a learn set and a test set with the same distributions in durations of deafness and in postoperative speech tests.

For the development of a classification function the learn and the test set were divided into performance classes by the results of the speech tracking test one year after implantation. On the learn set different classification functions were generated. The performance of a function like this can be obtained by the results on the test set. These results are lower than the results on the learn set, but they are more similar to the expected results that would be obtained with completely new data.

Divided into two performance classes, 57,9 % of all patients from the test set set were classified correctly and with three performance classes the result was 43,8 %. The most important variable was the ipsilateral duration of deafness.

The classification accuracy obtained up to now is only 5-10 % above chance level but this analysis shows that this way to generate a classification function is practicable.

O042

Musical attitude of implanted children:speech and musical perception results of one year follow-up

Yucel, E., Sennaroglu, G., Budak, B., Belgin, E.

Hacettepe University/Ankara

The purpose of this study is to determine whether children can gain benefit from training on pitch and music perception. Our main goal were to prepare a tool for training pitch and music perception and evaluating musical attitude in children, to determine whether pitch and music perception improve more rapidly with training and to assess the impact of training on speech perception. A family centered habilitation program based on musical training is developed. All children were between 3 and 8 years old to ensure they are old enough to perform the tasks required in the study. 10 newly implanted children whom were switched on in HiRes and trained from the outset and 10 children using HiRes strategy who did not receive training both undergo assessments to determine pitch and music perception skills and speech perception assessments. The speech perception test battery contains a comprehensive range of age appropriate tasks covering detection, discrimination, identification, recognition and comprehension abilities. Musical training program was based on a take-home electric keybord which is used for listening to different pairs of notes. For this test, three octaves and one extra note at the high end of the keyboard were used. Children were expected to discriminate a pair of notes. Assessments of speech perception and pitch-music assessments at pre-implant, 3-,6-,9-,12-,months post switch-on. Also parents were given the 'Musical Stages Questionnaire' which covers some of the key areas of musical development. Children who were involved in music study demonstrated significant familiarity in both determining pitch differences and in song appraisal. Statistically significant relation between music training and speech perception was observed at music group compared with the non trained group particularly at the rate of being linguistically/developmentally ready to carry out a formal open set speech perception evaluation.

1 S. Abdi, M.H. Khalessi, M. Khorsandi, B. Gholami, 2001, Introducing music as a means of habilitation for for children with cochlear implants, Int Jour Pediatric Otorhinolaryngology; 59:105-113

2 J. Stordahl, 2002, Song Recognition and Appraisal: A comparison of children who use cochlear implants and normally hearing children, Journal of Music Thearpy; 39(1): 2-19

O043

Speech perception in children using hi-resolution 120: preliminary report

Mancini, P., Bosco, E., D'Agosta, L ., Traisci, G., D'Elia, C., Filipo, R.

Dept. of Neurology and Otolaryngology, University "La Sapienza" of Rome, Italy

HiRes120 uses a new current steering approach to deliver electrical stimulation to sites between the physical electrode contacts. Simultaneous delivery of current from adjacent electrode contacts targets neural populations smaller than the physical electrode pitch. A group of 6 children were fitted with HiRes120 at their first fitting session. Fitting was conducted with the SoundWave fitting software and used the same psychophysical levels generated for the HiRes strategy, small adjustments being made following presentation of live speech. The children were managed in the normal clinical routine with an evaluation made after two months of implant use forming the results presented here. A comparison was made to a group of 6 children fitted with the HiRes strategy and subsequently switched over in Hires 120.

Method: Speech perception was assessed on the ground of Erber's categories. Tests included: detection, discrimination and identification performed live voce and with Auditory Speech Sounds Evaluation test (A§E®).

Results: Subject switched on in Hires 120 showed 100% detection for all phonemes tests and for common environmental sounds. All subjects switched over in Hires 120 showed improvement in discrimination of phonemes. Two subjects showed also improvement in identification task. HiRes 120 children learn much more from surrounding context (incidental learning). Some insight into the emergence of naturalness of speech production and access to music will also be reported.

Initial observations of HiRes120 appear promising although longer term results are required to be able to make a more reliable assessment.

O044

Preliminary results of the Adult multicentral European HiRes 120 study

Kienast, B., Boyle, P.

Advanced Bionics SARL

Background: Over the years, new sound coding strategies have been devoloped resulting in contineous improvement of performance. Recent research has shown that using spectral bands through stimulting areas between two electrodes have a benefit for the subject. This 'current steering' approach known for years is the basis for the newly implemented HiRes Fidelity with 120TM Sound Processing, refered as HiRes 120 strategy.

Aims: 1) Investigate the benefit of HiRes vs. HiRes 120 speech coding strategy; 2) Determine benefit of Auria+ Harmony sound processor1 vs. own processor; 3) Identify variables to predict benefit of HiRes 120 speech coding strategy; 4) Develop fitting guidelines.

Methods: The benefit of HiRes 120 is evaluated with subjects that have at least 3 months of HiRes with their own processor who are switched over to HiRes 120. Another protocol option looks at first fitting with HiRes 120 with the new Auria+ Harmony sound processor. Performance, as well as speech quality and music appreciation, are investigated.

Results: A clear benefit of the new HiRes 120 speech coding strategy can be seen with a PSP, as well as with a new Auria+ Harmony processor. Especially encouraging, is the benefit of HiREs 120 when lisientng in noise. This benefit is also seen in the subjective data collected. Data evaluated about the new Auria+ Harmony processor show very satifying rating for the processor.

Conclusions: The new Hires120 strategy proves itself as benifical in subjective and objective measurments. The new behind the ear Auria+ Harmony processor is very reliable and satisfatory.

1 Gault A., Frohne-Buechner C., Goldring J., Arnold A., Miller D., (2006); Concept and technical features of a new HiRes Auria+ Processor: A paediatric friendly behind-the-ear Processor; IXth International Cochlear Implant Conference Vienna, June, 14th - 16th 2006, Poster
2 Donaldson G.S., Kreft H.A., Litvak L. (2005); Place-pitch discrimination of single- versus dual-electrode stimuli by cochlear implant users; Journal of the Acoustical Society of America: 118(2), 623-626.
3 Townshend B., Cotter N., van Compernolle D. White R.L. (1987); Pitch perception by cochlear implant subjects; Journal of the Acoustical Society of America: 82,106-115
4 Wilson B.S., Lawson D.T., Zerbi M., Finley CC. (1994); Recent developments with the CIS strategies; In I. Hochmair-Desoyer and E. Hochmair E (Eds): Advances in Cochlear Implants. Proceedings of the Third International Cochlear Implant Conference, Innsbruck, Austria, April, 1993 (pp. 103-112). Vienna, Austria: Datenkonvertierung, Reproduction and Druck.

O045

Speech perception of finnish adult cochlear implant users during four years of implant use

Välimaa, T., Sorri, M.

Departments of Finnish, Information Studies and Logopedics and Otorhinolaryngology, University of Oulu, Finland

Background: It is well established that adult cochlear implant users benefit from implant in auditory speech perception. However, whether there is a continued or consistent improvement in overall performance over time or whether performance plateaus appear is largely unknown. This study investigated auditory speech perception in adult cochlear implant users in a prospective four-year follow-up design.

Methods: Sentence, word and phoneme perception in quiet were studied before implantation with and without a hearing aid (HA) and at 3 days, at 1, 3, 6, 12, 18, and 24 months as well as at 3 and 4 years after the switch-on of the implant.

Results: Speech perception results for 30 adults were computed. Before implantation, the subjects' mean sentence recognition score was 0% without and 20% with a HA. Six months after switch-on of the implant, their mean score was 77% (95% confidence interval [CI] 65–88), at 12 months it was 80% and at 4 years 88% (95% CI 78–97). In word recognition, the mean scores before implantation were 5% without and 12% with a HA. Six months after switch-on, the mean score was 54% (95% CI 45–64), at 12 months it was 65% and at 4 years 70% (95% CI 59–81). In phoneme perception, the subjects scored 0% without and 5% with a HA before implantation. Six months after switch-on, the mean score was 35% (95% CI 27-43), at 12 months it was 42% and at 4 years 53% (95% CI 42–63).

Conclusions: Auditory speech perception in these Finnish-speaking adult cochlear implant users continued to improve for several years. More precise analyses of the data will be conducted in order to investigate the rate or degree of the improvement over these years in different tests and to determine whether there are performance plateaus at some points.

O046

How can you hear? Results from an Everyday Listening Questionnaire

Krüger, B. (1), Brendel, M. (1), Frohne-Büchner, C. (1, 2), Lesinski-Schiedat, A. (1), Büchner, A. (1), Lenarz, T. (1)

(1) Medical University of Hannover, Department of Otolaryngology, Hannover, Germany;

(2) Advanced Bionics GmbH

The hearing abilities for Cochlear Implant (CI) users have continuously improved during the last years. Today many CI users hope for a new natural hearing, music appreciation, the possibility of telephone use and understanding in noisy backgrounds.

Routine speech perception tests show an understanding in clinical situations, which is not always comparable with an understanding in real life. To help the clinic assess how well CI recipients cope with the challenges of everyday life, and to help identify weaknesses that may be addressed with technical accessories, the Everyday Listening questionnaires was developed together with Advanced Bionics.

The first questionnaire was answered by 37 adult subjects implanted with the HiRes90K or CII implant system of Advanced Bionics and more then six months of CI hearing experience. They had a mean age of 50 years and a mean duration of deafness of 3.7 years.

The results showed a good speech understanding possibility in quiet surroundings and difficulties as soon as background noises emerged. It was seen that use of the T-Mic compensated for the need of other accessories for those with a behind the ear processor (BTE). An FM system was especially used in situations such as business meetings. Users of a body worn processor often benefited from an induction system on telephone and reached subjectively better speech understanding with it.

The knowlege acquired from the first Everyday Listening questionnaire was used for an updated version of the questionnaire. The new one considers all implants of Advanced Bionics. It also probes deeper into the reasons why certain technical accessories are not used. Results of more than 20 participants will be presented at the conference

O047

A prospective longitudinal quality of life study before and after cochlear implantation in post-lingually deafened adults

Meis, M. (1), Lesinski-Schiedat, A.(2), Plotz, K.(3), Dillier, N.(4), Walger, M.(5), Wechtenbruch, J.(6) & Hessel, H.(7)

(1) Hearing Center Oldenburg

(2) Department of Otolaryngology and Hearing Center Hannover, Medical University of Hannover

(3) Cochlear Implant Center CIC-Oldenburg at the Prospeterian Hospital, Oldenburg

(4) Laboratory of Experimental Audiology, ENT Department, University Hospital Zurich, Switzerland

(5) Department of Otorhinolaryngology, Head and Neck Surgery, University Clinics Cologne

(6) Department of Otorhinolaryngology, Head and Neck Surgery, Ludwig-Maximilians-University München

(7) Cochlear GmbH, Germany

A prospective longitudinal study with five specific investigation times with patients treated with cochlear implants was conducted.

Over a period from 9-12 months N=52 patients were measured before and after an implantation with cochlear implants. The research is still ongoing and up to now the data from N=36 patients over all five measurement points, 1-2 months before, and 1, 3, 6, and 9-12 months after implantation are available. The participants were post-lingually deafened adults (62% female, age range from 18-80 years).

Generic Quality of life was assessed with the German version of the Nottingham Health-Profile (Kohlmann et al., 2000). Hearing specific Quality of Life was measured with standardized questionnaires such as the Gothenburg Profile, the Oldenburg Inventory-R and other scales dealing with coping, hearing handicaps, leisure time etc (see Kompetenzzentrum HörTech, 2004).

In a cross-sectional quality of life study in the German-speaking part, Meis, Plotz, Dillier et al. (2006) demonstrated, that most of the used Quality of Life scales were sensitive regarding the degree of hearing loss, age, and bilateral vs. unilateral provision (hearing aids and cochlear implants). One important question is to clarify whether the scales are applicable also for longitudinal studies of the cochlear implantation process. First results of the ongoing longitudinal study will be presented at this session.

Kohlmann T., Deck R. & Böhmer S. (2000). Das Nottingham Health Profile (NHP) als Assessmentverfahren in der Rehabilitation: Psychometrische Prüfung mit modernen Methoden der probabilistischen Testtheorie. DVR-Schriften, 20, 162-164.

Meis M., Plotz K., Dillier N., Kießling J., Kinkel M. & Hessel H. Bilaterale Versorgung mit Hörgeräten und Cochlea Implantaten: Ergebnisse einer multizentrischen Studie zur (gesundheitsbezogenen) Lebensqualität. Tagungs-CD 9. Jahrestagung vom 08.-11. März 2006 der DGA in Köln.

Kompetenzzentrum HörTech (2004). Fragebogeninventar für die Hörgeräteversorgung, Version 1.0, Mai 2004.

P11

Life quality of the adults underwent cochlear implantation

Sahli, S., Aksoy, A.

Section of Audiology and Speech Pathology, Department of ENT, Hacettepe University, Faculty of Medicine, Ankara, TURKIYE

Objective: Profound deafness is an impairment which affects individual's physical, social and psychological aspects. Cochlear implantation is a rehabilitative procedure, which is used for the eligible candidates chosen from profound deaf population. The objective results of cochlear implantation can be evaluated by using various test methods. Other than these objective evaluations, subjective benefits, which are reported by the patients, are highly important in the outcome of cochlear implantation. Our aim was to assess the effect of cochlear implantation (CI) on the quality of life in deaf adults.

Methods: In this study, to assess the effect of the use of cochlear implants (CI) on the health status of postlingually deaf adults to evaluate the quality of life, a questionnaire was applied for adults with implanted in our department. Their physical, social and psychological experiences, before and after implantation, are evaluated and the results were analyzed statistically.

Results: In result, cochlear implantation in adults were significantly satisfied. Moreover, the behaviors, such as self-confidence, relationships with other people, emotional condition and concentration, of the adults after implantation were significantly different than before implantation.

Discussion: Cochlear implants were associated with statistically significant improvement in quality of life in postlingually deafened adults. The improvements were largest in the categories concerning communication, feelings of being a burden, isolation, and relations to friends and family. The implants also improved the relatives' daily lives. There was a statistically significant reduction in degree of depression and anxiety. Reduction in anxiety and depression was associated with gain in quality of life.

Health-related quality of life of Austrian children and adolescents with cochlear implants,International Journal of Pediatric Otorhinolaryngology, Volume 69, Issue 8, August 2005, Pages 1089-1101

1. Maria Huber, Health-related quality of life of Austrian children and adolescents with cochlear implants,International Journal of Pediatric Otorhinolaryngology, Volume 69, Issue 8, August 2005, Pages 1089-1101

2. Johannes B. Hinderink, Paul F. M. Krabbe and Paul van den Broek, Development and application of a health-related quality-of-life instrument for adults with cochlear implants: The Nijmegen Cochlear Implant Questionnaire ,Otolaryngology - Head and Neck Surgery, Volume 123, Issue 6, December 2000, Pages 756-765

3.YOUNG-JE SHIN, BERNARD FRAYSSE, OLIVIER DEGUINE, OLIVIER VALÈS, MARIE-LAURENCE LABORDE, DIDIER BOUCCARA, OLIVIER STERKERS and ALAIN UZIEL

Benefits of cochlear implantation in elderly patients, Otolaryngology - Head and Neck Surgery, Volume 122, Issue 4, April 2000, Pages 602-606

P12

Self-esteem of adolescents with cochlear implant and normal hearing, comparison between levels of depressive emotioning and sensitiveness towards criticism

Sahli, S., Belgin, E.

Section of Audiology and Speech Pathology, Department of ENT, Hacettepe University, Faculty of Medinice, Ankara, Turkiye

Methods: For this purpose 30 adolescents with cochlear implant were enrolled in this study. They ranged in age from 12 to 19 years. A control group without cochlear implant was compared of 60 adolescents with similar properties. Both groups were administered the Rosenberg Self-Esteem Scale. The scale was used to determine levels of self-esteem, depressive emotioning and sensitiviness towards criticism. At the end of the application, scores of both groups according to their responses were compared statistically.

Results: When the comparison results were examined, there has been found no statistically significant difference between girls and boys with cochlear implant regarding measurements of self-esteem and levels of depressive emotioning and sensitiveness towards criticism. Relation between self-esteem and depression was found to be statstically significant for boys in control group, whereas it is not for girls in the same group. Relation between self-esteem and depression was not statisically significant for girls and boys in adolescents with cochlear implant. In control group when we examined the relationship between self-esteem and sensitiveness towards criticism for boys but notfor girls. Also, this relation was not found to be statistically significant for both girls and boys in cochlear implant users group.

Discussion: As a result of these findings, it was recommed to adolescents and their parents professional support from experts towards approach principles and features of this period, to be supported by their ell developed abilities. Future advanced studies are also recommed with different ages groups on this issue.

1. Bradley, B., Mathews A.(1983). Negative Self-Schemas in Clinical Depressions, British Journal of Clinical Pschology, 22, s.173-181
2. Brown, J., Mann, L.(1991). Decision-making Competence and Self-Esteem a Comparision of Parents and Adolesents, Journal of Adolescence, s.14
3. Calmels, M.N., Saliba I., Wanna G.(2004). Speech Perception and Speech Intelligibility in Children After Cochlear Implantation, International Journal of Pediatric Otorhinolaryngology, March, s.347-351
4. Chan, D.W.(1995). Depressive Symptoms and Coping Strategies Among Chinese Adolescents in Hong Kong, Journal of Youth And Adolescence, 24 (39), s.267-279

P13

Functional results after bilateral Cochlea Implantation - The Zurich experience

Veraguth, D., Huber, A., Laske, A., Binkert, A., Dillier, N.

Department of ENT, University Hospital Zurich

Introduction: Cochlear implantation has become progressively more common in the last years. The goal of this study was to compare the subjective benefit, speech comprehension in quiet and noise and localisation ability of unilateral and bilateral implant use.

Method: All consecutive implanted adult patients of a tertiary referring centre using the second implant for more than 6 months were included in the study. Subjective benefit was assessed by a questionnaire (The Speech, Spatial and Qualities of Hearing Scale SSQ). Speech comprehension measures were performed by Oldenburger sentences in quiet and in noise with unilateral and bilateral implant use. Advantage for binaural stimulation was calculated with respect to unilateral stimulus. Additionally a localization test was performed using 12 speakers arranged in a circle.

Conclusion: The results will be discussed in the presentation. Bilateral cochlear implantation improves the speech understanding in noise. Thereby communication in daily live can be facilitated subjectively witch could be verified by the questionnaire.

O048

Steady State Gain Reduction produced by Amplitude Modulation Based Noise Reduction in Digital Hearing Aids

Hoetink, A.E., Körössy, L., Dreschler, W.A.

Academic Medical Center of the University of Amsterdam

Background: Noise reduction systems are important features of digital hearing aids. Different brands of hearing aids use different strategies to achieve noise reduction. How gain parameters are adjusted may not only depend on properties of the input signal, but also on the audiogram of the user.

Aims: The aim of this study is to compare noise reduction systems of 12 high end digital hearing aids in terms of steady state gain reduction as a function of frequency.

Method: To investigate the gain reduction of the hearing aids, they were programmed for different hearing losses and subjected to different test conditions. The test conditions differed in signal-to-noise ratio of the input signal and the level of the input signal. We measured for each test condition the output produced by the hearing aids in a 2 cc coupler and calculated the gain reduction achieved relative to a test condition with clean speech as input signal.

Results: Of the 12 hearing aids we investigated, 3 reduced the gain in the low - and high frequency bands and 3 in all bands. 2 hearing aids showed no reduction at all. Of the rest, 2 showed gain reduction in the low - and mid frequency bands, one hearing aid in the low frequency band only, and one hearing aid in the mid - and high frequency bands. The gain reduction of 6 out of 12 hearing aids was independent of input level or type of hearing loss. In 5 hearing aids gain reduction was dependent on input level and in 2 of those the gain reduction was also dependent on the audiogram. So, in only one hearing aid dependence of gain reduction on only audiogram configuration was found. The total reduction achieved by the hearing aids ranged from 0-15 dB, depending mainly on signal-to-noise ratio.

O049

A special hearing aid with high directivity: the hearing glasses

Boone, M.

University of Technology. Delft, The Netherlands

It has been a challenge for many years to develop and design a hearing aid that has such a high directivity that a considerable improvement of the speech intelligibility is reached under noisy or reverberant situations. It has been widely acknowledged that the best way to improve the speech intelligibility under these conditions is indeed by making the hearing aid directive, but a problem with normal hearing aids is that they do not have space enough for a sufficient number of microphones over a length that is needed to make such a design possible.

For that reason a special hearing aid has been developed in which the arms of a pair of spectacles are used to house the microphones and based on this idea on optimized acoustic beam forming method has been developed. Normally this method is applied separately for both ears.

It has taken a long time before these ideas could be realized because high speed and low energy DSP techniques are required for these beam formers.

At present the hearing glasses have been realized and are on the Dutch market now for about a year.

In this paper results are presented where theoretical directivity patterns of the hearing glasses are compared with physical measurements under anechoic and reverberant conditions. The influence of the human head has also been investigated, both in the far field and in the near field. The near field response is especially important in relation to feedback problems that may occur due to sound that is radiated back from the venting of the ear piece to the microphones.

Our results show that a high average directivity index of 8 dB is reached in combination with a low noise sensitivity. This result is obtained under undisturbed free field conditions. The influence of the human head reduces the directivity index to 7 dB, which is still very high as compared to normal directive hearing aids.

I.L.D.M. Merks

O050

Satisfaction of use with a commercial array-microphone hearing system

Verschuure, J., Homans, N., van der Zwan, J.

Hearing and Speech Center Erasmus MC, the NetherlandsVaribel, the Netherlands

Introduction: The benefit of array-microphone systems for speech understanding in noisy environments have been well documented. A problem in the commercialization of such systems is the aesthetics of an effective system consisting of four or five microphones. Varibel is a company marketing a modern design spectacles with a hearing aid and a four-microphone system in each leg.

Method: The directivity index was measured on Kemar. Next the APHAB and IOI-HA questionnaires were used to measure the benefit and satisfaction with a double four-microphone system during daily use as compared to a conventional hearing aid. 27 hearing-impaired people participated in the test with a prototype version. Scores were analysed for the total group and for subgroups based on amount of hearing loss and a classification of the hearing loss. Added were some questions on acceptance of the design.

Results: The hearing system has two settings giving a speech-weighted directivity index of 4.4 dB at the low setting and 7.2 dB at the high setting. The test persons reported a significant better performance on Ease of Communication, Background Noise and Reverberant Condition. No difference was found in the score on Aversiveness. This was a general finding over all classifications. The IOI-ha showed a significant improvement of performance in the most-relevant condition and in difficulties encountered in daily life.

Conclusion: The design of this type of hearing aid is very acceptable and the users noticed a positive effect of the array microphone in Ease of Communication, Background Noise and Reverberance. Improvement of performance was also indicated in the most relevant condition.

O051

Audiological Comparison of BTE Fitting Options

Branda, E., Chalupper, J.

Siemens Audiological Engineering Group, Erlangen

Background: A growing challenge for hearing care professionals is the increasing number of choices and decisions to face when determining how to address the amplification portion of auditory rehabilitation. In particular, for open canal behind-the-ear (BTE) fittings, there are many new choices available. This presentation will focus primarily on choices involving BTE hearing instruments, with a special emphasis on open canal fittings. We will review many of the rationales for using BTEs and further examine the different technologies and fitting options.

Methods: Regarding open canal fittings, many options and differences exist with earhooks, tubing and means of coupling the instrument to the ear canal. The major aspects with these options are understanding maximum insertion gain, occlusion effects and maximum stable gain. To investigate these aspects, real ear insertion gain (REIG), real ear occluded gain (REOG), open loop gain (OLG) and the occlusion effect were measured with human subjects.

Results: The measured differences between these open canal options show that there are clear differences in terms of occlusion, insertion gain and feedback stability. However, as interindividual differences are very large, it is important to understand how these factors inter-relate in obtaining the optimum fitting for an individual patient. Prepared with this information, one can incorporate a structured approach to the open canal BTE selection.

Conclusions: Attending to the individual needs of the hearing instrument wearer is a priority in any hearing instrument fitting. Factors such as the occlusion effect and maximum stable gain, which are very individual to the patient, need to be addressed with little compromise. Open fit BTEs, with their variety of technology and coupling options, enable audiologists to fulfill individual needs. The optimum selection of the best fitting option is a valuable tool in maximizing benefit and achieving patient satisfaction.

O052

Patient preferences for direct hearing aid provision by a private dispenser. A discrete choice experiment.

Grutters, J.P.C., Joore, M.A., Kessels, A., Anteunis, L.J.C.

University Hospital Maastricht, Maastricht

Background: In Europe there is increasing attention to the safety and efficiency of direct hearing aid provision by private dispensers, as it may save costs and decrease patient waits. Besides issues of safety and efficiency, it is important to consider patient preferences, since those may differ from the preferences of professionals and policy makers. Our objective was to elicit patient preferences for transferring elements of hearing aid provision from the medical sector to private dispensers.

Methods: A discrete choice experiment was used. Choice sets were based on five elements of hearing aid provision: performer of the initial assessment to distinguish between patients indicated for medical assessment and clients, accuracy of the initial assessment, time from initial assessment to approval of the hearing aid (duration), follow-up at the ENT-specialist to evaluate the hearing aid, and savings. Interviews were conducted face-to-face with persons with hearing complaints visiting a hearing aid dispenser.

Results: Overall, participants (n=147) preferred the initial assessment at the dispenser, more accuracy, shorter duration, and a follow-up at the ENT-specialist. They required compensation of at least € 17 per two months extra duration, € 54 for an initial assessment at the ENT-specialist, € 119 per 10% decrease in accuracy and € 227 to forgo the follow-up at the ENT-specialist. Older participants and participants who had previous experience with hearing aid provision preferred the initial assessment at the dispenser more strongly.

Conclusions: Hearing-impaired persons are receptive to transferring elements of hearing aid provision from the medical sector to private dispensers. They prefer an initial assessment at a private dispenser when the dispenser is at least 95% as accurate as the ENT-specialist, and prefer a follow-up visit at the ENT-specialist.

O053

Assessing the safety and efficiency of direct hearing aid provision by a private hearing aid dispenser: setting the research agenda

Joore, M.A. (1), Grutters, J.P.C. (1), Stokroos, R.J. (1), van der Horst, F. (2), Verschuure, J. (3), Dreschler, W.A. (4), Anteunis, L.J.C. (1)

(1) University Hospital Maastricht, Maastricht

(2) Maastricht University, Maastricht

(3) Erasmus Medical Center, Rotterdam

(4) Academic Medical Center, Amsterdam

Background: The ageing of the population predicts that the prevalence of hearing impairment and, as a result, the health care costs associated with hearing rehabilitation and patient waits, will continue to increase.

In Europe this has resulted in increasing attention to the safety and efficiency of direct hearing aid provision by private hearing aid dispensers. Our objective was to model the long-term consequences of direct hearing aid provision instead of by referral for a best case scenario and a worst case scenario, and to set the research agenda for the evaluation of direct hearing aid provision by private dispensers.

Methods: A Markov model was constructed with health states regarding hearing aid use, pathology (acoustic neuroma, chronic otitis media, otosclerosis and psychosocial problems), and whether pathology was detected or undetected. The cycle length of the model was one year. Transition probabilities were derived from published literature and from a multi-centre prospective evaluation study. The model outputs were missed pathology, quality of the hearing aid, health-related quality of life, survival, and cost-effectiveness. Probabilistic sensitivity analyses were performed to test parameter uncertainty. Expected value of perfect information analyses were used to support decisions regarding the investment in further research.

Results: The model calculates the cost-effectiveness margins of direct hearing aid provision by private dispensers. It also calculates whether future research is needed and for which parameters future research would be most valuable. Results will be available at the time of the congress.

Conclusions: We will be able to give insight in the safety and efficiency of direct hearing aid provision by private hearing aid dispensers. We can also conclude for which parameters further research is most valuable, and use this information to set the research agenda on direct hearing aid provision.

O056

Measuring the perception of soft sounds in tinnitus patients with hyperacusis using the Oldenburg loudness scaling

Dauman, R., Grugel, L.

Clinique des Acouphènes, Unité d'Audiologie, Service ORL Centre Hospitalier Universitaire de Bordeaux, Université Victor Segalen Bordeaux 2, France

Background: Even though audiological research progresses constantly, knowledge about loudness perception disorders is still limited. Until now there is neither consensus on the terminology describing hyperacusis, i.e. unusual tolerance to ordinary sounds, nor exists an internationally reliable instrument for measuring the impact of the pathology. The aim of the present study was to analyze whether the Oldenburg loudness scaling can be used to measure hyperacusis in a more precise way.

Hypotheses: Patients suffering from hyperacusis are supposed to judge sounds on a verbal scale other than normal hearing persons even for soft sounds.

Subjects and Methods: Of all patients of the tinnitus clinic of Bordeaux complaining about hyperacusis 8 persons have been recruted to take part in the study. The control group comprised 8 normal hearing persons. Additionally to the Oldenburg Loudness Scaling all persons have been assessed using tonal audiometry, the Multiple Activity Scale for Hyperacusis (MASH), measurement of unconfortable level and a French version of the Geräuschüberempfindlichkeitsfragebogen (GÜF).

Statistical Methodes: The data have been analyzed comparing the mean values of the thresholds for all levels.

Results: In almost each test situation, the mean thresholds for soft sounds of the hyperacusis group are lower than the thresholds of the control group. This corroborates the hypothesis disposed.

Keywords: loudness perception disorder, hyperacusis, psychoacoustic measurement, Oldenburg loudness scaling

O054

Hearing disorders in musicians

de Laat, J.A.P.M., Jansen, E.J.M., Neerings, M., Dreschler, W.A.

Dept. Audiology, Leiden University Medical Center, Leiden & Dept. Audiology, Academic Medical Center, Amsterdam

Exposition to loud sounds can cause hearing damage. In studies of Kähäri 74% of professional musicians demonstrated hear-ing problems, such as hearing loss, tinnitus, hyperacusis, distortion of sound, and diplacusis. It seems that average sound pres-sure levels of music have become higher and higher last decades, which can be the cause of greater number of hearing prob-lems in musicians even attended by unfitness for work.

In The Netherlands the department of social affairs, the board of almost all professional symphony orchestras and the union of musicians concluded a treaty to improve a) information about hearing problems due to loud sounds, b) screening and preven-tion of hearing problems in musicians, c) hearing protection, and d) rehabilitation of hearing impairment in musicians. In the framework of this treaty we performed a study to the hearing capacity of 259 musicians who are members of five professional symphony orchestras in Amsterdam, The Hague and Arnhem. In this study we combined results of questionnaires and tone and speech audiometry in quiet and in noise with auditory filtering, tinnitus analysis, loudness scaling and oto-acoustic emission measurements to gain more insight into individual sensitivity to hearing damage due to exposition to loud music.

The results of this study (ref. Jansen) show that a lot of the musicians participating in our experiments complain about their hearing which is associated with the outcome of the measurements, less with tone audiometry, but more with loudness scaling and tinnitus analysis. Oto-acoustic emission measurements appear to be of great significance. We are now performing con-tinuation measurements looking to the possible predictive value of OAE's with respect to regular audiometry.

Hearing assessment of classical orchestral musicians. Kahari KR, Axelsson A, Hellstrom PA, Zachau G. Scand.Audiol. 2001; 30(1):13-23.

Assessment of hearing and hearing disorders in rock/jazz musicians. Kähäri K, Zachau G, Eklöf M, Sandsjö L, Möller C. Int.J.Audiol. 2003; 42(5): 279-288.

De status van het gehoor van musici van vijf symphonieorkesten. Jansen EJM, Neerings M, De Laat JAPM, Dreschler WA. 2006; http://www.orkestengehoor.nl/achtergrond/downloads/gehooronderzoekrapportage.nl.pdf

O055

Musicians and music-induced hearing disorders

Arlinger, S.

Linköping University, Linköping, Sweden

Musicians, sound technicians and several other occupational groups within the music and entertainment industry are special with regard to hearing, since normal auditory function is essential for their professional activities. A hearing disorder may have devastating consequences for their continued professional life. Prevention of hearing disorders is therefore of fundamental importance. This report is based on a literature review regarding hearing disorders among musicians and other professionals in the music industry.

Risks for hearing loss has been assessed both through studies of temporary hearing loss, TTS, and permanent loss, PTS. Equivalent sound pressure levels in the range 90-95 dB during a single concert typically give rise to TTS of 5 dB or more. Most studies show no or small differences in PTS among musicians compared to relevant reference data bases after control for age. Tinnitus and hyperacusis are reported significantly more often among musicians than in reference groups. Use of hearing protectors, choice and placement of electro-acoustic equipment, design of room acoustics, and use of acoustic screens are means that may reduce the risk for hearing disorders.

P14

Changes in hearing of music students - repeated advanced measurements

Svensson, E.B., Lindblad, A.-C.

Technical and Experimental Audiology, Karolinska Institutet, Stockholm, Sweden

Musicians are extremely dependent on good hearing, and are also more at risk to become hearing-impaired than many others. It is therefore desirable to identify early signs of inner ear damage to prevent further development of a hearing impairment.

In a noise susceptibility project among Swedish conscripts the group of musicians was identified as especially affected. In a follow-up study connections were established with the Royal College of Music in Stockholm, Sweden. Recurrent measurements on a number of students were therefore added to the project.

It is worth mentioning that musicians and frequent music listeners often experience hearing problems such as hyperacusis and/or tinnitus without increased threshold. Such symptoms may originate from small lesions in the inner ear. Among students at the Royal College of Music in Stockholm, as many as 50% consider they have some type of hearing problems.

The hearing of 23 students at the Royal College of Music was measured once a year during a three-year period, starting during their first year at college. The test battery of measurements consisted of otoacoustic emissions such as transient evoked otoacoustic emissions with and without contralateral noise, distortion product otoacoustic emissions and spontaneous otoacoustic emissions. Furthermore, hearing thresholds with high accuracy, thresholds for brief tones in intensity-modulated noise, Hagerman's sentences in noise and forward masking were measured.

In addition the students filled in a questionnaire at each test occasion including questions about for example perceived hearing problems and amount of practice time.

P15

EEG activity while listening to piano music with and without out-of tune tones – a study on musicians

Oswald, S., Epler,T., Emmerich, E., Huonker (*), R., Richter, F.

Institute of Neurophysiology and (*) Biomagnetic Center Klinikum of the Friedrich Schiller University Jena

The level of human EEG activity depends on the afferent inputs and the processing of sensory stimuli. Here we investigated the effects of single out-of-tune tones in well-known music pieces on the activity in spontaneous EEG while listening to the music. We supposed that differences exist in the auditory processing of musical stimuli in musicians versus non-musicians that could be reflected in different alterations of the levels of EEG activity.

The experiments were performed in 10 normal hearing non-musicians (aged 18-30 years) and in 16 normal hearing musicians (aged 25-41 years). With a questionnaire, we asked for the instruments the musicians played, the duration of daily practise and the duration of playing in the orchestra. The auditory stimuli were piano pieces. In the pieces only single tones were out-of-tune. The music was presented via two active loudspeakers at 70 dB SPL. We recorded the electrocardiogram (Wilson, V1, V2). The EEG was recorded from 28 channels (Brain Products GmbH, Munich) for 10 minutes while the music was played. We analyzed the EEG by FFT (Brain Analyzer, Brain Products GmbH, Munich).

First results showed significantly changed levels in EEG activity towards higher frequencies in musicians, when out-of-tune tones were presented in the piano piece. In non-musicians the EEG activity was unchanged and they were unable to tell whether they had heard dissonant tones. We conclude therefore that musicians are trained to percept and to process musical signals in a more specific manner than non-musicians. This information is relevant to assess hearing ability in musicians.

Lopez,L.; Jurgens,R.; Diekmann,V.; Becker,W.; Ried,S.; Grozinger,B.; Erne,S.N. Musicians versus nonmusicians. A neurophysiological approach Ann N Y Acad Sci. 2003 Nov; 999: 124-30.

Lütkenhöner B, Seither-Preisler A, Seither S. Piano tones evoke stronger magnetic fields than pure tones or noise, both in musicians and non-musicians. Neuroimage. 2006 Apr 15;30(3):927-37. Epub 2005 Dec 6.

Münte,T.F.; Schuppert,M.; Johannes,S.; Wieringa,B.M.; Kohlmetz,C.; Altenmüller,E., 1998
Brain potentials in patients with music perception deficits: evidence for an early locus Neurosci.Lett., 256/2 pp 85-88

P16

Effects of exposure at UMTS electromagnetic field on human hearing

Sliwinska-Kowalska, M. (1), Zmyslony, M. (1), Politanski, P. (1), Bak, M. (1), Kotylo, P. (1),

Woznicka, E. (1), Thuroczy, G. (2), Ravazzani, P. (3)

(1) Department of Physical Hazards, Nofer Institute of Occupational Medicine, Lodz, Poland

(2) National Centre of Public Health “Fredesic Joiliot-Curie”, National Research Institute for

Radiobiology and Radiohygiene, Budapest, Hungary

(3) Instituto di Ingegneria Biomedica, Consiglio Nazionale delle Ricerche, Milano, Italy

e-mail: marsliw@imp.lodz.pl

In the last decade the European public concern was growing on the potential adverse health effects due to the use of mobile phones. Universal Mobile Telecommunications System (UMTS) is an advanced technology that differs from GSM in frequencies and patterns used (about 2 versus 0,9-1,8 GHz and code-division multiple access SDMA versus time-division multiple access TDMA). This study is a part of the European exploratory project on the potential health effects of UMTS phones on the hearing system.

Forty young volunteers (20 males and 20 females), aged from 18 to 30, with normal hearing were recruited. Their better ear was tested with pure-tone audiometry (2-dB steps), distortion product otoacoustic emission (DPOAE; DP-gram and I/O function at 2 and 4 kHz), click-evoked auditory brainstem response (ABR), contralateral suppression of transientevoked otoacoustic emission (CAS effect on TEOAE), and cognitive event related potential - wave P-300. Audiometric evaluation was performed before and after 20 min. exposure to real-life-like mobile phone activation (Nokia 6650).

Crude analysis of the data did not reveal statistically significant differences between the two test parameters in any of audiometric tests.

Acknowledgment

The study was supported by the project “Exposure at UMTS electromagnetic fields: study on potential adverse effects on hearing” (EMFNEAR), under the programme 2003-2008

Improving information and knowledge for the development of public health; agreement No 2004127; Coordinator Paolo Ravazzani.

O057

Experience of newborn screening for deafness in slovenia

Vatovec, J., Geczy, B., Gros, A.

Medical Centre Ljubljana, Slovenia

Background: an active approach of health service and professional expert teams is a prerequisite for early hearing loss detection. Newborn hearing screening has been shown to provide effective and cost-effective means of identification. It is the first step in early intervention programs.

Methods: in Slovenia neonatal hearing screening started in 1999, first in neonatal intensive care units. There are 14 maternity hospitals with altogether 17.500 births per year. Since 2005 hospital-based universal newborn hearing screening in all maternity hospitals was accepted. Further hearing evaluation of infants is done in three audiology units. The treatment of deaf children by cochlear implantation is performed in one centre on Univ. Dept. of Otorhinolaringology in Ljubljana.

Results: in seven year period there were 383 infants who failed neonatal hearing screening reported to audiology division of Univ. Dept. of Otorhinolaryngology in Ljubljana. Out of them 40 (10.44 %) did not come to further diagnostic procedure. Deafness was confirmed in 61 infants but not all of them were implanted.

Conclusions: a newborn hearing screening based on whole population can deliver satisfactory outcomes in terms of age referral, identification and intervention. There is certain amount of infants who were lost to follow-up. Challenges arise in ensuring the elaboration of consciousness through the promotion of information to the babies mothers.

O058

UNHS program – preliminary results in Romania

Georgescu, M., Pascu, A.

Institute of Phono-Audiology and E.N.T. Functional SurgeryBucharest, ROMANIA

Background: Bilateral congenital permanent hearing loss has a high incidence in general population (1.3-3.1/1000 live newborns). This handicap is invisible in first couple of years, which urges for early active diagnosis and intervention.

Methods: Our National pilot program started in 2006 in three public newborns facilities.

Target population was all alive newborns from these hospitals (between March and December 2006).

Screening Program consists of two steps:

• automatic TEOAE and ABR for full-term healthy newborns in day 3 and 3 days before maternity ward discharge for newborns who needed longer hospitalization;

• second test session (ATEOAE and AABR) for referred newborns in step I.

For infants with referred result in both steps of screening follows objective audiologic session.

Results: We tested 8801 (87.05%) newborns in 10 months of UNHS from 10110 alive newborns in three public facilities.

Among them 94 (4.04%) refer in first screening step and 11 (0.12%) refer in second step too. 4 infants (0.45‰) missed follow-up since they didn't come for objective audiologic investigations.

From 7 infants investigated by objective audiologic methods (impedancemetry, TEOAE and DP OAE, ABR and ASSR) in Institute of Phono-Audiology and E.N.T. Functional Surgery 6 (0.68‰) are hearing impaired and 1 (0.11‰) has auditory dis-syncrony.

Conclusions: First results of UNHS program consisted in early diagnosis of congenital hearing loss in infants 3-6 months old and fitting appropriate hearing aids in 3 (37.5%) of them.

We consider our protocol of UNHS reliable since fals positive and fals negative rates are similar with those reported in literature.

We concentrate our efforts in enlargement of UNHS pilot program in more public newborns facilities, since we consider very useful to diagnose and treat hearing impaired infants, the only condition which allows normal verbal development.

1. Grandori F, Lutman ME, Neonatal hearing screening programmes in Europe. Towards a consensus on good practice. Audiology (Guest Editorial) March 1996, pp 1-4.
2. Kemp DT, Stimulated Acoustic emissions from the human auditory system. J. Acous. Soc. Am. 1978; 64: 1386-91.
3. White KR, Vohr BR, Behrens TR, Universal newborn hearing screening using transient otoacoustic emissions: results of the Rhode Island Hearing Assessment project. Semin Hearing 1993; 14: 18-29
4. WHO: Forty-eighth world health assembly WHA 48.9, agenda 18.2, 22 May 1995

O059

Universal neonatal screening in Poznañ

Sekula, A., Obrêbowski, A., Hashimoto, A., Jackowska, J.

Medical University of Poznañ

Since autumn 2002, The Program of Universal Neonatal Hearing Screening UNHS has been in place in Poland. It includes 3 diagnostic level. The first one takes place in all neonatological wards in Poland. Over 98% of newborns are examined. Over 50 audiological care clinics organize the second level of the Program. Babies are examined during ambulatory or 1-day hospitalization. About 3 month old babies enter the second level of the Program. The third level has the aim to reconstruct the hearing threshold on ABR data, early fitting of hearing aid (before the 6 months) and beginning of rehabilitation. When the profound hearing loss is diagnosed, the qualifications for cochlear implants are started. The UNHS Program has been initiated and partly sponsored by Great Orchestra of Christmas Charity Foundation.

THE AIM: The aim of this study was to show our findings of hearing in babies examined in the Department of Phoniatrics and Audiology in Poznan. All the babies were examined by The Universal Newborn Hearing Screening Program during 2002 - 2006 as a second and third level.

MATERIALS: 2100 babies have been admitted to the Department of Phoniatrics and Audiology. They were referred from neonatological wards with refer results or because of risk factors of hearing loss in the anamnesis. The methods of audiological examinations were: DPOAE, impedance audiometry and ABR.

RESULTS: 2766 of DPOAE tests, 1536 of ABR tests and 960 impedance audiometry were done. Children were divided into 2 groups: 1. with pass result in DPOAE, without risk factors of hearing disorder in anamnesis 2. with refer result or with risk factors of hearing disorder.

Babies from the second group had the impedance audiometry and ABR tests done (cross check principle) to state the hearing threshold and define the type of hearing loss .

8,7% babies had the hearing aid fitted. 2,6% children were qualified to Cochlear Implants Program and 1,1% children underwent the cochlear implant surgery before the second year of their lives. The particularly results of the hearing screening examinations were analyzed in 2006 in 410 children. Binaural conductive hypoacusis was diagnosed in 16%, unilateral perceptive hearing loss in 7% and bilateral perceptive hearing loss in 7% of examined children. In 68% of children examined od 2nd level of Newborn Screening the hypoacusis wasn't confirm.

O060

Validity of threshold estimation obtained with the VRA method "VideoVRA"

Kjærbøl, E.

Bispebjerg Hospital, Department of Audiology, 2400 Copenhagen NV, Denmark

BACKGROUND: The Visual Reinforcement Audiometry (VRA) method "VideoVRA" developed at Bispebjerg Hospital has been used at our department since mid 2001. VideoVRA utilizes short video sequences as reinforcement and includes a fully automated algorithm for threshold estimation. The method was presented at NHS 2002 and 2006.

MATERIAL: Threshold estimation has been performed on at least 1600 children. A total of 110 children in this group have been fitted with a hearing instrument. Of these 110 children, 52 have reached an age where it has been possible to check the threshold estimation obtained with the VideoVRA method, by proper Audiometry. Of these 52 children, at least 34 had results with both VideoVRA and proper Audiometry without any signs of OME (Otitis Media with Effusion) at the time of either measurement.

METHOD: The VideoVRA system consists of a PC with 1 to 3 screens connected. The PC controls an audiometer. A footswitch connected to the PC is used for controlling the test. The video material used for reinforcement can be either mpeg-files or DVDs. The VRA test can be administered either manually or automatically. The build-in threshold estimation algorithm administers the automatic test. The results presented in this paper have been obtained using the automatic threshold estimation algorithm.

RESULTS/CONCLUSION: Results will be presented at the conference.

The VideoVRA method is a valuable measurement method to evaluate the hearing status of small children from about 8-42 months of age.

VideoVRA is a good test as part of the "Cross-check principle" which says:

"Agreement among all components of the test battery, both electrophysiological and behavioural, is necessary for the formulation of a clinical impression regarding the infant's hearing status".

Using the flexibility of the system by changing the type of reinforcement increases the performance of the system.

O061

Peripheral and Central Hearing Disorders in Persons with Intellectual Disability

Neumann, K. (1), Hey, C. (1), Koseki, J. (1), Baumann, U. (2), Hild, U. (3), Hoth, S. (4), Herer, G. (5), Janssen, T. (6), Montgomery, J. (7), Hoffmann, E. (8), Ludwig, A. (9), Rübsamen, R. (9)

(1) Clinic for Phoniatrics and Pediatric Audiology

(2) Ear, Nose and Throat Clinic, University of Frankfurt, Germany

(3) Faculty of Medicine, University of Utrecht, The Netherlands

(4) Ear Nose and Throat Clinic, University of Heidelberg, Germany

(5) Children's Hearing and Speech Center, Children's National Medical Center, Washington, DC, USA

(6) Ear, Nose and Throat Clinic, Technical University of Munich, Germany

(7) School of Education, Chapman University, Orange, CA, USA 8University of Applied Sciences Aalen, Germany

(9) Faculty of Biosciences, Pharmacy and Biology, University of Leipzig, Germany

Background/Aims: Persons with intellectual disability are at an increased risk for hearing impairment. During the 2004 German Special Olympics Summer Games 38.0% of 755 athletes with an intellectual disability failed a hearing screening. 32.8% were assumed to have a permanent hearing loss. These percentages exceed those from the international Special Oympics database (30.9% fails) and those of the 2005 World Winter Games (20.5% assumed threshold hearing loss). Thus, data replication and a more exact assessment of the auditory status of people with intellectual disability including a distinction between peripheral and central part of a detected hearing disorder are required.

Methods: During the 2006 German Special Olympics Summer Games 542 intellectually disabled athletes received a hearing screening including otoscopy, measurement of otoacoustic emission, and optionally tympanometry and pure tone audiometry. 20 athletes completed a test battery of discrimination thresholds for frequencies, tone amplitude modulation, and tone duration with both interaural and dichotic protocols.

Results: Even under improved sound protecting conditions 22.7% of the tested athletes were assumed to have a permanent hearing loss. All 20 athletes who received tests for central auditory processing had higher than normal thresholds for tone duration, 15 for amplitude modulation, and 14 of 19 for frequency discrimination in the dichotic protocol reflecting a considerable proportion of central auditory processing disorders in this population.

Conclusion: International standards for regular audiological assessment, observation, and treatment of the hearing disorders in this disadvantaged minority are required.

P17

Follow up of neonatal screened babies

Spindler, M.

General Hospital Maribor

Our hospital covers a region of about 320 000 inhabitants and we have about 2000 newborn infants per year. We are doing the universal neonatal screening for seven years.In last three years 99,3 % of newborn babies were screened The second stage of screening is made at ENT department. From beginning of 2000 to the end of 2006 we tested 158 babies, those with unilateral (45) or bilateral negative OAE (86) and those with positive OAE (27) and risk factors.

From those 158 babies tested, 15 had conductive loss. We found 11 deaf babies and 4 with a mild hearing loss. In a large group of 86 babies with bilateral negative OAE we found a normal value of ABR in 71 babies. The rest of them (15) had a mild to moderate hearing loss, but after a month the ABR was normal. Parents of all 86 babies got information how to observe hearing. 90 % of them were retested at one year and they had normal OAE and normal ABR. We wanted to follow their hearing later. But only 40 % of them came for testing. For the rest of them we made a statistic about visiting the ENT doctor, prescribing hearing aid and about visiting Center for hearing and speech. It was possible because in our region children are treated in two institutions only, hearing aids are prescribed on one place only and all children that have problems with hearing and speech are treated at one place. We found no permanent hearing loss in this group but also not by children that pass the neonatal screening. Was it coincidence, luck or interest on hearing with neonatal screening, information for parents, early intervention?

P18

Frequency-specific assessment of hearing loss in newborns and infants by means of extrapolated DPOAE I/O-functions

Haszprunar, B., Niedermeyer, H., Janssen, T.

Technical University Munich

DPOAEs provide frequency-specific and quantitative information about hearing disorders. When using extrapolated DPOAE I/O-functions cochlear hearing thresholds can be estimated (Boege and Janssen 2002) and presented in the form of an audiogram (Janssen et al. 2006). The purpose of the present study was to investigate the test-performance and the efficacy of the novel method in newborn hearing-screening and pediatric audiometry.

DPOAE I/O-functions (L2 = 15 to 65 dB SPL) were measured between 1.5 and 6 kHz. DPOAE-audiograms (derived from the extrapolated DPOAE I/O-functions) were obtained in 100 newborns (195 ears) within the early post-natal period (mean age 2.5 days) and in 148 children (296 ears) aged between 0.5 to 15 years. Measurements were done using a hand-held system (Cochlea-Scan, Fischer-Zoth).

In the newborns, the estimated hearing threshold was 12.7 dB for the right ear and 14.6 dB for the left ear on average across test-frequencies. Mean thresholds lowered with increasing age (1 day: 15.4 dB; 2 days: 14.4 dB; 3 days: 14.3 dB; > 3 days: 9.4 dB); this may be due to residual amniotic fluid and vernix. In some newborns a discrepancy between ATEOAE findings and DPOAE-audiograms was observed. In the pediatric group the difference between estimated and behavioural thresholds decreased with increasing age from 40 to 3 dB on average. Measuring time for establishing an DPOAE-audiogram took up from two to ten minutes depending on the hearing loss.

The findings suggest the novel method to be a suitable tool in “refer” babys and high-risk newborns in hearing-screening programs, as well for assessing cochlear hearing loss in pediatric audiometry. The method is able to assess hearing loss more precisely than behavioural audiometry or TEOAEs and ABRs. Within a short time and without sedative a maximum of information about the hearing loss can be achieved.

Boege P, Janssen T (2002) Pure-tone threshold estimation from extrapolated distortion product otoacoustic emission I/O-functions in normal and cochlear hearing loss ears. J Acoust Soc Am 111(4):1810-1818

Janssen T, Niedermeyer HP, Arnold W (2006) Diagnostics of the Cochlear Amplifier by Means of Distortion Product Otoacoustic Emissions. Otorhinolaryngol 68:334-339

P19

Implementation of a Universal Newborn Hearing Screening programme in existing health services/ a pilot project in the Tyrol

Nekahm-Heis, D. (1), Hirst-Stadlmann, A. (1), Oberaigner, W. (2), Stephan, K. (1)

(1) Dept. of Hearing, Speech and Voice Disorders, Medical University Innsbruck, Austria

(2) Institute of Clinical Epidemiology, TILAK, Innsbruck, Austria

Background: The Austrian Universal Newborn Hearing Screening (UNHS) programme, a nursery based two stage OAE-screening, was promoted by a position paper of the Austrian ENT-society in 1995. A centralized tracking of babies who failed the UNHS was not yet available.

Aim of the study: In order to improve efficiency and quality of the follow-up process, a tracking programme based on an already established database was developed in the Tyrol (10 regional hospitals participating).

Methods: The basic data set includes general information on all deliveries in the region as well as specific NHS results, registered anonymously at the Institute of Clinical Epidemiology, which also serves as the central tracking institution (CTI) for hearing screening. The UNHS result is entered in the database record by the professionals performing the screening test in each hospital and is transferred to the CTI. Information on children who did not undergo the screening or who had a 'fail' result is delivered back to each participating hospital quarterly by the CTI on an anonymous record. Information about the result of the follow-up is reported subsequently to the CTI and added to the database.

Results: The programme was implemented 2004 in all Tyrolean nurseries. Up to now, about 17000 births were documented: 91.6 % of the babies passed the UNHS. 1.1 % had a 'fail' result, for 7.3 % no result was documented in the central database.

Conclusion and consequences: Regular information on the current status of the programme provides a great advantage in achieving an early intervention in case of hearing loss. In order to improve efficiency of documentation, regular training and improvement of motivation of the professionals involved in UNHS has to be extended. The 7.3% records without documentation remain a challenge for future work.

O062

The effects of contralateral stimulation on DPOAE fine structure

Mauermann, M., Kollmeier, B.

Universität Oldenburg, Medizinische Physik

The activity of the medial olivocochlear efferents is assumed to be detectable by measuring the change of the level of distortion product otoacoustic emissions (DPOAE) during ipsilateral or contralateral acoustic stimulation (CAS), the so-called medial olivocochlear reflex (MOCR). The reliable detection of the MOCR is of some interest since the absence of MOCR could give an indicator for vulnerable ears. However, the DPOAE level changes according to CAS show a broad range of variability. This variability may suggest a complex interaction of the effects due to MOCR with the two sources/mechanisms of DPOAE generation. Such an interaction would make the correct interpretation of DPOAE level changes at isolated frequencies during CAS rather difficult. The interaction of the two DPOAE sources is reflected in the characteristics of DPOAE fine structure (DP-gram over a broader frequency range with high frequency resolution). Therefore, in the current study we investigated the influence of CAS on DPOAE fine structure. This approach may allow a more detailed interpretation in respect of the value of DPOAE level changes as MOCR indicator than previous studies.

DPOAE fine structures were measured with and without CAS for different primary and suppressor levels using (a) a "classical" frequency discrete DPOAE paradigm (highest frequency resolution: 3 Hz) and (b) continuously sweeping primary frequencies for an improved frequency resolution and reduced measurement duration.

Across the most frequencies CAS causes a reduction of DPOAE level. Most subjects show a slight shift of DPOAE fine structure towards higher frequencies during CAS. Around sharp DPOAE fine structure minima this leads to a strong "pseudo" enhancement or suppression of DPOAE level for some isolated frequencies.

Overall, the current findings suggest that DPOAE level changes at isolated frequencies are a rather arbitrary and inadequate indicator for the reliable detection and quantification of the MOCR. Alternatives will be discussed.

This study was supported by Deutsche Forschungsgemeinschaft, DFG KO 942/18-1.

O063

Ear asymmetries and sex differences in neonatal TEOAEs

Berninger, E.

Karolinska Institutet, Karolinska University Hospital

Background/aims: the aim of this study was to analyse TEOAEs obtained from more than 30,000 newborns that passed universal hearing screening during a six-year period, to study ear asymmetries and sex effects, specifically in the frequency domain.

Methods: this bedside, universal, screening approach was based on TEOAEs that were recorded in the non-linear mode with ILO 288 (Otodynamics Ltd.) using an electrically constant stimulus. A Matlab program was developed for retrieving data from the TEOAE files generated by ILO 288. This program was also used for computing levels in non-overlapping half-octave frequency bands, geometrically centred at 707, 1,000, 1,414, 2,000, 2,828, and 4,000 Hz.

Results: highly significant mean lateral asymmetries (right > left) and sex differences (female > male) existed in entire TEOAE level (n=60,431), S/N TEOAE, and in half-octave frequency bands (700-4,000 Hz). Mean lateral and sex entire TEOAE level differences were 1.1 dB and 1.3 dB, respectively. At high frequencies, the sex effect exceeded the ear effect. Stimulus levels were not affected by ear or sex.

Conclusions: highly significant ear asymmetries and sex differences existed in TEOAEs, thus reflecting physiological differences at the level of organ of Corti, at birth. The effect of sex exceeded the ear effect at high frequencies, and inter-aural TEOAE level differences in half-octaves centred between 1,414 and 2,828 Hz were significantly larger in males.

O064

Fast detection of ABR- responses using neural synchronization stability and single sweep analysis

Corona-Strauss, F. (1), Delb, W. (1), Strauss, D. J. (2)

(1) University of Saarland

(2) University of Applied Science, Saarbrücken

Background: The evaluation of auditory brainstem responses (ABRs) is accepted to be one of the most reliable methods for the objective diagnosis and quantification of hearing loss in newborns. However, in currently available devices, a large number of sweeps has to be used to obtain a meaningful signal at low stimulation levels. Due to the time consuming averaging procedure which requires the state of spontaneous sleep, sedation, or even narcosis of the newborns, the detection of ABR thresholds can only be used at the last stage of area-wide universal newborn hearing screening programs. Consequently there is a need for expensive follow up systems increasing their implementation cost significantly and thus making their realization impossible in many cases. The solution would be the detection of ABR threshold in the first screening stage by a very fast detection algorithm.

Methods: 30 normal hearing children (mean age 5;9 years) were included in the study. Brainstem evoked potentials were obtained at a stimulation level of 30 dB HL (ISI 64ms) as well as for a no stimulation condition. 250 single sweeps were obtained from right ear stimulation in each subject.

Results: In all subjects the synchronization stability (Strauss et al. 2004, 2005) as a measure of stability of the response from sweep to sweep was larger in the stimulated condition as compared to the non stimulated condition. Also the synchronization stability was significantly (Wilcoxon test) higher in the stimulated as compared to the non stimulated condition.

Conclusion: Even at the challenging stimulation level of 30 dB HL the synchronization stability allowed for the dicrimination of the stimulated from the non stimulated condition. Using the synchronization stability a reliable discrimination between the stimulated and the non stimulated condition can be made after 250 sweeps. Due to inter-subject variation, even better results can be obtained by combining the synchronization stability with a artificial learning algorithm such as the kernel based novelty detection.

It is concluded that the proposed method might be used for the ultra-fast detection of hearing thresholds and is thus ideally suited for universal hearing screening programs.

O065

Auditory Evoked Responses and the Threshold of Hearing

Lütkenhöner, B.

Münster University Hospital, ENT Clinic

An important clinical application of Auditory Evoked Responses is the estimation of frequency-specific electrophysiological thresholds. However, electrophysiological thresholds and pure-tone behavioral thresholds differ in several respects so that comparisons between the two types of thresholds may be similar to comparing apples and oranges (Elberling and Don, 2007). Here, we report three studies that have been done with the goal of learning more about auditory evoked responses at very low sound levels, well below the range considered in routine clinical investigations. In a first study (Lütkenhöner and Klein, 2007), we investigated wave N100m of the auditory evoked field (AEF). The stimulus was a 1-kHz tone with an effective duration of about 110 ms. Up to 10 dB above the behavioral threshold, the level was varied in steps of 2 dB. The N100m amplitude increased roughly linearly with the dB value (thus, as a logarithmic function of intensity). Such a nonlinear behavior is contradictory to the view that the auditory system is linear in the low-intensity limit. Moreover, it implies the existence of a sensory threshold, which would be inconsistent with signal detection theory. This seeming contradiction was resolved in the second, theoretical study, in which the mean firing rate of all fibers in the auditory nerve was simulated. The model suggests a smooth transition between proportionality with intensity (at extremely low intensities) and linear growth with level, as observed in the AEF experiment. First evidence of the predicted proportionality with intensity was obtained in the third study, in which the Auditory Brainstem Response (ABR) to Gaussian-shaped 4-kHz tone pulses was investigated.

Elberling C, Don M (2007) Detecting and assessing synchronous neural activity in the temporal domain (SNR, response detection). In: Auditory Evoked Potentials. Basic Principles and Clinical Applications. (Burkard RF, Eggermont JJ, Don M, eds), pp 102-123. Philadelphia: Lippincott Williams & Wilkins.

Lütkenhöner B and Klein J.S. (2007) Auditory evoked field at threshold. Hearing Res. (in press)

O066

Comparison of response thresholds derived from auditory steady state responses (ASSRs), tone pip-evoked auditory brainstem response (ABR) and click-evoked ABR with respect to their suitability for hearing aid fitting in small children

Koseki, J.-C., Neumann, K.

Klinik für Phoniatrie und Pädaudiologie der Johann Wolfgang Goethe Universität Frankfurt am Main

The ASSRs has found its application in fitting of infants and small children with hearing aides. In a comparison study we investigated ASSRs estimated audiogram and tone pip-evoked ABR with respect to ease of evaluation and measurement duration. We examined 94 children (age 1 to 106 months) with click-evoked ABR, ASSRs and tone pip-evoked ABR with the GSI Audera device. First we found the individual means of thresholds in four frequencies (0.5, 1, 2 and 4 kHz) by tone pip-evoked ABR and of values in same frequencies from ASSRs estimated audiogram and correlated these to the thresholds of click-evoked ABR. Second we analysed the discrepancy of ASSRs and tone pip-evoked ABR results from single frequencies to the mean of the four frequencies in the same individual. A significant correlation between the click-evoked ABR thresholds to threshold means of tone pip-evoked ABR and for value means of ASSRs was found. By analysing the discrepancy from single thresholds of tone pipe-evoked ABR to the mean of the corresponding four frequencies, we found considerable differences. The 0.5 kHz thresholds from tone pip-evoked ABR were significantly below the average in normal hearing and mild hearing loss but had better congruency in higher hearing loss. The single frequency results from ASSRs compared with the mean of the corresponding four frequencies had considerable discrepancy in mild to moderate hearing loss. There was no tendency which frequency was affected or whether the results were over- or underestimated. Conclusion: We cannot recommend ASSRs measurement to serve as the only basis for hearing aid fitting in small children and infants, because there is no predictable tendency to over- or underestimation of results in mild to moderate hearing loss.

P20

Calibration effects on optimal stimulus paradigms for measurement of distortion product otoacoustic emissions in humans

Oswald, J., Kandzia, F., Janssen, T.

Technische Universität München, Munich

Distortion product otoacoustic emissions (DPOAEs) and therefrom derived input/output (I/O) functions suffer from an interindividual variability in humans. This poster describes calibration effects on optimal primary tone settings.

Assumption: The optimal path in the primary tone level space (L1, L2 space) using a ear simulator based calibration method (ECCC) is notably less frequency dependent compared to in the ear (ITE) calibration. Basing on ITE, the optimal path is similar to the scissor's paradigm (Kummer et al., 2000), but differs notably when using a different calibration method.

Method: DPOAEs were measured in 13 normal hearing humans at test frequencies f2 = 1, 2, 3, 4, 6 and 8 kHz with fixed frequency ratio f2/f1 =1.2. The combinations of primary tone levels L1 and L2 differed whereas L2 reached from 25 to 75 dB SPL in steps of 10 dB and L1 varied in steps of 3 dB in a vast range in order to record individually maximal levels of DPOAE in L1, L2 space. Basing on the same data, the optimal primary tone settings were determined individually and in mean dependent on ECCC and ITE.

Result: Using ECCC, the optimal path over all subjects and frequencies was L1=0.5 L2 +39 [dB SPL]. Using ITE, the optimal path was L1,ITE = 0.5 L2,ITE + 42 or L1,ITE = 0.42 L2,ITE +44 [dB SPL] when restricted to stimulus levels L2< 65 dB SPL like in comparable studies in literature.

Conclusion: With regard to the whole frequency range, individually optimized stimulus paradigms basing on ECCC differed less than optimal stimulus paradigms basing on ITE. The instrument used for measurment must also be taken into account together with the used calibration method, in order to apply a general, optimal stimulus paradigm for eliciting DPOAEs.

Lodwig A (1997): Ein System zur Anpassung von Hörgeräten: Meßtechnik, patientenbezogene Modellierung, Optimierung der Komponenten. Dissertation, Ruhr-Universität Bochum, Fakultät für Elektrotechnik.

Kummer P, Janssen T, Hulin P, Arnold W (2000): Optimal L1-L2 primary tone level separation remains independent of test frequency in humans. Hearing Research, 146 (1): 47-56.

Whitehead ML, Stagner BB, Lonsbury-Martin BL, Martin GK (1995): Effects of ear-canal standing waves on measurements of distortion-product otoacoustic emissions. J. Acoust. Soc. Am., 98 (6): 3200-3214.

P21

Application of ABRs elicited by tone pips in diagnosis of retrocochlear hearing loss

Kochanek, K (1), Orkan-£êcka, E. (2), Durrant, J. D. (3), Œliwa, L. (1), Skar¿yñski, H. (1)

(1) Institute of Physiology and Pathology of Hearing, Warsaw, Poland

(2) ENT Department of the Medical University of Warsaw, Poland

(3) Department of Communication Science and Disorders, University of Pittsburgh, U.S.A.

The purpose of this study was to assess the sensitivity and specificity of a test of ABR elicited by short tone-pips, compared to test results using click-evoked ABRs, in the application to retrocochlear hearing loss diagnosis.

The group of subjects examined included patients with acoustic neuroma and cerebello-pontine angle tumours. Two methods of eliciting the ABRs were used: the standard click-ABR method and the ABR Tone method. For the latter, the stimuli were tone-pips of Gaussian envelopes. In the test measurement parameter was the latency of wave V and the inter-aural latency difference – IT5, both referred to the respective mean values observed in a normal control group and group of subjects with cochlear hearing loss.

The sensitivity of ABR Tone method was better than that of standard ABR method for all tone pips. The combinations of indices gave, for all the stimuli concerned, an improvement of sensitivity (up to 100%) over the sensitivity with single indices.

It is concluded that ABRs evoked by tone-pips of relatively long rise times offer greater sensitivity in detecting changes in the cochlear nerve and the brainstem than the sensitivity achievable when a click is used as the stimulus.

P22

Stochastic resonance on the intensity of DPOAE's

Tóth, F., Nagy, A. L., Vajtai, R.*, Gingl, Z.*, Rovó, L., Jóri, J., Kiss, J. G.

University of Szeged, Department of Otorhinolaryngology, Head and Neck Surgery, *Department of Experimental Physics, Szeged, Hungary

Many normal-hearing people show a threshold fine structure, i.e. a ripple effect in their hearing threshold of up to 15 dB. There are strong indications in the literature that fine structure may be a measure for cochlear vulnerability. Therefore a method for detecting fine structure may be relevant (1) for further investigating the nature of fine structure and (2) as a tool in the field of clinical diagnostics. In general, current methods are very time consuming and lack a thorough testing. In this study a FINE-Structure Screening (FINESS) method is presented which is an improved version of the procedure that was introduced on last year's DGA and ICAud conferences. The procedure FINESS measures the threshold with a high frequency resolution. The duration is kept short by using a tracking procedure and controlling the repetitions of a measurement in a flexible way. An automatic detector („FINESS-detector") identifies regions exhibiting fine structure, thus providing an objective measure of fine structure for an easier comparison of fine structure data between clinics and labs. The method has been tested on 20 subjects by performing test–retest measurements and comparing the measured thresholds to thresholds obtained by a psychoacoustical standard procedure, i.e. an adaptive alternative forced choice (AFC) procedure. The results show that (1) the thresholds can be measured with a high reproducibility (correlation of 0.9 between test–retest data), (2) fine structure is accurately measured (correlation of 0.9 between FINESS and AFC results) and (3) there is no trend due to potential bias effects with respect to the absolute thresholds across frequency. The average measurement time is just above 10 minutes per octave. In conclusion, the FINESS procedure together with the FINESS-detector provides a fast, reliable and user friendly method for the detection of threshold fine structure.

O067

Prosody perception in cochlear implant recipients wearing a hearing aid in the contralateral ear.

Landwehr, M., Pyschny, V., Walger, M., von Wedel, H., Meister, H.

Jean Uhrmacher Institute for Clinical ENT-Research, University of Cologne and University ENT-Hospital Cologne

Information in speech is carried mainly by phonetic segments like vowels, diphthongs, and consonants. In addition to phonetic segments information is also transmitted by prosodic cues like stress, tempo, rhythm, and intonation. Cochlear implants (CI) and hearing aids (HA) are not able to convey prosodic features without information loss. CI-patients are mostly able to recognize temporal changes but have difficulties to discriminate spectral changes, especially the contour of the fundamental frequency (F0). Hearing aids are able to transmit low frequency information such as F0 and additionally improve the recognition of spectral changes. Thus bimodal fitting utilizes residual acoustic hearing in the low frequencies for better place coding and might improve the perception of prosodic cues.

The present study investigates prosody perception of cochlear implant recipients who are using their hearing aid on the non-implanted ear. Prosody perception was examined by employing a prosody-testbatterie (see presentation H. Meister) with focus on intonation and stress for five conditions: CI alone, HA alone, CI plus HA (CIHA), CIHA with filtered stimuli where fundamental frequency has been removed and CIHA with filtered stimuli where frequencies up to the third harmonic have been removed. Five postlingually deafened CI-patients with bimodal fitting participated in the study.

Results of the prosody-testbatterie revealed a range of different response patterns in the five conditions that will be discussed further by means of individual parameters such as speech processing strategies, and results of a loudness scaling test.

O068

Acoustical frequency discrimination and speech perception in noise in EAS implanted ears

Baumann, U., Helbig, S., Gstöttner, W.

Johann Wolfgang Goethe Universität Frankfurt/Zentrum f. HNO-Heilkunde

Objectives: The results of a recently published study with speech in noise stimuli delivered to a model with simulated cochlear implant speech processing and presented to normal hearing ears have shown, that the addition of low-frequency pitch cues can remarkably improve speech recognition in noise (Chang et al., 2006). A brain-based mechanism is assumed that uses the voice pitch cue in the low-frequency sound to first segregate the target voice from the competing voice and then to group appropriate temporal envelope cues in the target voice for robust speech recognition under realistic listening situations. It is presumed, that this mechanism is responsible for the highly synergistic effects seen in combined electric and acoustic stimulation (EAS, Gstöttner et al., 2006). Therefore, a degradation of speech in noise performance of EAS-implantees has to be expected if the mapping of small frequency deviations is damaged.

Methods: Frequency discrimination of implantees using combined electric and acoustic stimulation (EAS) was assessed by means of an adaptive procedure with a two-interval forced choice paradigm. The ears contra-lateral to the implanted side as well as ears of non-implanted patients with severe high frequency sloping hearing loss were tested additionally to collect reference data. EAS patients and candidates with sensorineural hearing loss (SNHL) were recruited from the clinical program. EAS patients received either the MED-EL standard electrode or the recently introduced FLEX design with reduced diameter. Speech perception in noise was tested by means of the HSM sentence test (Schmidt et al., 1997).

Results: JNDF ranged from close to normal to grossly abnormal in either the EAS or the SNHL listeners. The median JNDF was 7.1% in the SNHL and 7.5% in the EAS group. There was no statistically significant difference in terms of JNDF between both groups of listeners. Currently, the so far obtained results show no correlation between speech perception in noise and JNDF.

Conclusion: Preliminary findings demonstrate that the insertion of an intra-cochlear electrode does not significantly hamper the average frequency discrimination ability in EAS patients.

Chang, J.E., Bai, J.Y., Zeng, F.G. (2006) Unintelligible low-frequency sound enhances simulated cochlear-implant speech recognition in noise. IEEE Trans. Biomed. Eng. 53:2598-2601
Gstöttner, W., Helbig, S., Maier, N., Kiefer, J., Radeloff, A., Adunka, O. (2006) Ipsilateral electric acoustic stimulation of the auditory system: results of long-term hearing preservation. Audiol. Neurootol. 11:49-56
Schmidt, M., Hochmair-Desoyer, I., Schulz, E., Moser, L. (1997) Der HSM-Satztest. In: Wille, P. (ed) Fortschritte der Akustik - DAGA '97, Oldenburg, DEGA e.V., pp 93-94

O069

Partial Deafness Cochlear Implantation: Outcomes with the DUETPartial Deafness Cochlear Implantation: Outcomes with the DUETPartial Deafness Cochlear Implantation: Outcomes with the DUET

Lorens, A., Polak, M., Piotrowska, A., Skar¿yñski, H.

International Center of Hearing and Speech of the Institute of Physiology and Pathology of Hearing, Warsaw, Poland

International Center of Hearing and Speech of the Institute of Physiology and Pathology of Hearing, Warsaw, Poland

Recently, Partial Deafness Cochlear Implantation (PDCI) subjects implanted at our center were upgraded with the DUET Hearing System (Combined Electric and Acoustic Stimulation device) from MEDEL. The objectives of this study were to identify a speech test performance with the DUET and to find the type of PDCI subjects benefiting from the DUET.

12 PDCI adults with at least 3 months of experience with their cochlear implant (CI) and hearing aid (HA) participated in this study. Subjects were tested with the monosyllable word and sentence tests in quiet and in noise in the conditions DUET, CI Only, DUET HA Only and Best Aided (DUET plus contralateral hearing). Subjective opinions were obtained from each subject. For each condition, optimized fitting parameters were used.

Mean score of speech tests showed best results in the condition Best Aided and the DUET. The poorest results were in the condition DUET HA Only. An exact area of audiograms for subjects benefiting from the DUET will be presented. Subjects who previously wore an HA in addition to their CI indicated an increased comfort with the DUET.

Majority PDCI subjects do benefit from the DUET not only in noisy, but also in quiet conditions.

H. Skarzynski, A. Lorens, A. Piotrowska; Partial deafness cochlear implantation provides benefit to a new population of individuals with hearing loss; Acta Otolaryngologica, 2006; 126; 934-40

O070

Increasing Frequency Intervals Improves Melody Recognition in Cochlear Implant Users

Digeser, F., Hast, A., Wesarg, T., Hessel, H., Hoppe, U.

HNO Klinik, Universität Erlangen-Nürnberg, Erlangen

Background: Music perception is a well known problem for most of the cochlear implant users [1]. Usually, limiting factors are melody and timbre recognition whereas rhythm can be identified satisfactorily [2, 3]. The aim of this study was to investigate the melody recognition of known melodies presented with increased distance between the notes and to relate the performance to the results of a frequency discrimination task.

Methods: Ten cochlear implant subjects and five normal hearing volunteers were investigated.

Each subject was asked to choose 10 out of a repertory of 23 nursery songs with a maximum of six different tones. Melodies were presented as a sequence of sinus tones in four different conditions. Besides the original version, the songs were played in three different frequency spread (FS) conditions: FS1: musical intervals were stretched by a factor of 4. A semi-tone step in a tune becomes a step of four semitones, a major third. FS2: An artificial octave was created within a pitch range from 130.8 Hz to 3500 Hz. FS3: each note of the song is played in a separate octave. Rhythm only was investigated as a fifth condition. In a second experiment, the rhythm information was excluded from all four conditions. In a third experiment, frequency discrimination was determined using a 2AFC algorithm. Frequency steps were 1/4 tones in five frequency ranges (200Hz, 500Hz, 1kHz, 2kHz, 4kHz).

Results: Normal hearing subjects and cochlear implant patients exhibited large inter-individual differences. While some of the patients were able to identify songs in all conditions others only judged on the basis of rhythm. Most of the patients exhibited best results in the frequency spread conditions exceeding their personal frequency discrimination abilities. However, no clear preference was observed.

Conclusions: These results indicate that music perception might be increased on the basis of individually adopted frequency allocations.

[1] Gfeller K., Turner C., Mehr M., Woodworth G., Fearn R., Knutson J.F., Witt S., Stordahl J. 2002. Recognition of familiar melodies by adult cochlear implant recipients and normal-hearing adults. Cochlear Implants International 3(1), 29-53.
[2] Kong Y.-Y., Cruz R., Ackland Jones J., Zeng F.-G. 2004. Music perception with temporal cues in acoustic and electric hearing. Ear & Hearing 25:2, 173-185.
[3] Laneau J., Wouters J., Moonen M. 2006. Improved music perception with explicit pitch coding in cochlear implants. Audiol Neurotol 11, 38-52.
lecture

O071

Music Perception with the Double Electrode Mode in the Nucleus Freedom CI System

Büchler, M., Lai, W., Dillier, N.

University Hospital Zurich, ENT Dept, CH-8091 Zurich, Switzerland

The Nucleus Freedom CI System offers the possibility to stimulate two adjacent electrodes simultaneously, resulting in 22 real and 21 virtual electrodes, and a total of 43 channels. It was shown by Busby and Plant (2005) that the stimulation of the virtual electrodes evokes a different pitch perception than the stimulation of the corresponding single electrodes alone. However, it was not clear if a processing strategy that is based on virtual channels will give better representation of the signal, especially in terms of pitch perception. The aim of the present study was therefore to test music perception of a 43 channel versus the standard 22 channel map.

Method: Four adult CI users took part in the study. First, the procedure after Busby and Plant (2005) was carried out, that is, pitch ranking tasks were done on electrode level. All subjects were able to rank most electrodes correctly; only on the basal side, some (real and virtual) electrodes could not be resolved for some of the subjects. Next, a 43 channel map was programmed on a research processor, and the subjects had to listen to this map at home for one to two weeks, to compare the quality of music to the quality when using the standard map. After this, pitch ranking of complex tones and an instrument recognition test were carried out in the lab for the 43 channel and the standard maps.

Results and conclusion: With the 43 channel map, pitch and timbre perception were not significantly improved, compared to the standard 22 channel map. Also, the standard map was subjectively preferred. Thus, even if pitch ranking on electrode level was mostly correct with virtual electrodes, a coding strategy based on this principle did not give much benefit.

Busby, P. A., and Plant, K. L. (2005).

O072

Cochlear Implantation as a treatment for unilateral deafness associated with ipsilateral tinnitus: a case study

Büchner, A., Lesinski-Schiedat, A., Battmer, R.D., Khajehnouri, Y., Lenarz T.

Medical University of Hannover, Department of Otolaryngology, Hannover, Germany

Of the overall population, 10 to 30% suffer from chronic tinnitus and the percentage is significantly higher in the population of deafened people. Still, no universal cure is available today. Several treatments, such as retraining or masking, are based on acoustic input. Therefore, those treatments do not succeed in subjects who are deaf in the affected ear. However, tinnitus suppression utilizing electrical stimulation of the auditory nerve has been reported to be successful by various research groups.

Therefore, a study with five subjects was initiated to investigate whether cochlear implantation is an appropriate treatment for unilateral deafness associated with ipsilateral tinnitus. The HiRes90K implant offers several features that may be beneficial when combining acoustic and electrical stimulation. A high update rate allows detailed transmission of the sound information in the time domain. This may help to increase the acceptance of the cochlear implant sound quality the particular patient group. Further increase of the sound quality may be given by the new feature of current steering technique. Current steering increases the number of stimulation sites beyond the number of electrode contacts allowing increasing the fidelity even further.

At this time, two subjects are enrolled, one of them implanted in October 2006. The implanted subject reports reduced strain from his tinnitus and is able to follow audiobooks through his implant. In everyday life he relies on his normal hearing ear which results in only little training of the implanted ear compared to regular cochlear implant subjects. Speech perception tests show benefit from the cochlear implant, however, the scores are lower than known from regular users.

Results of the effect of the electrical stimulation on tinnitus as well as data on the regained hearing with respect to speech perception in noise and directional hearing will be presented

P23

Voice discrimination by cochlear implant users

Pyschny, V., Weber, J., Walger, M., von Wedel, H., Meister, H.

Jean Uhrmacher Institute for Clinical ENT–Research, University of Cologne and University ENT-Hospital Cologne

The voice of an individual is an important attribute. Vocal characteristics contribute to differences that help to distinguish one speaker from another. The fundamental frequency (F0), which corresponds to perceived voice pitch, and the vocal tract (VT), which can be described in terms of formant frequencies, are two important measures for voice classification.

A very basic separation of different voices is reflected by the recognition of the speaker gender. Normal-hearing (NH) persons are usually able to identify the speaker gender. In contrast, cochlear implant (CI) patients do not typically have access to the rich spectral and temporal information available to NH listeners and might thus have difficulties to make a decision about the voice gender.

In order to examine the underlying cues F0 and the length of VT respectively were manipulated and it was tested which changes can be recognized. Manipulations were performed using ‘Praat’ (Boersma et al. 1996) according to a paradigm given in Darwin et al. 2003.

The poster describes the methods used and gives preliminary results for voice gender identification and discrimination for both, CI recipients and normal hearing subjects.

Boersma, P., Weenink, D. (1996): Praat, a system for doing Phonetics by Computer, version 4.4.22. Institute of Phonetic Sciences, University of Amsterdam; www.praag.org.
Darwin, C. J., Brungart, D.S., Simpson, B. D. (2003): Effects of fundamental frequency and vocal-tract length changes on attention to one of two simultaneous talkers. J. Acoust. Soc. Am. 114 (5), 2913 – 2922.
Fu, Q.-J., et al (2005): Voice Gender identification by cochlear implant users: The role of spectral and temporal resolution. J. Acoust. Soc. Am. 118 (3), 1711 – 1718.

P24

Pitch discrimination for different musical instruments with cochlear implant simulations

Haumann, S., Mühler, R., Ziese, M., von Specht, H.

Experimental Audiology, Otto-von-Guericke-University, Magdeburg, Germany

Aim: People with Cochlear Implants (CI) often report difficulties in listening to music. One reason is a limited perception of pitch and timbre. In this study the performance on discrimination of musical pitch with cochlear implants is investigated by simulations of CI.

Method: In a psychophysical experiment the difference limen for musical pitch discrimination were determined with stimuli processed by sine-excited vocoders which were presented to 20 normal hearing subjects. Unprocessed stimuli were presented to a normal hearing control group. Three notes were presented in a 3AFC-paradigm with one note higher than the other notes which should be identified by the subjects. To investigate the influence of the instrumental family pure tones and complex tones of seven instruments (clarinet, piano, trumpet, violin, celesta, harpsichord and guitar) in two octaves and additional pure tones were used. The acoustic stimuli were generated with a MIDI-synthesizer and presented in free field.

Results: Averaged over the octaves the mean of the determined difference limen was for pure tones (1.5 semitones) significant lower than for piano (2.9 semitones), guitar (2.5 semitones), harpsichord and trumpet (both 2.2 semitones). The limen of the other instruments were 1.9 semitones (violin) and 1.7 semitones (celesta and clarinet). The limen determined in the lower octave (2.4 semitones) were significant higher than the limen of the upper octave (1.7 semitones). The determined limen varied substantially between the subjects. The difference limen determined with unprocessed stimuli were mostly at the lower limit of the experiment at one semitone and therewith clearly lower than the limen determined with the processed stimuli.

Conclusion: The results show that the perception of musical pitch with processed stimuli is different for various instruments and altogether worse than with unprocessed stimuli. The time-frequency analysis of the acoustic and electric stimuli suggests that the number and the distribution of the harmonics and the attack of a tone influence the pitch perception.

P25

Pitch Ranking of Complex Tones using a Model of the Virtual Channels in the Nucleus Freedom System

Omran, S.A. (1, 2), Büchler, M. (1), Lai, W. (1), Dillier, N. (1)

(1) University Hospital Zurich, ENT Dept, CH-8091 Zurich, Switzerland

(2) Institute of Neuroinformatics, CH-8057 Zurich, Switzerland

Introduction: Nucleus Cochlear Implant (CI) devices provide 22 intracochlear stimulation electrodes which can be used as 22 stimulation channels. There are physical limitations preventing a substantial increase in the number of stimulation electrodes although theoretically a higher number of stimulation channels are expected to improve music notes discrimination. One way to do this in spite of the physical constraints of currently available electrode arrays would be to use Virtual Channels (VC). These are channels formed by stimulating two adjacent electrodes simultaneously. It was shown in [1] that VC stimulation can result in the perception of an intermediate frequency between adjacent electrodes.

Methods: VCs increase the number of available stimulation channels from 22 to 43. In this study, frequency discrimination for 43 and 22 channels using an Acoustic Model (AM) was measured. The degree of adjacent music notes discrimination is measured through a pitch ranking test using complex tones. The test involves a set of music notes separated by 6, 4 or 2 semitones respectively. Adjacent pairs of notes are presented to the subject who then has to indicate which note sounded higher in pitch. This test compares the subjects' ability to discriminate notes on a musical scale using 43 and 22 channels. The sounds were presented to Normal Hearing (NH) subjects after pre-processing them with an AM.

Discussion: Testing is currently in progress and the final results will be presented at the conference. It is expected that if the ability to discriminate music notes increases using 43 channels, this would be due to an increase in frequency representation that is beneficial for music appreciation. These tests with NH subjects are carried out to obtain an estimate of potential improvements in complex tone discrimination using VC instead of standard stimulation channels. The same tests will be applied to CI users subsequently.

This work was supported by research grant Nr. 32-110043/1 from the Swiss National Science Foundation.

[1] Busby, P. A., and Plant, K. L. (2005) “Dual electrode stimulation using the nucleus CI24RE cochlear implant: electrode impedance and pitch ranking studies,” Ear and Hearing 26(5), 504-511

O073

Children With Complex Needs : Cochlear Implant Candidates and Users

Herrmannova, D.

Several epidemiological studies on children with permanent hearing loss confirm that as many as one in three have another disability. Despite an initial reluctance to implant children with significant other disabilities, there is now a growing worldwide trend to offer CI to these children in order to promote their development of auditory perception, communication, psychomotor development, cognitive abilities, social skills, to enhance their educational opportunities and to facilitate their integration in the hearing world. In CI programme in the CR we already have several implanted children who suffer from a range of handicaps in addition to their hearing impairment.

Selection of children with other disabilities for CI requires a rigorous selection process. One important criterion is the level of family support available to the child so as to ensure compliance with the additional demands of rehabilitation. However, some of our children are placed in institutions and do not have any family support and we developed a special programme to meet their needs.

The rehabilitation programme should be flexible and be tailored to the needs of the individual child. In order to set realistic expectations parents and care-givers need skilled counseling with transfer of pertinent information. The impact of the additional disability can vary considerably; for instance, a paralysis or amputation may seriously limit sign language acquisition. Measures of success for these children should extend beyond the narrow domains of hearing and language assessments but should also encompass consideration of their autonomy, life quality and opportunities for wider involvement in the hearing world.

The presentation will focus on assessment, rehabilitation strategies and communication development on CI children with complex needs with video examples of CI complex needs cases.

O074

Risk factors of auditory neuropathy / auditory synaptopathy in children

Beutner, D., Foerst, A., Lang-Roth, R., von Wedel, H., Hüttenbrink, K-B., Walger, M.

Department of Otorhinolaryngology, Head and Neck Surgery Cologne

Background: The diagnosis of auditory neuropathy/ auditory synaptopathy (AN/ AS) is often delayed and cannot made in universal hearing screening programs based only on TEOAEs. The aim of this study is to describe risk factors in AN/ AS in order to reveal patients based on an ABR and TEOAE screening early.

Methods: Between 1997 and 2005 we diagnosed thirty-seven children with AN / AS. They underwent a critical chart review for risk factors and etiological coincidences in this idiosyncratic disorder.

Results: This study explores a multitude of risk factors in thirtyseven children with AN / AS. Eighteen neonates had a history of prematurity and low birth weight. Hyperbilirubinemia was present in thirteen children. Three patients had evidence of infection during pregnancy, and AN / AS was associated with complex syndromal diseases in two cases. A congenital, familial pattern was seen in two siblings. Seven patients had idiopathic AN / AS.

Conclusion: Rather than being a single etiological entity, AN / AS comprises a spectrum of risk factors and associated problems affecting the cochlea and the auditory pathway. This study shows that the majority of AN / AS in children is the result of perinatal problems and is not genetic in origin. Hyperbilirubinemia is a common and etiologically significant finding in infants suffering from AN / AS. Thus, early hearing screening for AN / AS including TEOAEs and ABR assessment among neonates having risk factors for AN / AS is crucial in order to better manage patients suffering from this disorder.

O075

Die phonologische Informationsverarbeitung bei hörbeeinträchtigten Kindern

Stumpf, P., Coninx, F.

Institut für Audiopädagogik an der Universität zu Köln

Hintergrund und Fragestellung: Die Bereiche phonologische Bewusstheit, auditiv- rezeptives Kurzzeitgedächtnis, phonologisches Langzeit- und Arbeitsgedächtnis sind Prädiktoren von Lese- Rechtschreibleistungen von Kindern. Keine Studie im deutschen Sprachraum befasste sich bislang im Kontext des Lesenlernens bei hörgeschädigten Kindern mit dieser Thematik.

Probanden und Methode: Es wurde ein Testverfahren, die Solinger Erfassung der phonologischen Informationsverarbeitung (SEPI) konstruiert, vorab erprobt und innerhalb einer Basisstudie mit hörgeschädigten Kindern der Regelschule und Förderschule Hören, die monolingual deutsch und primär lautsprachlich erzogen und einen Hörverlust von mindestens 50 dB aufweisen, eingesetzt. Die Erfassung der Leseleistungen und Unterscheidung entlang des Versorgungszeitpunkts ermöglichten dabei zusätzliche Ergebnisse.

Ergebnisse: Die Kinder der Förderschule fielen durch anhaltend signifikant schlechtere Leistungen im Bereich der phonologischen Bewusstheit auf, was sich in den Leseleistungen niederschlug. Die hörgeschädigten Kinder der Regelschule unterschieden sich lediglich im Bereich Wortschatz signifikant von der hörunauffälligen Peer, während die Kinder der Förderschule in allen erfassten Bereichen signifikant schlechter leisteten. Diese Kinder zeichnen sich vor allem durch sehr gute Leistungen im Bereich der Koordination verschiedener Gedächtnisprozesse aus.

Schlussfolgerungen: Die empirische Untersuchung belegt die Notwendigkeit einer expliziten Förderung hörgeschädigter Kinder nicht nur im Bereich der phonologischen Bewusstheit, sondern auch der Gedächtnisleistungen bereits vor dem Eintritt in die Schule.

O076

Vestibulo-cochlear symptoms due to large vestibular aquaeduct syndrome in children

Passou, E. (1), Gavalas, G. (1), Maroudias, N. (2), Xenelis, I. (3)

(1) Dept of Audiology/Neurotology of Henry Dunant Hospital, Athens, Greece

(2) ENT- Dept of Agia Olga Hospital, Athens, Greece

(3) University ENT – Clinic of Athens, Greece

Large vestibular aquaeduct syndrome (LVAS) constitutes a rare but important nosological entity, responsible for balance disorders and/or cochlear symptoms in childhood.

The aetiology of this syndrome is related to deformity of the vestibular aquaeduct, acquired or genetic (syndromic or not). This occurs because the vestibular aquaeduct continues to develop after birth and reaches its final J-like shape at the age of 3 – 4 years. An enlarged vestibular aquaeduct, leads to propagation of intracranial pressure waves to the perilymphatic space, resulting to SN hearing loss and vertigo.

In other cases (e.g. X – linked anomaly with stapes gusher), the hearing loss seems to be of the mixed type.

Our material was based on five cases of LVAS, diagnosed the last five years. The patients' age varied between 4 and 18 years. Three of them were females and two were males. The localisation of the syndrome was bilateral.

In one of the cases, the hearing loss was moderate and in the other four cases it was modurate to profound.

In two of the cases, the vestibular disorder was manifested as recurrent vertigo attacks, in one as recurrent unsteadiness and in another as positional vertigo. One of the cases did not show any balance disorders.

In this study, we will present the audio-vestibular and laboratory findings and we will discuss the diagnostic procedure and the treatment possibilities.

P26

Clinical findings and imaging in large endolymphatic duct and sac syndrome

Bartel-Friedrich, S., Amaya, B., Rasinski, C., Kösling, S.

Martin-Luther-University Halle-Wittenberg, Halle/S.

Objectives: Large endolymphatic duct and sac syndrome (LEDS) is known the most common kind of radiologically detectable inner ear malformations (IEM). However, LEDS is relatively unknown among general radiologists and audiologists. Therefore, we evaluated the incidence of LEDS in the own patient population and aimed to present our experiences regarding imaging findings, clinical presentation and follow-up.

Methods: Based on complete recordings of all patients, indicated and sent from ENT department to radiology between 1994 and 2002, we identified all radiologically diagnosed cases of IEM including LEDS and all patients, in whom an IEM was clinically suspected. The retrospective study included clinical data, HR-CT and MRI.

Results: Among 169 patients, 17 patients (median age: 12 years, 12 females) and 28 ears, respectively, had LEDS. In 10 patients (6%; 15 ears), no other IEM were detected, called isolated LEDS, seven patients showed additional IEM. Audiometric data at time of imaging revealed sensorineural hearing loss (HL) in 21 ears (eight ears with additional conductive com-ponent), deafness in 6 ears and normal hearing in 1 ear of 28 ears. In 26 ears with LEDS (two ears with unknown course excluded) seventeen ears showed progressive (P) or fluctuating progressive (FP) HL (ten -71%- of 14 ears with isolated LEDS) and 9 ears showed constant HL (four ears with isolated LEDS). Seven of 11 patients with P-HL or FP-HL had partly repeated sudden HL (eleven ears of 17 ears; seven with isolated LEDS). A trigger for worsening of hearing was found in 6 patients. A correlation between the severity of morphological changes on imaging and the degree of HL could not be detected. Only five young patients underwent imaging within two years after onset of HL. Three patients received a CI.

Conclusion: LEDS might be an underestimated cause of P-HL or FP-HL and repeated sudden HL in children and young adults. Early imaging plays an important role in ensuring the diagnosis

P27

What is 'normal hearing' in paediatric audiometry?

Campbell, P.E.

Audiology Division, Speech and Hearing Science Department, Queen Margaret University, Edinburgh, UK

OBJECTIVE: Reference data for paediatric audiometry urgently needs to be reviewed. International standards for air conduction (AC) audiometry in the conventional range of 0.25-8 kHz, for age groups below 18 years does not exist.

DESIGN: We present pure-tone air-conduction audiometry results from 90 normal children aged 4 to 17 years. The complete frequency range of 0.25 to 20 kHz was measured, and a number of different questions were raised.

RESULTS: Firstly, the hearing threshold in the conventional frequency range was compared to the international standard ISO 389. Significant differences from ISO zero were found for all groups at all frequencies between 0.25 to 8 kHz. Secondly, in the extra-high-frequency range, (9-20 kHz) sensitivity between groups was compared and a systematic decrease in sensitivity was found for the older group (11-17 years) compared to the younger group (5-10 years) children at frequencies higher than 14 kHz. Finally our data suggests that auditory thresholds should be analysed to account for potential ear and gender differences.

CONCLUSIONS: We conclude that normative data for various age groups should be used as a reference level until a general standard can be adopted.

P28

Clinical application of the Cochlea Scan for Hearing Threshold Estimation in Children

Knief, A., Schmidt, C.-M., Deuster, D., am Zehnhoff-Dinnesen, A.

Department of Phoniatrics and Pediatric Audiology, University Hospital of Münster, Westfälische Wilhelms-University Münster

Background: The growth function of distortion product otoacoustic emissions offers the possibility to estimate ear and frequency specific hearing thresholds in children. With the Cochlea Scan (Fischer-Zoth/Natus) a portable device for clinical measurements is commercially available. Its application was tested on a group of newborns, infants and children.

Methods: 95 children in the age from 7 days to 11.7 years (63 male, 32 female), mean age 5 y ± 4 m were examined. We performed Cochlea Scan measurements in the frequencies 1.5, 2, 3, 4, and 6 kHz and, dependent on age and individual development, sound-field or air conduction audiometry. Thresholds of Cochlea Scan and pure tone audiometry were compared with the Wilcoxon signed rank test. By using the analysis of variance (ANOVA) it was tested if frequency was an influencing factor of thresholds.

Results: Compared to sound-field audiometry, Cochlea Scan estimated significantly better thresholds at 2, 3, 4, and 6 kHz (Wilcoxon, $p<0.02$). Air conduction audiometry provided significantly better thresholds than Cochlea Scan at 1.5, 2, and 3 kHz and significantly worse thresholds at 6 kHz. Only Cochlea Scan thresholds showed frequency-dependency (ANOVA, $F=42.86$, $p<0.001$): The significantly highest mean Cochlea Scan threshold of 22 dB was found at 2 kHz, the significantly lowest mean threshold of 6 dB was found at 6 kHz.

Conclusion: Despite the unexpected variation of thresholds with frequency (lowest threshold at highest frequency), Cochlea Scan provides a valuable tool to measure peripheral hearing thresholds in newborns, infants and young children. Using Cochlea Scan to measure the cochlear function age independently, side-specifically and frequency-specifically is superior to sound-field audiometry. Nevertheless we have to keep in mind that middle ear pathologies can influence the results, hearing loss can only be estimated up to 50dB, and supracochlear damage cannot be ruled out by otoacoustic emission measurements.

P29

Does fluctuating conductive hearing loss affect children's phonological development in the early ages?

Stålnacke, H. (1), van Doorn, J. (2), Czigler, P. E. (1)

(1) Örebro University, Sweden

(2) Umeå University, Sweden

Background: One complication of acute otitis media is middle ear effusion, resulting in fluctuating conductive hearing loss. Fluctuating conductive hearing loss has been found to affect children's phonological development. From a developmental perspective, the difference between child and adult word productions is described in terms of phonological processes. However, a complete phonological analysis should include not only generative but also non-linear phonological analysis, i.e. a description of the child's phonology per se, including word and syllable shapes, and phoneme inventory. A complete phonological analysis of otitis-prone children is justified for two reasons: (1) early identification of children at risk of needing intervention, and (2) identification of additional phonological processes specific to fluctuating hearing loss, for differential diagnosis purposes. This paper presents the first stage of an extended, longitudinal study of phonological development of Swedish otitis-prone children.

Method: Four otitis-prone children, two 2,5 and two 3,5 years old, were selected from a larger sample. Speech samples, containing maximally 104 words per child, were elicited by standardized picture naming tasks. The full section of the data collection was recorded. The speech samples were narrowly transcribed, and analyzed with both a non-linear and a generative phonological approach.

Results: The analyses showed that word- and syllable shapes, phoneme inventories, and occurrences of whole word and segment substitution processes for the four children were within age-normal range of phonological development.

Conclusions: The finding that phonological development for these four children was within normal limits raises several questions. For instance, were the results influenced by the sampling procedure, or the kindergartens' pedagogical programme, that is designed to stimulate language development? Moreover, fluctuating hearing loss might affect phonological development more noticeably if other causes of delayed phonological development are also present, or might affect other aspects, or other stages, than those investigated.

P30

Diagnosis of secretory otitis media in otherwise healthy infant as a predicitive value for chronic disease in early childhood

Zupan, L.

ENT Department, General Hospital Celje, Oblakova ulica 5, 3000 Celje, Slovenia

BACKGOUND: Acute otitis media (AOM) and secretory otitis media (SOM) are among the most common diseases in young children. No single screening examination can detect or characterise middle ear effusion (MEE) in infancy. The criteria for selecting children who are particularly at risk and who should be actively followed-up are not established yet. In order to find these infants we conducted a prospective longitudinal study.

METHODS: During performing early hearing interventional programme 75 infants, who had no kraniofacial or neurological abnormalities and sensory deficits, were selected to be diagnosed for SOM. The diagnosis was established on the basis of pneumatic otoscopy and tympanometry. The chidren were distributed into two groups according to the presence of SOM. The following diagnostic tools were performed at the age of two months, one year and three years: ENT examination, pneumatic otoscopy, tympanometry, behavioral or tonal audiometry, transit evoked otoacoustic emissions and questionaire for parents. The data on child's illnesses and speech development were obtained from child's pediatrician.

RESULTS: 44 chidren completed the three-year follow-up: 22 chidren with SOM detected at the age of two months and 22 children without SOM detected. Children from the first group experienced statistically more often AOM and recurrent AOM (21/22, 3/22) than those from second group (9/22, 0/22) ($p<0.05$). At three years mild to moderate conductive hearing loss was detected in 15 children from first and in14 from second group. One child had speech development delay.

CONCLUSIONS: Infants with early onset of SOM are at risk for chronic disease. We have identified age two months as important for detection of SOM. We could not confirm the hypothesis that a history of SOM during the first years of life causes speech and language difficulties. Our results can have substantial impact on designing strategies for prevention and early management of these high risk children.

1. Shekelle P, Takata G, Chan LS, et al.: Diagnosis, Natural History, and Late Effects of Otitis Media With Effusion. Evidence Report/Technology Assessment No. 55. Rockville, MD: Agency for Healthcare Research and Qualitiy; 2003. AHRQ Publication No. 03-E023
2. Zielhuis GA, Rach GH, van den Broek P. Screening for otitis media with effusion in preschool children. Lancet. 1989; 1; 311-314
3. Canadian Task Force on Preventive Health Care. Screening for otitis media with effusion: recommendation statement from the Canadian Task Force on Preventive Health Care. CMAJ. 2001; 165: 1092-1093
4. Marchant CD, Shurin PA, Turcxyk VA, Wasikowski DE, Tutihasi MA, Kinney SE. Course and outcome of otitis media in early infancy; a prospective study. J Pediatr. 1984; 104; 826-831
5. Jaffe BF, Hurtado F, Hurtado E. Tympanometric membrane mobility in the newborn (with seven month's follow-up). Laryngoscope 1970; 30: 36-48
6. Balkany TJ, Berman SA, Simmons MA, Jafek BW. Middle ear effusions in neonates. Laryngoscope 1978; 88: 398-405
7. Rosenfeld RM, Kay D. Natural history of untrated ottits media. Laryngoscope. 2003;113: 1645-1657
8. Teele DW, Klein JO, Rosner BA. Epidemiology of otitis media in children. Ann Otol Rhinol Laryngol Suppl. 1980; 89: 5-6
9. Roberts JE, Zeisel SA, Rosenfeld RM, Reitz P. Otitis media and speech and language: a meta-analysis of prospective studies. Pediatrics. 2004; 113

P31

Basic auditory discrimination in children with auditory processing disorders (APD)

Ludwig, A. (1), Baldauf, J. (2), Kotz, S. (3), Friederici, A. (3), Rübsamen, R. (1)

(1) Faculty of Biosciences, Pharmacy and Psychology, University of Leipzig, Leipzig

(2) Center of Audiology and Phoniatry, Chemnitz

(3) Max-Planck-Institute for Cognitive and Brain Sciences, Leipzig

Auditory processing disorder (APD) is defined as a processing deficit in the auditory modality. Discrimination deficits are observed in multiple auditory processes as stated by the American Speech-Language-Hearing Association (ASHA, 1996). The purpose of the central auditory assessment is to determine whether an auditory processing disorder is present and, if so, to describe its parameters. Still, adequate tests which allow for a differential diagnosis are missing. To date, clinical audiology in the diagnosis of APD is mostly based on utilisation of speech material, which is not sufficient to delineate basic acoustic processing in APD.

In the present study, twenty-two children between 7 and 17 years of age, referred to an audiological clinic for diagnosis of APD, were evaluated with both standard audiologic tests and basic auditory discrimination tests. With our tests processing of the basic acoustic features frequency, level, and duration was investigated at two different stages of the central auditory system: (i) Auditory brainstem processing was evaluated by quantifying the ability for interaural frequency-, intensity-, and signal duration discrimination; (ii) Diencephalic/telencephalic processing was tested by varying the same acoustic parameters (plus signals with sinusoidal amplitude modulation) but presenting the test signals in conjunction with noise pulses to the contralateral ear (dichotic signal/noise stimulation).

Eleven children showed decreased discrimination abilities. Elevated thresholds were found in all tests but most consistently in the dichotic frequency- and in the temporal discrimination tests. From 13 children which were diagnosed with APD in the audiological clinic only six had deficits in basic auditory performance. Still, out of 9 children not diagnosed with APD in five auditory discrimination abilities were significantly reduced. The diagnostic procedure used to evaluate APD (AVWS in Germany) so far seems not to be sufficient to reliably assess central auditory processing and to differentiate pure auditory from higher order processing deficits.

American Speech-Language-Hearing Association, ASHA (1996): Central auditory processing: Current status of research and implications for clinical practice. American Journal of Audiology, 5:41-54

P32

Prediction of speech pereception from the acoustic conditions of unoccupied classrooms

Mora Espino, R. (1), Zenker Castro, F. (2), Rodríguez Jiménez, M.C. (3), Mesa Suárez, J.L. (4), Coello Marrero, A. (4), Barajas de Prat, J.J. (3)

(1) Clínica Barajas

(2) Fundación Dr. Barajas

(3) Universidad de la Laguna

(4) Consejería de Educación, Cultura y Deportes del Gobierno de Canarias

It is well recognized that the acoustical environment in a classroom is an important variable in the psychoeducational achievement of hearing-impaired children. For teens and young adults having normal speech processing in noise, ambient noise levels not exceeding 40 dBA are suggested as acceptable, and reverberation times of about 0.6 s are concluded to be optimum. Hearing-impaired children may require levels of ambient noise and reverberation times as low as only 21.5 dBA and 0.4 s respectively. The purpose of this study was to measure reverberation times, background noise levels and Speech Audibility Index (SAI) values in unoccupied classrooms. Estimations of speech perception were established for simple and complex sentences with familiar and unfamiliar content. In one-third of the classrooms the reverberation times were found to be longer than 0.9 s. at one or more frequencies ranging from 250Hz to 8 kHz. In most of the unoccupied classrooms, the background noise level was 45 dB(A) or less. Most classrooms had SAI values that reflected fair intelligibility, but very few classrooms had SAI values indicating excellent intelligibility. Educational implications of these data, such as acoustical modification of the classroom and/or the utilization of frequency modulation sound field amplification systems, are discussed.

P33

Effects of chronic railway noise exposure on children anxiety levels and emotion responses

Ekin, M.C., Atas, A., Aksoy, S.

Section of Audiology&Speech Pathology, Depart. Of ENT, Faculty of Medicine, Hacettepe University

Backround: Children are vulnerable to the effects of chronic railway noise exposure and also they are in a high-risk group. The aim of the study was to explore effects of chronic railway noise exposure on children's trait-state anxiety and emotion responses.

Method: In this study 400 children aged between 10-14 years attending a school in high railway noise area was compared with children attending one matched control school exposed to no railway noise. Parent form of The Emotion Regulation Checklist, Teacher form of The Emotion Regulation Checklist and State-Trait Anxiety Inventory for Children (STAIC) were administered to the children in the schools.

Results: Parent form of The Emotion Regulation Checklist, Teacher form of The Emotion Regulation Checklist and State-Trait Anxiety Inventory for Children (STAIC) demonstrated significant differences between high and no railway noise exposure conditions.

Conclusion: The results suggest that the high railway noise exposure is effective in trait-state anxiety and emotion regulation areas and offers a new reduced noise option for this kind of schools.

O077

New Standard for the Measurement of Speech Amplification in Modern Hearing Instruments

Vlaming, M. (1), Holube, I. (2)

(1) VU University Medical Center, Amsterdam, NL

(2) HörTech and University of Applied Sciences, Oldenburg, DE

The European Hearing Instrument Manufacturers Association (EHIMA) is preparing a new method for the measurement of speech amplification in modern hearing instruments. Current standards for the measurement of amplification are based on the use of traditional test signals like pure tones, noise, or modulated noise which are not very representative for the amplification of normal speech. Also most hearing instruments require the use of a special test mode in order to bypass the special signal processing for speech signals or noise suppression. The new measurement method will be based on the typical user settings of the hearing instrument. For that the hearing instrument will be programmed using the manufacturer's standard (automatic) fitting procedure. The fitting will be based on an audiogram selected from a new set of standard audiograms and will be typical for the application range of the specific hearing instrument. For making reproducible measurements a new standard speech-like test-signal has been developed. This speech-like test signal will be unintelligible, but representative for the characteristics of most frequent spoken languages. It will be outlined how this signal has been constructed. The measurement method will be based on a third octave analysis of input and output signal for short speech segments. By that it is possible to obtain the dynamic speech amplification for the internal structure of the speech signal. The results of a typical measurement will be shown and discussed. The new procedure is under submission to the IEC and ANSI standardization committees. (Supported by EHIMA).

O078

Evaluation of noise reduction algorithms in hearing aids with the Acceptable Noise Level Test (ANLT)

Schlüter, A., Holube, I., Bitzer, J., Simmer, U., Brand, T.

University of Oldenburg

Commonly, single microphone noise reduction algorithms are evaluated using speech intelligibility tests in noise. The desired result is an improvement of the speech reception threshold (SRT) when activating the noise reduction algorithm. Unfortunately, many studies show no or only minor advantages of the algorithms in the chosen test conditions. One possible explanation of these disappointing results might be the signal-to-noise ratio (SNR). While the SRT is typically located at negative SNRs, noise reduction algorithms seem to work more effectively at positive SNRs. Therefore, we applied a different approach to evaluate the benefit of those algorithms by using the Acceptable Noise Level Test (ANLT).

The ANLT is a two-step procedure. At first, speech in quiet is adjusted to the individual Most Comfortable Level (MCL). In a second step, background noise is added to the speech and adjusted to its individual upper limit of comfort. The ANL is defined as the difference in dB between the subject's MCL for speech in quiet and the adjusted noise level that the subjects rated as acceptable. Results of the ANL range between -2 and 30dB with a mean of 10-11dB.

Based on our investigations, it can be concluded that the ANL is suited to determine the benefit of noise reduction algorithms by comparing the adjusted noise level when activating and deactivating the respective processing. In addition, the results are influenced by changes in sound quality which are introduced by the algorithms themselves. Outcomes of the ANL are being compared to the Oldenburg Sentence Test, the Just Follow Conversation Test (JFC) and subjective paired comparisons.

O079

Verification of the hearing aid output using ecologically valid sounds in the lab (MPOver)

Kiessling, J. (1), Müller, M. (1), Keidser, G. (2), Bentler, R.A. (3)

(1) Justus-Liebig University Giessen, Germany

(2) National Acoustic Laboratories, Chatswood, Australia

(3) University of Iowa, Iowa City, USA

Background: Optimizing hearing aid output has been an intermittent goal of hearing aid fitting for many years. Despite the technological and prescriptive breakthroughs, hearing aid users continue to be only moderately satisfied with the outcomes in terms of loudness discomfort and annoyance by loud sounds.

Method: We developed a Matlab program called MPOver (Maximum Power Output Verification) to establish a quick and valid hearing aid output verification tool using narrowband and ecologically valid sounds in the lab. Based on comprehensive sound analyses we selected four typical sounds (frying, party noise, bus engine, vacuuming) for the broadband test module. These environmental sounds and a set of narrow band noises (1.5, 2, 3, 4, 6 kHz) were presented by a loudspeaker from the front with ascending levels in 5 dB steps from 75 to maximum 90 dB until the subjects indicated unacceptable loudness on a touch screen. Several versions of MPOver were accomplished with 151 hearing aid users. The test results were correlated with the loudness discomfort (both general and gradual) experienced with hearing aids in everyday environments.

Results: Statistical analysis of the data based on a logistic regression model reveals that a prediction of loudness discomfort is likewise possible either with the set of broadband noises or with the narrowband noises if loudness discomfort in the field is assessed by asking 'How bothered are you by loud sounds (on a scale 1…5)'. Particularly, the 1500 Hz narrowband noise contributes strongly to the prediction. If the wording is 'Have you experienced any loudness discomfort (yes/no)' with this lab test no prediction is possible.

Conclusions: A quick lab test can be developed to identify hearing aid users complaining about loudness discomfort with their hearing aids.

O080

A comparison and real life evaluation of different data logging systems

Tiefenau, A., Fröhlich, M.

Siemens Audiological Engineering Group, Erlangen

Today, advanced hearing instruments provide lots of information about the individual usage of the hearing instrument to the dispenser. This supplies the audiologist with objective information not easily available from the user. However, in case of substantial differences between the technical (i.e. logged) data and the subjective (i.e. hearing aid user) response, it is up to the audiologist to decide which data to use. Thus, the two most important issues in validation of the various data logging systems are the reliability of the logged data and the correspondence of the logged data with the individual subjective impression.

Two studies were conducted to asses the effectiveness of different data logging systems. In the first study, 14 hearing instruments with 7 different data logging systems were simultaneously exposed to a controlled sequence of stimuli reflecting distinct acoustic conditions. More than 90 hours of continuous stimulus presentation of the data were read out and analyzed. In the second study we compared how accurately the logged data match respective subjective ratings in diaries. Both the data logging recordings and the diary entries were collected from the users during a test period of one week.

Our results point towards a number of differences between the accuracy of data acquired from the different data logging systems. The correspondence between the logged data and the data recorded in the journals will also be discussed.

Capturing the real world conditions with accuracy is essential for the validity of the data logging system if the acousticians are to trust and use the data supplied by the hearing aid. In this sense, the cross comparison of the different data logging systems provides an additional benefit for the acoustician in case of systematic deviations between the recorded data and the perceptual correlates.

O081

Sounds perceived as disturbing by hearing aid users in their daily soundscape

Skagerstrand, Å.

Örebro University, Sweden

Soundscape of today is becoming more and more noisy and noise is a major origin for problems of annoyance. The noisy soundscape restrict the condition for full participation in particular for spoken communication. For the hearing impaired person annoyance of noise affects the well being in several situations besides communication situations. Earlier studies have tried to describe the urban soundscape and normal hearing persons perception of the same, but data for hearing impaired persons are rare. In this study 60 hearing impaired persons are describing their daily soundscape with focus on disturbing sounds that causes annoyance.

The aims of the study are twofold, to describe sounds that hearing aid users find annoying in their daily soundscape and to investigate if fundamental factors, such as age or gender can predict if hearing aid users will experience disturbance from certain sounds.

The used method is a diary with questions about disturbing sounds in the daily soundscape to be answered every day during 14 days. The diaries were analysed with content analysis.

The result of the study shows that most hearing aid users experience disturbing sounds in their daily environment and disturbing sounds are common sound sources such as water, paper rustling. When studying the data grouped in relation to age, gender, hearing aid experience, and signal processing no significant factors can be found to explain the experience of disturbing sounds.

From this study it can be concluded that further research is needed to improve the knowledge of hearing aid users soundscape and the soundscapes consequences for hearing impaired and their rehabilitation.

O082

Questionnaires For Hearing Aid Evaluation – Useful tools or Wasting Time?

Latzel, M., Blab, S., Auer, M., Heuermann, H.

Siemens Audiologische Technik, Erlangen & University of Applied Sciences, Oldenburg & Academy of Psychotherapy, Wiesbaden

Motivation: Hearing aids are evaluated using different objective and subjective procedures. The advantage of using objective procedures is that they provide reliable and valid results, but the extrapolation from these results to the benefit in real life can be difficult. On the other hand, the results of subjective procedures are often uncertain, but data gained in this way are more readily transferable to the benefit of the hearing aid user in real life.

To improve the reliability of data collected with a questionnaire as a typical example of a subjective test, several studies comparing a set of questionnaires in terms of reproducibility and dependence on experience with listening tests were conducted.

Research Questions: The following issues are important for estimating the variance of different questionnaires:

• Open vers. closed questions

• Bipolar vers. unipolar scales

• Continuous vers. discrete scale

• Experience vers. inexperienced test person

Subjects and Methods: We conducted three studies with 30 hearing impaired and 47 normal hearing subjects fitted binaurally with hearing instruments. The devices had 3 pre-adjusted programs. Different sound examples were presented and the subject's task was to fill in the questionnaires for all programs and sound examples. To check the test-retest reliability, this procedure was repeated several times in consecutive sessions.

Results and Conclusions: In all studies, the variance of the judgments depended on the experience with listening tests and the complexity of the scanned dimensions. We also found that in order to simplify and advance the task, the most meaningful scale to use is the discrete scale since the increased variance of the continuous scale counteracts its higher resolution. The results show that questionnaires can be a useful tool for hearing aid evaluation if they are designed carefully with respect to the research questions.

O083

Successful and unsuccessful users of bilateral amplification – differences and similarities in binaural performance

Köbler, S., Hagerman, B., Lindblad, A., Olofsson, Å.

Karolinska Institutet, Stockholm

Bilateral amplification seems to be the best solution for bilaterally hearing-impaired persons. Nevertheless, some individuals are unsuccessful with this strategy. Within this study, we compared results for different aspects of binaural listening for two groups of hearing-impaired persons: one group contained 11 successful and the other 11 unsuccessful users of bilateral amplification. The methods used measured both peripheral and central auditory function with an emphasis on binaural integration, as well as cognitive abilities. We included speech-in-noise and signal analysis performance as well as dichotic tests. Furthermore, hearing thresholds and hearing aid gain curves were measured. The subjects also answered to the questions of the Speech, Spatial and Quality of hearing Scale (SSQ). The speech-in-noise and signal analysis performance tests included the phenomenon of Binaural Masking Level Difference, BMLD.The results show differences between successful and unsuccessful users of bilateral hearing aids, manifested in both cognitive and auditory (central and possibly also peripheral) auditory function. Specifically, the group preferring bilateral amplification showed better speech-in-noise results, better results in the dichotic digits task as well as better subjective abilities in spatial listening.The hearing aids in the group preferring unilateral amplification showed slightly higher amplification than those of the subjects in the bilateral amplification group. Because of binaural loudness summation effects these subjects might have experienced the hearing aids as too loud when using both, even if none of them described problems with bilateral amplification in such terms.Most of the results therefore suggest, that unsuccessful users of bilateral amplification have degraded function of central pathways, centres and commissures. Peripheral hearing and slightly too high hearing aid amplification might contribute to a minor degree to problems using two hearing aids for those individuals.

P34

Analog versus digital hearing aids in patients with noise-induced hearing-loss

Sulkowski, W.J. (1), Sward-Matyja, M.(2), Kowalska, S. (3)

(1) Department of Occupational Diseases, Nofer Institute of Occupational Medicine, Lodz, Poland

(2) Hearing Aids Company Widex-Polska, Wroclaw, Poland

(3) ENT Clinic, Medical University, Lodz, Poland

e-mail: sulkowki@imp.lodz.pl

Introduction: A major consequence of noise-induced sensorineural hearing loss (NIHL) is the difficulty in understanding of speech, especially in noisy or reverberant listening environments; this may be improved, at least in part, by the provision and fitting of hearing aids. The aim of the present study was to compare the effectiveness of audiologic rehabilitation of NIHL patients by means of analog (AMA) versus digital hearing aids (DHA).

Methods: Forty-six adult listeners (7 women and 39 men, aged 46–77 years), suffering from NIHL of varied degrees, participated in the investigations. Pure tone air-conduction and bone-conduction threshold were obtained bilaterally. Speech intelligibility was measured at 65 dB SPL in free field in the unaided and aided (AHA vs. DHA technology) listeners to check the benefit of using both types of the instrument. Next, the questionnaire tests: Abbreviated Profile of Hearing Aid Benefits (APHAB), International Outcome Inventory-Hearing Aid (IOI-HA) and Nordiska Samarbetsorganet for Handikapfragar (NSH) were carried out.

Results: The statistical evaluation of findings showed a significant difference in speech intelligibility, amounting to over 30%, between the unaided vs. aided (both AHA and DHA) patients; the average quantitative benefit was greater by 7% for DHA. As regards the subjective feelings of the patients, the major advantages of the DHA application were reported in the APHAB questionnaire, namely the improvement in speech recognition in the conditions of reverberation (RV), background noise (BN) and aversiveness (AV). Also, responses to the IOI-HA test confirmed the virtues of DHA wearing; every second patient wore it for the whole day. Accordingly to the results of NSH examination, DHA was favored by 39 persons vs. 2 persons who preferred AHA and 5 persons giving no answer; in addition, it turned out that DHA was used for 8 h and more by 65% of tested patients (vs. 33% of those with AHA), for 4–8 h/day by 31% (vs. 52% of those with AHA) and for less than 4 h/day by 2% (vs. 6% of those with AHA).

Conclusions: Although digital hearing aids seem to be in general more acceptable as those better improving the ability to understand speech among listeners with NIHL, a final choice of the hearing aid should by based on the patient's individual preferences.

P35

New Stimuli for Evaluation of Multichannel Noise Reduction Hearing Aids

Rout, A., Hanline, L.E., Halling, D. E.

James Madison University, Harrisonburg, VA, 22802 USA

Noise reduction in multichannel hearing aids is currently quantified by using steady-state signals and measuring the gain reduction. This method does not assess noise reduction within individual channels. In this presentation we describe new stimuli and their effectiveness in evaluating multichannel noise reduction circuits more precisely. The proposed stimuli were created by notch-filtering ICRA noise and filling-up the notch with steady-state narrowband noise so that the resultant spectrum matched that of the original ICRA noise.

Multichannel digital BTE hearing aids from five major manufacturers were programmed for a flat hearing loss; noise reduction “off” and “maximum” were stored as separate memories. All other features such as directionality, feedback suppression, and manual volume control were disabled. The hearing aids were mounted on KEMAR with custom earmold. The test stimuli were presented from a loud speaker at 65 dB in a double walled booth, and the output of each hearing aid was recorded. The amount of noise reduction achieved in each channel was calculated by measuring the “notch-depth” in the output spectrum. Results indicate that the proposed new stimuli can adequately measure noise reduction within individual channels and the degree of noise reduction varies significantly across the tested hearing aids.

P36

Speech recognition in a realistic noise field: a test method for hearing and hearing aid evaluation

Laukli, E., Andersen, R.

University of Tromsø, Norway

Background: About 5 % of the general population will be in a need of hearing aids. Most of them are found in the elderly groups. The cost of hearing aid programs is increasing, and both the government and the individual hard-of-hearing subject will, depending on the support system in each country, be heavily charged. The evaluation of hearing aid fittings is therefore crucial, and the cost-benefit has to be shown in each individual case. It is of great importance to develop methods where some quality insurance of the hearing aid fitting may be presented.

Methods: We have developed a system based on the anechoic chamber in our department. A speech material is presented from a front loudspeaker, and all together six loudspeakers will present noise in a free field. The noise signal is taken from the ICRA record and is presented uncorrelated (> 10 sec. delay) in the different channels. Speech or noise level may be varied, and the signal-to-noise ratio (S/N) is determined for a fixed, 40 to 60 % speech recognition.

Results: The S/N-ratio may be presented for the unfitted situation and for left and right ear fittings and compared to the binaural fitting. As such, the binaural advantage may be demonstrated. The different two- and three-microphone hearing aids may be compared regarding the effects of the directional characteristics, and the different noise suppression and speech enhancement systems may also be compared.

Conclusion: We believe that such measurements will be of great importance in the future evaluation or quality insurance of hearing aid fittings. These measurements should be a general part of the fitting procedure and will hopefully add more information than what is generally possible with the present routine methods. The results will have a better reproducibility when measurements are perfomed in an anechoic chamber, but the system will also work in an ordinary audiometric room, but with less precision

P37

Development of an Audio Compact Disc for Speech Audiometry Testing

Trimmis, N. (1), Markatos, N. (1), Malaperdas, K. (1), Papadas, T. (2)

(1) Department of Speech Pathology. Technological Educational Institute of Patras.

(2) Department of Otolaryngology. University Hospital of Patras.

The aim of this study was to develop an auditory compact disc for assessment of word recognition score and auditory processing in populations who speak Modern Greek. Speech materials were digitally recorded and equalized according to the 'Equal speech level method'. The materials included on the compact disc were the four lists, each of which contains 50 phonetically balanced bisyllabic words, developed by Trimmis and colleagues (2006). All 200 words were recorded in an Industrial Acoustic Company booth meeting ANSI S3.1 standards, by one male and one female native professional speaker. An AKG model C-1000-S condenser microphone covered by a windscreen and positioned at optimum distance, a FireWire Solo sound card interfaced to a PC computer, and digital signal processing software (Adobe Audition. Version 1. Adobe Systems Incorporated. San Jose, CA) were used for all recording and editing tasks. Each word was produced several times with minimum suprasegmental features. Two judges, one male and one female, rated the repetitions of each word for perceived quality of production, and the best production of each word was selected. Each digitized word (sampling frequency of 44.100K Hz and 16-bit resolution) was placed in a unique file and was edited for noise elimination, equalization, high-pass, low pass and compression according to specific parameters. The disc contains 24 tracks with 50 bisyllabic words in each track, a 1000-Hz calibration tone of 30 seconds at the beginning of each track and interstimulus intervals of 5 seconds. Tracks 1 through 8 are used for word recognition score testing and contain the initial four 50-item lists and a randomization of each list. Tracks 9 through 24 are used for auditory processing testing and contain the same 4 lists low-pass, high-pass, 45% and 65% compressed.

Trimmis N, Papadeas E, Papadas T, Naxakis S, Papathanasopoulos P, Goumas P. Speech Audiometry: The Development of Modern Greek Word Lists for Suprathreshold Word Recognition Testing. Mediterr J Otol 2006; 3:117-126.

O084

The prelingual deafness DFNB9 is caused by a synaptopathy of inner hair cells

Moser, T., Roux, I., Safieddine, S., Nouvian, R., Grati, M., Simmler, MC., Perfettini., I., Le Gall M., Rostaing, P., Hamard, G.,Triller, A., Avan, P., Petit, C.

University of Goettingen Inserm UMRS587, Unite de Genetique des Deficits Sensoriels, College de France, Institut Pasteur, Paris

The molecular mechanisms underlying the specific functional properties of the auditory hair cell ribbon synapse are largely unknown. Here we studied otoferlin, a predicted transmembrane protein containing six C2-domains, which is defective in a recessive form of human deafness. We show that otoferlin expression in the hair cells parallels their afferent synaptogenesis. Using immunogold electron microscopy, we localized otoferlin to ribbon-associated synaptic vesicles. Otoferlin displays Ca2+-dependent interactions with the SNARE proteins syntaxin1 and SNAP25, in vitro. Otoferlin null mice (Otof-/-) are profoundly deaf. Exocytosis of Otof-/- inner hair cells, as monitored by membrane capacitance measurements, was nearly completely abolished, despite normal ribbon synapse morphogenesis and Ca2+ current. Furthermore, these cells lacked the fast secretory component of the exocytic burst in Ca2+-uncaging experiments. Therefore, otoferlin is essential for a late step of synaptic vesicle exocytosis, probably by acting as the major Ca2+ sensor triggering fusion at the auditory hair cell ribbon synapse. We conclude that DFNB9 represents an auditory synaptopathy.

O085

Identification of modifier genes for connexin 26-related hearing impairment

Hilgert, N., van Camp, G.

Department of Medical Genetics, University of Antwerp, Antwerp, Belgium

Background: GJB2 encodes the connexin 26 protein and is the most frequently mutated gene in patients with non syndromic autosomal recessive hearing loss. More than 80 mutations have been identified, causing a variable hearing loss ranging from mild to profound, with 35delG as the most common mutation in Caucasians. For most genotypes, a specific genotype-phenotype correlations was established by analysing the audiometric profile of 1351 patients with biallelic GJB2 mutations (Snoexkx et al, 2005). Despite this correlation, a variability within the genotypes remains for all mutations and is most clear for patients with a homozygous 35delG genotype. We believe that modifier genes are partly responsible for this variability.

Methods: We aimed to detect modifier genes by collecting 35delG homozygous patients together with their general and audiometric data. The idenfication of these genes will be done by performing an association study using a case-control paradigm.

Results: The association study was first performed on a selection of 9 candidate genes functionally related to connexin 26. Secondly, the first phase of a genome-wide association study (WGA) was performed using an established pooling strategy (Pearson et al, 2007). The pools were analysed by two high-density SNP chips. The results of these analyses will allow to make a selection of the 250 most significant SNP's which will afterwards be genotyped individually on the same sample set. Confirmation of these results should be done by genoyping of the significant SNP's in an independent replication population.

Conclusions: In order to identify modifier genes for connexin 26 related hearing loss, we performed an association study. In a first phase, we used a candidate gene approach and we subsequently performed a WGA on the same sample set. To replicate the results of this study, we will need to collect additional samples to set up a replication population.

Snoeckx et al, Am. J. Hum. Genet. 2005 Dec;77(6):945-57
Pearson et al, Am. J. Hum. Genet. 2007 Jan;80(1):126-39

O086

Laser Microdissection and Pressure Catapulting is superior to conventional manual dissection for isolating cellular compartments of the cochlea

Torkos, A. (1, 2), Wissel, K. (2), Warnecke, A. (2), Lenarz, T. (2), Stöver, T. (2)

(1) Dept. of Otorhinolaryngology and Head & Neck Surgery, University of Szeged, Hungary

(2) Dept. of Otorhinolaryngology and Head & Neck Surgery, Hannover Medical University, Germany

Background/aims: Isolating a pure cell pool by conventional methods from a specific cellular compartment of the cochlea for gene expression analysis and other molecular biological studies has proven to be inefficient due to contamination by unwanted other cell types. In this study we set out to demonstrate that Laser Microdissection and Pressure Catapulting (LMPC) is much more reliable than conventional manual cochlea dissection for this purpose.

Methods: Spiral ganglions (SG) were isolated from postnatal rat cochleae by manual dissection and LMPC. Also, modioli from rats were manually dissected. Total RNA was isolated from all three cell pools. The presence of type II iodothyronine deiodinase (D2), claudin 11 (Cld-11), neurofilament light chain (NF-L) and glyceraldehide-3-phosphate dehydrogenase (GAPDH) transcripts were determined in all sample pools by means of RT-PCR and agarose gel electrophoresis.

Results: The similar levels of GAPDH indicated the same amount and quality of RNA in each sample. The transcript of NF-L, a neural tissue marker was detected in all three samples, indicating that they contained RNA from SG cells. Transcripts of the Cld-11 and D2 genes (which are never expressed in the SG cells) were not present in the laser microdissected SG cell pool, but could be detected in both manually dissected pools. This indicates that LMPC is capable of providing a pure SG cell pool as opposed to conventional manual dissection.

Conclusions: We conclude that Laser Microdissection and Pressure Catapulting is superior to conventional manual dissection for isolating cellular compartments of the cochlea. LMPC opens up a vast new frontier for tissue preparation which will have dramatic impact on molecular biological studies of the inner ear.

O087

Genotypes and phenotypes of various nonsyndromic hearing losses of genetic origin

Kiss, J. G., Nagy, A. L., Csáki, R., Tóth, F., Klem, J., Kovács, K., Jóri, J.

University of Szeged, Department of Otolaryngology, Head and Neck Surgery, Department of Biotechnology, Alfa-Biosoft Kft., Szeged, Hungary

Objectives: Nonsyndromic hearing loss of genetic origin is one of the most abundant human sensory disorders, and can be found in 1 out of 1000 newborns. The phenotype varies from moderate hearing loss to almost complete deafness. Most of the phenotypical alterations can not be attributed to one single mutation. There is a high probability that most of these disorders are polygenic.

Methods: We collect blood from patients with probable hereditary hearing loss, or deafness. We carry out allele-specific PCR (AS-PCR) reactions on each sample. We have analysed our samples looking for 35delG mutation in the GJB2 (Cx26) gene. Since then we are in the process of screening our population of patients with Denaturing High Performance Liquid Chromatography (DHPLC), which enables us to screen for 43 genetic regions in total.

Results: We found numerous patients with 35delG mutations, both heterozygous and homozygous forms. Most of these mutations have different phenoypes. Other genetic profiles we get from the mutation screening are being compared to the audiological findings of the examined patient.

Conclusions: Our plan is to develop a method that can detect the risk of hearing loss of genetic origin with high probability, at best after birth, from only a little blood sample. This goal is very hard to reach, considering the high number of genes involved in the physiology of hearing. Still, our experiments can get us closer to the desired objective.

O088

Socialisation of CI children over the past 10 years – expectation reached?

Lesinski-Schiedat, A., Chute, P., Lenarz, T., Lesinski, M.

MHH, ENT Clinic & HZH

The outcome in early implanted children is measured by the good open speech understanding in quite. However teens with CI are faced with increasing demands in the mainstreamed high schools and the changing challenges in the communication with their peers.

We send out a questionnaire to 800 children. The questions focused on the auditory technical possibilities, to the possibilities of assistance from parents, teachers and friends and to the reality of their grade of integration.

The children are socialised in their mainstreamed school and during leisure time with hearing youngsters. Difficulties are realised in communication situations which were overcome by technical means or by avoiding. An alternative group is not found in hearing impaired youngsters.

In conclusion the expectations of the parents preoperative are reached but the process of socialisation seems to be finalised only after finishing the school education.

O089

Examining “Informational Masking” in Cochlear Implant users.

Pyschny, V., Landwehr, M., Walger, M., von Wedel, H., Meister, H.

Jean Uhrmacher Institute for Clinical ENT-Research, University of Cologne and University ENT-Hospital Cologne

The processing of spectral and temporal cues as well as amplitude changes is restricted in Cochlear Implants. Cochlear Implants yield satisfactory understanding when communication takes place in silent environments, but with the addition of noise or competing talkers the identification and discrimination of speech gets worse (Stickney et al, 2004).

“Informational Masking (IM)” describes the disturbances that context has on the detection and discrimination of target components in a complex sound. These disturbances are not only attributable to “Energetic Masking (EM)” which occurs when spectral energy of a signal overlaps with the energy in a target signal, since additional information is irrelevant for the listener and therefore interfering (Brungart, 2001).

In this study the “Oldenburg sentence-test (OlSa)” was used to examine to what extent a target signal can be understood if it is masked with a simultaneously presented speech masker. The OlSa seems suitable because of several reasons. On one hand the special structure of the OlSa permits defining a keyword for marking the target phrase. On the other hand the sentences are composed of several recordings, so that it is impossible to make distinctions based on prosodic cues (Wagener et al, 1999).

The speech maskers differ from the target phrases in target-masker ratio (TMR) and fundamental frequency (F0). The speaker of the target phrases had a fundamental frequency of 100 Hz. By stepwise varying this frequency the speech maskers showed an F0 up to

180 Hz. In order to keep the number of parameters small, the characteristics of the vocal tract were not changed. The second manipulated parameter was the TMR which showed values from 0 dB to 20 dB in steps of 5 dB.

The aim of the study was to point out the difficulties CI-users have to face in a multitalker situation and which factors yield a release from IM.

It is hypothesized that CI recipients benefit more from changes in TMR than in F0 since their spectral resolution is restricted. The results will be discussed on Cochlear Implant users with normal hearing persons serving as controls.

Brungart, D. (2001): Informational and energetic masking effects in the perception of two simultaneous talkers. J. Acoust. Soc. Am. 109 (3), 1101 – 1109.
Stickney, G., Litovski, R., Assmann, P. (2004): Cochlear implant speech recognition with speech maskers. J. Acoust. Soc. Am. 116 (2), 1081 – 1091.
Wagener, K., Brand, T., Kollmeier, B. (1999): Entwicklung und Evaluation eines Satztests für die deutsche Sprache I: Design des Oldenburger Satztests. Z Audiol 38 (3), 86 - 95.

O090

Speech recognition in noise by hearing-impaired children using fm systems

Mora Espino, R. (1), Zenker Castro, F. (2), Rodríguez Jiménez, M.C. (3), Mesa Suárez, J.L. (4), Coello Marrero, A. (4), Barajas de Prat, J.J. (3)

(1) Clínica Barajas

(2) Fundación Canaria Dr. Barajas para la Prevención e Investigación de la Sordera

(3) Universidad de la Laguna

(4) Consejería de Educación, Cultura y Deportes del Gobierno de Canarias

The typical classroom presents a very difficult listening situation for a child with hearing impairment. Background noise, reverberation and distance from the speaker can interfere with accurate speech perception. Children with moderate to severe hearing loss routinely use personal frequency modulated (FM) systems in the classroom to improve the signal to noise ratio of teacher-directed speech with notable success. Speech recognition performance in noise was examined in hearing-impaired children with cochlear implants (CIs) and Hearing Aids (HA) when using a frequency modulation (FM) system (a) with the FM microphone/transmitter on and off (b) in noise and in quiet (c) for words and sentences. Recognition of phonemes for lexically frequent and rare words and identification of correct words in simple and complex sentences was measured in 12 teenage students. The results showed that there were no differences in speech recognition between CI and HA users. FM benefit was present in both quiet and noise but was somewhat greater in noise. Recognition of phonemes was high for lexical frequent words and for simple sentences. The findings confirm the value of FM amplification in both quiet and noise conditions.

O091

Influence of the mixing ratio of a FM-system on speech understanding in noise for CI user

Hey, M. (1, 2), Hocke, T. (8), Scholz, G. (3), Anft, D. (4), Abels, D. (5), Schmid, C. (6), Kompis, M. (6), Seeling, K. (7), Hessel, H. (8), Begall, K. (1)

(1) AMEOS Klinikum St. Salvator GmbH, Halberstadt

(2) Cochlear Implant Rehabilitationszentrum, Cecilienstift, Halberstadt

(3) Charité, Berlin

(4) Martin-Luther-Universität, Halle

(5) Universitätsspital Basel

(6) Inselspital, Universitätsspital Bern

(7) Universität Dresden

(8) Cochlear GmbH Hannover

Introduction: Hearing in noise is one of the most important challenges in everyday life for cochlear implant users. Understanding of a speaker in noise can be improved by using a FM system.

The aim of this study is the investigation of the influence of the mixing ratio between fm and microphone signal on speech understanding. As a result there should be made suggestions for optimal FM mixing ratio for different listening conditions like learning in classrooms or hearing a lecture.

Methods: The acoustical situation in a classroom was imitated by an audiological setup. Using a two loudspeaker setting we simulated the acoustical situation of a pupil equipped with a FM system, sitting in front of a teacher and being among other pupils making “noise”. Two situations were investigated: (cond 1) Teacher is speaking through the FM system and the surrounding pupils making noise and (cond 2) one pupil in the classroom is speaking, being disturbed by the other pupils. The FM mixing ratio was varied for both conditions from 1:1 up to 5:1 (fm : microphone). The speech understanding was evaluated using the adaptive Oldenburger sentence test in noise.

11 experienced postlingually deafened CI patients using the Freedom cochlear implant system (Cochlear Ltd) took part in this investigation. The FM system „Microlink for Freedom“ together with the Campus transmitter (Phonak) were used.

Results: The speech understanding in noise without FM system served as a individual base value for further normation of the data. The results show that speech understanding of the teacher (cond 1) is continuously increasing with mixing ratio. On the other hand the understanding of the pupil (cond 2) is decreasing for mixing ratios greater then 2:1.

Discussion: The understanding of different speakers for the two investigated listening conditions show reverse direction. This may lead to different suggestions for different listening conditions. The optimal choice for a classroom condition may be the 2:1 mixing ratio.

This study was supported by Cochlear GmbH and Phonak Communications AG.

P38

Influence of Iridium Coating and Application of Steroids on Electrical Stimulation with Cochlear Implants

Paasche, G., Lesinski-Schiedat, A., Stöver, T., Lenarz, T.

Medical University Hannover

Background: The increase of impedances of cochlear implant (CI) electrodes shortly after implantation is typically explained by the formation of a fibrous tissue sheath around the electrode carrier. Earlier investigations have shown, that intra-operative and intra-cochlear application of steroids resulted in a long-term reduction of the postoperative impedances of the stimulating electrodes in the cochlea. The development of the impedances shall be correlated with the stimulation effect (daily impedance difference between unstimulated and stimulated electrodes) and the post-operative development of T- and C-Levels.

Methods: All patients received a Contour electrode array. The following groups of patients have been investigated: a) control (N=17), b) intraoperative application of steroids (N=8), c) Iridium-coated cochlear implant (N=10), and d) Iridium-coated CI with intraoperative application of steroids (N=8). Impedances have been measured using standard fitting software and common ground mode during rehabilitation period in the morning before switch-on of the device and in the afternoon after at least 4 hours of stimulation. Impedances and T- and C-Level were evaluated during regular test sessions from first fitting to two years post implantation.

Results: During evaluation of the stimulation effect, reductions of impedances by 0 to 5 kW or 0 to 50 % of its initial value were found. On average, the largest stimulation effect and also highest T-and C-Levels were found in the group with Iridium-coated electrodes. A correlation between initial impedances and the stimulation effect was only found in the steroid-treated group.

Conclusions: Intra-operative application of steroids reduces the impedances on a long term but does not affect the development of the stimulation level. As the data for the stimulation effect showed some large variations between the patients, differences could not be allocated to the different treatments.

P39

Fine-tuning of implant material-cell interactions by laser microstructuring

Reich, U., Reuter, G., Müller, P., Stöver, T., Chichkov, B., Lenarz, T.

Medical University of Hannover, Department of Otolaryngology, Hannover

An optimal electrical stimulation of neuronal cells requires a closed position of the electrodes to the neuronal structure and a low impedance of the electrode contacts. In case of the cochlear implant the interaction to the connective tissue growth is important. In contrast by the neuronal auditory implants the close contact to the neuronal cells is important.

The electrodes contain platinum contacts in a silicone carrier. The silicone carrier is manufactured (Cochlear Ltd, Sydney) from two types of silicone. For our studies we use silicone sheets (LSR 30) with rough and smooth surface, moulded silicone LSR 30 and rough silicone HCRP 50. As a model for the platinum contact material we used a micro-structured and platinum sputtered glass wafer. With femtosecond laser geometric microstructures produced on the surface of cochlear implant materials (width 1-10 µm). GFP-marked cells allow to observe cell morphology and cell growth in correlation with the structure geometry also on the non-transparent materials.

The cell growth rate on all kinds of silicone is significantly lower than on platinum. Polished silicone surface decreases cell growth on silicone. The laser structure further reduced the growth of fibroblasts. The number of cells on the microstructured platinum was significantly reduced. On all types of the silicones the effect of the microstructuring was also visible. On LSR 30 with smooth surface the reduction during the microstructure tends to be larger than on the rough surface and also larger then on the moulded silicone.

GFP-marked fibroblasts are a model for connective tissue cells. The micro structure affected fibroblast growth and guide neuronal cell growth. In further experiments structures of different size are to be tested on several electrode materials. The aim is to optimize the electrode interface, to reduce the connective tissue growth and to the electric contact to the neuronal target cells.

This project was supported by German Research Foundation, Collaborative Research Centre 599: “Sustainable Bioresorbable and Permanent Implants of Metallic and Ceramic Materials”

P40

Synaptic contact number and transmitter exocytosis are maximal in mouse inner hair cells corresponding to frequencies of best hearing.

Meyer, A., Egner, A., Yarin, Y., Moser, T.

Inner Ear Lab, Dept. of Otorhinolaryngology, University of Göttingen, 37099 Göttingen, Germany

The sensitivity of sound perception is highly dependent on the frequency - each detected at a specific tonotopic location in the cochlea. Here, we investigated whether the morphological and physiological properties of the afferent hair cell synapses could contribute to this phenomenon. We found that the number of synaptic contacts per inner hair cell had a maximum in the cochlear region that transmits sounds with highest sensitivity (10-24 kHz). Confocal microscopy of the organ of Corti following immunostaining for RIBEYE, a major component of the synaptic ribbon and for AMPA-receptor subunits GluR2 and 3 was performed to estimate the number of afferent synaptic contacts as colocalized spots of pre- and postsynaptic immunofluroescence.

We then investigated the presynaptic function of inner hair cells at different positions along the apical turn of the cochlea by perforated patch-clamp recordings. Probing exocytosis by measurements of cell capacitance increments after brief depolarizations, we found that hair cells located ~300 µm from the apex released 44% less transmitter than cells located at ~1400 µm from the apex. This functional finding corresponded to a 31% difference in the number of morphologically identified afferent synapses betwen these locations. Interestingly, size, charge and kinetics of the calcium current did not vary with the tonotopic position of the hair cells.

As the IHC Ca2+ influx may not only depend on the synapse number but also on the active zone size we asked whether the size of presynaptic ribbons may vary tonotopically. The Ribbon size distributions at the two tonotopic positions of ~180 and ~1060 µm, as estimated by 4Pi high-resolution optical microscopy, were indistinguishable from each other.

In conclusion, the cochlea may use a maximum of neural information channels per hair cells in the range of best hearing. The comparable Ca2+ current despite varying IHC release area might indicate a significant number of extrasynaptic Ca2+ channels.

P41

The perception of prosodic cues in normal listeners and cochlear implant recipients

Meister, H., Landwehr, M., Pyschny, V., Walger, M., von Wedel, H.

University of Cologne, Jean Uhrmacher Institute for Clinical ENT-Research and ENT- University Hospital Cologne

Prosody has a myriad of linguistic functions and involves specific aspects of speech, such as stress, intonation and pauses. The underlying acoustic quantities (amplitude envelope, pitch frequency, and temporal structure) can be processed by cochlear implants (CI) only to a limited extent. In order to investigate prosody perception in hearing impaired persons and subjects provided with hearing aids and/or CIs we developed a test battery which addresses several prosodic cues such as minimal pairs differing in duration, sentence stress, question vs. statement and gender of the speaker. The test battery consists of two parts: One part involves natural utterances from six different speakers (3 female, 3 male) and aims to reflect everyday listening situations. The other part consists of “morphed” stimuli which describe a continuum from one extreme (e.g. question) to the other (e.g. statement) and thus might be suitable to detect small differences in perception with considering the underlying acoustical parameters, e.g. pitch frequency (see presentation M. Landwehr).

The talk presents results from both, normal listeners and cochlear implant recipients. The normal hearing subjects were very well able to discriminate the prosodic cues and revealed very low interindividual differences. In contrast, the cochlear implant listeners covered a wide range of performance categories. Especially the perception of sentence stress posed problems to the CI-subjects. Since stress involves short leaps of the pitch frequency on the corresponding word or syllable, it can be hypothesized that the processing of the F0-contour plays a major role in the perception of prosodic cues.

P42

Language development in profoundly deaf children with and without cochlear implants

Suárez Rodríguez, M. (1), Rodríguez Jiménez, M.C. (1), Leal Hernández, E. (1) Coello Marrero, A (2) and Zenker Castro, F. (3)

(1) Universidad de La Laguna

(2) Consejería de Educación, Cultura y Deportes del Gobierno de Canarias

(3) Fundación Dr. Barajas.

Most children born with profound deafness develop language abilities at approximately half the rate of theirs peers with normal hearing. They fall significantly behind in the acquisition of oral language. Previous research indicates that when deaf children receive cochlear implants (CI) they can gain access to a substantial amount of auditory information which allows them to develop language skills more rapidly than their no implanted peers. The objective of this preliminary study was to evaluate the benefits of cochlear implantation in infancy and compare them to those obtained in children implanted at older age and those obtained in profoundly deaf children no implanted. The participants were profoundly deaf children: deaf children who received a C.I. prior to 2 years of age, deaf children who were implanted at an older age; and deaf children no implanted with similar ages to the implanted ones at the moment of the language assessment. Children’s language development was assessed using the Illinois Test of Psycholinguistic Abilities (ITPA; Kirk, McCarthy & Kirk, 1996). The discussion will be focused on the gap between language age and chronological age in the different groups of participants.

Miyamoto, R.T. et al. Language development in deaf infants following cochlear implantation. Acta Oto-Laryngologica 2003; 123, 2: 241-244.
Svirsky, M.A. et al. Language development in profoundly deaf children with cochlear implants. Psychol Sci. 2000; 11: 153-8

P43

What is the prognostic quality of the electrical acoustic nerve test performed before cochlear implantation for the speech reception obtained after rehabilitation?

Rader, T. (1), Wechtenbruch, J. (1), Baumann, U. (2), Suckfüll, M. (1), Matthias, Ch. (1), Hempel, J.M. (1)

(1) Klinik und Poliklinik für Hals- Nasen- und Ohrenheilkunde der Ludwig-Maximilians-Universität München

(2) Klinikum der Universität Frankfurt, Zentrum für HNO-Heilkunde

Background:

An important precondition for a successful cochlear implantation is the integrity of the acoustic nerve (N. cochlearis). An examination with a needle electrode placed transtympanically near the promontory and subsequent electrical stimulation of the auditory nerve can investigate its function. It is often discussed, if psychophysical parameters gained before cochlear implantation can predict the scores of speech reception obtained after rehabilitation. Blamey et al. [1] reported a small value of prediction yielded in the estimation of time resolution by means of a gap-detection paradigm. Likewise, the data presented in our work is analysed to seek for a correlation between speech perception with a cochlear implant at 3 or 12 months after implantation and time resolution.

Methods:

The data of 70 postlingually deafened patients were included into this study. The auditory nerve was stimulated by a biphasic pulse train delivered to transtympanic needle electrode, which was placed near the promontory. Auditory nerve function was assessed several weeks before cochlear implantation. Time resolution was measured by means of a gap detection paradigm. The Freiburger monosyllable and number test and the HSM-speech test were conducted three and 12 months after activation of the speech processor. The time resolution was correlated with the score of different sentence tests at different times and the data underwent a statistical analysis.

Results and Conclusions:

Speech reception measures are highly uncorrelated with preoperatively determined time resolution of the auditory nerve. We conclude that a measurement of time resolution by means of a gap detection paradigm and promontory electrical stimulation gives no reliable forecast on the later obtained speech perception outcome with a cochlear implant.

Blamey PJ, Pyman BC, Gordon M, Clark GM, Brown AM, Dowell RC, Hollow RD. Factors predicting postoperative sentence scores in postlinguistically deaf adult cochlear implant patients. Ann Otol Rhinol Laryngol. 1992 Apr;101(4):342-8.

P44

Expectation of cochlear implant benefits prior to implantation

Piotrowska, A., Putkiewicz, J., Lorens, A., Pankowska, A., Zgoda, M., Lutek, A., Skar¿yñski, H.

International Center of Hearing and Speech, Warsaw, Poland

Background: Reasonable expectation after cochlear implantation may include improved detection of speech and environmental sounds, improved speech reading ability, speech ability or clarity of the patient's speech. The benefits are difficult to predicted. There are many factors that contribute how well a person dose with a cochlear implant.

Purpose: The purpose of this study was to evaluate the CI candidates expectation.

Material and Methods: 43 adults subjects aged between 21 to 63 and 47 children aged between 5 months to17 were underwent this investigation. All with different speech ability and different time of hearing lost. To asses subjects' expectation questionnaire technique was used during the diagnostic procedure to cochlear implant.

Results: The findings reflect that in both group expectations are concentrated on development in speech ability.

Conclusion: Both, the patient and family mostly are interested in improvement in communication ability. If we consider all factors which influence benefits it is very important to based the expectation on discussion with the audiologist and surgeon before the operation.

P45

Cochlear Implants

Huber, M. (1), Hitzl, W. (2), Albegger, K. (1)

(1) ENT Department, Paracelsus Medical University, Müllnerhauptstr. 48

(2) Research Department, Paracelsus Medical University, Strubergasse 21, both Salzburg, Austria

Background/aims: Since its start in 1992, more than 250 deaf children were supplied with cochlear implants at the CI- Center Salzburg. Many of them have now grown up to adolescents and young adults. The purpose of this study was to evaluate schooling, out of school education and employment status of young people with cochlear implants as a critical evaluation of CI in children. To our knowledge only few studies on this subject are published up to now.

Methods: 64 Candidates, between 12- 21 years old, pre-perilingual deafened , implanted in our clinic, with at least 3 years of hearing experience with CI, and their parents were invited for structured interviews. In addition all adolescents up to the year of 17, parents and teachers were asked to answer the `Strengths and Difficulties Questionnaire´ (SDQ). Normal hearing persons, homogenous concerning age, gender and education, served as control groups.

Results: 52 out of 64 participated. Their level of school education corresponded with the educational level of the parents (p= 0,0005, p= 0,047) and with speech- test outcomes (monosyllables p=0,03, sentences p=0,02). At time of suryey 30 out of 37 pupils attended mainstream schools. They did not differ from Austrian standard pupils.(p>0.05), concerning the quota of attended secondary-, secondary grammar- and vocational schools Nevertheless the parents rated the career chances of their children with CI less optimistic than parents of normal hearing pupils (p=0.0002). 15 participants were already out of school: 2 were at university, 7 had regular apprenticeships, 5 were employed and one was unemployed. All were wearing their CI continuously at a daily basis. The prevalence rate of mental health disorders was not increased, compared to normal hearing adolescents (p> 0.05, result of SDQ).

P46

Making AGC work: variable presentation level speech testing

Khajehnouri, Y. (1, 2), Büchner, A. (2), Lenarz, T. (2)

(1) Advanced Bionics

(2) Medical University Hannover

Background: Speech tests virtually always present material at a fixed presentation level. Even when psychometric functions are measured blocks of words or sentences are presented at the same level. Since subjects may adjust their hearing aid or cochlear implant processor to optimize audibility such tests do not represent real-life listening situations. The Automatic Gain Control system is not exercised.

Methods: A new approach to speech testing was developed. Sentences were presented randomly at either 55, 65 or 75 dB SPL. Competing speech shaped noise was used to estimate Speech Reception Threshold across a block of 30 sentences. SRT scores were compared to the conventional HSM sentence test. A series of questionnaires targeting loudness, speech and music quality was delivered. Two groups of six subjects were tested: Advanced Bionics Auria or, Cochlear Corporation 3G or Freedom users. Both groups had equivalent HSM scores being good or excellent performers.

Results: SRT outcomes from the roving level test ranged from –0.8 dB to over +20 dB speech to noise ratio (SNR). Testing on the fixed presentation level test found scores around 50% correct for SNRs between +5 and +10 dB, all subjects showing relatively similar scores on this measure. While testing is still ongoing, it appears that the 3G or Freedom users struggled more with the roving level. Loudness was generally reported to be satisfactory in everyday life. Despite subjects scoring well in the conventional test, questionnaire responses pointed to problems when listening in noise.

Conclusions: The roving level test was found to be much more difficult than a traditional fixed level test. The new test may better probe everyday listening experience and appears to support the usefulness of processing a larger acoustic dynamic range. Traditional tests may overestimate the ability of cochlear implant users to cope in noisy real life situations.

P47

A verification protocol of fm systems for children with cochlear implant

Zenker Castro, F. (1), Mora Espino, R. (2), Rodríguez Jiménez, M.C. (3), Mesa Suárez, J.L. (4), Coello Marrero, A. (4), Suárez Rodríguez, M. (3), Barajas de Prat, J.J (3).

(1) Fundación Canaria Dr. Barajas para la Prevención e Investigación de la Sordera

(2) Clínica Barajas

(3) Universidad de la Laguna

(4) Consejería de Educación, Cultura y Deportes del Gobierno de Canarias

Children with Cochlear Implants (CIs) can receive significant benefit in speech recognition through the use of an FM system in the educational setting. However, there are numerous settings as well as equipment arrangements that may be selected for a particular child. Therefore, a clinical protocol is needed for verification of performance to determine the optimum settings and arrangement. Evaluation through informal listening checks or electrouacoustic measures as conventionally done with Hearing Aids are not possible with CIs. Optimal connections and setting must be ensured by systematic speech recognition measures. This study shows a verification protocol of the benefit of FM systems connected with the Cochlear SPrint procesor. Speech recognition is measured in the sound field by live voice with the CI speech processor alone and combined with the FM receiver. Speech perception scores were obtained in quiet and in background noise with portable equipment of speakers in the children's classroom. Benefit of the FM System was established through identification of words and sentences with different lexical and grammatical difficulties. This protocol may be used to behaviourally verify the benefit received when coupling FM systems to CIs.

P48

Unified approach to hearing instrument fitting and rehabilitation: Professional end-user opinions in Germany, the Netherlands, and the UK

Vormann, M., Wagener, K.

Hörzentrum Oldenburg GmbH

One aim of the European project HearCom (FP6-004171) is the harmonization and optimization of hearing instrument rehabilitation. Therefore, an unified approach in this field was investigated as following.

In a first step a pathway for hearing aid fitting that could draw on best practice in NL, DE and the UK was set up by an expert group. This survey contained both procedures and tests which are in common use in each of the three countries as well as recently developed procedures considered likely to be appropriate for widespread use.

In a second step these procedures and tests were the subject of user evaluations: The users consulted were primarily professionals involved in the fitting of hearing instruments in the three participating countries. The opinions of hearing instrument users and unaided hearing-impaired persons were also included. An online survey was completed by over 100 professionals: The data addressed frequency of use of 83 specific procedures, and professionals´ opinions on whether these procedures were acceptable in their current form, or whether they need any improvement.

For most of the procedures, professionals supported the recommendations of the expert group. Some of the proposals of the experts deal with less familiar procedures (e.g. psychoacoustic tests) or procedures which can be performed in many different ways (e.g. speech tests, disability and benefit questionnaires). For these procedures, professionals showed limited evidence of willingness to shift to more novel approaches. Therefore, there is a clear need for both well-targeted educational materials for new procedures and for development of time-efficient methods of administration if a change in best practice should be achieved.

P49

Neuronal fitting of hearing aids

Kurz, H.-R.

Kurz Hörsysteme Wiesmoor

For many years now little progress has been made in the fitting work performed by hearing aid audiologists, which may be explained by the following reasons:

Incorrect programming occurs as the acoustic data is measured with audiometers, standardised 20ccm² couplers and closed headphones. These measurements are incorrect because modern hearing systems are worn open or with an otoplastic, with the result that the ear input resonances gained with closed 20ccm² headphones are either not achieved or dissipated. Reproducible measurements can only be obtained with open headphones and are only comparatively useful if reproducible measuring results obtained under realistic conditions produce the best possible speech comprehension. Due to the changes in ear input resonances and volume levels, ear fitting pieces for connecting hearing aids to the individual anatomy are subject to considerable irreproducible changes and influences that provide an incorrect result for the configuration of the hearing aid. The peripheral and central hearing loss varies from patient to patient. A combination is also possible. Today, hearing aids are still configured empirically, i.e. according to the "hearing preferences" of the patient, even when an in-situ measuring device is used. As a result, the hearing performance is always programmed to the level with which the respective wearer is familiar and comfortable with. A transmission range that ensures the desired improvement in speech comprehension should, however, be provided. The industry is still developing hearing aid software empirically from 20 ccm² coupler values. Consequently, hearing aids fall short of the necessary hearing threshold by up to 40 dB despite subjective satisfaction.

The result is instinctive satisfaction without a gain in speech comprehension, i.e. there is no ability to react to speech, as the brain does not receive any new information where this would be required. With direct, neuronal transmission, as mostly carried out with the cochlea implant, the hearing performance is considerably higher as the system guarantees that the hearing signals are perceived across the whole signal path of the peripheral and central auditory pathway. The process developed uses a similarly successful method to CI configuration. Under new, realistic measuring conditions and using new measuring technology, the new process guarantees that a direct neuronal adaptation is performed on the patient, from the open headphones up to perception. The audiometer is used only as a signal source and the calibrated norm desktop of the hearing aid is used for audiometric levelling (audiometer function) until the necessary hearing thresholds for signals that are barely perceptible, signals with a pleasant volume, and very loud signals at the limit of tolerance are clearly defined. The entire hearing aid market is looking for a new measuring system to configure percentile-controlled hearing aids (see scientific comparisons of CI hearing aids) to provide the best possible, reproducible speech comprehension. The new method achieves this aim by effecting a paradigm change to cortically reproducible perception. The sales of hearing systems can be significantly increased with this system, this procedure and the new, linear, digital hearing aid products since basic customer needs for improved speech comprehension (where it is possible; not with death areas) are met to a much greater degree of satisfaction. Rehabilitation work in the form of information and explanations (counselling) and audio-therapy or speech-therapy work will also be required.The same methods have long been used in the cochlea implant configuration.

The further advantages are:

- • Rapid success with reaction to speech by means of guaranteed, linear, static perception
- • Other configuration measurements such as those performed by ENT doctors
- • Reduction in the stock of hearing aids kept by audiologists
- • Higher profit as only high-quality hearing systems are involved
- • The transparency of hearing aid configuration is no longer just limited to the hearing aid, but includes services
- • Meeting patient expectations to regain the ability to understand speech, rather than merely subjectively 'hearing' better.

Literaturhinweise

- DIE ZEIT zitiert am 8. Dezember 2005 u.a. PD. Gerhard Hesse, Arolsen und Jürgen Rehkopf
- PhD Blamy Zeitschrift für Audiologie 2/2006 Seite 72f
- Hörakustik 2/2006 Seite 42f
- Zeitschrift für Audiologie 2/2006 Seite 76 TEOAE und Linearität
- Interton Power- Point Präsentation ADRO
- Statistische Signalverteilung im Fuzzy- Algorithmus
- Mueller- Deile J, Versorgung mit Cochlear Implantaten, Sprache Stimme & Gehör, 2004; 04-28
- Ruhruniversität Bochum DGA- Tagung 2005 Postervortrag
- BIHA Downloadcenter „Offene Versorgungen"
- Die Ziele der DGA im Fachausschuss Hörgerätetechnik und Hörgeräteversorgung
- Forderungskatalog vom DHI (Deutschen Hörgeräteinstitut – Expertengruppe)
- Manfred Spitzer „Geist im Netz" Seite 52ff
- Manfred Spitzer „Lernen" Seite 86ff
- Tallal p, Miller SL „Langauge comprehension in language-learning impaired children improved with acoustically speech" Seite 81ff
- Spiegel Spezial "Bewegung ist alles" Seite 92ff
- Gerald Langner „Die zeitliche Signalverarbeitung im Hörsystem: Neuronale Grundlage für die Tonhöhenwahrnehmung und für ein künstliches Gehör" aus: Thema Forschung (TUD) 2/99
- Arthur Schaub „Digitale Hörgeräte- was steckt dahinter?" Median- Verlag Seite.74
- Spitzer. "Geist im Netz" Seite 111

O092

Intelligibility of German digit triplets for non-native German listeners

Warzybok, A. (1), Wagener, K.C. (2), Brand, T. (3)

(1) Institute of Acoustics, A. Mickiewicz University, Poznañ
(2) Hörzentrum Oldenburg GmbH
(3) Medizinische Physik, Carl-von-Ossietzky Universität Oldenburg

The aim of this study was to investigate the German digit triplets test (Wagener et al, 2006) with non-native listeners. The test was developed as a screening test for speech intelligibility in noise and measures the speech reception threshold (SRT) of digit triplets in noise. The test can be used in a broadband version via headphones or as a telephone test.

35 normal- hearing international students who spent a few months at Oldenburg University took part in this experiment. The subjects differed in German verbal skills. Each subject measured 7 lists consisting of 27 triplets each: 2 lists via headphones using an adaptive procedure, 2 lists via telephone using an adaptive procedure and 3 lists via headphones at three different fixed signal-to-noise ratios. In an additional experiment, the German Oldenburg sentence test (OLSA, Wagener et al, 1999) was also used with some of the participating subjects.

The mean SRT results of the digit triplets test of non-native listeners showed no significant difference to the SRT reference values of German listeners, as far as measurements via headphones are concerned. Poorer speech perception in noise and significant differences between subjects can be observed in telephone measurements with the digit triplets test and in the OLSA test which requires larger verbal skills compared to the digit triplets test.

Wagener, K., Brand, T., Kollmeier, B. (1999) "Entwicklung und Evaluation eines Satztests für die deutsche Sprache I-III: Design, Optimierung und Evaluation des Oldenburger Satztests". Zeitschrift für Audiologie, 38(1-3), 4-15, 44-56, 86-95

Wagener, K.C., Bräcker, T., Brand, T., Kollmeier, B. (2006) „Evaluation des Ziffern-Tripel-Tests über Kopfhörer und Telefon". DGA 9. Jahrestagung Köln 2006, TagungsCD

O093

The Adaptive Auditory Speech Test (AAST) - development of of the Polish version.

Coninx, F. (1), Lorens, A. (2), Piotrowska, A. (2), Hübinger, P. (1), Skarzynski, H. (2)

(1) Institut für Audiopädagogik – IfAP – at the University of Cologne, Solingen/Cologne

(2) International Center for Hearing and Speech, Kajetanu/Warsaw, Poland

Aim: The construction, norming and validation a Polish version of the Adaptive Auditory Speech Test (AAST) for children aged 3-4 years and older (and adults).

Method: The Adaptive Auditory Speech Test (AAST) is based on a closed set paradigm and includes - in the original German version - 6 spondee words. The test is relatively independent on the child's vocabulary. The child can click on one of 6 pictures on the computer screen. After a correct response the stimulus intensity is reduced by one step, i.e. after an incorrect response increased by two steps. Step size is 5 dB (and 2 dB for speech in noise). The algorithm automatically stops the up-down procedure after 7 incorrect answers and calculates a threshold value based on the last 6 reversals.

As spondees are not existent in Polish language, trisyllable words were chosen instead. After careful selection of the words in order to meet the construction criteria (easy for children, picture available, group-balanced phoneme representation) sound recordings were made and stimuli were implemented in the software. Internal balancing of the 6 words was based on collective psychometric curves measured in a pilot test group of normal hearing subjects.

Results: A Polish version of AAST could be established meeting the same quality as the original German test version. Age dependent normdata for speech in quiet as well as for speech in noise were collected and will be presented.

The adaptation process to produce a new language version of AAST has been evaluated. The consequences for the production of more language versions will be discussed.

O094

Normalisation of the "Time-Compressed" and " Dichotic Digit" speech tests

Canatan, M. D., Budak, B.

Hacettepe University Medical Faculty E.N.T Department, Audiology Section, Ankara-Turkey

Aims: In our study, we planned to make the normalisation study of time-compressed and dichotic digit speech tests.

Background: Time-Compressed practised as monaural and Dichotic Digit test practised as dichotic are among the most sensitive tests in determining cortical and hemisferic lesions and which are considered among the tests in which different speech stimulus are being applied and which evaluate central auditory system and necesiate cortical integration.

Material-Method:"Time-Compressed" and " Dichotic Digit" speech tests were intended for 80 individuals between 20-40 years old showing the normal otological, audiological and impedansmetric symptoms were included to the study. Time-Compressed speech test was applied by 40% ratio to the individuals.Scores obtained by both tests were evaluated as percent (%) and the norm criteria was determined for clinical study.

Results:Norm criteria for time-compressed speech test for right and left ear was 90%; for dichotic digit speech test, for right ear 87%, for left ear 86%. Moreover, in dichotic digit test, the advantage of right ear was significantly determined on the individuals. The norm criteria obtained conduct the prediagnostic feature for the pathologic group in respect to the abnormal performance evaluation.

Baran,J.A & Musiek, F.E. (1990) Behavioral assessment of the central auditory nervous system
Chermak,G.D,Hall,J.W,Musiek,F.E.Diagnosisi and management of CAPD nad ADHD.American Academy of Audiology,11.Annual ConventioniMiami,1999.
Katz,J.HANDBOOK OF CLINICAL AUDIOLOGY (1998), Williams and Wilkins Company,Baltimore
Silman,S.,Silverman,C.A (1997).Auditory diagnosis,Singular pub., London

O095

The effect of age over the dichotic digit test

Zenker Castro, F. (1), Mora Espino, R. (2), De Lucas Carmona, G. (1), Fernández Belda, R. (1), and Barajas, J.J. (3)

(1) Clínica Barajas

(2) Fundación Canaria Dr. Barajas para la prevención e investigación de la Sordera

(3) Universidad de La Laguna

The Central Auditory Processing mechanism of binaural integration can be assessed through behavioural non-invasive procedures such as the Dichotic Digit Test. This procedure consists of simultaneous presentation of digits to the two ears in a unpredictable presentation in groups of one, two and three pairs of items. The Dichotic Digit Test is commonly used in the diagnosis of Central Auditory Processing Disorders in the educational setting and in the clinical audiological practice. In the present study the effect of age, ear and difficulty were studied in a group of 127 participants aged from 6 to 72 years old. Results showed a Right Ear Advantage of scores obtained by the right ear in all subjects. As age and difficulty increase worse scores were obtained. The effect of age over the items recognitions were described by a curvilinear regression function. Normative values are obtained according to the age of the subjects who took part in the present study.

O096

Listening Effort and Speech Intelligibility

Schulte, M., Meis, M., Wagener, K.

Hörzentrum Oldenburg GmbH

Hearing impaired people often report that it is difficult to understand speech in situations with high background noise levels. Difficulty often means that hearing impaired people are able to understand everything but they need to concentrate to the speaker very much or in other words, they need a lot of listening effort (LE). In this study we evaluated whether listening effort can be measured by a simple scaling procedure. Another question was whether LE and speech intelligibility (SI) are different factors that both describe the perception of speech in noise or if they influence each other so that the measure of one would be sufficient.

10 normal hearing subjects (group 1), 10 subjects with a mild hearing loss (group 2) and 10 subjects with moderate hearing loss (group 3) participated in this study. SI measure was performed using the adaptive Oldenburg sentence test to get the SRT and the slope of the psychometric curve [1]. An effort scaling using a 60 point scale from “extreme easy” to “extreme difficult” was used to evaluate the subjectively perceived LE at 11 different Signal to noise ratios (SNRs). So, SI and LE could be compared over a wide range of SNRs. Both measurements were performed with two different background noises: the “olnoise” and a “cafeteria noise”.

Subjects from all three groups showed better speech reception thresholds with the “olnoise” compared to the “cafeteria noise” over a wide range of SNRs. However, the effort was rated to be less with the “cafeteria noise”. This indicates that LE and SI are two different factors that both describe the perception of speech in noisy conditions. This might explain why e.g. Marzinzik and Kollmeier found no effect on SI when using noise suppression algorithms but an effect in LE [2].

1. Brand, T. and B. Kollmeier, Efficient adaptive procedures for threshold and concurrent slope estimates for psychophysics and speech intelligibility tests. J Acoust Soc Am, 2002. 111(6): p. 2801-10.
2. Marzinzik, M. and B. Kollmeier, Development and Evaluation of Single-Microphone Noise Reduction Algorithms for Digital Hearing Aids, in Psychophysics, Physiology and Models of Hearing, T. Dau, V. Hohmann, and B. Kollmeier, Editors. 1999, World Scientific: Singapore. p. 279-282.

P50

The phonetic contents of texts as function of the intended age group.

Koopman, J., Verschuure, J.

Erasmus MC, Rotterdam

A lot of speech in noise tests have been developed. Most tests compare the phonetic structure of their speech material to the phonetic structure of written text. This is based on the assumption that the assessment of speech intelligibility becomes more reliable when being assessed on material following the phonetic distribution of daily speech. Different passages from books (each contained 2000 words), written for 6 different age groups (2-4; 4-6; 6-8; 8-12; 12-16; adults) were analysed on their phonetical contents. The phonetical distributions were compared using a Chi-squared test. In addition, the list for adults was compared to a previous study conducted in Dutch. Results indicated that, when developing speech in noise tests, one should take into account that language changes due to influences of other languages. In addition, when developing speech in noise tests for a specific age-group, one should take into account that children are addressed using different language than adults, which results in a different phonetic distribution.

P51

Speech intelligibility

Cekic, S., Sennaroglu, G., Soli, S.D.

Hacettepe University, Ankara

The difficulty in understanding speech in noisy conditions is one of the most important problems for not only hearing impaired people but also for some normal hearing people. Various speech audiometry materials have been developed in Turkish for clinical use previously, but most of them include words to assess speech intelligibility or make this evaluation under quiet conditions. Daily sentence materials may be better means to assess speech intelligibility both for noisy and quiet conditions. HINT created by Nilsson et al. provides a reliable method of evaluating speech intelligibility in quite and in noisy conditions by measuring speech reception thresholds for sentences, thus avoiding ceiling and floor effects that plague traditional measures performed at fixed presentation level. In this thesis study, the Turkish version of HINT is developed and presented in this manuscript to describe the development details of this test. The methodology used includes: 1) Development of a large set of sentences and validation of their naturalness as judged by native Turkish speakers; 2) Recording and the processing of the speech material; 3) Determination of the performance intensity function; 4) Equalization of the sentence intelligibility; 5) Generation of the phonetically balanced lists; 6) Establishment of the SRT norms for Turkish population. As a result, two versions of the test materials, twelve 20-recorded sentence lists and twenty four 10-recorded sentences lists are created from a single set of 240 recorded sentences. Average headphone SRTs with 30 native Turkish speaker adults with normal hearing are 23,6 dBA in quiet, -3,3 dBA SNR in 65 dBA noise front condition and -11,6 dBA SNR in 65 dBA noise side condition. The low response variability suggests that consistent results could be obtained using any list. The Turkish HINT norms are found to be comparable with those for the English HINT.

1. Cox, R.M., Gray, G.A. ve Alexander, G.C. (2001). Evaluation of a revised speech in noise (RNIS) test. Journal of American Academy of Audiology, 12, S423-432.
2. Nilsson, M., Soli, S.D. ve Sullivan, J.A. (1994). Development of the hearing in noise test for the measurement of speech reception thresholds in quiet and in noise. Journal of Acoustical Society of America., 95(2), S1085-1099.
3. Plomp, R. (1977). Acustical aspects of cocktail parties. Acustica. 38, S186-191.
4. Killion, M. ve Niquette, P.A. (2000). What can the pure-tone audiogram tell us about a patient's SNR hearing loss? Hearing Journal. 53, S46-53.
5. Muellr, G.H. (2001). Speech audiometry and hearing aid fittings: going steady or causal acquainstances? Hearing Journal. 54(10), S19-29.

P52

Word Recognition Scores by Native and Non-Native Speakers of Modern Greek Language

Trimmis, N. (1), Markatos, N. (1), Malaperdas, K. (1), Papadeas, E. (2)

(1) Department of Speech Pathology. Technological Educational Institute of Patras

(2) Department of Otolaryngology. University Hospital of Patras.

The goal of this study was to examine performance on word recognition score testing of native and non-native adults of Modern Greek language in quiet and at various signal-to-noise ratios (SNR). The individuals who participated in this investigation included twenty native Modern Greek adult listeners and twenty adult listeners for whom Modern Greek is a second language (GSL). All GSL subjects were Albanian natives who learned Albanian as a first language and Modern Greek as a second language after puberty and lived for a minimum of five years in Greece. All subjects had pure tone thresholds of ¡Ü 15 dB HL at all octave frequencies ranging from 250 Hz to 8000 Hz with no known history of auditory dysfunction or neurological disorder. The speech stimuli used in this experiment were the four 50-word lists developed by Trimmis and colleagues (2006). Speech-shaped noise was used as the noise competition. Testing was conducted in a sound isolated booth with all stimuli presented monaurally (right ear) at 40dBSL. Word recognition scores were assessed in quiet and under 5 different SNRs (SNR= +6, +3, 0, -3, and -6 dBHL). Results indicated that although both groups obtained essentially equivalent scores in quiet, performance was poorer for both groups across all SNR conditions. In addition, significant differences were noted between the groups as the SNR became less favorable. These findings are consistent with previous research suggesting that bilingual listeners will exhibit decreased perceptual performance in the second language in degraded listening environments.

Trimmis N, Papadeas E, Papadas T, Naxakis S, Papathanasopoulos P, Goumas P. Speech Audiometry: The Development of Modern Greek Word Lists for Suprathreshold Word Recognition Testing. Mediterr J Otol 2006; 3:117-126.

O097

Hearing in two samples of 55- to 65-year-old populations in Northern Finland

Mäki-Torkko, E. (1, 2), Hannula, S. (1), Jounio-Ervasti, K. (2), Sorri, M. (2)

(1) Dept. of Otorhinolaryngology, University of Oulu, Finland

(2) Dept. of Otorhinolaryngology, Linköping University Hospital, Linköping, Sweden

Although there is significant individual variation, some ARHI (age-related hearing impairment) changes can be seen from 50 years of age onwards in western populations. According to current knowledge, both genetic and environmental factors are involved in ARHI. In order to investigate the hearing of 55- to 65-year-old people in Northern Finland, two population-based samples were collected at an interval of 20 years. The participants were recruited randomly from the population register. The first sample (Sample I, N = 851) consisted of 378 men (44.4 %) and 473 women (55.6 %), and the second sample (Sample II, N = 835) of 378 men (45.3 %) and 457 women (54.7 %). Sample I was examined in 1983-1986 and Sample II in 2003-2005. After otoscopy, air conduction thresholds were measured at 0.125, 0.250, 0.5, 1, 2, 3, 4, 6 and 8 kHz, and bone conduction thresholds at 0.250, 0.5, 2 and 4 kHz. Medians of better ear hearing levels at frequencies of 0.5, 1, 2 and 4 kHz (BEHL 0.5-4 kHz) and of individual thresholds at frequencies from 0.125 kHz to 8 kHz were calculated. Background information was elicited by means of a structured interview. Background factors, such as subjective hearing difficulties, ear diseases, general health, occupational and leisure time noise exposure and family history of hearing impairment, were covered. The median of the better ear hearing level (BEHL 0.5-4 kHz) was 13.75 dB HL in both samples. In Sample I, the median BEHL 0.5-4 kHz was 11.25 dB HL for women and 17.5 dB HL for men. In Sample II, the corresponding figures were 12.5 dB HL and 13.75 dB HL. The hearing of both women and men at different frequencies will be described, and the role of different background factors will be discussed.

O098

The impact of aging and age related hearing loss on otoacoustic emissions

Hoth, S., Gudmundsdottir, K., Plinkert, P.

Univ.-HNO-Klinik Heidelberg, Germany

OBJECTIVE: The amplitude of transitory evoked and distortion product otoacoustic emissions (TEOAE and DPOAE) is known to depend on age. Up to now it is not clear whether the amplitude reduction is a direct effect of aging or rather mediated by the age dependence of hearing loss. In order to clear this issue, data from a large population are needed to examine a subgroup of normal hearing persons covering at least seven decades of age.

METHOD: TEOAE and DPOAE were recorded in 10284 ears of 5142 patients from 0.4 to 89.8 years of age during 12 years of clinical routine audiometry. From this data pool, all cases with reliable pure tone audiogram and without conductive hearing loss, sudden deafness or retrocochlear disorders were selected. The remaining 5571 ears were arranged in groups according to age and hearing capability and underwent a regression analysis.

RESULTS: In all age groups, the OAE amplitude decreases with increasing hearing loss and in all hearing loss groups, the OAE amplitude decreases with increasing age. In the subgroup of audiometrically normal subjects, the amplitude of TEOAE and DPOAE decays with a slope of 0.6 to 1.1 dB per decade. This amplitude loss occurs much faster (0.8 to 2.2 dB per decade) if ears with age accordant instead of normal hearing are analyzed.

CONCLUSIONS: The amplitude of TEOAE and DPOAE is not exclusively determined by the functionality of those inner ear structures whose performance is mirrored in pure tone threshold. If the OAE amplitude is used as a measure for hearing assessment, its dependence on age has to be taken into account. Normal hearing and age accordant threshold must be strictly differentiated.

O099

Older people with hearing impairment: Examining the variations in the use of health services and maintenance of autonomy and independence. A prospective study

El Refaie, A.

Bristol University/ UK

Background: Hearing impairment is common in older people. It affects at least 37% of people under the age of 60 and 60% of those aged between 70 and 80, and it is one of the most common three conditions affecting the elderly. The effect on the quality of life of the individuals and their families and quality of life as a result of hearing related disabilities can be marked. Several studies showed that only 1.4 million people actually use hearing aids out of the 2 million people who have acquired them, and in the age group above 75, only 50% of individuals experiencing hearing loss own a hearing aid.

Aims: We aim to investigate the mechanisms by which hearing loss affects uptake of services, the sense of independence and the quality of life of elderly individuals. We will explore the attitudes, beliefs and experiences of elderly people with hearing impairment in relation to maintaining the delicate balance between growing old with disabilities, seeking help and maintaining autonomy.

Methodology: The study will be carried out in two phases using mixed methods.

The first phase comprises a qualitative interview-based study, using a semi-structured, open-ended format, to identify the experiences of suffering from hearing loss and seeking help. These findings will be used to develop a questionnaire, which is designed to reveal the prevalence and quantify pattern of the identified barriers to the uptake of professional help with hearing disability. Obtaining information from a wider population sample will add weight to the findings and enable the development of evidence-based recommendations. We aim to develop the questionnaire as a standardised instrument to reflect older people views on hearing services

I intend to present an outline of this Prospective study, some background information and explore avenues for European collaboration on similar studies.

O100

Examinations of the brainstem function in diabetic patients

Kiss, J. G., Várkonyi, T. T.,* Tóth, F., Rovó, L., Lengyel, Cs.,* Légrády, P.,* Jóri, J.

Department of Otolaryngology, Head and Neck Surgery

*1st Department of Medicine, University of Szeged, Szeged, Hungary

Methods: We performed brainstem auditory evoked potential (BAEP) examinations in patients with long-standing type-1 diabetes mellitus (DM). 12 middle-aged, non-obese, insulin-treated patients with DM of long duration were included. Cardiovascular reflex tests were applied for assessment of autonomic neuropathy. Peripheral sensory nerve function was studied with a Neurometer (Neurotron Inc., Baltimore), using constant current sine wave transcutaneous stimulation. Our aim was to compare the BAEP results of this patient group with controls and to look for the possible correlation between the alteration of the auditory brainstem function and the cardiovascular autonomic and the peripheral sensory neuropathy.

Results: Analysis of the latencies (wave I, II, III and IV/V) and the inter-peak latencies (IPL I-III: and I-IV/V) of BAEP revealed a significant difference between diabetics and healthy controls at 16 Hz stimulus rate. The amplitudes of wave I, II, III and IV/V were definitely lower in comparison with healthy controls. These differencies were more definite at high frequency stimulation (64 Hz). A positive correlation was observed between the overall autonomic score (AN) and the latencies (wave III and V) and IPL-s (I-III, I-V). Evaluation of the peripheral sensory nerve function revealed positive association current perception thresholds (CPT at 2 kHz and 250 Hz) and wave latency values (wave III and V).

Conclusions: Several parameters of autonomic and sensory neuropathy consequently worsen together with abnormalities of brainstem function. Our data support the hypothesis that diabetic neuropathy might be manifested in certain dysfunctions of the central auditory pathways.

O101

Random gap detection threshold: a useful measure of auditory aging?

Owens, D. (1, 2), Campbell, P.E. (1), Liddell, A. (1, 2), DePlacido, C. (1), Wolters, M. (2)

(1) Audiology Division, Speech and Hearing Science Department, Queen Margaret University, Edinburgh, UK

(2) Centre for Speech Technology Research, University of Edinburgh, Edinburgh, UK

OBJECTIVE: Temporal processing deficits are believed to contribute to older adults difficulties in understanding speech in background noise. Recent consensus studies have advocated the use of at least one measurement of temporal processing in the diagnosis of auditory processing disorders. However, there has been little or no evidence to support the use of such testing particularly among older adults. This is further compounded by the lack of age related normative data for the click gap detection subtest. We present our recent findings from a commercially available Random Gap Detection Test (RGDT).

DESIGN: The RGDT recording consists of six subtests using tones (500, 1000, 2000, and 4000 Hz, with 7 ms duration) and click pairs presented randomly with inter-stimulus intervals of 0 to 40 ms. The RGDT was administered to 29 normal hearing adults. Subjects were divided into two groups: younger group (aged 20-30 years; 2 males, n=11) and an older group (aged 50-65 years; 9 males, n=18).

RESULTS: Results showed mean gap detection thresholds of 14.6 ms for 500 Hz, 11.8 ms for 1000 Hz, 10.8 ms for 2000 Hz, 8.4 ms for 4000 Hz and 10.3 ms for the click stimuli. We could find no evidence to suggest a significant relationship between the two groups for tonal stimuli (1000, 2000, 4000 Hz) or paired click stimuli (Kruskal-Wallis chi-squared test, df= 1, $p > 0.05$). However there was a significant difference between the two groups for tonal stimuli presented at 500 Hz (Kruskal-Wallis chi-squared test, df= 1, $p < 0.05$).

CONCLUSIONS: To our knowledge, this is the first study of normative data for the click gap detection subtest in an older population. We present our normative data for future comparison with other studies. We discuss these findings and the clinical usefulness of RGDT as a measure of temporal resolution in an older population.

O101a

Peculiarities of Age Related Hearing Loss in Females and Males

Sharashenidze N., Kevanishvili Z.

Center of Audiology and Hearing Rehabilitation

Tbilisi, Georgia

Background/aims: No standards exist currently for prevention or treatment of presbyacusis. New approaches seem thus necessary to the problem of age related hearing loss. With this goal in mind, we attempted to assess the gender peculiarities of the dynamics of presbyacusis. Information on age related hearing impairments in females and males was expected to promote the search of effective designs for their prevention, management, rehabilitation.

Methods: Hearing acuity was measured in 128 females and 96 males. None of subjects reported any noise exposures or other hearing confounding histories in the past. Auditory thresholds were estimated by tonal audiometry at 0.125-16-kHz frequencies.

Results: Initial signs of hearing impairments were revealed in females and males of 40-49 and 30-39 years of age, respectively. In both genders the disorders involved high sound frequencies. In the following age decades, 50-59, 60-69, and 70-79 years, the hearing loss progressed in magnitudes and extended to lower frequencies. From the age of 30-39 to that of 40-49 and 50-59 years the dynamic of threshold elevations appeared more rapid in males vs. females. The gender differences in hearing sensitivity accentuated respectively in this age period. Thereafter, in the ages of 60-69 and 70-79 years, the hearing alterations became steeper in females than in males. As a result, the gender differences in hearing smoothed or negated.

Conclusion: Age related hearing impairments in females and males possess different characteristics. The dissimilarities concern starting time as well as a rate of hearing losses within different age spans. A significance of early detection of ageing processes in auditory system with application of both subjective and objective procedures and of timely start of respective preventive and treatment actions has been emphasized.

P53

Hearing, communication, and use/non-use of hearing aids by older people

Erber, N. P.

School of Audiology, University of Melbourne (Australia)

Many older people lose high-frequency hearing sensitivity, score poorly on auditory word tests, and report communication difficulty in noise. Yet only about 20% obtain hearing aids, and about 25% of aid owners are non-users. A literature review has shown a relation between hearing loss, communication difficulty, and use/non-use of hearing aids.

A typical older person's audiogram is flat below about 1KHz, then slopes about -15 dB/ octave (e.g., Gussekloo, et al, 2003). Older people typically report communication difficulty when their thresholds are > about 35 dB HL in the lower frequencies (Lichtenstein, et al, 1990; Holt and Seeger, 1995). In contrast, hearing aids often are recommended to people when their thresholds > about 20 dB HL in the lower frequencies (e.g., Davis, 2003). Although most older people with mild losses experience difficulty with auditory perception of speech, much daily communication is auditory-visual (face-to-face). They rely on lipreading and cooperation from others, and thus postpone the use of hearing aids. They eventually obtain/use hearing aids when face-to-face communication becomes difficult.

Regular use of hearing aids is related to need (impaired speech audibility), motivation (recognition of difficulty), and benefit (communication with aids better than without aids). In general, older people who do not use their hearing aids: have good low-frequency hearing thresholds (Erber, 2003), lack self-motivation (Garstecki, 1996), attempt to converse in noise with uncooperative partners (Erber, et al, 1996), have incorrectly programmed aids (Erber, 2006), cannot manage their aids or earmoulds (Stephens and Meredith, 1990), or have other health problems (Gussekloo, et al, 2003).

It is recommended that audiologists recognize the contribution of lipreading to daily communication, provide hearing aids to optimize low-frequency audibility, measure benefits face-to-face, test vision and manual dexterity, and check audiogram accuracy.

Davis, A. (2003).). Population study of the ability to benefit from amplification and the provision of a hearing aid in 55-74 year-old first-time hearing aid users. International Journal of Audiology, 42 (Supplement 2), 2S39-2S52.
Erber, N.P. (2003). Use of hearing aids by older people: Influence of non-auditory factors (vision, manual dexterity). International Journal of Audiology, 42 (Supplement 2), 2S21-2S25.
Erber, N.P. (2006). Use and non-use of hearing aids. Unpublished report, Office of Hearing Services, Department of Health and Ageing, Australian Government.
Erber, N.P., Lamb, N.L., and Lind, C. (1996). Factors that affect the use of hearing aids by older people: A new perspective. American Journal of Audiology, 5, 11-18.
Garstecki, D.C. (1996). Older adults: Hearing handicap and hearing aid management. American Journal of Audiology, 5, 25-33.
Gussekloo, J., deBont, L.E.A., von Faber, M., Eekhof, J.A.H., de Laat, J.A.P.M., Hulshof, J.H., van Dongen, E., and Westendorp, R.G.J. (2003). Auditory rehabilitation of older people from the general population – the Leiden 85-plus study. British Journal of General Practice, XX, 536-540.
Holt, T.D. and Seeger, C.P. (1995). Rehabilitation assessment: Audiologic findings over a 3-year period. Journal of Rehabilitation, 61, 57-61.
Lichtenstein, M.J., Bess, F.H., Logan, S.A., and Burger, M.C. (1990). Deriving criteria for hearing impairment in the elderly: A functional approach. Journal of the American Academy of Audiology, 1, 11-22.
Stephens, S.D. and Meredith, R. (1990). Physical handling of hearing aids by the elderly. Acta Otolaryngologica Supplement, 476, 281-285.

P54

Can extended high frequency hearing thresholds be used to detect auditory processing difficulties in an aging population?

Liddell, A. (1, 2), Campbell, P.E. (1), Owens, D. (1, 2), DePlacido, C. (1), Wolters, M. (2)

(1) Audiology Division, Speech and Hearing Science Department, Queen Margaret University, Edinburgh, UK

(2) Centre for Speech Technology Research, University of Edinburgh, Edinburgh, UK

OBJECTIVE: Age-associated hearing loss and the subsequent masking of any speech information carried above 8 kHz may result in older adults' difficulties in understanding speech in adverse listening conditions. However the use of extended high frequency (EHF) audiometry is still limited and additional studies are required to establish its use, particularly among older adults. In this study, we sought to determine the clinical usefulness of EHF audiometry in detecting increases in pure-tone hearing thresholds in adults who complained of discrimination difficulties in background noise despite normal hearing in conventionally tested frequencies.

DESIGN: We measured hearing thresholds from 0.25 kHz to 20 kHz in 18 subjects (aged 50-65 years) using a GSI-61 high frequency audiometer with Sennheiser HDA-200 earphones. EHF audiometry thresholds were established at intermediate frequencies between 9 and 20 kHz (9, 10, 11.2, 12.5, 14, 16, 18 and 20 kHz) using a modified Hughson-Westlake procedure [1]. Subjects were divided into two groups: group 1 reported difficulties with their hearing in background noise (n=7) and group 2 reported no concerns (n=11).

RESULTS: All participants had normal peripheral hearing across 0.5 kHz to 4 kHz. However, significant differences were observed between the two groups for the extended high frequencies (9-20 kHz). In adults who complained of noise (group 1), there were statistically significant elevations only in frequencies higher than 9 kHz.

CONCLUSIONS: Although our sample size are small, our data lead us to conclude that EHF audiometry is an important instrument to distinguish auditory sensitivity, even for those considered as audiologically normal. Extended high frequency audiometry may serve as a useful measure of elevation in pure-tone hearing thresholds that precede noticeable loss of auditory acuity.

[1] Stelmacowicz PG, Beauchaine KA, Kalberer A, Jesteadt W. Normative thresholds in the 8-to 20-kHz range as a function of age. Journal of the Acoustical Society of America 1989; 86: 1384-1391

P55

Aural rehabilitation, person centred or cost effective?

DePlacido, C.

Queen Margaret University Edinburgh

Objective: Audiology services within the UK face the challenge of providing appropriate aural rehabilitation to an increasing population, within a restrained budget. The debate around what constitutes a 'comprehensive service' continues. Following the recent introduction of open ear fittings and telephone reviews, a new concern has emerged regarding the decrease in patient contact time as a result of these new implementations. Such developments are welcomed by managers because they enable redirection of resources to address waiting times. Many clinicians however are concerned about the effect of limited contact time on rehabilitation. What also remains unclear at present is the patients' perception of a comprehensive rehabilitation plan. This study sought to explore patients concerns about acquired hearing loss and their expectations of service provision.

Design: Seven newly diagnosed subjects were interviewed prior to their first Audiology consultation. The tape recorded interviews were open ended and lasted for one hour. The tapes were transcribed and analysed using a grounded theory approach. Results: All subjects reported concerns regarding the psychosocial aspects of deafness. The main themes included: coming to terms with the onset of hearing loss; reactions of their family; coping with future social interactions; the ability to cope with hearing aids and the stigma attached to hearing aid use . Interestingly, all subjects reported little or no knowledge regarding the services which would be provided for them, with many expecting only to be given one hearing aid and no other intervention or support.

Conclusions: Rehabilitation services need to meet the needs of individuals, while remaining cost effective. In order to plan services effectively it is essential that clinicians are aware of concerns and expectations. This paper will discuss the implications of these results for service provision and outline areas of research which will be undertaken as a result of this study.

O102

Automatic screening and detection of threshold fine structure

Verhey, J.L., Mauermann, M., Heise, S.

Carl von Ossietzky Universität Oldenburg

Many normal-hearing people show a threshold fine structure, i.e. a ripple effect in their hearing threshold of up to 15 dB. There are strong indications in the literature that fine structure may be a measure for cochlear vulnerability. Therefore a method for detecting fine structure may be relevant (1) for further investigating the nature of fine structure and (2) as a tool in the field of clinical diagnostics. In general, current methods are very time consuming and lack a thorough testing. In this study a FINE-Structure Screening (FINESS) method is presented which is an improved version of the procedure that was introduced on last year's DGA and ICAud conferences. The procedure FINESS measures the threshold with a high frequency resolution. The duration is kept short by using a tracking procedure and controlling the repetitions of a measurement in a flexible way. An automatic detector („FINESS-detector“) identifies regions exhibiting fine structure, thus providing an objective measure of fine structure for an easier comparison of fine structure data between clinics and labs. The method has been tested on 20 subjects by performing test–retest measurements and comparing the measured thresholds to thresholds obtained by a psychoacoustical standard procedure, i.e. an adaptive alternative forced choice (AFC) procedure. The results show that (1) the thresholds can be measured with a high reproducibility (correlation of 0.9 between test–retest data), (2) fine structure is accurately measured (correlation of 0.9 between FINESS and AFC results) and (3) there is no trend due to potential bias effects with respect to the absolute thresholds across frequency. The average measurement time is just above 10 minutes per octave. In conclusion, the FINESS procedure together with the FINESS-detector provides a fast, reliable and user friendly method for the detection of threshold fine structure.

O103

Threshold fine structure and its role in temporal integration

Verhey, J.L., Lendzian, H., Mauermann, M.

Carl von Ossietzky Universität Oldenburg, Oldenburg

Normal hearing listeners often show periodic ripples in the audiogram when measured with a high frequency resolution. The present study investigates how the fine structure influences temporal aspects of auditory processing near threshold. Pure-tone thresholds in quiet were measured for different signal durations in the range from 8 to 512 ms at frequencies corresponding to minima and maxima of the fine structure. In addition, thresholds were obtained for frequencies corresponding to a transition region between adjacent extrema and at regions with a flat threshold curve. To select the frequencies, threshold fine structure was measured individually prior to the main experiment using an optimized Békésy tracking method [FINESS]. For all frequencies, thresholds decreased as the duration increased reflecting the well known temporal integration properties of the auditory system. The steepest decrease was observed for a minimum of the fine structure. The shallowest threshold curves were obtained for frequencies corresponding to a maximum of the fine structure. The same intermediate temporal integration curves were found for frequencies in a flat region and between two extrema. Fine structure was largely reduced or absent for the shortest duration. The threshold curves were simulated with an effective model taking into account general characteristics of the fine structure, spectral splatter and temporal integration. The simulations indicate (1) that the data can be modelled with a single time constant for the leaky integrator and (2) the differences in the curvature are largely due to the characteristics of the fine structure. A slightly larger time constant derived from the data for the maximum than for the minimum may indicate slight changes in the compression between the extrema.

O104

The new ISO 16832 „Acoustics – Loudness scaling by means of categories“

Kinkel, M.

KIND Hörgeräte, Kokenhorststr. 3-5, D-30938 Burgwedel

The assessment of loudness function based on category loudness scaling is used when the evaluation of hearing is not only necessary at ghe boundaries of the auditory sensation area (threshold of hearing, uncomfortable level), but for a knowledge over the entire individual auditory sensation area. Important fields of use are diagnostic evaluations, especially the evaluation of recruitment and fitting of hearing instruments. Since the results of loudness scaling can markedly depend on the exact procedure used, the ISO 16832 sets the conditions for reliable measurement methods and specifies basic methods for scaling loudness into categories for audiological applications. An exemplary method is given in detail.The key points of the standard and its applications for hearing aid fitting and assessment are given.

O105

Does the natural sounds loudness estimation method work for patients with "dead regions"?

Hojan-Jezierska, D. (1), Skrodzka, E. (2), Hojan, E. (2)

(1) Chair of Biophysics, Medical Academy of Pozna, Poland

(2) Institute of Acoustics, A. Mickiewicz University, Pozna, Poland, hojanaku@interia.pl

A “dead region”, DR, is defined in terms of the characteristic frequencies of the inner hair cells and/or neurones immediately adjacent to the dead region [1]. It is usually not possible to predict the occurrence of dead regions based on a tonal audiogram [2] and specific methods of diagnosis must be used (threshold equalizing noise method (TEN test)). Classic hearing aid fitting methods which ignore the presence of dead regions are often unsuccessful and hearing aids fitted using such methods do not improve a life comfort of hearing impaired people with dead regions.

We propose an alternative method of hearing aids fitting for patients with “dead regions” - The Natural Sounds Loudness Estimation (NSLE) [3]. We have investigated four persons with DR’s in both ears. There were high-frequency DR’s starting in different frequencies, from 750 Hz up to 5000 Hz, were found. Listeners ability to follow subjectively perceived changes in loudness was investigated. Tracking of loudness changes is the basis for calculation of insertion gains of hearing instruments. We found that all DR-subjects were able to follow the task, with correlation to the original sound track of 0.6-0.8. Therefore, in our opinion NSLE method seems to be good, alternative method for hearing aids fitting for people with well diagnosed “ dead regions”.

[1] B.C. J. Moore, Ear and Hearing, 25(2), 2004, 98-116.
[2] B.C. J. Moore, Trends in Amplification, 5, 2001, 1-34.
[3] W. Geers, E. Hojan, D. Hojan-Jezierska, Applied Acoustics, 51(2), 1997, 199-209.
[4] T. Baer, B.C.J.Moore, K.Kluk, J. Acoust. Soc. Am, 112, 2002, 1133-1144.

P56

Development of Frequency Selectivity Map (FSMap) depiction system for hearing impairment

Nakaichi, T. (1), Sakamoto, S. (2)

(1) RION CO., LTD, Tokyo, JAPAN

(2) Otodesigners Co., Ltd. Saitama, JAPAN

An audiological assessment of hearing impairment and the fitting of hearing aids require an accurate measurement of auditory profiles of hearing-impaired listeners, since sensorineural hearing loss shows several perceptual changes such as loudness recruitment, reduced frequency selectivity and reduced temporal resolution. It is known that frequency selectivity can be expressed as the bandwidth of auditory filters. For investigating the reduced frequency selectivity, a system that could measure an individual auditory filter of hearing impairment for 3 minutes was developed. The measured auditory filters are depicted as Frequency Selectivity Map (FSMap) which is drawn with colored gradation. This system calculates the ratio between Equivalent Rectangular Bandwidth (ERB) of an individual hearing-impaired listener and that of normal-hearing listeners. Data of auditory filters for several frequencies and sensation levels were employed to draw a FSMap. In this study, FSMaps of thirty subjects with sensorineural hearing loss using this system were evaluated. Results showed that frequency selectivity of sensorineural hearing loss was reduced as comparing with that of the normal hearing. Different degrees of frequency selectivity for individuals who had the similar contour in audiogram were further obtained in FSMap. Consequently, reduced frequency selectivity, i.e. how much is your frequency selectivity poorer than normal hearings, is quantitatively and intuitively and showed with the FSMap. Results of this study suggested that FSMap had a potential to be a new practical auditory profile.

P57

Measuring the diffusiveness of spatial sound: A common framework for binaural perception, neurophysiological correlates and modelling

Lüddemann, H., Riedel, H., Kollmeier, B.

Medical Physics, Carl-von-Ossietzky-University Oldenburg

Binaural listening is generally thought to facilitate the separation of single sound sources from diffuse ambient noise and thereby enhance speech intelligibility. Therefore it is important to understand how the perceived diffusiveness in complex acoustical situations per se - or, as its related physical quantity, the normalized interaural cross correlation (IAC) - are represented in the auditory system.

This contribution investigates the binaural system's sensitivity to static and dynamic changes in the IAC of noise stimuli. Psychometric functions for the discriminability of signals with different IAC were obtained from pairwise comparisons in a 2-AFC-paradigm at 15 reference correlations. In EEG recordings the effect of different kinds of IAC changes on the amplitude

of late auditory evoked potentials (LAEP) was studied. In contrast to previous electrophysiological research, the stimulus correlation was varied over the whole parameter range, including +1, 0, -1 and intermediate values.

Rescaling the stimulus parameters of the psychometric functions according to a Bradley-Terry-Luce model suggests that the binaural system's internal decision variable, representing the degree of spatial diffusiveness, is in good approximation proportional to the dB-scaled ratio of energies in the correlated vs. the anticorrelated signal components, AC[dB(N0/Npi)]=10*log(1+IAC/1-IAC).

LAEP amplitudes can be described as linear functions of the stimulus parameters, but only if the latter are transformed to their corresponding dB(N0/Npi)-value. In this case the goodness of fit is far better than for stimulus parameters expressed in terms of the normalized IAC.

A plausible model is introduced which extracts a signal's IAC directly in dB(N0/Npi). The model explains own data and is also compatible with recent binaural psychoacoustics and neurophysiology by qualitative and quantitative means. It might provide a common framework to explain perceptual phenomena and underlying physiological mechanisms beyond the scope of competing IAC models, in particular the effect of unilateral hearing loss on binaural performance.

P58

Mechanisms of speech masking release: role of temporal and spectral cues

Gnansia, D. (1), Meyer, B. (2), Frachet, B. (3), Philippon, B. (4), Jourdes, V.(4), Lorenzi, C. (1)

(1) Ecole Normale Supérieure, University Paris

(2) Hôpital Saint-Antoine, Paris

(3) Hôpital Avicenne, Bobigny

(4) Neurelec-MXM France

Speech “masking release” (MR) corresponds to the improvement in speech intelligibility in fluctuating compared to steady-state background maskers. This effect is substantial in normal-hearing listeners, reduced in hearing-impaired listeners, and completely abolished in cochlear implantees. The current research program attempts to clarify the different mechanisms involved in the MR effect.

MR was assessed systematically as a function of masker modulation depth and rate in 8 normal-hearing listeners. Vowel-consonant-vowel logatomes were embedded in a steady-state or fluctuating speech-shaped noise masker and presented at a fixed signal-to-noise ratio yielding 50% correct identification in steady noise. Fluctuations were obtained by applying sinusoidal modulation to the amplitude of the noise. For each modulation rate (8 and 32 Hz), masker modulation depth was varied systematically from 0.1 to 1.0.

The results show that for both masker modulation rates, MR (performance in fluctuating minus steady noise) increases monotonically as a function of masker modulation depth, and reaches 35 points of percentage when modulation depth is 1.0. In a second experiment, the temporal fine structure of the stimuli was degraded using a 32-band tone vocoder, in order to force listeners to identify the speech items on the basis of temporal-envelope and spectral cues. The results show that MR increases more slowly as a function of masker modulation depth and reaches about 20 points of percentage when modulation depth is 1.0.

Taken together, these results indicate that at least two separate mechanisms are involved in MR: a first one using spectral and/or envelope cues contributing to roughly 2/3 of the effect, and a second one based on fine structure cues contributing to roughly 1/3 of the effect. These data provide therefore additional evidence that current implant processors should be modified to deliver place and fine structure cues in order to restore MR.

P59

A scanner noise impact on functional Magnetic Resonance Imaging studies

Bogorodzki, P. (1, 2), Piatkowska-Janko, E. (2), Wolak, T. (2), Sliwa, L. (1), Kochanek, K. (1), Orzechowski, M. (2), Kurjata, R. (2), Golebiowski, M. (3), Skarzynski, H. (1)

(1) Institute of Physiology and Pathology of Hearing in Warsaw

(2) Institute of Radioelectronics, Warsaw University of Technology

(3) 1st Dept. of Clinical Radiology, Medical University of Warsaw

The aim of the study was to measure the level of impact of the Echo Planar Imaging (EPI) sequence noise on BOLD response in auditory cortex area.

For each of the 20 healthy subjects at age 23.6 ±0.7 four functional ‘runs’ were acquired with variable TR and block type acoustic stimuli with (/ka/, /ta/, /pa/, /ga/, /da/, /ba/) syllables in 30s length ‘on’ periods. In order to detect linear dependence of activation volume in dependence of TR a linear model was applied giving two regression parameters for each hemisphere.

Activation was detected in both hemispheres for all functional runs. The mean activation size averaged across the runs was 32 and 25 cm3 for left and right hemisphere respectively. Pair-wise comparisons between groups TR2-TR3, TR2-TR4, TR2-TR6 did not show any differences on the alpha=0.05 level.

The presented work revealed a single percent range dependence of activation size in dependence from varying amount of noise in stimulating paradigm. The linear relation was rejected suggesting nonlinear relation between mentioned variables. A region of interest based approach may allow more quantitative or semi-quantitative analysis of functional activations.

P60

Evaluation of differences between audiometric and ASSR thresholds

Sliwa, L., Kochanek, K., Piotrowska, A., Plka, A., Skarzynski, H.

Institute of Physiology and Pathology of Hearing, Warsaw, Poland

The aim of the study was to determine the differences between audiometric thresholds and ASSR thresholds measured with different devices in groups of normal and hearing impaired subjects. An additional objective was to assess threshold variability.

Three systems were used in the tests: GSI Audera, BioLogic MASTER, and GN Otometrics Chartr EP. ASSRs were measured at four audiometric frequencies using procedures recommended by manufacturers. The ASSR thresholds were also compared with ABR thresholds.

The investigation showed that significant differences between behavioural and ASSR thresholds may appear irrespective of the applied measuring system. Intra- and intersubject variability of the ASSR thresholds is also meaningful.

The estimation of audiometric threshold based on ASSR measurement must take into account specificity of the patients' population and the applied signal detection method. Threshold variability must also be considered as a factor limiting estimation accuracy.

O106

BAHA in children, audiological results

Snik, A., Kunst, S., Leijendeckers, J., Bosman, A., Mylanus, E., Cremers, C.

ENT department, University Medical Centre St. Radboud, Nijmegen, the Netherlands

The BAHA is the most effective bone-conduction device that is on the market. Owing to the successful application in adults, the BAHA is used more and more in children. Literature review shows that results in children are comparable to those in adults.

Special attention will be paid to two rather new applications, namely the BAHA for children with unilateral conductive hearing loss (UCHL, n=18) and conventional transcutaneous application of the BAHA in children who are too young for implantation (BAHA Softband, n=10).

Results in children with UCHL were ambiguous. Achieved binaural advantage was poorer than that found in adults. However, most adults had acquired UCHL while the children had congenital UCHL. This might have played a role. Questionnaires showed that most parents were satisfied with the results.

Longitudinal research showed that the BAHA Softband worked as effectively as conventional transcutaneous bone-conductors. However, the softband is more convenient to use than a steel headband and the microphone is in the same housing as the transducer, thus not positioned contralaterally, as in most conventional bone conductors.

Conclusion: For congenital UCHL it is not yet clear who will profit from a BAHA and who won't. Nevertheless, subjective reports are encouraging.

The BAHA Softband is an effective hearing solution for children awaiting surgery

O107

Implantable hearing aid transducers: Output measured for different coupling parameters

Stieger, C., Arnold, A., Candreia, C., Pfiffner, F., Kompis, M., Bernhard, H., Häusler, R.

Departement of ENT, Head- and Neck surgery, Inselspital, University of Berne, Switzerland

Background/Aims: Several principles of implantable hearing systems exist. In this study the influence of coupling parameters of different output transducers was investigated i.e Direct acoustical cochlear stimulator (DACS), Floating mass transducer (FMT), a driving rod transducer (DRT) and a contactless electromagnetic transducer (CLT).

Material and Methods: Experiments were performed with Laser doppler vibrometry on a life size mechanical ear model, fresh human temporal bones, as well as on human cadaver whole heads fixated according to Thiel.

The mechanical middle ear model offers direct access to the middle ear cavity to perform implantation and Laser measurements. On the other hand a mastoidectomy and facial recess approach was performed in the temporal bones and the Thiel fixed whole heads. A specific set of coupling parameters was tested for each transducer.

Results: Results show a substantial impact of coupling parameter variations on the output of the CLT, FMT and less on the DACS and DRT. e.g. a load on the FMT cable alone already has an effect up to 20 dB in the frequencies important for speech intelligibility i.e. 500-1500Hz. Results from Thiel and the mechanical middle ear model are comparable to those of fresh temporal bones.

Conclusion: Specific coupling parameters have to be considered in most of the transducers while implantation. Secondary, our experiments showed similar Laser doppler vibrometry characteristics for heads fixated according to Thiel and fresh temporal bones and a life size mechanical middle ear model.

O108

Comparison of Indicators for Efficient Coupling of an Electromagnetic Transducer (Otologics MET™) to the Ossicles.

Maier, H. (1), Sancez-Hanke, M. (1), Leuwer, R. (2)

(1) ENT Dept. Hamburg University Medical School, Germany

(2) ENT Dept. Krefeld General Hospital, Krefeld, Germany

Objectives: In implantable middle ear hearing devices, success and patient satisfaction crucially depend on the efficiency of sound transmission to the ossicles. Although laservibrometry of the ossicles is a Goldstandard for sound transfer it is inappropriate under intra-operative conditions or simply not available. In our study the appropriateness of electrical transducer impedance and ear canal sound pressure as indicators for optimal coupling of the electromagnetic Otologics LLC MET™ transducer were investigated.

Methods: 10 fresh (<48h) and 2 fresh frozen human temporal bones were implanted with the Otologics MET™ transducer. Laser Doppler vibrometry (Polytec HLV 1000 Vibrometer) was used to monitor ossicle vibration driven by the transducer (multi-tone signal, 100Hz-8 kHz, 4/Okt). In addition, sound pressure level in the ear canal (Etymotics, ER-10B+) and electrical transducer impedance were measured at different loading positions.

Results: During the loading procedure, both ear canal sound pressure level and MET transducer electrical impedance were sensitive indicators for initial contact between the transducer tip and the incus as well as overloading of the transducer or blockade of the ossicles. While LDV measurements are sensitive over the entire frequency range (100Hz to 10 kHz), the acoustic signal can be used at low frequencies (<1 kHz) and the transducer impedance is limited to frequencies around the resonance frequency (1.5 – 3.5 kHz). After contact is established, further optimization of the coupling efficiency is limited due to a broad plateau range.

Conclusions: Both, transducer impedance and probe microphone measurements are sensitive indicators for initial contact to the incus and overloading of the transducer. A broad plateau range between the two states contributes to uncritical adjustment properties and the robustness to external influences of the connection.

P61

Concepts for the expansion of the audiological indication range of implantable air conduction hearing devices

Winter, M., Wesendahl, T.

Hörzentrum Rheine, Rheine, Germany

The open fitting of hearing aids is still one of the highest demands of hearing impaired patients. Using modern and high sophisticated feedback management systems this has recently become available for a wide range of hearing losses. However, there is still some kind of acoustical and/or physical occlusion by the long silicon tube with a perforated earplug or external speaker to transmit the amplified sound into the ear canal.

The semi-implantable air conduction hearing aid system RetroX has shown to overcome this problem while using an implanted titanium tube for sound delivery. The very positive aspect of a high wearing comfort by the true open ear fitting on the one hand side leads to a limited amplification of low-frequency sound on the other side. To remain the effectiveness of the RetroX device also for those patients with a progressive or sudden hearing loss in the low-frequency range new concepts for the expansion of the fitting range will be shown and discussed. Measurements have been performed in-situ and on an artificial head with specific ear molds to allow higher low-frequency gain, with different speakers having an extended high-frequency characteristics and with a new two-loudspeaker concept.

P62

Audiological results with implantable hearing device vibrant soundbridge in moderate to severe mixed hearing loss

Mojallal, H., Teschner, M., Schwab, B., Stöver, T., Lenarz, T.

Medical University of Hannover, Hannover

Introduction: Hearing rehabilitation of moderate-to-severe mixed hearing loss with conventional hearing aids often presents insufficient improvement of hearing and speech discrimination. Application of implantable hearing devices to bypass the disordered middle ear may be a good possibility for such patients. An important advantage of these methods is preservation of residual cochlear hearing.

Methods and patients: In a new application of the implantable hearing device Vibrant Soundbridge (VSB) for treatment of mixed hearing loss, the stimulating transducer is implanted in the round window niche, on the round window membrane. In a clinical study, 5 patients with mixed hearing loss were implanted with this approach. Audiological tests consisting of pure tone audiometry (air and bone conduction), free-field audiometry, speech audiometry (SRT and SDS) and speech-in-noise test were performed with conventional hearing aids and VSB pre- and post-operatively.

Results: Post-operative results of the first 4 patients showed an average functional gain of 45 dB by VSB and 33 dB by conventional hearing aids. Particularly, there was a considerably higher functional gain for the frequencies above 1.5 kHz by VSB. In speech discrimination tests presented at 65 dB SPL, an average discrimination score of about 57 % was measured when using VSB whereas with conventional hearing aids a score of 23 % was achieved.

Conclusion: Implantation of a Vibrant Soundbridge middle ear implant on the round window membrane provides more effective amplification and better speech discrimination for patients with moderate-to-severe mixed hearing loss as compared to conventional hearing aids.

P63

First results for the treatment of combined hearing loss using the Vibrant Soundbridge with a round window approach and prosthesis bound application

Mlynski, R., Müller, J., Hagen, R.

Dept. of Otorhinolaryngoloy, University of Wuerzburg

Current criteria for treatment of patients with a Vibrant Soundbridge® (VSB) are limited to patients with an unimpaired middle ear and an intact ossicular chain. In the present study, these criteria were extended in order to treat patients with mixed hearing loss and ossicular chain defects.

In six patients with combined hearing loss either a floating mass transducer (FMT) was implanted in the round window niche or it was coupled with a modified ossicular replacement prosthesis (TORP or PORP). All patients had previously gone through multiple tympanoplasties because of varying chronic middle ear conditions. Their hearing improvement was poor though. At time of implantation none of the patients showed signs of recent or present inflammation.

The postsurgical thresholds were tested at an average of 30 dB [HL] after implant activation (unaided between 50 dB and 75 dB). The 50%-threshold for word recognition was reached at 45 dB [SPL] (unaided 60 dB). Most patients achieved 100% monosyllable comprehension at 65 dB [SPL] with this supply.

These results show that the implantation of the active middle ear implant VSB at the round window niche or coupled to a prothesis in a tympanopasty type III offers a promising treatment option in patients with combined hearing loss.

O109

The effect of endolymphatic shunt surgery on macula and crista function

Park, J.J.-H., Westhofen, M.

Universityhospital of Aachen, Department of Otolaryngology, Aachen, Germany

Background: Endolymphatic shunt surgery (ESS) is a hearing preserving surgical treatment option for patients with Meniere's disease refractory to medical management. Treatment effectiveness of ESS is under discussion. Therefore the sacculus and the lateral semicircular canal functions were investigated in patients with ESS.

Methods: In 23 patients with unilateral Meniere's disease (AAO-HNS) who were treated by ESS caloric reactions in prone and supine position and vestibular evoked myogenic potentials were investigated before and after surgery. Pre- and postoperative findings were compared.

Results: 74% (n=17) of the patients did not show changes of the caloric reaction in prone and supine position. An improved crista response was seen in 8% (n=2) of the patients and a functional impairment was noticed in 17% (n=4). In all measurements of vestibular evoked myogenic potentials no recovery of sacculus dysfunction was recorded postoperatively.

Conclusion: ESS does not have an effect on the crista function of the lateral semicircular canal and on the sacculus function. Contrarily, two-thirds of the patients who received an ESS show a subjective improvement of their complaints. Compared to other surgical options for patients with Meniere's disease refractory to medical management ESS should be favored since it is a hearing preserving procedure with low surgical morbidity. The mechanism responsible for resolving the symptoms of Meniere's disease needs be studied.

1. Miller GW, Welsh RL. Surgical management of vestibular Meniere's disease with endolymphatic mastoid shunt. Laryngoscope 1983;93:1430–1440.
2. Thomsen J, Bretlau P, Tos M, Johnsen NJ. Meniere's disease: endolymphatic sac decompression compared with sham (placebo) decompression. Ann N Y Acad Sci 1981;374:820–830.
3. Kitahara M, Kitajima K, Yazawa Y, Uchida K. Endolymphatic sac surgery for Meniere's disease: eighteen years' experience with the Kitahara sac operation. Am J Otol 1987;8:283–286.
4. Smith DR, Pyle GM. Outcome-based assessment of endolymphatic sac surgery for Meniere's disease. Laryngoscope 1997;107:1210–1216.

O110

VENG Abnormalties in BPPV

Atas, A. (1), Aksoy, A. (1), Turan, E. (2)

(1) Audiology and Speech Pathology Department

(2) ENT Department of Hacettepe University, Ankara,Turkiye

Aim: The purpose of this study was to investigate the abnormal VENG results in patients with BPPV.

Methods: 33 patients (48.54 ± 15.94 years of age), (24 women and 9 man) with bening paroxysmal positional vertigo (BPPV) were evaluated in Hacettepe University, Vestibular Lab. with Video-ENG (January 2006 – December 2006).

Results: In 8 (24.24%) patients were found pathologic results that indicating BPPV in VENG during Dix-Hallpike maneuver and no any other pathologic findings.

But there were found abnormal VENG results in 25 patients with BPPV. “Vertical Gaze” in 4(16%),”Horizontal Gaze” in 11(44%), “Saccadic” in 5(20%), “ OPK-Fixed” in 14(56%) and “Spontan Nistagmus” in 18(72%) patients were found. After treatment with canalith repositioning maneuver, the abnormal VENG results were disappeared.

Conclusion: VENG is an effective test methods for BPPV. But abnormal results can be seen during the VENG tests. The control tests must be done after repositioning maneuver in BPPV patients.

1. Approach to bilateral benign paroxysmal positioning vertigo
American Journal of Otolaryngology, Volume 27, Issue 2, March-April 2006, Pages 91-95
Lea Pollak, Rafael Stryjer, Mark Kushnir and Shlomo Flechter

2. Benign positional vertigo: Prognostic factors
Otolaryngology - Head and Neck Surgery, Volume 130, Issue 4, April 2004, Pages 426-429
Maria Del Rio and Moisés A. Arriaga
3.The maneuvers for benign positional vertigo
Operative Techniques in Otolaryngology-Head and Neck Surgery, Volume 12, Issue 3, September 2001, Pages 148-150
Mohamed Hamid

O111

Hearing complaints related to solvent exposure: Possible connections to (central) auditory processing disorder

Fuente, A., McPherson, B.

Centre for Communication Disorders, The University of Hong Kong, Hong Kong

Various research studies have demonstrated that organic solvent exposure may induce hearing loss. Studies based on animal models have shown outer hair cell damage due to solvent exposure. Research conducted in workers occupationally exposed to solvents suggests on one hand, poorer hearing thresholds than matched non-exposed workers, and on the other hand, has also suggested central auditory damage due to solvent exposure.

Taking into consideration the possible auditory damage induced by solvent exposure due to the neurotoxic properties of such substances, the present research aimed to study possible (central) auditory processing disorder [(C)APD], and possible hearing difficulties in daily life listening situations that solvent-exposed workers may acquire. 70 workers exposed to organic solvents (xylene, toluene, methyl ethyl ketone) and 70 age and gender matched non-exposed workers were assessed. Only subjects with no history of ear infections, high blood pressure, kidney failure, metabolic and neurological diseases, and alcoholism were selected. Subjects had either normal hearing or sensorineural hearing loss, and type A tympanometry results (Jerger, 1970). The following procedures were carried out: Hearing-in-noise (HINT) test; dichotic digit (DD); filtered speech (FS); pitch pattern sequence (PPS); random gap detection (RGD); and masking level difference (MLD) tests. A self-report inventory detailing each subject¡¦s performance in daily life listening situations, the Amsterdam Inventory for Auditory Disability and Handicap, was also administered. Significant differences between exposed and non-exposed workers were found for hearing thresholds at most test frequencies, for both ears. However, exposed-workers still presented normal hearing thresholds as a group (equal or better to 20 dB HL). For the HINT, DD, PPS, FS, and RGD tests, non-exposed workers obtained better results than exposed workers. Finally, solvent-exposed workers reported significantly more hearing complaints in daily life listening situations than non-exposed workers. A possible (C)APD related to solvent exposure is considered and the clinical implications of the findings are discussed.

P64

Evaluations of Electrocochleography in Possible Meniere's Disease without Hearing Loss

Han, K.Y., Song, Y.J., Ko, H.S., Park, Y.J., Kim, J.H.

Department of Otolaryngology, Gangeung Asan Hospital, Gaungeung, South Korea

Background: It is hesitative to diagnose the conditions with multiple episodes of vertigo of duration varying from 20 minutes to 24 hours without hearing loss as Meniere's disease, and the lack of sensitivity of elevated SP(summating potential)/AP(action potential) ratio in the conventional electrocochleograhy(ECOG) for the diagnosis of Meniere's disease is troublesome for the patients whose symptoms are not "classic".

Aims: To estimate whether ECOG using alternating, rarefaction, and condensation click phase can increase the sensitivity for the detection of endolymphatic hydrops, and to evaluate the incidence of endolymphatic hydrops in possible Meniere's disease without hearing loss with this ECOG method.

Subjects and Methods: Extratympanic ECOG analysis using alternating, rarefaction and condensation click phase was performed on 42 ears of control group, 26 ears of definite Meniere's disease, 17 contralateral ears of unilateral definite Meniere's disease, and 28 ears of possible Meniere's disease without hearing loss. SP/AP ratios and AP latency differences between rarefaction phase clicks and condensation phase clicks were measured.

Results: The sensitivity of ECOG was increased by addition of AP latency difference measurement to the conventional measurement of SP/AP ratio. The frequency of elevated SP/AP ratio or increased AP latency difference was significantly higher in the ears of definite Meniere's disease than in the ears of possible Meniere's disease without hearing loss. It was higher even in the contralateral healthy ears of definite Meniere's disease than in the ears of possible Meniere's disease without hearing loss.

Conclusions: Measurement of AP latency differences between rarefaction phase clicks and condensation phase clicks may serve as a useful addition to ECOG in the detection of suspected endolymphatic hydrops. It is suggested that further study towards identification of possible cause in addition to endolympathic hydrops for the episodic vertigo without hearing loss will be required.

P65

Hearing impairment and balance disorders in patients with anti-cancer chemotherapy

Usowski, J., Kantor, I., Jurkiewicz, D.

Department of Otolaryngology, Military Institute of Medicine, Warsaw, Poland

Since 2000, the Department of Otolaryngology of the Military Institute of Health Services in cooperation with Department of Oncology of MIHS has been conducting research upon effects of anti cancer chemotherapy on hearing and balance organ.

The research included 70 patients (women and men between 35 and 70 years old) hospitalized in Department of Oncology of MIHS, who had prescribed chemotherapy courses with cisplatine.

The research utilized a survey developed in Department of Otolaryngology of MIHS, that comprised of questions on patients' subjective opinions about hearing and balance problems after chemotherapy. The specialist examinations consisted of tonal audiometry and videonystagmography performed after completion of treatment.

Audiology and labirynth tests revealed post chemotherapy hearing and balance organ damage and lack of relationship between patients' symptoms, and specialist exams results.

Patients have complained of laryngological problems, occurring during anti cancer chemotherapy. During the treatment itself the patients experience and report the hearing problems to be the most annoying ones. In our research we have made attempts to find a relationship between patients' feelings and specialist exams results. None could be established. During the treatment itself laryngologic ailments seem to be less important for the patient than problems such as: nausea, vomiting, lassitude, psychophysical tiredness. Patients tend to associate balance disorders during treatment with weakness. Patients were very brief about their laryngologic problems in the survey. Only after chemotherapy end, during relative stabilization, did they pay attention to hearing problems. However, the examinations revealed not only hearing but also balance organ function impairment.

1. LE T., LEIS A., PADWA P. Quality of life evaulations In patients with ovarian cancer during chemotherapy treatment. Gynecol Oncol. 92, 839-44, 2004
2. KNIGHT K., KRAEMER D., NEUWELT E. Ototoxicity in children receiving platinum chemotherapy. J Clin Oncol. 1(23), 8588-96, 2005
3. HALLMARK R., SNYDER J., JUSENIUS K. Factors influencing ototoxicity in ovarian cancer patients treatment with cis-platinum based chemotherapy. Eur J Gynaecol Oncol. 13, 35-44, 1992
4. MCALPINE D., JOHNSTONE B. The ototoxic mechanism of cisplatin. Hear Res. 151, 191-203, 1990
5. £ASZCZEWSKA V., KOCHANEK K., PIERCHA£A K. Hearing evaluation in a group of testicular cancer patients treated with cisplatin-based chemotherapy. Nowotwory. 1 (48), 472-482, 1998
6. MIELCAREK P., MAJDAK E., KRASIÑSKA L. Comparison of quality of life in patients with advanced ovari an cancer treated with intravenous paclitaxel and carboplatin versus cyclophosphamide and cisplatin as first line chemotherapy- a preliminary report. Nowotwory. 52, 33-36, 2002
7. CANO J., CATALAN B., JARA C. Neuronopathy due to cisplatin. Rev Neurol. 27, 606-10, 1998
8. NEUWELT E., BRUMMETT R., REMSEN L. In vitro and animal studies of sodium thiosulfate as a potential chemoprotectant against carboplatin-induced ototoxicity. Cancer Res. 15,706-9, 1996
9. ERTL T., HADZSIEV K., VINCZE O. Hyponatremia and Sensorineural hearing loss in preterm infants. Biol Neonate. 79,109-112, 2001
10.KUBICZKOWA J. On drug ototoxicity. Post.Nauk Med. 8,145-147, 1995

P66

A systematic review of the role of tympanostomy tubes (grommets) in the management of recurrent acute otitis media and otitis media with effusion

Bylander-Groth, A., Jörgensen, F., Axelsson, S., Bengtsson Boström, K., Eckerlund, I., Pettersson, A., Ryding, M., Uhlén, I., Hellström, S.

The Swedish Council on Technology Assessment in Health, SBU, P.O. Box 5650, SE -114 86 Stockholm, Sweden

The most common surgical intervention in children is tympanostomy tube (ventilation tube, grommet) treatment of recurrent otitis media and otitis media with effusion. In Sweden about 10000 children are subjected to this treatment, ¾ related to otitis media with effusion and ¼ with respect to recurrent otitis media. Still several questions have to be answered concerning the effectiveness, routines and cost-effectiveness regarding this procedure. Against this background the Swedish Society for Otorhinolaryngology, Head and Neck Surgery has proposed a systematic review on the role of tympanostomy tube treatment in these middle ear inflammatory conditions.

The review is conducted by the Swedish Council on Technology Assessment in Health Care (SBU), an agency run by the Swedish government. An assessment group was called upon, representing general practioners, otorhinolaryngologists, audiologists and pediatricians, to perform the review. The work was aided by officials from the SBU, experienced in the methodology of systematic reviews.

The following questions were to be answered;

- Is tympanostomy tube treatment effective in the short- and long-term perspective regarding hearing results, development of speech and language, number of recurrencies and quality of life?

- Is tympanostomy tube treatment more effective than other treatment strategies?

- Is the effectiveness improved by adenoidectomy?

- Are there any differences in effectiveness and complications with respect to tube material and surgical techniques?

- How should tympanostomy tube treated children be followed up?

- Which ethical aspects should be considered when deciding tube treatment?

- Is tube treatment a cost-effective treatment?

The assessment group is in the phase of finalizing the systematic review in a written report, which then will be scrutinized by an expert committee, representing family medicine, otorhinolaryngology and pediatrics. The report will then pass the Scientific Council and the Board of the SBU and after that it will become public. Except published in Swedish the report will be written in English and sent to an international otorhinolaryngology journal. Based on the assessment report the Swedish Society for Otorhinolaryngology, Head and Neck Surgery will edit their recommendations and form guidelines about the use of tympanostomy tubes in the management of recurrent acute otitis media and otitis media with effusion.

Congress Fees

Nr.	Category	Late Registration (from April 2, 2007)
1	Non-Member	370 €
2	Member of EFAS Societies	300 €
3	Members reduced (students, less than half-time employees, pensioners, invited speaker [member of EFAS societies])	150 €
4	Day ticket (only for members of the German Society of Audiology)	100 €
5	Day ticket including membership in the German Society of Audiology for the year 2007	145 €
6	Congress ticket including membership in the German Society of Audiology for the years 2007 and 2008	360 €
7	Invited speaker (non-member of any EFAS society), staff member	0 €

Proceedings

Short papers of all oral and poster presentations will be published on a CD (with ISBN number). The format of the proceeding papers is described on the congress website (www.efas2007.org). The size is limited to 4 full pages for free paper and poster submissions (including figures and references) and maximally 8 pages for keynote lectures and contributions to structured sessions.

An approval of the responsible ethics committee has to be available for studies with patients or test persons or living animals. All clinical studies have to be carried out according to the Declaration of Helsinki.

The manuscript should be submitted to the DGA office by email (Microsoft Word) or CD-ROM. The files should be denoted by the name of the first author and the session identifier. Figure have to be sent as separate files, preferrably in JPG, PICT, TIFF or EPS format.

Deadline for Proceedings

The manuscripts of the short papers have to be sent to the DGA office by July 31st 2007.

Language

The official language of the congress is English. No translation facilities will be provided. The sessions on Wednesday morning and early afternoon, June 6th 2007 will be held in German (10th Annual Meeting of the German Society of Audiology). Tutorials A and C will be held in German, Tutorials B and D in English.

Travel Connections

Travel Connections to Heidelberg

Heidelberg is located in central Germany and is easily accessible by rail, car or by aeroplane.

By Plane

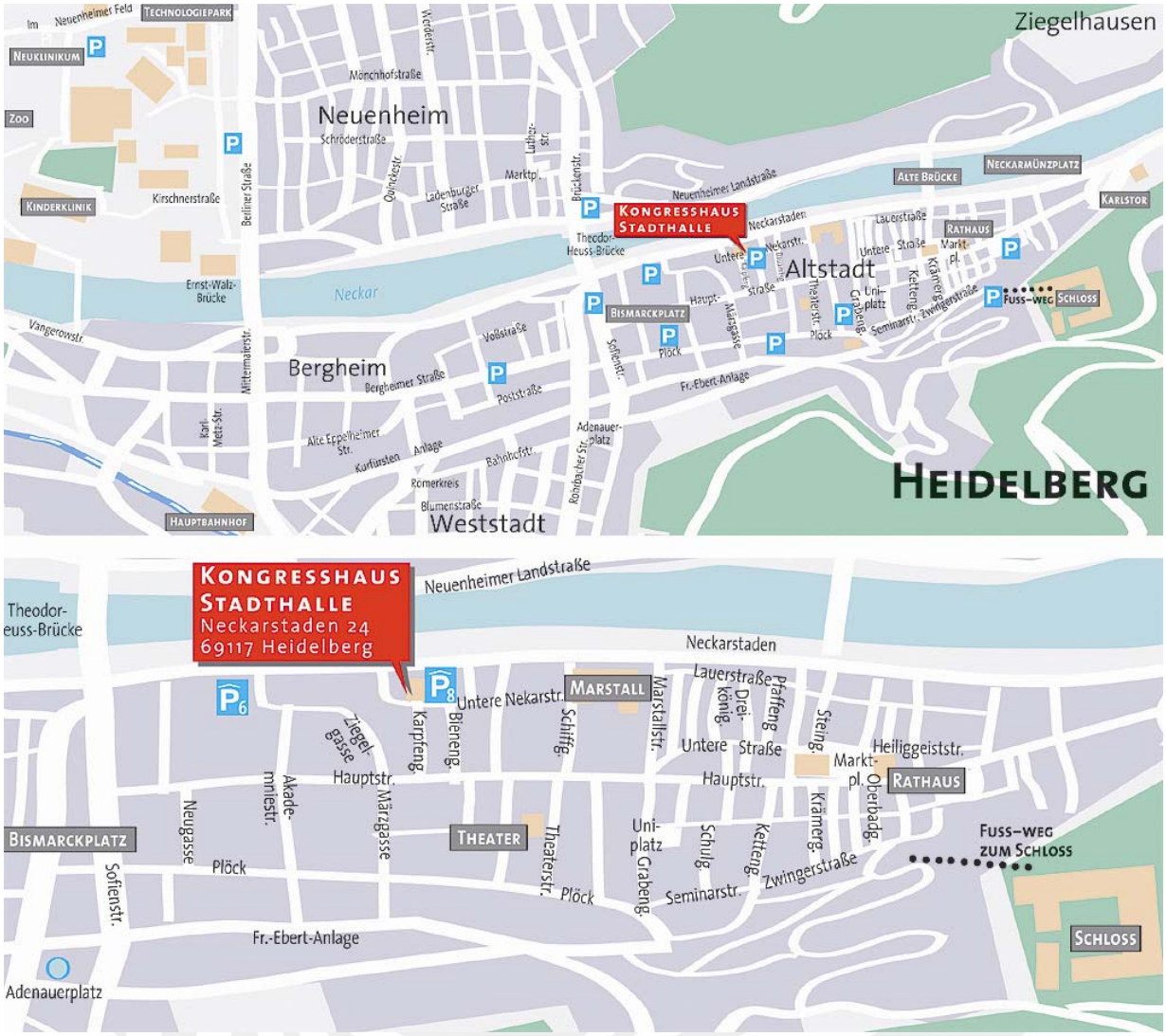
Being only an hour's drive away (80 km), Frankfurt Rhein-Main Airport (Flughafen) is within easy reach of Heidelberg. Airport Transfer is available: By means of the Airport Shuttle Service TLS, the Lufthansa Airport Bus Service or by train (Deutsche Bahn).

By Car

Drive along the Autobahn A5/A656 (Darmstadt-Karlsruhe/Basel) and take the exit "Autobahnkreuz Heidelberg" or "Heidelberg-Schwetzingen". Follow the signs to Heidelberg. As you approach the town, you will find signposts clearly directing the way to the "Kongresshaus Stadthalle" (Heidelberg Convention Centre). Once you have reached the "Kongresshaus Stadthalle", there is ample underground car parking space for both exhibitors and visitors, located right next to the Convention Centre. Simply follow the signs marked P8/P6 which will guide you to the appropriate car parking areas.

By Train

Comfortable, fast, safe and environmentally friendly, Heidelberg is linked with high speed inter-city trains, which bring you right into the city centre. Bus or Taxi connections ensure that you will reach the Convention Center (Kongresshaus Stadthalle) within 20 minutes of your arrival at Heidelberg's main railway station, the "Hauptbahnhof".



Local Bus Service

From Heidelberg's main railway station, the "Hauptbahnhof", Bus number 41, brings you directly to the Convention Center (Kongresshaus Stadthalle). Buses run from 05.30 a.m. to 24.00 hrs. at regular 10 minute intervals, with a journey time of approximately 20 minutes.

Further information regarding fares and timetables of local Heidelberg transport services, are available from the Ticket/Information Office (HSB), situated on Bismarckplatz, from the bus drivers themselves, or via Transport Enquiries
Tel: +49 62 21–5 13 20 00, or www.hvv-heidelberg.de

DGA Awards and Grants

Meyer-zum-Gottesberge Prize / *Meyer-zum-Gottesberge-Preis*

The German Society of Audiology (DGA) awards the Meyer-zum-Gottesberge prize for outstanding achievements in hearing disorders research. The prize is remunerated with 3,000.00 EUR. Scientists and physicians from Germany and the neighbouring countries can apply for it. Especially young scientists who published in peer reviewed journals about audiological research in German, French or English can be awarded.
Applications or qualified suggestions for a person have to be sent to the DGA office until July 31st 2007.

Für hervorragende Leistungen auf dem Gebiet der Hörforschung vergibt die Deutsche Gesellschaft für Audiologie (DGA) den Meyer-zum-Gottesberge-Preis. Der Preis ist mit 3.000 EUR dotiert. Er steht allen Fachwissenschaftlern und Ärzten aus Deutschland und den Nachbarländern offen. Ausgezeichnet werden können insbesondere Nachwuchswissenschaftler, die in den letzten Jahren wichtige Arbeiten auf dem Gebiet der Hörforschung in deutscher, französischer oder englischer Sprache publiziert haben.
Bewerbungen oder qualifizierte Vorschläge von dritter Seite werden bis zum 31. Juli 2007 an die Geschäftsstelle der DGA erbeten.

Research Awards of the DGA / *Förderpreis der DGA*

The DGA research award is intended to support research, development, education and clinical practice in audiology in order to better understand the phenomena of hearing and to reduce hearing loss problems and related disorders (like tinnitus). Poster and oral presentations of young experts given at the previous annual DGA congresses are awarded during the DGA congress.
Up to four prizes of 500.00 EUR each may be awarded. A jury, appointed by the executive board of the DGA, decides upon these awards. The presentation of a paper during the congress is a prerequisite. The proceedings manuscript should be submitted (Microsoft Word file) to the DGA office (info@dga-ev.com) by email or CD-ROM before July 31st 2007.

Durch den Förderpreis der DGA soll die Audiologie in Forschung, Entwicklung, Lehre und klinischer Praxis mit dem Ziel gefördert werden, die Phänomene des Hörens besser zu verstehen und die Schwerhörigkeit und die damit verbundenen Störungen (z.B. Tinnitus) wirksamer zu bekämpfen. Im Zusammenhang mit der Jahrestagung der DGA sollen insbesondere herausragende Beiträge von jüngeren Wissenschaftlerinnen oder Wissenschaftlern – mündliche Vorträge oder Posterpräsentationen – ausgezeichnet werden.
Es werden bis zu vier Preise in Höhe von 500 EUR vergeben. Über die Vergabe des Preises entscheidet ein Preisrichterkollegium, dessen Mitglieder vom Vorstand der DGA benannt werden. Als Beurteilungsgrundlage für die Zuerkennung eines Preises dient die Präsentation des Beitrages während der Tagung. Nur solche Beiträge finden Berücksichtigung, deren Manuskripte fristgerecht (bis zum 31. Juli 2007) abgegeben worden sind.

Congress-scholarship / *Kongress-Stipendien*

Every year the German Society of Audiology awards up to five congress scholarships of maximally 500.00 EUR to qualified young members of the DGA, who would like to participate with a scientific contribution in an international congress. The written application has to be sent to the treasurer of the DGA. There is no deadline for the application. The application has to include a CV, a list of publications of the applicant, the congress announcement, an abstract of the paper submission, a budget plan as well as a short statement why the visit of this congress is important for the own scientific development. The supported applicant is expected to participate in the continuous work of the DGA (e.g. presentations at the annual congress / participation in an expert committee).

Die DGA vergibt jährlich bis zu fünf Kongress-Stipendien zu je maximal 500 EUR an qualifizierte, jüngere DGA-Mitglieder, die sich mit einem eigenen wissenschaftlichen Beitrag an einer internationalen wissenschaftlichen Tagung beteiligen wollen und hierfür keine ausreichende Finanzierung aus anderen Quellen erhalten. Die schriftliche Bewerbung ist nicht an einen bestimmten Termin gebunden und sollte an den Schatzmeister der DGA gerichtet werden. Neben dem Lebenslauf und der Publikationsliste der Antragstellerin/des Antragstellers sollte die Tagungsankündigung, ein Abstract des eigenen Beitrags, ein Finanzierungsplan sowie eine kurze Begründung der Bedeutung des Tagungsbesuchs für die eigene wissenschaftliche Entwicklung eingereicht werden. Von den Geförderten wird erwartet, dass sie eine aktive Rolle in der DGA spielen (z.B. durch Beiträge zu den DGA-Jahrestagungen und/oder Mitarbeit in einem Fachausschuss).

About the DGA

The scientific discipline of Audiology comprises the investigation into the causes of hearing disorders and all related phenomena, diagnostics and treatment of hearing disorders and the rehabilitation of hearing impaired and deaf patients. Members of many different professional categories work in the audiological field, such as physicians (especially otorhinolaryngologists, phoniatricians, pedaudiologists and occupational physicians), physicists, biologists, psychologists, engineers, pedagogues working with hearing impaired persons, acoustians and medical technical assistants.

The German Society of Audiology aims to combine these various professional categories into one scientific organisation in order to strengthen the position of Audiology in research, development, education and clinical practice in Germany and Europe (as member of the EFAS).

Die Audiologie beschäftigt sich mit der Erforschung der Ursachen von Hörstörungen und aller damit zusammenhängenden Phänomene sowie mit der Diagnostik und Behandlung von Hörstörungen und der Rehabilitation schwerhöriger und ertaubter Patienten. Daher sind Angehörige einer Reihe verschiedenster Wissenschaftsdisziplinen und Berufsgruppen in der Audiologie tätig. Das Spektrum reicht von der Medizin (insbesondere Hals-Nasen-Ohrenheilkunde, Phoniatrie und Pädaudiologie, Arbeitsmedizin), Natur- und Geisteswissenschaften (Physik, Biologie, Psychologie), Ingenieurwissenschaften und Hörgeschädigtenpädagogik bis hin zur Hörgeräteakustik und zu medizinisch-technischen Assistenzberufen.

Die Deutsche Gesellschaft für Audiologie hat sich zum Ziel gesetzt, diese unterschiedlichen Berufsgruppen in einer wissenschaftlichen Organisation zusammenzufassen, um die Belange der Audiologie in Forschung, Entwicklung, Lehre und klinischer Praxis in Deutschland und (als Mitglied in der Föderation Europäischer Audiologischer Gesellschaften, EFAS) in Europa zu fördern.

Note

KIND – Partner der Hals-Nasen-Ohren-Ärzte.

Jetzt anmelden und Anzeigen schalten!

www.hno-boerse.de

Neu im KIND Online-Service – der Anzeigen-Markt für HNO-Ärzte

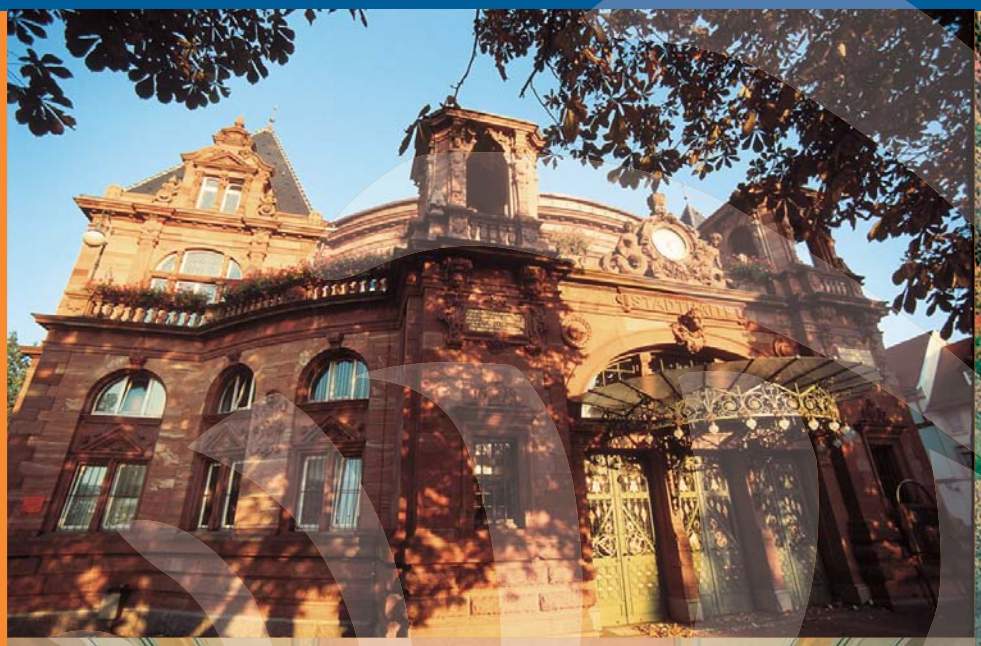
KIND
HÖRGERÄTE

Direkt und effektiv: Ob Stellenangebot oder Praxis-Suche, vom Medizintechnik-Angebot bis zum Vertretungsgesuch – mit Ihrer eigenen Anzeige erreichen Sie Ihre Kollegen direkt. Schalten Sie jetzt in der neuen Internetbörse für HNO-Arzt-Praxen!

KIND ist Entwickler und Produzent innovativer Hörgeräte und mit über 370 Fachgeschäften einer der führenden Hörgeräte-Akustiker. Mehr Infos unter **www.kind.com**

KIND Hörgeräte · Kokenhorststraße 3–5 · 30938 Großburgwedel/Hannover
Telefon (0 51 39) 80 85-141 · Fax (0 51 39) 80 85-297 · info@kind.com

KIND. Gemeinsam für besseres Hören.



Tagungsbüro:
0 62 21–1 42 28 12