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From the President

Dear friends & members of ICRA,

Lillian and I remember very well the pleasant time spent together with you in the summer of 1985 in Göteborg. Three intensive days. The working groups were well prepared and the participants managed to cope even with the long Scandinavian nights. I am proud of a statement from my ambitious friend Arne Leijon: "Well it was also from a professional point of view a good meeting".

Jürgen Kiessling was a star and organised the first Collegium in Schloss Rauischholzhausen in 1988. Herb Oyer was the father and president of the executive committee including John Bamford and Jürgen. The papers given at the first meeting were published as abstracts in the British Journal of Audiology with the support of the then editor, Dai Stephens. Perhaps this was an initiative we should take up again. I well remember our first dinner. Nassar Kotby, who does not look like a Swede (I hope he will excuse me saying that) started talking with a Norwegian accent and changed over to the genuine one used on the islands outside Göteborg. He also left an impression on me at the next meeting organised in Tallahassee, Florida in 1989 by Herb Oyer, by refusing to drink out of a 'glass' made of plastic. He had landed in the wrong country! Two pleasant experiences of the Florida meeting were the countryside of that part of the American continent, and being guided in the office of a US senator.

This contrasted with the Zurich meeting at the futuristic house of Phonak in 1991. The Cairo meeting scheduled for that year had been postponed and Herbert Bächler prepared an excellent Collegium in a short time.

Cairo in 1993 was an exclusive experience with one of the best guides in archaeology, Nassar Kotby. He represents a culture so old that in it's day there were no Swedes. However, over his bed he has a painting by one of the best known Swedish painters, Carl Larsson.

I have completed my contribution to ICRA and am grateful for all the personal experiences contributed by members of ICRA and the regions they represent. Visits to EFAS, IFOS et., cannot compete with these personal experiences.

So, Vienna-no; Würtzburg perhaps and finally Amsterdam-yes. I was delighted that, when I asked them in Prague in June 1997 Hans and Wouter accepted with enthusiasm the task of arranging the next conference. Now we are focusing on the next meeting in Amsterdam. Van Gogh, the red-light districts, Dam Square, night on the canals and Rijstafel are my associations with the city as well as the highly regarded research in Audiology from Holland.

Our next task is to try new ideas and to find a place for the "in-between" meeting in 1999. We cannot compete with the celebration of the new millennium in the year 2000 but it would be nice to find a place somewhere around the world to sit in and discuss our interests for a few hours. Kunigunde Welzl-Mueller has asked the members for suggestions to be discussed at the meeting together with the election of a member who is willing to organise the meeting in 1999. If you are a candidate please get in touch with the EC.

Well met in Amsterdam.

Anders Ringdahl, President ICRA.

ICRA Meeting: Amsterdam 12th to 15th November 1997

Outline programme

Wednesday 12th November

19.00 Dinner at the Hotel Estheréa

Thursday 13th November

am: Reports by Working Group on Self-Assessment
Moderators: S. Gatehouse; J-P. Gagné; W. Noble.

pm: Presentation on on-going activities by workers in Amsterdam and Rotterdam including European Union projects DICTUM, HEARDIP and SPACE and a project financed by the Netherland Health Research Institution on prescriptive methods for hearing aids.
Special attention will be given to acclimatisation effects, compression and noise reduction algorithms, psychophysical tests for patients and general problems of doing field studies with modern hearing aids.

Friday 14th November

am: Free papers

pm: Social activities

Saturday 15th November

am: ICRA General Assembly

pm: Report by the Working Group on Noise
Moderators: S. Westermann; C. Ludvigsen

17.00 Close of meeting

ICRA GENERAL ASSEMBLY: Saturday 15th November

AGENDA

1. President's opening remarks

2. Approval of agenda

3. Report of Secretary/Treasurer (H. Bächler)

4. Report on ICRA Newsletter

5. Report of nominations committee (D. Stephens)
   discussions and elections (Secretary/Treasurer & 2 Members-at-Large)

6. Future development of ICRA

7. Next ICRA Meeting and the "In-between" Meeting
   location and date

8. Future plans of the Working Groups (W.Noble & S Westermann)

9. New business:
   - new working groups
   - new activities and strategies of psychological rehabilitation audiology
   - presentations

10. Adjourn

Nomination for membership of ICRA: Nancy Tye-Murray

Nominees: D. Byrne & W Noble

Work Address: Central Institute for the Deaf
909 South Taylor
St. Louis, MO 63110

Academic Background: 1977 BA (Deaf Education) Texas Christian University

1979 MA (Audiology) University of Iowa

1984 Ph D (Speech & Hearing Science) Washington Univ.

Work Experience: 1981-83 Audiologist, VA & University Hospitals, Iowa & Alaska

1983-95 Research posts, Iowa

1995- Associate Professor Interim Director of Research, CID

Publications: 47 Paper (31 first author)

3 Sole + 2 multi-authored books

26 chapters/contributions

Dr Tye-Murray is incoming President of the Academy of Rehabilitative Audiology

Nomination for membership of ICRA: Kathy Pichora-Fuller

Nominees:

Work address: School of Audiology & Speech Sciences
University of British Columbia
5804 Fairview Avenue
Vancouver, BC
Canada

Academic Background
1977 BA (Linguistics) University of Toronto

1980 MSc (Audiology & Speech Sciences) U of B.C.

1991 PhD (Cognitive Psychology) University of Toronto

Work Experience:
1979-86 Audiologist, Mount Sinai Hospital, Toronto

1992- University of BC
School of Audiology & Speech Sciences
Department of Psychology
Institute of Health Promotion Research

1997- Acting Director, Institute for Hearing Accessibility Research

Publications:
27 Papers (13 first author)

3 chapters

3 special editions editor

Curriculum Vitae - Gerhard Andersson

Date of Birth:	10th June 1966
Present positions:	Researcher, Department of Psychology, Uppsala University, P.O. Box 12 25, SE-751 42 Uppsala, Sweden. E-mail: Gerhard.Andersson@itp.uu.se Clinical psychologist, Department of Audiology, Uppsala University Hospital, SE-751 85 Uppsala, Sweden.
Academic Qualifications:	Associate Professor of psychology, Uppsala University, Sweden, 1997 Ph.D in Clinical Psychology, Uppsala University, Sweden, 1995 Licensed Psychologist, National Board of Health and Welfare, 1993 M.Sc in Clinical Psychology, Uppsala University, Sweden, 1991 Audiology grade, Karolinska Institute, Stockholm, 1993
Memberships:	Member of the Swedish Psychologists' Association Member of the board of the Swedish Association for Behaviour Therapy Member of the Swedish Society for Behavioral Medicine Member of the Association for Psychologists' for the Deaf and Hearing Impaired Member of the European Health Psychology Society
Editorial position:	Editor-in-Chief *Scandinavian Journal of Behaviour Therapy*
Research visit:	One month stay at the Adult Audiology Department, Royal National Throat, Nose Ear Hospital, London UK. Supervised by clinical psychologist Laurence McKenna.
Post-doc:	Research fellow at the Department of Psychology, University College London with Dr Lucy Yardley. Honorary psychologist at the Adult Audiology Department, Royal National Throat, Nose Ear Hospital, London UK.
Awards:	Diploma for scientific and pedagogic presentation at the annual conference for the Swedish Society for Medicine, 1993. Award for best poster presentation at the biannual conference for Swedish Psychologists' Association, 1994.
Thesis:	Andersson, G. (1995). *Hearing as behaviour. Psychological aspects of acquired hearing impairment in the elderly.* Comprehensive Summaries of Uppsala Dissertations from the faculty of Social Sciences 53, Uppsala: Acta Universitas Upsaliensis.

Papers in Peer-reviewed Journals

Over 30 published peer-reviewed articles.

Selected examples:

Andersson, G., Ekvall, L., Kinnefors, A., Nyberg, G., & Rask-Andersen, H. (1997). Evaluation of quality of life and symptoms following translabyrinthine acoustic neuroma surgery. *American Journal of Otology*.18, 421-426.

Andersson, G., Green, M., & Melin, L. (1997). Behavioural hearing tactics: a controlled trial of a short treatment programme. *Behaviour Research and Therapy*, 35, 523-530.

Andersson, G., Hägnebo, C., & Yardley, L. (In press). Stress and symptoms of Meniere's disease: a time-series analysis. *Journal of Psychosomatic Research*

Andersson, G., Kinnefors, A., Ekvall, L., & Rask-Andersen, H. (In press). Tinnitus and translabyrinthine acoustic neuroma surgery. *Audiology & Neuro-Otology*

Andersson, G., & Lyttkens, L. (1996). Acupuncture for tinnitus: time to stop? *Scandinavian Audiology*, 25, 273-275.

Andersson, G., & McKenna, L. (In press). Tinnitus masking and depression. *Audiology*

Andersson, G., Melin, L., Hägnebo, C., Scott, B., & Lindberg, P. (1995). A review of psychological treatment approaches for patients suffering from tinnitus. *Annals of Behavioral Medicine,* 17, 357-366.

Andersson, G., Melin, L., Scott, B., & Lindberg, P. (1994). Behavioural counselling for subjects with acquired hearing loss. A new approach to hearing tactics. *Scandinavian Audiology*, 23, 249-256.

Andersson, G., Palmkvist, A., Melin, L., & Arlinger, S. (1996). Predictors of daily assessed hearing aid use and hearing capability using visual analogue scales. *British Journal of Audiology*, 30, 27-35.

BOOK-CHAPTERS

Andersson, G. (In press). Hearing impairment and behavioral hearing tactics. In R. Lehey (Ed.), *Cognitive-behavioral interventions for persons with disabilities* Jason Aronson, Inc.

McKenna, L., & Andersson, G. (In press). Hearing disorders. In M. Hersen & A. Bellack (Eds.) *Comprehensive Clinical Psychology.*

Conference Proceedings

Twelve conference proceedings from national and international conferences.

Selected examples:

Andersson, G., Melin, L., & Palmkvist, A. (1995). Predictors of hearing aid use and hearing capability. In R. Schoonhoven, T. S. Kapteyn, & J. A. P. M. de Laat Ed.), *Proceedings European Conference on Audiology*, (pp. 45-47). Noordwijkerhout, The Netherlands, 19-23 March, 1995: Nederlandse Vereniging voor Audiologie.

Andersson, G. (1996). Clinical psychology and rehabilitation of hearing impairment. *International Journal of Psychology. Abstracts of the XXVI international congress of psychology,* 31(3-4), 98.

Other publications

Book reviews and popular science presentations of research.

ICRA Working Party on Self Assessment

A statement prepared by Bill Noble on behalf of the Working Party
Statement Date: 30/7/96 (updated 25/7/97)

The following statement is in lieu of a report about the deliberations of the ICRA Working Party on "Self-assessment in audiology" following a meeting in Gothenburg in May 1995.

As members may know, Raymond Hétu was in charge of that Working Party. After his tragic death I agreed to take over responsibility for its continuation and final reporting. The situation was hampered by the fact that no-one appeared either to have a set of notes concerning these deliberations, or adequate recall of what was the agreed outcome in Gothenburg. A search among Raymond's papers revealed nothing. During a visit to the UK in March opportunity was taken, through conversations with Dai Stephens and Stuart Gatehouse, to make a reconstruction of what might be the preferred way forward. This was supplemented in May when Stuart was in Australia.

Thus, presented below is a statement that makes proposals for future development. The statement does not claim to be a report of proceedings, but rather a canvass of options. It could be that its content coincides in part with the report Raymond would have provided; but I expect we will never know.

SELF-ASSESSMENT IN AUDIOLOGY

1. Purposes of self-report.

There are several identifiable purposes for the use of self-assessment; among the most valuable, and least implemented, is comparative program evaluation. Different approaches to hearing rehabilitation exist across countries around the world, as well as within countries and states. Certain of these programs may well offer better outcomes to clients than other ones. Various measures of outcome can be identified - self-assessment of hearing disabilities and handicaps (at entry, and at various stages after exit), is an obvious tool to assist in comparison of program effectiveness.

Self assessment may be used as a rapid and low-cost screening device. Coupled with self-assessment profiles associated with better and poorer rehabilitation outcomes, such screening may be valuable as an indicator of likely success, and as a basis for counselling if a less successful outcome is indicated.

There is scope for coupling self-assessment of hearing disability and handicap with broader quality of life measures. At the end of the day, it is the quality of life in everyday family, occupational and leisure-time contexts that is at issue in rehabilitation efforts. Hearing impairment is not typically a life-threatening or physically painful state. It is nonetheless associated with continual misery for sufferers and those they live and work with. Changes in the general quality of everyday life for individuals and other family members, should be assessed along with more specific assessments of hearing disabilities and handicaps.

2. Standardised assessment device/s.

One potential development is the establishment of a standardised assessment scale in numerous languages, which could thus permit international comparisons and, within any country, inter-ethnic comparisons. A starting place may be the Hearing Disabilities and Handicaps Scale: so far published only in French (Hétu et al, 1994), but validated in English, and translated into some 12 other common languages, without, as yet, further validation data. This 20-iten scale covers two elements of disability (five items on hearing for speech, five on hearing for non-speech sounds) and 10 items on handicap.

It is noted that in the recommended short form of the Hearing Measurement Scale, the HMS-25 (Eriksson-Mangold, Hallberg, Ringdahl & Erlandsson, 1992), six of the original seven items on localisation are retained, whereas only three of the original seven items on hearing for non-speech are retained. The HDHS is based in part on the original HMS (Noble and Atherley, 1970). There may be scope for replacing items on non-speech hearing with items on localisation in a revised form of the HDHS, or scope for adding such items.

Post Scriptum - July 25, 1997.

Since the writing of the foregoing, a study has been set in train by Stuart Gatehouse, Anders Ringdahl and Dai Stephens, comparing the HDHS, the Gothenburg Profile (Ringdahl, Eriksson-Mangold & Karlsson, 1993) and the Glasgow Hearing Aid Benefit Profile (Gatehouse, 1997). The Gothenburg Profile contains localisation items, hence can be said to offer what would be covered by the HMS-25.

The results of this research, at least as obtained to date, will be reported at the up-coming ICRA meeting in Amsterdam (12-15 November 1997), where Bill Noble will also present a draft 'Final Report' for consideration both by the Working Party on Self-Assessment and by the meeting more generally.

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The ICRA Noise Work Group (H.A.C.T.E.S.)

Søren Westermann and Carl Ludvigsen, Widex ApS, Denmark

Since the last ICRA meeting in 1995 in Göthenborg a test version of the ICRA noise has been available to the work group members and also to a few other researchers from various countries. We have received some feed back, primarilly from Sweden and Holland, but we would have liked to have had even more comments. At Widex we have used the test version of the ICRA noise for several purposes, both clinical evaluation of digital/ non-linear hearing aids and electroacoustic measurements of such hearing aids. The comments and experiences so far are purely positive and this led to the production of a more final noise collection on a CD in the beginning of 1997.

The ICRA noises were generated anew taking the utmost care that all conditions and levels were 100% controlled and reliable. Also, the first versions of the ICRA noises were limited to the frequency range below 10 kHz whereas the new version extends all the way up to 20 kHz. After the generation, all the noises were control measured for accurate RMS level and correct spectrum. The noises on the CD consist of unmodulated noises and modulated versions of single and multiple male and female Schröeder “voices”. Also a calibration tone is included for easy calibration of the system. This new ICRA noise CD was sent out to the work group members as well as a number of other interested parties for test purposes and comments. This was done in March 1997 and close to 100 CDs have been distributed by now.

The single talker ICRA noises have shown very efficient in simulating the speech situation when measuring hearing aids. And the multiple talker noises are well suited as babble noises in performing discrimination tests in background noise. The advantage of the noises is their nonsense nature which means that they can be used internationally.

We have seen considerable interest from manufacturers of hearing aid test equipment for the single talker noises in connection with measuring non-linear and digital hearing aids, and the ANSI Standards Committee for Hearing Aid Test and Measurement is presently looking at the ICRA noise. Also, a number of hearing aid manufacturers have expressed interest and acknowledgment of the ICRA noises. As, in fact, we have not received any negative criticism of the noises, we hope to be able to have the noises approved at the Amsterdam meeting as an ICRA recommendation. Copies of the CD will be available at the Amsterdam meeting.

PAPERS AND ABSTRACTS

Noise-induced hearing loss: Coping and consequences on family and social life.

Lillemor Hallberg, Associate professor
Dept. of Psychology, Göteborg University, Sweden

Introduction.

In Sweden about 12% of the adult population have difficulties in following a conversation with two or more persons involved, aided or unaided (National Statistics Office, 1997). During the last two decades, subjective hearing loss has shown a slightly increasing frequency, probably due to a growing number of elderly individuals and to increasing leisure time noise. A majority of acquired hearing impairments are of sensorineural origin: 90% are due to increasing age and noise exposure. There is an obvious relationship between exposure to noise and the development of noise-induced hearing loss (NIHL) and noise induced tinnitus. Despite periodic audiometric testing of most noise-exposed individuals and, also, information about hearing protection in noise, too many workers still develop severe NIHL. Maybe, periodic audiometric testing makes individuals feel that "everything is under control", leading to less personal responsibility for hearing protection.

Purposes.

One aim of the studies which are summarised here was to describe experiences of noise as a threat to health in noise-exposed individuals. Other aims were to describe coping strategies used by individuals with hearing impairments and consequences of the hearing loss on family and social life, i.e., having to live with NIHL.

Methods.

Both qualitative and quantitative research methods have been used, depending on the actual research questions. In the qualitative studies, taped in-depth interviews (lasting about 1 hour) have been conducted. These verbatim transcribed interviews have been analyzed by a method influenced by the tradition of grounded theory (Glaser & Strauss, 1967; Strauss & Corbin, 1991). Such an inductive method aims at generating concepts, models or a theory from the empirical data rather than to test existing theories. The sample in a grounded theory study is strategically selected in order to form a heterogeneous group.
In the quantitative studies I have used a variety of instruments, intended to measure perceived disability, coping strategies, acceptance of hearing loss, social support and perceived handicap, e.g., the Hearing Measurement Scale (Noble and Atherley, 1970), the Hearing disabilities and Handicaps Scale (Hétu et al, 1994), the Communication Strategies Scale (Demorest & Erdman, 1987), Strategies to Handle Stress

Questionnaire (Persson, 1985), Hearing Handicap and Support Scale (Hallberg et al, 1992) and then Acceptance Scale (Hallberg, 1994).

Results and Discussion

Interviews with men with NIHL showed that the risk of noise is strongly underestimated. Most men assumed that they themselves could judge when the noise was damaging and when it was not. Only when the noise was judged as "damaging" and lasted long enough, will the worker put on his hearing protectors. The norm system among workers tells that "a real man can endure noise". This is in line with Gaylin (1992), professor in psychiatry at the Columbia University who argues that "a real man" must be tough, courageous and stoic. A common belief is that the awareness of noise hazards is much higher among younger workers than among older ones. This was also the opinion of some of the interviewed men, whereas others said that the awareness of risks of noise as a hazard to hearing is still low in younger workmates. In sum, the awareness of the risks of noise exposure and the motivation to wear hearing protectors is still low.

Men are unwilling, or reluctant, to acknowledge hearing problems (Blakie & Guthrie, 1984; Lalande et al, 1988; Hétu et al, 1990; Hallberg & Barrenäs, 1993; 1995) This denial or self-deception might be a way to protect the image of oneself when there is a discrepancy between the reality and the desired self-image. Denial, or self-deception could also be seen as a coping strategy aimed at concealing the hearing disability in order to preserve a positive self-image. Two qualitatively different ways to manage demanding auditory situations, i.e., controlling and avoiding strategies, were reported in interviews with individuals with hearing loss (Hallberg & Carlsson, 1991). It was obvious that avoiding strategies, e.g., guessing, pretending to hear, and to avoid interactions, dominated among men with NIHL. However, in situations related to working life, situations judged by the men as focused on important subjects and situations in which one or a few known persons only were involved, controlling strategies could also be chosen.

Spouses of men with NIHL often take considerable responsibility for their husband's abilities to participate in conversations with others. Many spouses perceived this 'double work' as extremely stressful. The interviews with the spouses showed that the consequences of the husband's hearing loss to a great extent affected the spouse. Two core concepts were identified in the data: "The husband's reluctance to acknowledge hearing problems" and "the impact of hearing loss on the intimate relationship". Combinations of these core concepts were related to four management styles used by the spouses to handle daily life: co-acting strategies, minimising strategies, managing strategies and distancing strategies. One of the conclusions of the study was that NIHL affects the nearest relatives, especially the spouse. In a pilot study a model for rehabilitation of men with NIHL and their spouses has been evaluated in an experiment-control group design (Hallberg and Barrenäs, 1994). After the short- and long-term evaluation, the rehabilitation programme has been improved (Hallberg & Barrenäs, 1996).

Studies on men with NIHL are, as far as I know, sparsely reported. In a pilot study of a small group of women with NIHL, four concepts emerged from the interviews: lack of awareness, ambivalence, controlling and avoiding strategies, and stigmatisation (Hallberg & Jansson, 1996). The women's knowledge about risks of noise on hearing was low and they seldom used hearing protectors. Their conception was that they had never been informed about the risks of noise. The women's lack of knowledge was

surprising because most of them had hearing aids and were patients at the local hearing clinic. The women's expressions indicated ambivalence concerning the cause of the hearing loss and how to manage the consequences of it. The women alternated between feelings of hopelessness/resignation and a state of acceptance of the hearing disability. They also alternated between blaming themselves and blaming others for the cause of the hearing loss. In coping with demanding auditory situations they alternated between controlling and avoiding strategies. The coping strategy chosen in a specific situation was intended to prevent or minimise stigmatisation, i.e., "to pass as normal" (Goffman, 1963), and thereby to maintain a positive self-image of normality. Despite this, the women perceived negative and stigmatising attitudes from others which reinforced their feelings of ambivalence. Presently, interview- and questionnaire-data from a larger group of women with NIHL are assessed in order to explore the impact of the hearing loss on the quality of life.

General discussion

The annual cost of the management of occupational hearing loss in Sweden (8.5 Million inhabitants) is approximately 620 million Swedish crowns, of which 60 millions only are used for preventive efforts (Axelsson & Hellström, 1991). In a health care perspective, with the main aim of promoting health, the imbalance between prevention and compensation of NIHL is unfortunate. Prevention of NIHL requires procedures that improve future health and could be included in a model of decisions and perceived time. The individual is recommended to accept present day costs (wearing hearing protectors in noise) for future benefits (good hearing). However, the final goal of good health, ie, good hearing ability, may seem so distant that the immediate satisfaction (release from protectors) is chosen. This temporal discounting implies that the value of a future outcome is decreased because of the time factor. Temporal discounting is also involved in prevention of over-eating, smoking and drinking. Research on decision making with future consequences, i.e., with attention to the factor of time, is still very restricted.

Such educational models that passively transmit factual knowledge from the professionals to the general public have generally low success in health promotion. In health promotion activities in audiology, the preventive model, including adequate information on the risks of noise exposure must be complemented by psychological models (Hallberg, 1997). These psychological models should include issues like rational judgements and decisions, social norms, self-esteem enhancement and changing of beliefs. Also, I think that in health promotion activities in audiology it is necessary to adjust the health model to each individual's unique life situation.

In clinical audiology, the dominating medical-technical perspective facilitates and reinforces the patient's reluctance to acknowledge hearing-related problems. In my opinion, a professional approach to treating patients with NIHL should be to take a patient-centred perspective, focused on the patient's total life situation and the impact of hearing loss on social roles, life habits and quality of life (Hallberg, 1996). The first step in such a process of problem solving and coping is, for the patient and his/her nearest relative, to identify and acknowledge existing problems. The next step is a search for solutions to the problems, which might require support from the professionals. A hearing loss creates problems for both the sender and receiver of a message, therefore it seems necessary that the nearest relatives are involved in the process. With such a broadened approach the preventive efforts in audiology might be successful.

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Perceived hearing aid satisfaction

Alice Holmes & Brett Kemker,
University of Florida

As a means of assessing patient outcome for hearing aid use and satisfaction we sent out questionnaires to 850 individuals who had received hearing aid services at he University of Florida over the past four years. The questionnaire was a modified version of the Hearing Aid Review developed by Brooks (1990). The first 199 completed questionnaires have been analyzed. The number of patient visits was significantly correlated with subject's reported satisfaction. This important finding indicates the need for more patient contact and follow-up services after the initial hearing aid fitting.

A retrospective, exploratory study was completed using the questionnaires to compare the perceived hearing aid benefit with objective outcome measures from the patient's files, taking into account variables such as type and severity of hearing loss, age of onset, age at time of hearing aid fitting, type of hearing aid and amount of follow-up services. By creating a computer data base on these patients, multiple comparisons have been made between subjective and objective outcome measures while taking into account the independent variables across subjects.

Perceived hearing aid benefit was assessed using an overall hearing aid satisfaction rating of 1 to 10 (1 = total dissatisfaction; 10 = total satisfaction). Two questions on hearing aid use and five questions related to self-perceived performance were used as the criteria to determine the cut-off number on the satisfaction rating scale. If the subject responded positively to four out of seven questions s/he was considered satisfied. Sensitivity of 83% and specificity of 81% were found when 5 was used to divide the satisfied and dissatisfied users on the perceived satisfaction scale. Fifty-six subjects rated their hearing aids less than or equal to 5 and 141 rated them greater than 5. Two subjects did not answer the question.

Four variables were correlated with user satisfaction. These were:

* Programmable vs. Standard Analog
* Compression vs. Linear Amplifier
* New vs. Old Users
* Word Recognition Scores

Statistically significant correlations were not found for the first two variables. Old hearing aid users were significantly more satisfied than new users. Word recognition ability was a significant indicator of hearing aid satisfaction.

One segment of the questionnaire asks the respondent to circle descriptors of their current feelings about their hearing aids. These words and phrases were grouped into four categories for statistical comparison to their reported hearing aid satisfaction.

These categories were: manipulation of the HA's; performance with the HA's; cosmetic concerns; and psychological aspects. All the categories, with the exception of cosmetic concerns, had significant correlations with reported HA satisfaction. These results suggest that training on the manipulation (care and use) of HA's and counselling on dealing with hearing loss are repair strategies may increase satisfaction.

An important statistically significant finding was that the greater the number of patient visits the more likely it was that the subject reported satisfaction. This indicates the need for more patient contact and follow-up services. Further, it highlights the importance of studying the time course of hearing aid use and the effects of hearing aid follow-up in the form of formalised hearing aid orientation.

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Quality assurance in rehabilitative audiology
Anders Ringdahl

I am the chairman of a professional Swedish group writing a report on Quality Assurance in aural rehabilitation. It is not an easy task as there are not many scientific studies published with controls concerning evaluations of rehabilitative audiology as can be seen from the list of references prepared by Gerhard Andersson.

Jean-Pierre Gagné presented a paper in Göteborg with the following statement: "Audiological physicians, audiologists and other allied health professionals in the field of rehabilitative audiology are faced with pressures to demonstrate the efficacy and cost effectiveness of the services they provide. Heath care administrators, legislators, and the professionals themselves seek assurance that the aural rehabilitation programs that they provide to patients are beneficial and cost efficient (Gagné & Tye-Murray, 1994; Hyde & Riko, 1994). These challenges must be given serious consideration. Moreover, they should be viewed as an opportunity to further promote and foster the development of aural rehabilitation."

I have found about six different groups of authors who have published one or more papers where a more extensive program has been evaluated against controls. That is not very impressive. What can we do in our colloquium to improve this? We are quite a large number of members working with aural rehabilitation, probably the largest organised group in Europe. Is there someone who would like to start a working group? Aims could be to promote more round tables, key lectures, etc., on this topic at the established meetings; to support and present research and to work according to the needs expressed by Jean-Pierre. Please take the initiative now at our meeting!

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Cognitive behavioural methods in the rehabilitation of hearing impairment and tinnitus

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In recent years cognitive behavioural treatment methods have been developed and widely used in clinical psychology and psychiatry. Moreover, these methods have gained increased recognition in the treatment of chronic pain and somatic problems.
This paper will focus on cognitive behavioural treatment methods commonly used and how they can be applied in the rehabilitation of hearing impairment and tinnitus. Research on cognitive behavioural hearing tactics will be briefly described. Three controlled studies conducted in Uppsala, Sweden, indicate that the principles can be incorporated in management models as described by Stephens and coworkers. The empirical support for cognitive behavioural treatment methods in the management of tinnitus is sadly neglected. Controlled studies have been conducted and the rationale behind the treatment is corroborated by the recent research and theoretical developments made by Jastreboff and Hazell.
In conclusion, there is a lack of cognitive behavioural clinicians in audiology. It is hoped that cognitive behavioural methods will be applied in multidisciplinary teams.

The Gothenburg profile, hearing disability and handicap scale, and Glasgow hearing aid benefit profile as measures of hearing aid benefit

Stuart Gatehouse, Dafydd Stephens, Anders Ringdahl

Hearing aid benefit in groups of first-time hearing aid users in Cardiff, Gothenburg and Glasgow have been used to study the extent to which the Gothenburg Profile, Hearing Disability and Handicap Scale, and Glasgow Hearing Aid Benefit Profile provide informative and clinically useful information. The extent to which each of the questionnaire instruments may be used as a quality standard and service performance will be analysed and presented.

Acclimatization effects of non-linear processing schemes in hearing aids
Stuart Gatehouse

Previous research has demonstrated the existence of material acclimatization effects to linear amplification in first-time hearing aid users. This paper presents data regarding the existence, time course, and magnitude of acclimatization effects to non-linear hearing aid processing over and above linear processing in two devices (Resound BT2 and the Oticon JUMP-1 platform configured as DigiFocus) which can be programmed both as linear and as non-linear devices. The data show that acclimatization effects are highly specific to both the processing and test condition, and furthermore demonstrate that rank ordering of outcome between processing algorithms is maintained provided comparable time points are used for assessment.

Problems with recovery times in non-linear hearing aids
L. Moser, Wuerzburg, Germany

Measuring distortion and attack and recovery times in multi-channel hearing aids is no easy task, doing that at ear level is even more complicated. The paper will describe some instrumentation to reach that goal. When you provide internet connection at the convention site I will demonstrate it in real time over the internet.

Self-assessment of disability/handicap and hearing aid fitting
William Noble, Psychology Department, University of New England, Australia

This paper offers a review of significant issues attending the use and benefits of personally-worn hearing aids, as reflected in studies that have included a self-assessment component. A major issue is the factor of extent of use (and non-use) of hearing aids, once acquired, and the effect of counselling on such use. Related to this is the issue of selective versus general non-use. The adaptation (acclimatisation) phenomenon has been addressed using both self-assessment and performance measures, and a question remains concerning the interaction of this phenomenon with the extent and pattern of use of hearing aids. The effects of bilateral versus unilateral fitting of hearing aids, and of BTE versus ITE, are reviewed; results suggest that factors of degree of impairment, and of stigma management, interact with fitting profile. Assessment of the general benefit from wearing hearing aids has been tackled in various ways, and 'single-estimate' measures are contrasted with those involving comparison of unaided versus aided listening.
The usefulness of one particular scale of handicap assessment (HHIE) is called into question on the basis of a range of studies. Finally, client-centred versus more normative forms of self-assessment are discussed.

Sound localization, speech hearing in noise, and hearing impairment
William Noble, Psychology Department, University of New England, Australia

Our previous research has established that, in terms of self-assessment, there appear to be coherent links between localization and speech hearing disabilities. It has been more difficult to observe this in performance terms, although some signs are indicated, particularly in listeners with conductive-mixed hearing loss, in whom supra-threshold distortion effects are presumably less marked. A recent development in earmould design allows localization function to be restored in listeners with poor low-frequency but good high-frequency hearing. An advantage in hearing speech in spatially separated noise can also be demonstrated for such listeners using the new mould.

Hearing aid benefit, components, correlated and determinants
Dafydd Stephens, Stuart Gatehouse and Anders Ringdahl

The extent to which variables including impairment level, technical quality of the hearing aid fit, age and aspects of motive and expectation related to hearing aids influence outcome in the hearing aid benefit domain as measured by the Gothenburg Profile, the Hearing Disability and Handicap Scale, and Glasgow Hearing Aid Benefit Profile have been studied in groups of first-time hearing aid users in Cardiff, Gothenburg and Glasgow. The extent and ways in which the correlates and determinants systematically relate to the overall scales and the subscales of the three questionnaire instruments for the assessment of outcome are described.

Overview of HEARDIP
Wouter A. Dreschler, Academic Medical Centre, Amsterdam

This paper is a presentation of the project HEARDIP (Hearing Aid Research using Digital Intelligent Processing). HEARDIP is supported by the EC-program TIDE and focuses on the compensation of impaired hearing by optimal fitting, restoration of the auditory dynamics, and noise-reduction algorithms in order to optimise speech intelligibility. The aim is to develop fitting procedures and signal processing techniques that will introduce a new generation of intelligent and selective digital hearing aids. The paper describes some starting points for the application of digital signal processing algorithms that are under investigation in project HEARDIP. The Dutch contribution focuses on the compensation of the reduced dynamic range and the use of fast compression systems to enhance speech intelligibility. Given that an AVC-type compressor will be able to present the overall level at the most comfortable loudness level, we investigated whether

syllabic compression is able to increase the maximum discrimination score for speech. Other parts of HEARDIP focus on noise-reduction algorithms in order to optimise speech intelligibility. In the end, fitting procedures and signal processing techniques may result in a new generation of intelligent and selective digital hearing aids.

Effects of acclimatisation in field tests with experimental compression systems

A. Goedegebure, J. Verschuure, Erasmus University Rotterdam

Recent publications have shown that acclimatisation to new hearing aids is an important issue in the acceptance of strange-sounding new hearing aids by its user. The acclimatisation shows up as an improving speech score after about six weeks of
use and develops further over the years. The role of acclimatisation may become even more important in relation to digitally-processed sounds. Till now advanced signal-processing techniques have been mainly tested in laboratory conditions. The performance with these programmes as tested in these conditions might be improved if hearing impaired listeners would have the opportunity to get used to the processed sounds.

In the European HEARDIP project we implemented the speech-processing schemes based on fast-acting compression that gave the best performance in laboratory conditions on a digital wearable device. A number of hearing impaired subjects tested one or more of these programmes in everyday environments for a period of six weeks. The effects of acclimatisation were measured by means of speech intelligibility tests and questionnaires about the performance with the system. The effects of training with a multi-media training programme were investigated in addition as a part of the European DICTUM project.

We found significant acclimatisation effects in both speech intelligibility scores and performance with the system in everyday environments as indicated by the subjects. It was possible to separate the effects of acclimatisation to fast-acting signal-processing from other acclimatisation effects. The results show the importance of intensive field testing in the evaluation of advanced hearing-aid techniques and the necessity to develop specific training tools to speed up acclimatisation.

Spectral sharpening and dynamic range compression
B. Franck, Academic Medical center, Amsterdam

In this study we investigated the separate and combined effects of compensation of the reduced dynamic range by compression, and compensation of the reduced frequency resolution by spectral enhancement on speech perception. The study has been designed to compare the effects of signal processing on monosyllabic consonant-vowel-consonant words for hearing impaired listeners in quiet, fluctuating noise, and continuous noise. On one hand pre-processed, spectrally enhanced speech, was compared with unprocessed speech. On the other hand a comparison was made between combinations of spectrally enhanced speech and two types of syllabic compression. The spectral enhancement produced significant improvements for vowel perception. But this was counteracted by a deterioration of the consonant scores, for all but one subject. In general the best consonant-vowel-consonant scores were obtained in the unprocessed condition. After the spectral enhancement a single-channel syllabic compressor added no extra improvement. There are indications that a multi-channel syllabic compressor and spectral enhancement have opposite effects, because the scores for this combination are in general lowest.

Speech analysis within the HEARDIP project
J.M. Droogendijk, Erasmus University Rotterdam

Hearing impaired persons often have complaints about the fact that they are not able to understand speech, even when they wear a hearing aid. Actually they hear a whole sentence, but the information within this sentence is being distorted' so that understanding is very difficult. Speech intelligibility tests ,make it possible to investigate the amount of distortion'.

Within the HEARDIP project we used nonsense Consonant-Vowel-Consonant (CVC) word lists as speech material for the speech intelligibility test. These CVC-words are embedded in carrier phrases and the subjects had to repeat the CVC-words literally. Before presenting the words to the subjects, all words are being processed by different processing techniques.

The responses of the subjects are being used for further research. In the first place we investigated the score is of each subject with the different processing techniques. This gives information about the speech intelligibility of each subject and about the benefit of each processing technique on the speech intelligibility. Next we investigated what the underlying problems are for each subject to understand speech properly. We want to know what part of the speech signal is distorted and what part is perceived correctly. With parts of the speech signal' we mean the phonemes or the phonetic features of speech. Therefore phonetic analysis methods are used to examine the phonemes or phonetic features are being perceived correctly by the hearing impaired persons and which confusions they make. Within the HEARDIP project we used two different methods of phonetic analysis, Individual Difference Scaling (INDSCAL) and Sequential Information

Analysis (SINFA). We have compared the procedures and the results of both analysis methods. We found especially that the procedures within each analysis method are very important because investigation of the INDSCAL procedure shows that there are different ways of performing the analysis. The outcome of results is being determined by the way of performing the analysis.

Some of the problems that can appear in the INDSCAL procedure will be discussed and how we can avoid them. We'll do so by using actual analysis data as examples. The results from both methods will be compared for interpretation.

Overview of SPACE
Wouter A. Dreschler, Academic Medical Centre, Amsterdam

There is a large discrepancy between the extent of auditory problems and actual use of hearing aids. Although cosmetic factors play their role, the most important reasons for this discrepancy are the problem of providing optimal compensation for the reduced selectivity of the pathological ear, the problem of selective listening in noisy situations and the dependence of a successful hearing aid fitting on careful fitting procedures. Hearing-impaired persons (about 7% of the population, rising to 10% due to the ageing of population) suffer from reduced capabilities in selective perception of speech, especially in the noisy situations of everyday life. Only 1% of the population wears hearing aids. One of the most important reasons is that today's hearing aids are of limited value in conditions with background noise.

Some working conditions will allow the introduction of wearable units as communication devices, that can be helpful not only for hearing-impaired subjects but for normal-hearing workers, too. In noisy working environments, normal-hearing listeners experience a similar communication handicap as hearing-impaired listeners in quiet. This enlarges the number of potential users of the technology developed within the current project.

The project SPACE (Signal Processing for Auditory Communication in noisy Environments) focuses on the application of advanced signal processing techniques to enhance the auditory communication in difficult listening situations. The complexity of the communication conditions can be determined either by a hearing handicap and/or by difficult acoustical conditions (noise and/or reverberation). The prerequisites are the most difficult to fulfil in working conditions, where intensive communication is needed in spite of difficult acoustical conditions. Most knowledge from laboratory experiments can be translated only partly into practical solutions. The complexity of difficult communication situations is hard to simulate in the lab. Extensive field testing is needed to asses the benefits of different noise-reduction schemes. In this way the best feedback can be obtained from the end-users.

Overview of DICTUM and NATASHA
Hans Verschuure, Erasmus University Rotterdam

We, Amsterdam and Rotterdam, partcipated in a number of European projects. Two projects will be introduced:

DICTUM:
This project has already been ended. It was the development of a prototype interactive training program. The program consists of two sections, one a microworld which was a kitchen and an analytic training program. In the microworld training could be provided in real-life situations. Detection and recognition of sounds, words and short phrases could be trained. Additional noise could be given. In the analytic world special features could be studied. The program could provide auditory information, spectral information, written text, lip-reading information and sign language and all combinations of these. Various parts of the program were available in Dutch, English, GreSwedish

It could be shown that such a program is very effective in speeding up the learning process either as an extra help during study or just in acclimatization.

NATASHA:
This is a new program for which we just received the funding. It focuses on the standardization of tests over national and language borders.

The amount of adjustment possible in new hearing aids is far greater than in the past and it is growing. If we want to make use of the increased capabilities, we should develop tests that can be used for parameter adjustment or we must rely more and more on the fitting programs that hearing aid manufacturers supply. Many of these programs aim at an average performance and a restriction always is that it should be speedy and easy, otherwise hearing aid dispensers will no or cannot use them. This may result in quick and dirty programs.

We know that there is quite a variation in the required settings of hearing aids, suggesting that the use of quick programs will not give the best possible setting. Such a setting could be used as a first step but it requires fine-tuning.

In research institutes there are many tests available to describe the hearing potential of impaired listeners. These tests are in part and could be helpful in the fine-tuning process. However, the tests are not generally available in the clinic because they require special equipment, are not optimized for patients and most clinical staff do not know how to use and interpret the tests.

There is quite a difference in the availability of the present tests over the countries. In a unifying Europe this may cause problems, specifically if exchange of people (service providers and patients) become a reality. Tests should be interpretable and manageable over national and language borders. More standardization of existing tests is necessary.

The NATASHA proposal aims at standardizing clinical tests. These tests should be useful for the future and should therefore include tests necessary for fitting new types of digital hearing aids.

The program consists of:

* Inventory of existing tests.
* Inventory of required tests in view of modern insights in auditory processing and in processing in hearing aids.
* Standardization of the tests that should be used in the future.
* Standardization of speech tests over language borders.
* Development of workstations or computer configurations on which such tests can run.
* Testing of developed material.
* Introduction of material in clinics and training of personnel to administer the tests and to interpret the tests.
* Introduction of the procedures through presentations on national and international audiology (EFAS, ISA) meetings.
* Link to hearing aid fitting

Some of the work has already been done in labs, but they should be brought out in the open now. This concerns the use of (psychophysical) test of auditory processing and the translation of speech tests over the national and language borders. In projects like HEARDIP and SPACE basic tests have been developed. In DICTUM, OSCAR a.o. it could be shown that practical speech tests can be developed that are very similar in different languages.

The proposal was partly granted by the EU. We will start with some three workshops and establish an agreement on what tests should be developed, what the exact specifications should be and how we could implement such tests in the clinical practice. To cover different language groups the consortium is build up of representative institutes in France (Bordeaux, Marseille), Germany (Oldenburg, Giessen), Netherlands (Amsterdam, Rotterdam and Utrecht), United Kingdom (UCL-London) and Sweden (Link"ping and KTH-Stockholm). This involves a number of Germanic languages and a Romanic language. Cooperation between these partners was or is a reality in other projects and should guarantee good cooperation. Last but not least also EFAS is involved for obvious reasons.

Field trials with full-digital hearing aids
Monique Boymans, Academic Medical Centre, Amsterdam

The introduction of full-digital hearing aids allows the assessment of the benefits of digital techniques in the field. We will present some work on the Widex Senso and some preliminary data from a study with the new digital Siemens hearing aid.

The Senso-experiments focus on different aspects of the application of the digital hearing instrument: the fitting procedure, laboratory experiments and a field test. The study combines a field test of 2x4 weeks with laboratory experiments. We used both objective measurements (speech perception tests in background noise, loudness scaling) and subjective evaluations (questionnaires). The measurements were performed before and after the field test. The questionnaires were given after each field test. The results of the digital hearing instruments are compared to the results of similar tests with newly fitted analogue reference aids. On average, the subjective data are more positive than the objective data. In the end 20 out of 27 subjects had an overall preference for the digital hearing aid, despite the financial consequences of this choice. However, the objective data do not support this strong subjective preference. One reason can be that the method of analysis used (short sentences in a short-duration background noise) is far from optimal to allow the noise-reducti algorithm to adapt to the background noise. New evaluation techniques should be developed for this new generation of active non-linear hearing instruments. The Siemens-experiments used rather bulky prototypes. For that reason, the experiments concentrated on laboratory measurements. The focus of this study was on the comparison of different settings of the noise-reduction algorithm, using the technique of paired-comparisons. Results will be discussed.

Effects of fast, non-linear processing on modulated signals and speech
A.J.J Maas, R. De Jong, J. Verschuure, Erasmus University Rotterdam

Hearing aids with non-linear processing such as Automatic Gain Control (AGC) are commonly used. Non-linear systems that are fast enough to affect modulations of speech are mainly developed and tested in research laboratories with the aim to improve speech intelligibility in hearing impaired persons. Most of these systems are based on the concept that modulations in the speech signal should be reduced to compensate for loudness recruitment and temporal masking effects. However, the complexity of speech and the intransparancy of many speech processing algorithms hinder an adequate prediction of the effect of fast processing on the dynamic properties of speech.

We developed two methods to measure the effect of fast processing on dynamic signals. The first method measures the reduction of modulation depth for an Amplitude-Modulated (AM) sinusoidal signal. This signal consists of a carrier frequency with two side-band components. The level difference between carrier and side bands is related to the modulation depth. The difference in modulation depth between input and output can be accurately quantified in terms of an

'effective compression ratio', which can be calculated from the measured level differences between carrier and side bands. The effective compression ratio for a modulation frequency can be compared with the modulations present in running speech.

The second method measures the amplitude distributions of running speech. The width of the amplitude distributions should be reduced if the speech is effectively compressed, which can be estimated by visual inspection of the measured distributions of compressed and linear speech. A more accurate estimation is obtained by determining the cumulative distribution; from the distance in amplitude level between compressed and linear processed speech at equal percentages of counts, a 'dynamic' input-output characteristics can be constructed that can be compared with the original 'static' input-output characteristics.

Loudness summation

Wouter A. Dreschler and Sidonne G.M. van Kreveld-Bos, Academic Medical Centre, Amsterdam

Especially the fitting of multi-channel hearing instruments requires knowledge of the frequency-dependent dynamic range of the ear. Several methods have been developed to measure the loudness perception in different frequency bands, for instance by means of loudness scaling techniques with narrow-band noises or warble tones. However, loudness perception of broadband signals will also be determined by loudness summation. This complicates the predictive value of narrow-band measurements for the settings of the (multi-channel) hearing instrument. For this purpose we developed a method based on broadband signals composed of narrow-band components of equal loudness. This facilitates the interpretation in terms of loudness summation, even in cases with irregular pure-tone audiograms and/or dynamic ranges.

The method consists of four consecutive steps:

a) First part of the loudness scaling for NB-noises at .5, 1, 2, and 4 kHz
b) Fit of the four NB loudness growth functions for each frequency
c) Compose WB noise signals from two to four NB-noises with intensity relations that agree with equal loudness (for each individual and for each level)
d) Second part of the loudness scaling for the composite WB-signals

This approach was applied in two groups of normal and hearing-impaired listeners. First of all we found bias effects in the second part of the measurements, ranging from 0 categorical loudness units (CL-units) for the lower presentation levels to 10 CL-units for the higher levels. Because there are no indications that the bias is frequency dependent, we applied a frequency-independent correction factor, which resulted in a higher (but to our opinion more realistic) estimate of the summation effect. The loudness summation in both groups on average 5 CL-units for the 2-component stimuli and 10 CL-units for the 4-component stimulus. However, the loudness summation data show some unexpected results that cannot easily be understood from existing loudness

models. The discrepancies between the measurements and predictions from two loudness models will be discussed.

Structure and purpose of the NedNAL-study, a comparative study to the quality and efficiency of the Dutch hearing aid fitting procedure and the NAL-r method.

R.M. Metselaar, B.M. Maat, J. Verschuure, W.A. Dreschler, Erasmus University Rotterdam and Academic Medical Center Amsterdam.

In this prospective double-blind randomized clinical trial, we compare the quality and efficiency of the NAL-r prescription method to our “Dutch procedure” for selecting and fitting hearing aids.

The Dutch procedure is based on data, derived from pure-tone and speech audiometry. The primary goal is maximum improvement of the speech discrimination. To evaluate speech discrimination, testing procedures for clinical speech audiometry were developed to obtain sufficiently reliable data within a reasonable period of time. Therefore, we use standardized speech material, recorded on compact disc and delivered via standard audiometric earphones. The test material consists of sets of 11 phonetic balanced CVC-words (monosyllables) from which each correctly reproduced consonant or vowel adds 3% to the discrimination score. When necessary, the contralateral ear is masked with composite speech noise. By measuring speech discrimination at different levels, one obtains a speech audiogram: a function of discrimination (%) to level of speech (dB HL). During hearing aid fitting, we measure the ability of understanding speech in a free field condition at different levels. By changing between hearing aids and by altering tone settings, we find out which is the best hearing aid and setting for the particular hearing impaired subject. During evaluation after a 6 week try-out period in which the hearing impaired subject has the opportunity to get used to the hearing-aid sound, we assess the performance of speech discrimination with the earmold in situ and change tone settings when necessary. Aspects of sound quality and comfort are of secondary importance in hearing aid evaluation.

One of the most widely documented contemporary fitting procedures is the NAL-r method (Byrne & Dillon, 1986). Advantages of using a procedure in which amplification is calculated directly from the pure-tone audiogram thresholds, can be expected in terms of time, degree of audiological experience en automation.
In the NedNAL-study, about 530 hearing impaired subjects with cochlear hearing losses will, stratified over their speech discrimination score, be fitted according to both the Dutch and the NAL-r method. A randomization procedure decides wether the NAL-r or Dutch prescription will be used. Extended hearing aid evaluation, including speech audiometric testing and subjective measurements by different questionnaires, takes place after a period of 12 weeks, including speech-in-noise measures. Costs-profit analysis will also be carried out.

After final statistical analysis we will possibly be able to decide for a hearing impaired subject with a given tone- and speech audiogram which of the two procedures will be most appropriate in terms of the formulated criteria of quality, efficiency en cost.

Demonstrations will be given of The DICTUM interactive hearing training program and an automated hearing-aid selection program developed for the NED-NAL research project.

Robyn M. Cox,

Hearing Aid Research Laboratory,University of Memphis.

The laboratory is dedicated to the study of issues related to the selection, fitting, and function of hearing aids as well as the outcomes of amplification in everyday life. For the past decade, the work has focused on development and evaluation of procedures for fitting hearing aids and for measuring hearing aid fitting outcomes. The ultimate goal of the research program is to develop a sufficiently thorough understanding of the inter-relationships of individual characteristics (physical, psycho-acoustical and psychological) and amplification characteristics (gain, distortion, maximum level, processing schemes, etc.) to be able to predict the outcome of a hearing aid fitting on the day that the fitting is made. In the pursuit of this goal, several measurement tools have been developed that have found wide acceptance in research and/or clinical applications. These include objective tests of speech intelligibility, self-administered questionnaires, and hearing aid fitting procedures.

Current research programs explore the effects of acoustic, psychoacoustic, cognitive, and psychological variables on hearing aid fitting outcomes. A major direction of the laboratory's work has been the development of new approaches to measurement and quantification of outcome variables such as benefit and satisfaction. The laboratory also studies innovative approaches to clinical hearing aid selection and fitting with particular emphasis on the use of new signal processing strategies by elderly hearing-impaired listeners. Brief descriptions of some recent research projects are included below.

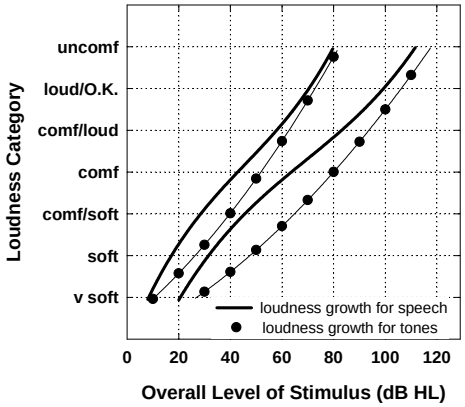
The laboratory maintains a home page on the internet at http://www.ausp.memphis.edu/harl. Information about personnel, recent publications and research projects can be accessed at this site. In addition, some of the laboratory's products can be reviewed and/or downloaded. These include questionnaires, clinical forms, speech intelligibility test materials, manuscripts and software. Elderly individuals who wish to volunteer as research subjects can do so via the home page.

Title: The Contour Test of Loudness Perception

Authors: Robyn M. Cox, Genevieve C. Alexander, Izel M. Taylor, Ginger Gray

The Contour Test is a test of loudness perception which was devised for use in clinical hearing aid fitting. It yields data describing the sound level required for each of seven categories of loudness ranging from very soft to uncomfortably loud. A series of studies have been performed to develop and evaluate the procedure.

Norms were developed for each loudness category for warble tones and speech stimuli. It was observed that the shape of the loudness growth function for warble tones was substantially different from that for speech (see figure). However, when data were expressed in dB HL, there were no differences in mean loudness growth functions across warble tone test frequencies. Thus, it is possible to construct a template that can be used to compare clinic patient's loudness growth curves with normative values at any test frequency. Reliability of loudness category levels appears to be similar to that of the few other category scaling tests described in the literature. Most test-retest differences are 6 dB or less.



Evidence from this and other research indicates that standardized measurement of loudness perception is an achievable goal for clinical practice. The Contour Test appears to offer a viable approach to clinical measurement of loudness perception: It has good patient acceptance and combines fairly rapid administration with acceptable reliability. Details of test procedures and scoring sheets for manual administration can be downloaded from the internet at www.ausp.memphis.edu/harl. There is a need for additional research to establish an empirical link between clinically measured loudness perception and optimal amplification characteristics.

Title: Ear Canal Speech Levels Produced Using The Viola I/O-Based Prescription Procedure.

Authors: Robyn M. Cox, and Gregory A Flamme

The Visual Input/Output Locator Algorithm (VIOLA) is a software-assisted method for prescribing and selecting a hearing aid. The approach incorporates loudness perception data from the Contour test and is suitable for either linear or non-linear instruments (Cox RM., Hearing Journal, 47(2): 10, 39-42, 1995).

Using VIOLA, hearing aid selection follows a two-dimensional strategy, considering gain as a simultaneous function of frequency and input level. VIOLA facilitates the selection process by providing input/output functions for two frequencies, each showing the target levels at that frequency for the 1/3-octave band of speech at three input levels.

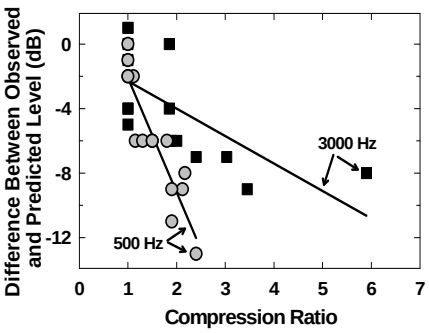
The purpose of this study was to evaluate the assumption inherent in the VIOLA procedure that a hearing aid fitted using a prescribed pure tone input/output function would produce amplified speech having a predicted long-term 1/3-octave band spectrum in the earcanal.

Conclusions were as follows:

- When the hearing aid was operating linearly and well below limiting, the ear canal target was met, eg., Widex soft, 3M soft, TILL K-amp soft.

- When the hearing aid was operating non-linearly, output was lower than the ear canal target level and the amount of error was proportional to the compression ratio.

- The figure (right) shows the relationship between error and compression ratio (CR) in non-linear instruments for 500 and 3000 Hz. From these data, we could predict the difference between VIOLA target and observed levels as follows:



When frequency = 500 Hz Diff (dB) = 5 - 7.1(CR) When frequency = 3000 Hz Diff (dB) = -0.6 - 1.7(CR)

(Where CR= compression ratio computed from pure tone I/O function at the corresponding input level)

- The VIOLA procedure could be modified to account for the error expected with any compression ratio so that adjustments could be made to provide a better match to target level in the ear canal.

- Long release time did not produce more or less error than short release time, eg., compare 3M short RT with 3M long RT.

- Errors between observed and predicted levels were not less for 2-channel compression systems than for single channel compression (K-amp) systems. However, note that 2-channel compression processing might permit a closer match to VIOLA targets.

- When the hearing aid was operating linearly and input speech level was higher than soft, output levels were lower than ear canal target levels, eg., Widex average and loud. The discrepancy between observed and predicted levels in the linear-average and linear-loud conditions was mostly attributable to the effects of limiting.

Title: Relationships Between Selected Personality Variables And Self-Assessed Hearing Aid Benefit.

Authors: Robyn M. Cox, Genevieve C. Alexander, and Ginger A. Gray

There is large between-subject variability in self-assessed hearing aid benefit, even among persons who seem superficially similar. Aspects of individual personality might contribute to this variability. If so, it might be possible to use personality variables to help predict the success of amplification, or to plan a treatment strategy, even before a hearing aid is fitted. This research assessed the extent to which four personality variables contributed to the prediction of unaided and aided disability measured by the Abbreviated Profile of Hearing Aid Benefit (APHAB).

Eighty-three elderly hearing aid wearers (successful and unsuccessful) provided data on the APHAB inventory as well as on measures of extraversion, anxiety, and locus of control. Multiple regression techniques were used to determine whether personality attributes are significantly related to subjective benefit.

It was found that certain personality attributes are related to the way that individuals interpret the efficacy of amplification. Outward oriented (extroverted) persons reported more speech communication benefit. Individuals who felt more under the control of other persons tended to display greater negative reactions to environmental sounds.

Title: Benefit Acclimatization In Elderly Hearing Aid Users

Authors: Robyn M. Cox, Genevieve C. Alexander, Izel M. Taylor, Ginger A. Gray

A previous study from this laboratory indicated that the benefit obtained from a hearing aid in a noisy environment might increase over the first few months of hearing aid use. It was hypothesized that this acclimatization of benefit was due to a process in which the individual optimized his/her use of modified or newly available high frequency acoustic speech cues. This investigation further explored the effect in twenty-two elderly individuals with mild to moderate sensorineural hearing losses, fitted unilaterally with hearing aids. None of the subjects was a current or recent hearing aid wearer. Speech intelligibility testing over a 12 week post-fitting period indicated that a significant improvement in benefit was seen for the group as a whole, probably beginning after about six weeks of regular hearing aid use. However, the magnitude of improvement was very small for most subjects. Only three individuals experienced a dramatic improvement in their benefit for speech in noise over this period. No evidence was found for a specific role of high-frequency cues. Seven subjects participated in a long-term follow-up in which benefit was measured after several months of use of their newly acquired personal hearing aids. Further increase in benefit was noted but was due exclusively to a decline in performance for unaided listening.

Title: Measuring Satisfaction with Amplification in Daily Life

Authors: Robyn M. Cox and Genevieve C. Alexander

In the current health care climate it is important to be able to document the efficacy of hearing aid provision. Further, maintenance of excellence in clinical practice requires regular monitoring of patient's perceptions of products and services.

Standardized self-assessment instruments that can measure reduction of handicap and reduction of disability resulting from use of amplification have come into fairly wide use for these purposes. However, neither type of instrument addresses the global satisfaction of the hearing aid wearer with the amplification device. In the long run, global satisfaction is probably the variable most closely related to the success of a hearing aid fitting from the patient's point of view.

In this research, we performed a series of studies designed to develop a self-assessment instrument for clinical measurement of hearing aid satisfaction in elderly people. The inventory, the Satisfaction with Amplification in Daily Life (SADL) Scale, is composed of 15 items. It produces a global scores as well as scores for four subscales: benefit, service and cost, negative features, and personal image.

The SADL could be used to assess the outcome of a new fitting after a reasonable accommodation period or to assess the efficacy of an existing fitting. Current

research is addressing the relationships between SADL scores and pre-fitting expectations as well as those between SADL scores and hearing aid type.

The Satisfaction with Amplification in Daily Life (SADL) Scale: Preliminary Report

Robyn M. Cox, Professor of Audiology and Director, Hearing Aid Research Laboratory,
University of Memphis, Memphis, TN.

In the current health care climate it is important to be able to document the efficacy of hearing aid provision and to monitor patient's perceptions of products and services. We have developed the Satisfaction with Amplification in Daily Life (SADL) Scale for this purpose. The scale is composed of 15 items and generates four sub-scale scores and an overall score. This talk will describe the development and final form of the scale, and will present preliminary information about the relationships between scores and several demographic variables such as age, gender, type of clinic, hearing aid experience, etc. (Supported by US Department of Veterans Affairs, RR&D Service)

Possible Uses of InterNet for ICRA

Alice Holmes (Co-Editor of Newsletter No. 10)

Many organizations are now finding the Internet as an expedient means of sharing information to their membership. There are various options that technology has made available to us in the past few years. Several organizations now use a "Home Page" to deliver news not only to their membership but to the community at large. Other groups have developed electronic newsletters to get information quickly out to their membership.

Currently over 25 ICRA members have E-mail addresses. Particularly with our international focus the use of the internet may provide us with an additional avenue for discussions and collaboration. Is there interest in developing an electronic newspaper for ICRA or an ICRA home Page? If so are any of you interested in the development of internet linkages?

Please consider volunteering to help with this effort and e-mail AndersRingdahl (anders.ringdahl@orlss.gu.se) or me (Aholmes.hrp@mail.health.ufl.edu) if you are interested.

Possible dates for ICRA "in-between" meeting in 1998

PERIOD (1998)	EVENT	PLACE	PARTICIPATION
February 20-22	Conference on Classroom Hearing Accessibility	Vancouver, Canada	Kathy Fuller
March 11-12	Deutsche Gesellschaft für Audiologie	Oldenburg	Jürgen Kiessling? Kunigunde Welzl-Müller
April 23-26	Cognitive Aging	Atlanta, Georgia	Kathy Fuller
April 2-5	AAA Conference	Los Angeles, USA	Carl Ludvigsen Soren Westermann
April 29-May 2	Canadian Association of Speech-Language Pathologists and Audiologists Conference	Halifax, Canada	Kathy Fuller
April 29-May 1	13th National Conference of the Audiological Society of Australia	Sydney, Australia	Harvey Dillon
May 15-16	European Consensus Development Conference on Neonatal Hearing Screening	Milano, Italia	George Tavartiladze Kunigunde Welzl-Müller
May 25-29	Lake Arrowhead Conference	UCLA Lake Arrowhead, Conferene Centre, Calif. USA Organized by: House Ear Institute	Carl Ludvigsen Soren Westermann Harvey Dillon Bjorn Hagerman
June 8-11	Politzer Society Meeting	Antalya, Turkey	George Tavartiladze
June???	Academy of Rehabilitative Audiology	Orlando, Forida	Kathy Fuller
June???	Acoustic Society of America	Seattle, Washington	Kathy Fuller Jürgen Kiessling?
August??	IALP	Amsterdam	Jürgen Kiessling
August 29-Sep 3	International Audiology Congress	Buenos Aires	Kathy Fuller Jürgen Kiessling?? George Tavartiladze Mimmo Cuda
October 6-10	UHA/ Hörgeräteakustiker-Kongress	Köln, Germany	Carl Ludvigsen Soren Westermann Harvey Dillon Jürgen Kiessling Kunigunde Welzl-Müller

In addition a meeting takes place in Stockholm March 13-15, called Nordic Noise in conjunction with the PAN European concerted action program. An ICRA meeting in conjunction with this meeting will not fit well because Stig Arlinger and Bjorn Hagerman are involved in this meeting.