

2ND INTERNATIONAL CONFERENCE ON HYPERACUSIS



9-10 JULY 2015, BIRKBECK COLLEGE,
UNIVERSITY OF LONDON, UNITED KINGDOM

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FINAL PROGRAMME



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CONFERENCE AIMS

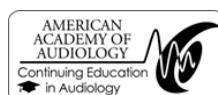
Conference theme is public involvement in promoting hyperacusis research & clinical practice.

The aims of this conference are to (1) raise awareness about hyperacusis, (2) exchange ideas, experiences, and research outcomes on assessment and management strategies for hyperacusis, (3) discuss implications of findings from experimental studies for clinical practice, and (4) encourage involvement of patients in guiding research directions and clinical practice.

CONTINUING PROFESSIONAL DEVELOPMENT (CPD) & CONTINUING EDUCATION UNITS (CEUS)

2nd International Conference on Hyperacusis (ICH2) has been approved for:

- 1.6 CEUs from the American Academy of Audiology (15RTS-200)
- 5 CPD points for the pre-conference workshop, 4 points for 9th July and 6 points for 10th July by the British Academy of Audiology
- 16 CPD points for 9-10 July (CPD1517 032) and 7.75 points for the pre-conference workshop on 8th July (CPD1517 031) by Audiology Australia
- 5.5 CPD points for the pre-conference workshop and 5 points for 9th July and 6 points for 10th July by (8603) by the British Society of Hearing Aid Audiologists



CONFERENCE PROGRAMME

PRE-CONFERENCE WORKSHOP (8TH JULY 2015, BIRKBECK COLLEGE, LONDON) - ROOM 415

09:00 - 09:45	Registration & Refreshments
09:45 - 10:45	Hyperacusis: Causes, Assessment and Management Hashir Aazh (UK)
10:45 - 11:15	Break
11:15 - 12:15	Overview of Physiological Models for Hyperacusis Professor Marlies Knipper (Germany)
12:15 - 13:15	Break (Lunch is not included)
13:15 - 14:00	ENT Assessment and Management of Hyperacusis Dr. Alessandra Fioretti (Italy)
14:00 - 14:30	Evidence Based Practice Applied to Tinnitus Management Dr. Deborah Vickers (UK)
14:30 - 15:15	An Introduction to Physiological Measurements and their Relevance to Hyperacusis Dr. Nicola McEvoy (UK)
15:15 - 15:45	Break
15:45 - 17:00	Cognitive Behavioural Therapy in Management of Hyperacusis Hashir Aazh (UK)

PROGRAMME FOR ICH2 (9TH JULY 2015 BIRKBECK COLLEGE, LONDON)

09:00 - 10:00	Registration & Refreshments (Rooms B02 and B04) Session 1: Plenary (Lecture Theatre B34)
10:00 - 10:30	Welcome & Orientation Hashir Aazh , Conference Organiser, Royal Surrey County Hospital (UK)
10:30 - 11:30	Noise Exposure, Hyperacusis and Tinnitus Jos J. Eggermont , Professor Emeritus of Psychology and Physiology & Pharmacology, University of Calgary (Canada)
11:30 - 12:00	Break
	Session 2: Public Involvement (Lecture Theatre B34) Chairpersons: Professor Deepak Prasher (UK) & Myriam Westcott (Australia)
12:00 - 12:45	Enabling Everyone's Effective Involvement Peter Beresford , Professor of Social Policy, Brunel University London (UK)
12:45 - 13:05	Sanitary Soundscapes: The Noise Effects From Ultra-Rapid "Ecological" Hand Dryers on Vulnerable Subgroups in Publicly Accessible Toilets John Drever , Professor of Acoustic Ecology, University of London (UK)
13:05 - 13:25	Patient Stories
13:25 - 14:30	Break (Lunch is not included)
	Session 3: Hyperacusis & Tinnitus (Lecture Theatre B34) Chairperson: Professor Marlies Knipper (Germany) & Dr. Tanit Ganz Sanchez (Brazil)
14:30 - 15:15	Animal Models of Hyperacusis and Tinnitus Jos J. Eggermont , Professor Emeritus of Psychology and Physiology & Pharmacology, University of Calgary (Canada)

15:15 - 15:35	Analysis of Hyperacusis in Tinnitus Patients Sofie Degeest , PhD Student, Ghent University (Belgium)
15:35 - 16:00	Break
	Session 4: Electrophysiological Measurements for Hyperacusis (Lecture Theatre B34) Chairpersons: Professor Ali Danesh (USA) & Dr. Alain Londero (France)
16:00 - 16:30	Electrophysiological Correlates of Hyperacusis Annick Gilles , Post Doc Research Fellow, University of Antwerp (Belgium)
16:30 - 17:00	ABR and MLR Responses Pre- and Post-Treatment for Hyperacusis Hearing-Impaired Patients Successfully Treated with a Low-Level Sound-Therapy Protocol to Improve Sound Tolerance and Expand the Dynamic Range for Loudness Craig Formby , Distinguished Graduate Research Professor, University of Alabama (USA)

10TH JULY 2015

	Session 5: Plenary (Lecture Theatre B34) Chairperson: Professor Craig Formby (USA) & Dr. Annick Gilles (Belgium)
09:00 - 10:00	Loudness Hyperacusis: Mechanisms of Normal Loudness and Their Breakdown Brian C. J. Moore , Emeritus Professor of Auditory Perception, University of Cambridge (UK)
10:00 - 10:20	Hyperacusis and Tinnitus Development Over Age Dorit Möhrle , PhD student (Germany)
10:20 - 10:50	Break

PARALLEL SESSIONS

	Session 6: Clinical Papers (Lecture Theatre B34) Chairpersons: Professor Brian Moore (UK) & Professor Damiaan Denys (Netherlands)	Workshop: Hyperacusis-Induced Pain: Understanding and Management Room 153
10:50 - 11:10	Psychometric Properties of the Hyperacusis Questionnaire (HQ) in a UK Research Population Kathryn Fackrell , PhD Student, University of Nottingham (UK)	Duration: 11:00-12:30 Organiser and Speaker: Myriam Westcott , Dineen Westcott Moore Audiology Melbourne, Australia
11:10 - 11:30	The mini Hyperacusis Questionnaire (Mini-HQ): A New Tool for the Hyperacusis Identification and Measurement Alessandra Fioretti & Federica Tortorella , University of L'Aquila, L'Aquila (Italy)	Pre-requirement for workshop participants This workshop is aimed at clinicians/medical practitioners providing hyperacusis therapy, as well as neuroscientists interested in the neurological pathways and physiological mechanisms underpinning the clinical presentation/ treatment of hyperacusis-induced pain. Hyperacusis patients and their families will also benefit, particularly if they have attended the preconference workshop.
11:30 - 11:50	Validity of Hyperacusis Screening Items in Chronic Tinnitus Martin Schecklmann , Postdoctoral Fellow, Department of Psychiatry and Psychotherapy, University of Regensburg (Germany)	

11:50 - 12:10	<p>The Relationship Between Hyperacusis and Autism Spectrum Disorder: A Review of Literature</p> <p>Isabella Marques Pereira, Audiologist, Federal University of Minas Gerais (Brazil)</p>	
12:10 - 12:30	<p>Sensory Symptoms and Sensitivity to Sound in Tourette Syndrome</p> <p>Andrea Cavanna, Consultant in Behavioural Neurology, Birmingham (UK)</p>	
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12:30 - 13:30	Break (Lunch is not included)	
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<p>Session 7: Psychological Aspects of Sound Intolerance (Lecture Theatre B34) Chairpersons: Professor Ali Danesh (USA) and Dr. Dario Roitman (Argentina)</p>		
13:30 - 14:30	<p>Psychiatric Evaluation of Misophonia Damian Denys, Professor of Psychiatry, University of Amsterdam (Netherlands)</p>	
14:30 - 15:30	<p>Behavioural Experiments in Cognitive Therapy for Hyperacusis Hashir Aazh, Head of Tinnitus & Hyperacusis Therapy Specialist Unit, Guildford (UK)</p>	
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15:30 - 16:00	Break	
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<p>Session 8: Alternative Therapies (Lecture Theatre B34) Chairperson: Dr. Martin Schecklmann (Germany) & Dr. Federica Tortorella (Italy)</p>		
16:00 - 16:20	<p>Improving Hyperacusis and Tinnitus Through Serotonin Action Drugs Tanit Ganz Sanchez, Associate Professor of Otolaryngology Department of University of São Paulo (Brazil)</p>	
16:20 - 16:40	<p>The Cochlear Dysfunction of Hyperacusis. A Way to Improve the Cochlear Homeostasis by LLLT (Low Level Laser Therapy) Eugenio Hack, Medical Director of Otolinica, ENT Specialist (Spain)</p>	
16:40 - 17:00	<p>What Struck me in This Conference? My Reflections on ICH2 2015 Professor Brian C.J. Moore</p>	
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ABSTRACTS

PRE-CONFERENCE WORKSHOP 8TH JULY 2015

HYPERACUSIS, CAUSES, ASSESSMENT AND MANAGEMENT, HASHIR AAZH

Hyperacusis is described as abnormally sensitive hearing in which normally tolerable sounds are perceived as excessively loud. Hyperacusis can lead to a high level of disability for some leading to joblessness, an overrepresentation of emotional disorders and relationship difficulties. Substantial discomfort, total sense of dissatisfaction from health care professionals, inability to access public services, health and education, suicidal ideations and violence on people or animals have been reported among hyperacusis sufferers in internet patient's forums in the UK and USA. Despite such a high level of disability and a high co morbidity with a wide range of hearing disorders, Hyperacusis has been a neglected area for intervention and research in Audiology. In this lecture we review the theoretical models describing the development and maintenance of hyperacusis as well as the evidence base for various assessment and management strategies.

By the end of this presentation participants should be able to demonstrate an understanding of physiological and psychological aspects of hyperacusis, assessment strategies and distinguish different forms of the condition.

BIOGRAPHY

Hashir qualified as an audiologist in 2001 and has worked in a number of clinical and research posts since then. He is the head of the tinnitus and hyperacusis specialist unit as well as clinical research lead at Audiology Department, Royal Surrey County Hospital, Guildford, UK. His clinical work focuses on providing specialist therapy for adults and children experiencing tinnitus and hyperacusis. Hashir has written over 20 scientific papers in the field of Audiology.

Hashir runs an annual tinnitus & hyperacusis international masterclass at Birkbeck College and is the organiser of the International Conference on Hyperacusis.

OVERVIEW OF PHYSIOLOGICAL MODELS FOR HYPERACUSIS, MARLIES KNIPPER

Hyperacusis and tinnitus both often occur in conjunction with a loss of threshold hearing sensitivity (Dauman and Bouscau-Faure, 2005), but neither hearing threshold loss nor OHC loss is essential to develop either condition. This suggests that their etiologies may be related. However, evidence suggests that there are also important differences between the mechanisms involved in tinnitus

and hyperacusis. We will discuss the background of similarities and differences between the two etiologies with a special focus on the current ideas of the knowledge of the basis of hyperacusis.

ACKNOWLEDGEMENTS

Supported by the Marie Curie Research Training Network; CavNET MRTN-CT-2006-035367, DFG-Kni-316-4-1 and Hahn Stiftung (Index AG). Supported by Action on Hearing Loss, RNID G45 (Rü)

BIOGRAPHY

Marlies is a professor at Molecular Neurobiology and Cell Biology of the Inner Ear Tübingen Hearing Research Center, University Hospital Tübingen, Germany. Her research aims to elucidate the molecular origin of congenital and acquired hearing loss and deafness. We particular focus on the role of thyroid hormone using it as a master component to elucidate functional relevant genes for hearing. Of special interest is currently also the analysis of the synaptic machinery of hair cells and its correlation to the temporal coding of auditory fibers. For these projects we use conditional and constitutive mice models as well as gerbils and rats. We also investigate the molecular basis of tinnitus, using a behaviour model in comparison to a molecular approach (Activity dependent genes) and electrophysiology (CAP measurements of auditory fibers and field potential measurements of central auditory nuclei). The overall main techniques are molecular based (In situ hybridization, Northern blot, Y2H, Real time PCR, transgenic mice technology) or functional based (Hearing measurements, ABR, CAP, DPOAEs, Field potentials, behaviour animal model).

ENT ASSESSMENT AND MANAGEMENT OF HYPERACUSIS, ALESSANDRA FIORETTI

The prevalence of hyperacusis among patients referring to a tinnitus center rises up to 40% representing a field of interest for its social consequences and the negative impact on patient's quality of life. Hyperacusis should be distinguished from phonophobia (fear of sound), misophonia (dislike towards specific sounds) and recruitment (increased loudness perception caused by cochlear impairment).

Hyperacusis may be associated with ear pathologies (like Ménière's disease, perilymphatic fistula, sudden sensorineural hearing loss, acoustic trauma, otosclerosis, Bell's facial palsy and Ramsay Hunt syndrome) and CNS disorders (like migraine, depression, post traumatic stress disorders, multiple sclerosis, benign intracranial hypertension, Tay-Sachs syndrome, Williams syndrome, Lyme's disease).

The differential diagnosis between recruitment and hyperacusis is based on audiologic tests like tonal and speech audiometry, tympanometry and acoustic middle ear reflex study, acoustic brainstem responses

(ABR). There are also specific tests for hyperacusis such as the determination of the loudness discomfort level (LDL), which is generally considered pathological below 90dBHL. Questionnaires for decreased sound tolerance are useful in the clinical diagnosis to evaluate cognitive reactions to hyperacusis, behavioral changes and emotional responses to external sound. Cognitive behavioral therapy and sound-therapy may be helpful for patients with hyperacusis but well-controlled studies are needed to measure their long-term efficacy and to propose new treatments.

BIOGRAPHY

Dr. Alessandra Fioretti graduated from Ancona University (Italy) in Medicine and specialized from L'Aquila University (Italy) in ENT, audiology and phoniatics; Ph.D. in Otolaryngological Sciences at Rome Tor Vergata University (Italy). She focuses her clinical research on the multidisciplinary approach for the diagnosis and therapy of tinnitus and hyperacusis with the University of L'Aquila and the Tinnitus Center of Rome. Dr. Alessandra Fioretti is member of the Management Committee of the TINNET COST action BM1306 "Better Understanding the Heterogeneity of Tinnitus to Improve and Develop New Treatments".

AN INTRODUCTION TO PHYSIOLOGICAL MEASUREMENTS AND THEIR RELEVANCE TO HYPERACUSIS, NICOLA MCEVOY

Hearing, hyperacusis and how they relate to the central auditory nervous system (CANS) are complex. The complex nature of the system requires an equally complex protocol to test function at different levels as one test would not be sufficient.

Otoacoustic emissions (OAEs) are a by-product of cochlear function and give insight into the functioning of cochlea. OAEs are preneural responses indicating healthy cochlear status but cannot be used to detect neural function.

Evoked potentials (EP) measure the electrophysiological response of the CANS to an auditory stimulus. The latency of the observed response is thought relate to different structures in the auditory system with the short- latency responses observed in relation to brainstem function and the late evoked responses are typically observed when studying higher cortical function.

The auditory brainstem response (ABR) generates wave forms which are labelled wave I to wave V, relate to different structures along the auditory pathway and occur before 10 milliseconds (ms). There is however no direct relationship between a waveform and an anatomical structure when you move beyond wave I and II as multiple sources can contribute to a particular waveform.

The middle latency response (MLR) is thought to be derived from the medial geniculate body, inferior

colliculus and the primary auditory cortex. The MLR is used to assess auditory cortical function. Po, Pa and Pb are the labels used to mark the MLR at high intensities and the response occurs between 10 to 80 ms. The Na will occur at 12 to 18 ms, Pa at 25 to 30 ms and Pb at approximately 50 ms.

The late latency response or cortical auditory evoked potential (CAEP) generators include primary auditory cortex, auditory, association areas, frontal cortex, and subcortical regions. The P1-N1-P2 complex and the P300 response are two important measures of cortical function. The P1-N1-P2 response is an obligatory cortical AEP and a passive recording response while the P300 response is generated from conscious discrimination of different auditory stimuli. The P1-N1-P2 complex has latencies between 80ms and 200ms and the P300 with latencies between 150ms and 1000ms.

It is in understanding how each of these tests relate to different structures in the CANS that insight is gained into the possible generation sites related to hyperacusis and its management.

BIOGRAPHY

Nicola is the team leader for the Balance Services at Royal Surrey County Hospital. Nicola qualified as an Audiologist in 2004 and has been working at the Royal Surrey County Hospital since 2006.

She completed the Doctor of Audiology program with Nova South eastern University in 2012. She established the Vestibular assessment and rehabilitation service at Royal Surrey County Hospital and currently aims to expand this service to include paediatrics.

Nicola is the lead for University students training at the Royal Surrey. She runs an annual international balance seminar 'How to manage a dizzy patient' in Guildford. She is also involved in teaching the vestibular module for Msc. and PTP students at ISVR in Southampton University. She is the current BAA regional Southeast England representative.

COGNITIVE BEHAVIOURAL THERAPY IN MANAGEMENT OF HYPERACUSIS, HASHIR AAZH

The application of a cognitive behaviour therapy (CBT) protocol to the treatment of hyperacusis and its associated distress is described. CBT conceptualises patients' reported adverse emotional response to sound as catastrophic misinterpretation of sound, itself rather than merely a consequence of hypersensitivity. The Cognitive-behavioural conceptualisation posits that patients hold beliefs that environmental noises will lead to catastrophic consequences for their daily life. These so-called negative automatic thoughts (NAT) occur when patients face situations that violate underlying rules and assumptions they have established during their early years "in order to survive I should always be at my

peak efficiency". These rules are assumed to reflect an individual's core belief (e.g., I am a failure). The onset of hyperacusis can precipitate a perceived threat to these life rules and some people therefore direct their behaviour at reducing this threat (e.g. avoiding noise at work). The paradoxical effect of this is a heightened awareness of the source of threat (i.e. sound) and limiting their life. CBT aims to enable the patient to live a more fulfilled life by identifying and modifying NATs, maladaptive rules for living, negative core beliefs and reducing safety seeking behaviour.

ABSTRACTS OF 9TH JULY 2015

NOISE EXPOSURE, HYPERACUSIS AND TINNITUS, JOS J. EGGERMONT

Hyperacusis, the abnormally large loudness rating of sound, can result from two basic processes. The first is a bottom-up one in which the neural representation of sound is amplified in the various stages of the auditory pathway. The second is an abnormal interpretation in non-auditory structures downstream from auditory cortex, which still shows a normal neural representation. Reports suggest that this can happen in the insular cortex.

The bottom-up process is often initiated by hearing loss, which is frequently induced by noise exposure. Not only traumatic noise can induce gain changes. Long exposure to moderate level noise (<70 dBA), either continuous or with interruption (12h:12h), and not causing hearing loss, changes in otoacoustic emissions, and ABR, do result in neural gain changes. These changes are a reduction in gain for neurons tuned to the frequency range of the exposure, and an increase in gain for neurons below and above this frequency range. The gain changes are accompanied by correlated changes in spontaneous firing, and potentially tinnitus. The induced changes in the auditory cortex of such exposures for about two weeks or more take several months to recover. This points to potential risk of working or living in certain noisy environments. I will describe the type of sounds that induce these changes and explore whether there are safe levels and durations of exposure.

BIOGRAPHY

I started my research in the topic of hearing and deafness in 1968 at the Department of Otolaryngology at Leiden University in the Netherlands. The topic of my thesis work was electrocochleography and modeling of cochlear adaptation. This method evolved in the Auditory Brainstem Responses, for which I pioneered its use in the diagnosis of vestibular schwannoma and its use in obtaining objective audiograms (at the House Ear Institute, Los Angeles). In 1978 I moved to Nijmegen University and started working on the development and use of the Spectro-temporal Receptive Field for

characterizing auditory neurons. From 1978-1986 I was also coordinator of the EU-concerted action on auditory development (which later evolved in universal new-born hearing screening). In 1986 I moved to the University of Calgary, Canada, where I started working on auditory plasticity in general and human auditory development in particular. In 1997 I became the Campbell McLaurin Chair for Hearing Deficiencies. Again in collaboration with the House Ear Institute in Los Angeles, I did the first comprehensive study on the development of cortical activity in children from 5 years to young adults, and contributed to the understanding of long-term deprivation effects in the auditory system.

Around 1990 the effects of noise trauma on the auditory cortex and its role in inducing tinnitus became the main topic. Around 2005, we discovered that long-duration non-traumatic noise (i.e., without inducing a hearing loss) still causes dramatic changes in auditory cortex that recover only very slowly. This has important consequences for people who work in the same acoustic environment day-in day-out, namely problems with speech understanding in the absence of any demonstrable hearing loss.

- Published >200 peer reviewed journals; Received >14,500 citations.
- Elected corresponding member of the Royal Netherlands Academy of Arts and Sciences (1989).
- Elected Fellow of the Acoustical Society of America (1998).
- Elected Fellow of the Royal Society of Canada (2014)
- Editor-in-Chief of "Hearing Research" (2005-2010)

ENABLING EVERYONE'S EFFECTIVE INVOLVEMENT, PETER BERESFORD

This presentation will seek to offer practical help and improve understanding for all seeking to support the more effective involvement of people affected by hyperacusis. It will explore this in relation to involvement in policy, practice, research and evaluation, drawing on evidence. It will pay particular attention to issues of access and inclusion, drawing on a national Department of Health research and development project exploring the barriers restricting people's involvement and how these can be overcome. The presentation will also take account of the practical realities of the current practice and policy environment.

BIOGRAPHY

Peter Beresford OBE is Professor of Social Policy and Director of the Centre for Citizen Participation at Brunel University London. He is a long term user of mental health services and Co-Chair of Shaping Our Lives, the user controlled and disabled people's organization and network. He has a longstanding involvement in issues of participation as an activist, educator, researcher and writer. He is joint editor with Sarah Carr of Service Users, Social Care And User Involvement, 2012, Jessica Kingsley.

SANITARY SOUNDSCAPES: THE NOISE EFFECTS FROM ULTRA-RAPID "ECOLOGICAL" HAND DRYERS ON VULNERABLE SUBGROUPS IN PUBLICLY ACCESSIBLE TOILETS, JOHN DREVER

This presentation will consist of a review of the issues arising from a preliminary study of the noise effects of ultra-rapid "ecological" hand dryers (Dyson Airblade, Airfore, XLerator, et al.) in publicly accessible toilets. These devices are very popular due to impressive data on efficiency, effectiveness, hygiene and speed, the corollary is however an increase in noise levels in this socially sensitive environment. The study comprised of study of related standards and policy, acoustic testing including sound power (in an anechoic chamber) followed up by in situ sound pressure tests in a range of different sized WCs. The most extreme example showed for one dryer in situ the equivalent Leq of 19 dryers in a free field environment. The final stage of the project involved discussion from sufferers and carers. While arguably not as serious as hearing loss, the project learnt of a wide range of users who were experiencing pain, fear, discomfort, anxiety, sensory shutdown, social exclusion and the onset of phobia that was coming about due to the quality and level of sound generated by high-speed hand dryers within the highly reflective acoustic of the WC. As well as children and infants the project found particular complaints among the following groups – visually impaired; hearing aid users; Alzheimer's disease; Ménière's disease; cerebral palsy and, most significantly, hyperacusis sufferers, and hyperacute hearing in autism and Asperger syndrome. This study functions as a microcosm for soundscape and acoustic issues in the urban environment for those with sensitive hearing. To communicate these issues to designers, policy makers and the public at large, the project was followed up by the devising and presenting of a number of sound art works. In conclusion, the presentation proposes a new paradigm for understanding hearing that extends from a medical classification of the otologically normal to a socio-cultural conception of the auraltypical. Within the hegemony of the auraltypical, the author calls for a new agenda of auraldiversity and aural relativism within urban design and product design.

BIOGRAPHY

John Drever is Professor of Acoustic Ecology and Sound Art at Goldsmiths, University of London, where he leads the Unit for Sound Practice Research. He is an Academician of The Academy of Urbanism, a Member of the Institute of Acoustics and a Visiting Research Fellow at Seian University of Art and Design, Japan.

ANIMAL MODELS OF HYPERACUSIS AND TINNITUS, JOS J. EGGERMONT

Traumatic noise exposure causes the neural gain to be increased in the hearing loss range. Non-traumatic noise exposure increases the gain outside the frequency range

of the noise, which shows a severe reduction in neural activity in the absence of hearing loss. We explored the effects of noise level, exposure duration, noise bandwidth, and spectrum on cortical representation, neural gain and spontaneous firing rates. Neural gain changes are caused by changes in the synaptic efficacy, between auditory nerve fibers and cochlear nucleus units (first stage), and subsequently between other synapses in the auditory pathway. The change in synaptic gain also has the consequence that spontaneous synaptic activity can be amplified, which results in increased spontaneous firing, and may cause tinnitus. Interestingly, in early stages following hearing loss, this gain change may amplify the remaining spontaneous firing in auditory nerve fibers. After weeks to months the intrinsic spontaneous firing in e.g., the inferior colliculus, is permanently increased. This points to difference in transient tinnitus and long-standing tinnitus. Another way in which the gain is increased in the auditory pathway and auditory cortex is by a reduction in neural inhibition, this can happen in association with presbycusis. Both mechanisms are likely causing hyperacusis as well as tinnitus.

ANALYSIS OF HYPERACUSIS IN TINNITUS PATIENTS, SOFIE DEGEEST

Objectives: Tinnitus and hyperacusis often occur together; both affecting a persons' quality of life. More specifically, a higher degree of distress was reported in tinnitus patients with associated hyperacusis. Therefore, the present study evaluated the presence and subjective impact of various hyperacusis symptoms in a group of subjects with chronic tinnitus using common audiometric measures and questionnaires.

Methods: The present study is a cross sectional study, including 81 patients with chronic tinnitus. The protocol consisted of measurements of hearing status, tinnitus pitch, loudness, maskability and loudness discomfort levels (LDLs). All patients filled the Tinnitus Sample Case History Questionnaire (TSCHQ) and the Tinnitus Handicap Inventory (THI). Furthermore, the hyperacusis questionnaire (HQ) was used, which has been shown to be a valuable tool for identifying hyperacusis. First, the univariate relation of each variable with the HQ was evaluated and second, variables that were significantly related to the HQ were entered into a multiple regression analysis.

Results: Tinnitus was mostly observed bilaterally with a high pitch and an average loudness of 6.1 dB SL (SD 4.47; range 1-21). The mean LDL was calculated as the average of the LDL thresholds at each octave-frequency, including 3 kHz and 6 kHz, and showed a mean of 91.4 dB HL (SD 14.51, range 60-120 dB HL). Based on the LDLs, 73.5% of the patients had a decreased sound tolerance. The HQ had a mean score of 18.5 (SD 10.10; range 2-40). Five variables related statistical significantly with the HQ: LDLs, subjective tinnitus pitch, subjective hearing impairment, subjective noise-intolerance and the THI. The results of the multiple regression analysis

showed that mainly the score on the THI, subjective hearing impairment, subjective noise intolerance and the LDLs contributed significantly to the HQ. Conclusion The present study showed that the subjective impact of hyperacusis in tinnitus patients is related with subjective hearing impairment, subjective noise intolerance, LDLs and the THI. The THI was the strongest contributing factor for hyperacusis, whereby a higher degree of tinnitus distress was related to a higher score on the HQ. Besides, it was found that the subjective impression of noise intolerance was strongly related to the HQ. However, the contribution of the LDLs to the results of the HQ was small, which confirmed that there is a discrepancy between the experienced severity of hyperacusis and the results of the audiometric measurements. Patients who indicated subjective hearing loss, had significantly higher HQ-scores. However, the average score for those patients was below the cut-off score for clinically severe hyperacusis, indicating that subjective hearing loss did not have a relevant impact on the subjective impact of hyperacusis. Therefore, in clinical practice, it is recommended to include a hyperacusis questionnaire, in addition to questionnaires dealing with tinnitus, in the evaluation of tinnitus patients. Furthermore, these variable can addressed more extensively in counselling.

BIOGRAPHY

Sofie Degeest is a PhD. student at Ghent University, Belgium. She received her Master's degree in Logopedic and Audiological sciences in 2011, and joined the Department of Speech, Language and Hearing Sciences after she was graduated. Her main research area focuses on the prevalence and characteristics of tinnitus and hearing loss due to excessive recreational noise exposure in Flemish young adults. Besides, she is engaged in research concerning speech recognition and listening effort. Further, she is involved in teaching audiological skills to Bachelor and Master students Audiology at Ghent University and is also involved in the audiological assessment of tinnitus patients at the department of Otorhinolaryngology at University Hospital Ghent, Belgium.

ELECTROPHYSIOLOGICAL CORRELATES OF HYPERACUSIS, ANNICK GILLES

Introduction: Auditory evoked potentials are the correlates of neural activity elicited by the application of an external sound. In the presence of an intact auditory pathway, the application of an external stimulus will induce an electrical potential at multiple cortical areas, representing the summation of synchronized electrical activity of thousands of neurons in auditory as well as non-auditory brain regions. The P300 potential is an event-related potential (ERP) characterized by a large positive-going wave typically peaking at 300 ms or more after the onset of a rare stimulus, provoked by a standard oddball paradigm. It is an endogenous potential, meaning that it is highly dependent on the cognitive context in which a stimulus occurs, the level of attention and arousal. A

limited amount of studies have investigated the effect of tinnitus on the P300 component reporting a slight increase of component latency in this population. It is unknown what the effects of hyperacusis are on the ERPs. Moreover, as tinnitus and hyperacusis are often associated symptoms, the question arises whether a combination of these symptoms causes different outcomes on the ERP components. Therefore, the aim of the present study is to evaluate higher, cognitive, auditory top-down processing in patients with tinnitus with and without hyperacusis compared to a normative database of controls without tinnitus/hyperacusis. This study was approved by the IRB of the University Hospital Antwerp.

Methods: The ERPs are elicited by use of a standard oddball paradigm with a 1kHz tone as the standard stimulus and a 2 kHz tone as the deviant stimulus (ratio 80 and 20% respectively). A minimal electrode placement is used with the electrodes placed on Cz, linked mastoids and high forehead. Recordings are performed by use of the Bio-logic AEP and Navigator Pro system. Trials with the frequent stimuli elicit a P1-N1-P2-N2 complex (bottom-up processing), while the trials with the deviant stimuli elicit a P300 component (top-down processing) provided that the subject is aware of the stimuli. These mechanisms allow to evaluate the more automatic auditory processing (P1-N1-P2-N2 complex) as well as the higher-order auditory processing (P300 component) in tinnitus/hyperacusis patients. ERPs will be recorded in a group of tinnitus patients with hyperacusis (N = 20) and a group of tinnitus patients without hyperacusis (N = 20). This data will be compared to an age- and gender matched group of healthy controls without tinnitus/hyperacusis.

Results & conclusions: Data are still collected and analyzed at the moment. The data will be presented at the conference.

BIOGRAPHY

Annick Gilles obtained a Master's degree Audiology from the University of Ghent in 2010. She defended her doctoral thesis at the University of Antwerp in June 2014 entitled: 'Noise-induced tinnitus in adolescents: Prevalence, detection and prevention'. She is now involved in postdoctoral research focusing on the disentanglement of the underlying neural correlates of the tinnitus percept and supporting several PhD students on topics including 'How is an auditory conscious percept generated?' and 'The cognitive functioning of geriatric patients with cochlear implants'. In addition, she supports several Medicine Master theses. She is currently active as a postdoctoral researcher at the University of Antwerp.

The focus of the research is on central auditory evoked potentials and EEG measurements in order to assess the brain functioning of tinnitus patients. She is a member of the organizing committee of the 2nd Hyperacusis conference in London.

ABR AND MLR RESPONSES PRE- AND POST-TREATMENT FOR HYPERACUSIC HEARING-IMPAIRED PATIENTS SUCCESSFULLY TREATED WITH A LOW-LEVEL SOUND-THERAPY PROTOCOL TO IMPROVE SOUND TOLERANCE AND EXPAND THE DYNAMIC RANGE FOR LOUDNESS, CRAIG FORMBY

Introduction: At the 1st International Conference on Hyperacusis, we reported findings from a clinical trial (C. Formby, Intervention for hyperacusis and reduced sound tolerance, March 2, 2013) of a combined counseling and low-level sound-therapy approach, which applied principles originally described by Hazell & Sheldrake (1992) for treating tinnitus patients with primary hyperacusis. Our results replicated Hazell & Sheldrake's basic findings and revealed that the combined counseling and sound-therapy approach yielded greater efficacy (shown by ≥ 10 dB treatment-related increases in the auditory dynamic range) than the efficacies measured for either of the individual treatment components administered alone (shown by treatment-related expansion of the auditory dynamic range ≤ 5 dB) in matched groups of hearing-impaired persons with mostly mild sound intolerance. These individuals, prior to treatment, were problematic hearing-aid candidates because of their mildly diminished sound tolerance and reduced dynamic ranges, which were expanded post-treatment, allowing many of them to benefit anew from amplification.

Methods: In this presentation, we will focus on the results of selected subjects who exhibited large positive treatment effects in our clinical trial. Of prime interest is the analysis of their 500- and 2000-Hz tone-pip ABR and MLR responses measured pre- and post-treatment as a function of presentation level (and as a function of their categorical loudness judgments). We will consider their responses for evidence of hyperacusis (i.e., larger pre-treatment response amplitudes and shorter response latencies than normal) and for evidence of treatment effects (i.e., smaller normative-like post-treatment response amplitudes and longer post-treatment response latencies relative to their corresponding pre-treatment values) in an effort to gain insights into the neural origins of their hyperacusis conditions and the neuronal sites responsive to treatment.

Results: Preliminary analyses for three patients who demonstrated large treatment-related dynamic-range increases (≥ 20 dB) reveal the strongest indications of hyperacusis and treatment-related effects in their MLR latency responses for wave Pa at 2000 Hz. Other response indices, including ABR wave V latency and wave V-V' amplitude values and MLR wave Na-Pa amplitude values for 500 and 2000 Hz, appear either ambiguous across and/or within patients.

Conclusions: Although preliminary and based only on findings for three patients, our initial analyses suggest

MLR wave Pa latency values at 2000 Hz may be promising indicators of hyperacusis and dynamic-range-expansion treatment effects. [Research supported by NIDCD; this research was approved by Institutional Review Boards at the University of Maryland-Baltimore and the University of Alabama]

BIOGRAPHY:

Dr. Craig Formby is a Distinguished Graduate Research Professor at the University of Alabama, with appointments in the Colleges of Arts and Sciences, Medicine, and Engineering. In addition, he holds a university-wide appointment as Director of the Office of Research Faculty Development. Dr. Formby was awarded his doctoral degree in Communication Science from Washington University and the Central Institute for the Deaf in 1982, after which he completed a year of post-doctoral research training in Neurology. From 1983-1990, Dr. Formby served on the faculty at the University of Florida, where he was the recipient of a National Institutes of Health (NIH) career development award. From 1990-2006, Dr. Formby directed audiological services and clinical training programs at the Johns Hopkins University and the University of Maryland Schools of Medicine, including co-direction of a joint graduate training program with the University of Maryland, College Park. From 2004-2007, Dr. Formby served in a dual capacity as an assistant dean for research in the University of Maryland School of Medicine and as an assistant dean in the Graduate School at the University of Maryland in Baltimore, where he established an institutional office for post-doctoral scholars. Dr. Formby is a past editor for the Journal of Speech, Language, and Hearing Research, and is a fellow of the Acoustical Society of America.

ABSTRACTS OF 10TH JULY 2015

LOUDNESS HYPERACUSIS: MECHANISMS OF NORMAL LOUDNESS AND THEIR BREAKDOWN, BRIAN C.J. MOORE

There appear to be many different forms of hyperacusis (Tyler et al., 2014). This presentation is concerned with "loudness hyperacusis", which is a form of hyperacusis where sounds with medium and high levels appear to be louder than normal.

The normal perception of loudness can be understood using a model with the following stages (Moore et al., 1997):

(a) A fixed filter representing transfer through the outer ear. This filter can differ depending on the listening conditions (free field, diffuse field, or headphone presentation).

(b) A fixed filter representing transfer through the middle ear.

(c) Calculation of an excitation pattern from the physical spectrum. The excitation pattern is calculated on an ERBN-number scale, where ERBN stands for the equivalent rectangular bandwidth of the auditory filter, as determined using young normally hearing listeners at moderate sound levels. The excitation level is calculated at intervals of 0.1 ERBN.

(d) Transformation of the excitation pattern to a specific loudness pattern. Specific loudness is a kind of loudness density and has units sones/ERBN.

(e) Determination of the area under the specific loudness pattern, which gives the overall loudness for a given ear in sones.

This model has been modified to take into account the perception of loudness by people with cochlear hearing loss (Moore and Glasberg, 2004). Hearing loss due to outer hair cell dysfunction is modeled by broadening the filters used to calculate the excitation pattern and by using a steeper function in the transformation from excitation to specific loudness. Hearing loss due to inner hair cells dysfunction is modeled by an attenuation of excitation level. The model can account for the loudness recruitment and reduced loudness summation that occur for people with cochlear hearing loss. The model also predicts that hearing loss can sometimes be associated with "over-recruitment", so that some sounds appear louder than normal. Factors not currently taken into account in the model are the role of the efferent system and central plasticity effects. The possible role of these two factors in loudness hyperacusis will be discussed.

BIOGRAPHY

Brian Moore is Emeritus Professor of Auditory Perception in the University of Cambridge. His research interests are: the perception of sound; mechanisms of normal hearing and hearing impairments; relationship of auditory abilities to speech perception; design of signal processing hearing aids for sensorineural hearing loss; methods for fitting hearing aids to the individual; design and specification of high-fidelity sound-reproducing equipment; perception of music and of musical instruments. He is a Fellow of the Royal Society of London, a Fellow of the Academy of Medical Sciences, a Fellow of the Acoustical Society of America, a Fellow of the Association for Psychological Science, and an Honorary Fellow of the Belgian Society of Audiology and the British Society of Hearing Aid Audiologists. He is a member of the Experimental Psychology Society (U.K.), the British Society of Audiology, The American Auditory Society, the Audio Engineering Society, and the Association for Research in Otolaryngology. He is President of the Association of Independent Hearing Healthcare Professionals (UK). He has written or edited 19 books and over 600 scientific papers and book chapters. He is an associate editor of the journal *Hearing Research*. He has been awarded the Littler Prize and the Littler Lecture of the British Society of Audiology, the Silver and Gold medals of the Acoustical Society of America, the first International Award in Hearing from the American Academy of Audiology, the Award of Merit from the Association for Research in Otolaryngology, and the Hugh Knowles Prize for Distinguished Achievement from Northwestern University. He is wine steward of Wolfson College, Cambridge.

HYPERACUSIS AND TINNITUS DEVELOPMENT OVER AGE, DORIT MÖHRLE

Progressing loss of auditory sensation is a major problem of aging populations. In humans, loss of hearing function can be seen through increased thresholds, altered sound processing of temporally and spatially modulated auditory stimuli, but also through abnormal perception of above-threshold sounds or phantom perceptions, like hyperacusis and tinnitus. Previous studies on the mouse had already demonstrated the degeneration of auditory fibres following mild auditory trauma (Kujawa and Liberman 2009, Furman et al. 2013) and over age (Rüttiger et al., 2013, Sergeyenko et al. 2013). We here challenge the question if a mild auditory trauma induces hyperacusis or tinnitus in young or aged animals. Hyperacusis and tinnitus sensation were tested using a behavioral approach (Rüttiger et al. 2003), and hearing function was studied using auditory evoked brainstem responses (ABR) and otoacoustic emissions (DPOAE). To gain insight into the central brainstem function above-threshold responses to click and frequency specific stimuli were analysed in detail for recruitment and latencies of ABR wave deflections (wave amplitudes and latencies). Results from behavior studies on young and aged rats, before and after auditory overstimulation, are

presented in correlation with individual hearing functions and morphological specifications of hair cell molecular phenotype and hair cell ribbon loss. Supported by Action on Hearing Loss, RNID G45 (Rü)

BIOGRAPHY

PhD student (Faculty of Biology) at the Molecular Physiology of Hearing, AG Knipper, Tübingen Hearing Research Center, Germany.

HYPERACUSIS-INDUCED PAIN: UNDERSTANDING AND MANAGEMENT, MYRIAM WESTCOTT

Hyperacusis patients suffer greatly from frequent or constant pain, often triggered or aggravated by everyday sounds, without underlying aural or TMJ pathology. This has been linked to tonic tensor tympani syndrome (TTTS) by Jastreboff and Hazell (2004) and Westcott (2006).

TTTS is an involuntary condition where the centrally mediated reflex threshold for tensor tympani muscle activity is lowered, resulting in a frequent spasm (Klockhoff, 1961, 1971, 1978, 1979). This can trigger symptoms in and around the ear from tympanic membrane tension, alterations in middle ear ventilation and trigeminal nerve irritability (Westcott, 2008, 2009, Ramirez et al, 2008, Aristeguieta et al, 2010). Central pain sensitisation can develop from chronic trigeminal neuralgic TTTS-induced pain, which explains why patients with severe hyperacusis are in frequent or constant pain, further exacerbated by intolerable sound exposure.

Symptoms consistent with TTTS can include: a sharp stabbing pain in the ear; a dull earache; tinnitus, often with a clicking, rhythmic or buzzing quality; a sensation of aural pressure or blockage; tympanic flutter; pain/numbness/burning around the ear, along the cheek and the side of the neck; mild vertigo and nausea; a sensation of "muffled" or distorted hearing; and headache.

A high prevalence of these symptoms has been investigated and documented in hyperacusis patients (Westcott, 2008). In a multiclinic study analysing data collected on 345 patients by eight tinnitus clinics in Australia, Spain and Brazil, most hyperacusis patients (81.1%) were shown to develop ≥ 1 symptoms consistent with TTTS (Westcott et al, 2013). This rises to 91.3% in those diagnosed with severe hyperacusis. In this study, 74.0% of hyperacusis patients with the symptom of dull ache in the ear and 66.7% of those with the symptom of sharp pain in the ear reported those symptoms developed or were exacerbated by loud/intolerable sound exposure.

These symptoms have not been widely acknowledged or investigated in hyperacusis patients and tend to be overlooked once an underlying pathology has been excluded. The development or exacerbation of these symptoms following exposure to loud/intolerable sounds can reinforce the belief in hyperacusis patients

that their ears are no longer able to physically tolerate these sounds, or that these sounds are causing damage to their ears/hearing, and should be avoided. If patients are not given an explanation of their symptoms, the resultant anxiety and distress can play a role not only in tinnitus and hyperacusis escalation but also in limiting the degree of efficacy of therapeutic intervention. Explaining TTTS provides validation, reassurance and helps reduce anxiety, which can have an immediate effect on reducing the symptoms.

TTTS symptom desensitisation can be achieved using a Tinnitus Retraining Therapy (TRT) approach to hyperacusis therapy, with the addition of cognitive behavioural therapy (CBT) strategies to reframe maladaptive beliefs and manage auditory and TTTS symptom hypervigilance. For patients with chronic TTTS-induced pain, medical management will be discussed.

BIOGRAPHY

Myriam Westcott is a Melbourne based audiologist specialising in evaluation, diagnosis and therapy for patients with tinnitus, hyperacusis, acoustic shock and misophonia. She first began working with tinnitus and hyperacusis patients 20+ years ago. Myriam is committed to the development of innovative approaches to hyperacusis therapy, carries out clinically based research, provides medico-legal opinions and regularly gives presentations/lectures on tinnitus, hyperacusis, acoustic shock and misophonia.

HYPERACUSIS QUESTIONNAIRE (HQ) AS A TOOL FOR MEASURING HYPERSENSITIVITY TO SOUND IN A TINNITUS RESEARCH POPULATION, KATHRYN FACKRELL

Objectives: Hyperacusis can be extremely debilitating, seriously impacting on daily life with emotional, cognitive and behavioural consequences. It is estimated to affect 2% of adults in the UK population. Hyperacusis (hypersensitivity to external sounds) is often comorbid with tinnitus and may be significant for the acceptability and adherence to certain tinnitus management options such as sound therapy. It is important to accurately diagnose hyperacusis in a tinnitus population. The hyperacusis questionnaire (HQ; Khalifa et al., 2002) was developed to specifically assess and quantify hyperacusis, with three subscales measuring attentional, social and emotional aspects. The aim of this study was to evaluate the validity and reliability of the HQ for use as a measurement tool in tinnitus research.

Methods: The study involved a retrospective analysis of data collected for 264 adults experiencing tinnitus who participated in research studies between 2008 and 2014. As part of initial assessments, participants were tested for Uncomfortable Loudness Levels (ULLs) and completed a series of questionnaires; the HQ; Tinnitus Handicap Inventory (THI); Tinnitus Handicap Questionnaire (THQ); Beck's Depression Inventory-II (BDI-II); Beck's Depression

Inventory fast screen (BDI-fast); and the Beck's Anxiety Inventory (BAI). We evaluated the HQ factor structure (Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA)), reliability (internal consistency), validity (convergent and discriminant validity), and responsiveness (floor and ceiling effects).

Results: CFA revealed that the three factor structure to the HQ originally proposed was not a good fit of the data (N:264). The internal consistency for the 14-item HQ was high (0.877). However, the follow-up one-factor CFA using half the sample (N:132) showed similar misfit. Four problematic items (Items 1, 5, 6, and 11) were identified and removed. An EFA (N:132) identified a two-factor solution (10-items) with attentional and social components. Moderate correlations were observed between the HQ and the ULLs ($r = 0.55$), the THI ($r = 0.49$), THQ ($r = 0.40$), BDI-II ($r = 0.37$), BDI-fast ($r = 0.32$) and BAI ($r = 0.38$). Floor and ceiling effects were present in four items in particular.

Conclusion: The original three-factor structure of the HQ was not confirmed. The evidence suggests that all 14-items do not accurately assess hypersensitivity to sound in a tinnitus population. We propose a 10-item (2 factor) version of the HQ, which may provide a more reliable indicator of hyperacusis in tinnitus population than the current version. Further evaluation is needed; the proposed structure will need to be confirmed.

BIOGRAPHY

Kathryn is a graduate student completing her PhD at Nottingham Hearing Biomedical Research Unit in the Tinnitus Etiology and Management team. The aim of her PhD is to evaluate and validate a new tinnitus questionnaire, the Tinnitus Functional Index. Her broad research interests include tinnitus, hyperacusis, psychology, particularly cognition, attention, and statistics. Her particular area of expertise is the development and evaluation of outcome measures; specifically she has extensive knowledge of statistics in the field of psychometrics. Her publication highlights include a book chapter on evaluating questionnaire tools for tinnitus measurement, a peer-reviewed article on evaluating and modifying selective attention tests, and a peer-reviewed publication on the evaluation of the quality of tinnitus information on websites preferred by general practitioners. She has received a number of prestigious awards for her work including the British Tinnitus Associations 2013 Marie and Jack Shapiro award.

THE MINI HYPERACUSIS QUESTIONNAIRE (MINI-HQ): A NEW TOOL FOR THE HYPERACUSIS IDENTIFICATION AND MEASUREMENT, F. TORTORELLA, A. FIORETTI, S. PAVACI, F. MASEDU, M. FUSETTI

Introduction: The Mini Hyperacusis Questionnaire (Mini-HQ) is a self-report questionnaire based on the more

significant items obtained from the 14 items-Italian version of the Khalifa's Questionnaire on hyperacusis (HQ). In order to explore the collapsibility of number of items of the HQ, in the present study, we identified seven items more statistically significant and we created the Mini-HQ.

Methods: We recruited 150 consecutive outpatients 78 male (52 %) and 72 female (48%), age range 17 -88 years, (mean = 51 years), with a primary complaints of tinnitus at least from 3 months. The Mini-HQ was filled in by all patients who also had an audiological examination including audiometry, pitch and loudness tinnitus matching, otoacoustic emissions with distortion products (DPOAE) and the uncomfortable loudness level (ULL). Internal consistency was assessed by means Cronbach Alpha index. A non parametric ROC analysis having ULL as reference variable and Mini-HQ as classification variable was carried out. The overall Mini-HQ performance was described by the area under the ROC curve (AUC). Optimal cut-off point and the corresponding test sensitivity and specificity were found using the Youden index.

Results: The odds ratio estimates were statically significant for seven items of the HQ, showing the dominance of these items in predicting the hyperacusis status. Our statistical analysis showed a Cronbach Alpha of 0.85 and we found a cut-off of 9 as indicative of hyperacusis (sensitivity (Se) = 64.29%, specificity (Sp) = 63.33% and AUC = 0.71). 63 patients (42%) obtained a score \geq of 9 as indicative of hyperacusis.

Conclusion: The Mini-HQ is a new tool for the identification and measurement of hyperacusis, based on the score obtained from the seven more significant items of the HQ. The mini-HQ has showed a Cronbach a Se and a Sp similar to those of the HQ and, thus, it could be quite useful when we have many questionnaires to administer.

VALIDITY OF HYPERACUSIS SCREENING ITEMS IN CHRONIC TINNITUS, MARTIN SCHECKLMANN

Hyperacusis in chronic tinnitus was shown to represent a specific subtype of tinnitus with greater need for treatment. Thus, screening tools for hyperacusis are necessary in the diagnostic assessment of chronic tinnitus. Here, we investigate the validity of the two hyperacusis items ("Do you have a problem tolerating sounds because they often seem much too loud? That is, do you often find too loud or hurtful sounds which other people around you find quite comfortable?"; "Do sounds cause you pain or physical discomfort?") of the TSCHQ (Tinnitus Sample Case History Questionnaire) of the TRI (Tinnitus Research Initiative) database with a German hyperacusis questionnaire (GÜF, Geräuschüberempfindlichkeitsfragebogen). In 161 patients with chronic tinnitus both TSCHQ items and the GÜF total score were highly associated. Focusing on the interrelationship of all three measures a principal

component analysis (varimax rotation) with the 15 GÜF and the 2 TSCHQ items revealed a three-factor solution.

One factor represents an emotional-physiological component (fear and pain related hyperacusis) including six GÜF and both TSCHQ items, a hearing quality factor with three GÜF items, and a quality of daily life factor with six GÜF items. Correlating these three factors with tinnitus-specific items from tinnitus questionnaires, quality of life measures, depressivity index, hearing level, numeric rating scales affirmed these factor structure. In conclusion, both TSCHQ items can serve as screening questions with respect to self-reported hyperacusis in chronic tinnitus with a specific focus on emotional-physiological components of hyperacusis.

BIOGRAPHY

Martin is psychologist (graduation: 2005; dissertation: 2009) and started his working with tinnitus and hyperacusis in April 2010. He is member of the Interdisciplinary Tinnitus Center Regensburg (Germany) and scientific leader of the Center for Neuromodulation Regensburg (Germany). In his working with respect to tinnitus and hyperacusis he is involved in anamnestic interviews and counselling, in treating patients with non-invasive brain stimulation and cognitive behavioural therapy, in planning, conducting, analysing, and publication of clinical trials and basic science.

THE RELATIONSHIP BETWEEN HYPERACUSIS AND AUTISM SPECTRUM DISORDER: A REVIEW OF LITERATURE, ISABELLA MARQUES PEREIRA

Introduction: The autism spectrum disorder (ASD) is a developmental problem characterized, in part, by sensory abnormalities. Different hearing disorders are reported among children with ASD, and hyperacusis is one of the most common challenges. Such children usually react covering their ears or even avoiding staying in the presence of particular sounds.

Methods: To systematically review the literature in Pubmed database describing the relationship between autism spectrum disorder and sensory-perceptual abnormalities, emphasizing auditory hypersensitivity (hyperacusis) and discuss their effects in auditory pathway. We used the keywords "autism and hyperacusis" and "autism and auditory hypersensitivity" in the 2005-2015 period in humans.

Results: Studies were found and reviewed. Sound hypersensitivity in the ASD may be due to abnormality of the efferent auditory system by lack of sufficient contralateral suppression. Auditory sensory modulation difficulties are common in ASD and may stem from a faulty arousal system that compromises the ability to regulate an optimal response. The atypical P100m lateralization in the ASD subjects was associated with greater severity of sensory abnormalities assessed by Short Sensory Profile, as well as with auditory hypersensitivity during the first

two years of life. Unusual reactions to auditory stimuli are often observed in autism and may relate to ineffective inhibitory modulation of sensory input. P50 suppression in response to the second click was significantly reduced in autism children with mental retardation.

Superior semicircular canal dehiscence (SSCD) was more prevalent in ASD children with hyperacusis, than in those without it, both through CT images and ABR. All participants had normal hearing sensitivity in ABR testing, while absolute wave V peak and interpeak latencies I-V and III-V were shorter in duration in study group when compared to the control group. The apparent hypersensitivity to auditory stimuli despite the normal physiological measures in ASD children with auditory hypersensitivity can provide a clinical clue of a possible SSCD.

Studies with SSCD and ASD used the association from oVEMP and high-resolution CT where oVEMPs show diagnostic ability in differentiating ASD children complaining of auditory hypersensitivity.

Autistic disorder with hypersensitivity showed significantly more delayed M50/M100 peak latencies than ASD without. This study indicates auditory hypersensitivity in autistic spectrum disorder as a characteristic response of the primary auditory cortex. The auditory cortex in ASD subjects responds to sounds fully during attention. Difficulties in attention control may account for the contrary behaviors of hypersensitivity.

In cases where hearing impairment exists, hyperacusis should be taken into consideration when fitting amplification and planning behavioural intervention. Case report about effect of risperidone for improving hyperacusis in children with autism was reported.

Conclusion: The early diagnosis of auditory pathway disorders in ASD is considered relevant for the possible identification of atypical sensorial markers and for the better understanding of their impact on the development of communication in autistic individuals.

BIOGRAPHY

Isabella Marques Pereira, Graduated in Speech Language Pathology at Methodist University Izabela Hendrix (2007). Postgraduate degree in Audiology at Catholic University of Minas Gerais (2010). Master Degree at School of Medicine- Health of Children and Adolescent- Federal University of Minas Gerais (2013-2015). Specialist in Tinnitus and Hyperacusis from University of London (2014). Internship at the Erasmus University Medical Center (Rotterdam, 2013) Internship at Hopital Pitié-Salpêtrière (Paris, 2013). Follow up in audiology at Klinikum der Johann Wolfgang Goethe Universität Frankfurt am Main, Germany (2007, 2009, 2011, 2012). She has experience in Voice area, Language, Audiology, Otoneurology and Hearing Aid Selection and Adaptation.

SENSORY SYMPTOMS AND SENSITIVITY TO SOUND IN TOURETTE SYNDROME, ANDREA E. CAVANNA

Tourette syndrome is a neurodevelopmental condition characterised by multiple motor and vocal tics affecting up to 1% of school-age children, with a wide range of severity. Tics are involuntary movements or vocalisations which are known to be modulated by psychological and environmental factors. The vast majority of patients with Tourette syndrome report specific sensory symptoms ('premonitory urges') prior to tic expression. Site sensitisation has also been reported, with heightened sensitivity to auditory stimuli, alongside tactile and visual perceptions. The exact nature of the relationship between hypersensitivity to sensory stimuli and subjective 'urges to tic' is still poorly understood. Case studies suggest that sensitivity to sound can lead to increases in both frequency and severity of tic symptoms, including complex tics such as palilalia and echolalia. Sensory symptoms add significantly to the impact caused by tic disorders on patients' health-related quality of life and their better understanding could reveal new avenues for treatment strategies.

BIOGRAPHY

Andrea E. Cavanna, MD PhD FRCP, is Consultant in Behavioural Neurology at the Department of Neuropsychiatry, BSMHFT, Birmingham, Honorary Professor in Neuropsychiatry, Aston University, Birmingham, Honorary Reader in Neuropsychiatry at the University of Birmingham, Honorary Senior Research Fellow at the Institute of Neurology, University College London, United Kingdom, and Honorary Professor in Neuropsychiatry at University of Pavia, Italy. He currently is Lead Consultant for the specialist Tourette syndrome clinic at the Department of Neuropsychiatry, Birmingham. He has published extensively in the fields of behavioural neurology and neuropsychiatry, with special focus on the behavioural aspects of Tourette syndrome and epilepsy. His other research areas include the neural correlates of altered conscious states in neuropsychiatric/neurodegenerative conditions. In 2010 he received the American Neuropsychiatric Association Career Development Award.

HEARING MISOPHONIA! DAMIAAN DENYS

Some patients report a preoccupation with a specific aversive human sound that triggers an impulsive aggression. This condition is relatively unknown and has hitherto never been described, although the phenomenon has anecdotally been named misophonia. At the AMC we have screened nearly 250 patients with misophonia. All patients were interviewed by an experienced psychiatrist and were screened with an adapted version of the Y-BOCS, HAM-D, HAM-A, SCL-90 and SCID II.

The misophonia patients shared a similar pattern of symptoms in which an auditory or visual stimulus provoked an immediate aversive physical reaction with anger, disgust and impulsive aggression. The intensity of these emotions caused subsequent obsessions with the cue, avoidance and social dysfunctioning with intense suffering. The symptoms cannot be classified in the current nosological DSM-IV TR or ICD-10 systems. We suggest that misophonia should be classified as a discrete psychiatric disorder. Diagnostic criteria could help to officially recognize the patients and the disorder, improve its identification by professional health carers, and encourage scientific research. In an open trial, 100 patients were treated with a specially designed cognitive behavioral program. In this presentation we will report on the clinical phenomenology of misophonia, neurobiological correlates and treatment options.

BIOGRAPHY

Damiaan Denys is Professor at the University of Amsterdam, Chair of the department of psychiatry at the AMC and group leader at the Netherlands Institute for Neuroscience in Amsterdam, the Netherlands. He completed his degree in philosophy and medicine at the University of Leuven, Belgium and obtained his doctorate cum laude from Utrecht University. Damiaan Denys conducts clinical and neurobiological research into anxiety, impulsive and compulsive disorders. His scientific research is characterized by a translational approach and makes use of philosophy, animal models, neuroimaging, neuropsychology, electrophysiology, and genetics. In order to develop connections between psychiatry and the fundamental neurosciences, he employs a new approach, which instead of examining disorders concentrates on broader concepts such as compulsivity, reward learning, habit formation, and fear conditioning across disorders. A particular focus of his research is the development of deep brain stimulation (DBS) for psychiatric disorders such as obsessive-compulsive disorder, depression and addiction.

BEHAVIOURAL EXPERIMENTS IN COGNITIVE THERAPY FOR HYPERACUSIS, HASHIR AAZH

Cognitive behaviour therapy (CBT) shown to improve hyperacusis symptoms as measured via Uncomfortable Loudness Levels test and hyperacusis questionnaires (Juris et al. 2014), and patients' physiologic response to sound as measured via heart rate, skin conductance, and eye-blink electromyogram (Griffin et al. 2012).

CBT for hyperacusis asserts that the noise-induced distress in individuals with hyperacusis arises from the meanings they give to their experiences. For example catastrophic misinterpretation of physical symptoms (e.g., "my ears will explode when I listen to loud noises", "I will faint") is central to experience of panic in noisy places, while exaggerated sense of guilt due to intrusive thoughts is central to anger reaction in respond to noise (e.g., "I will smash his face if he continue to make this

noise”, “My reaction to noises that others make is rude”). In CBT, behavioural experiments are defined as planned experiential activities undertaken by patients which are designed directly from a cognitive formulation of a problem and are aimed to (1) test the validity of patients’ existing beliefs, (2) construct more adaptive beliefs, and (3) contribute to development and verification of cognitive formulation (Bennett-Levy et al. 2004).

Behavioural experiments in the context of CBT are different from approaches which are rooted from behaviour psychotherapy (i.e., Tinnitus/Hyperacusis Retraining Therapy (TRT; Jastreboff & Jastreboff 2014)) which aim to facilitate habituation through gradual, repeated, and prolonged exposure to feared stimulus. The main aim of behavioural experiments is to change perspective. If the troublesome thought and safety behaviours are accurately captured and examined in the experiment, then the change is likely to happen even after one single key behavioural experiment.

IMPROVING HYPERACUSIS AND TINNITUS THROUGH SEROTONIN ACTION DRUGS, TANIT GANZ SANCHEZ

Introduction: One of the theories to explain hyperacusis is related to changes in the levels of neurotransmitter serotonin (5-HT) in central nervous system. Tinnitus has been widely linked to depression, which is one of the manifestations of decreased serotonin levels. 5-HT has a big and complex family of receptors to exert its multiple effects in the body. Moreover, diverse pharmacological effects occur between different receptor subtypes and also within one single subtype, depending on the ligand. Fluoxetine is an antidepressant, acting at least on receptors 5-HT_{1A}, 5-HT_{1A/1B}, 5-HT_{2C}. Cyclobenzaprine is a central action muscle relaxant derived from amitriptyline, acting at least on 5-HT₂ receptor. Our aim is to describe the effect of drugs that interfere with serotonin in patients with hyperacusis and tinnitus.

Methods: In this open label retrospective study, we selected the last 10 patients seen with the following selection criteria: clinical complaint of hyperacusis and constant non pulsatile uni- or bilateral tinnitus; recent audiological battery including altered Loudness Discomfort Levels (LDL < 95dBHL) in at least 2 of the 4 frequencies (500, 1000, 2000, 4000Hz) in one year; consistent measurement of tinnitus pitch and loudness matching (tested and retested in the same day). There were 4 males and 6 females, whose age ranged from 24 to 69 years (mean 47.7). None has previously received the diagnosis of depression by a psychiatrist. After excluding possible counter indications and explaining the action mechanisms of both medications, they were asked to choose to use either fluoxetine (20mg/day, chosen by 3 patients) or cyclobenzaprine (10mg/day, chosen by 7 patients) for 2 months and to return to comparative exams.

Results: Visual analogue scale (VAS 0-10) was used to

compare annoyance with both symptoms in the same instrument. The mean score of VAS was 5.4 for hyperacusis and 6.9 for tinnitus. Analyzing hyperacusis before and after treatment, the mean thresholds of LDL in 500 to 4000Hz from 76.62dBHL (right ear - RE) and 79.87dBSL (left ear - LE) to 82.75dBSL (RE) and 85.87dBSL (LE). This improvement ranged from 3 to 8dBHL per frequency in both ears. Regarding tinnitus pre and post treatment, the loudness matching varied from 1 to 16dBSL (mean 7dBSL in both ears) and changed to vary from 1 to 8dBSL (mean 3.88dBSL in RE and 4.11dBSL in LE). This improvement ranged from 2 to 8dBSL (60% improved at least 4dBSL). **Conclusion:** Drugs with potential action on serotonin levels, such as fluoxetine and cyclobenzaprine, maybe useful tools to improve both hyperacusis and tinnitus in patients with concomitant symptoms. Future studies with bigger and randomized samples are recommended to confirm such benefits.

BIOGRAPHY

Dr. Tanit Ganz Sanchez joined the University of São Paulo Medical School in 1985, and the residency in Otolaryngology in Clinics Hospital in 1991. She performed her Doctorate thesis in 1998 and Free Docent thesis in 2003, both about tinnitus. She became Associate Professor of the Dept of Otolaryngology in 2004. She is considered to be a “different” ENT because of her dedication, for the last 20 years, to develop public actions pro awareness of tinnitus and sound sensitivity. In 1994, she founded the first Tinnitus Research Group in Brazil. In 2006, she wrote the book “Who Said That Tinnitus Cannot Have Cure?”, aiming to change pessimistic points of views about treatments. In 2009, she created the Instituto Ganz Sanchez, an interdisciplinary team focused on tinnitus and sound intolerance treatment.

From 2010 on, she has been the President of Association of Interdisciplinary Research and Divulcation of Tinnitus, a non-profit organization that organizes the Tinnitus TV and the “Orange November” (National Campaign on Tinnitus and Sound Intolerance Alert). In 2011, she chaired the X International Tinnitus Seminar, held in Brazil. She has authored more than 150 journal articles and book chapters and was extensively invited to lecture nationally and internationally.

THE COCHLEAR DYSFUNCTION OF HYPERACUSIS: A WAY TO IMPROVE THE COCHLEAR HOMEOSTASIS BY LOW LEVEL LASER THERAPY, EUGENIO HACK

Purpose: The Objective of our study is to confirm that hyperacusis as a disorder is more susceptible to a cochlear homeostasis abnormal condition than other non well-known neurophysiological processes. Application of laser irradiation inside the inner ear has been investigated to observe the therapeutic effectiveness in cochlear injury and other vestibular dysfunction. Many of the disorders of the inner ear, sudden hearing loss, vestibular diseases, peripheral dizziness, Hyperacusis, etc., are the

result of a possible vascular alteration or degradation of endocochlear homeostasis. Multiple proteins and other molecules like connexins, fibrocytes and genes are involved in the vascularization of the stria vascularis and spiral ligament.

They are fundamental in the ion homeostasis by the cochlear fluids and recycling the K⁺. The positive influence of large dose of light irradiation with laser photo-therapy on the treatment of vascular disorders (activating of microcirculation, improving rheological properties of blood increasing its fluidity and level of oxygen and activating functions of intracellular transport) are well known and published for several authors from Russian Medical Groups and other researchers and scientists from UK, Japan, US and others.

Method: Data collection was from a prospective study of a group of Fifty-eight (58) patients who were suffering hyperacusis from several innerear diseases (Morbus Menière, Tinnitus and other disorders) was made with laser irradiation therapy based upon a photobiostimulation energy protocol. Patients were treated twice a week for six weeks by irradiation of a dose of Low Level Laser Therapy (LLLT). A laser device with double wavelength and independent light beams were used to irradiate through the ear canal with light power irradiance of 0.2 W/cm² to 1.8 W/cm². Pure tone Loudness Discomfort Levels as well as other auditory test threshold levels were measured and evaluated by comparing Audiometric Dynamic Range before and after treatment period. Recently a new trial research has been adopted by using an spectrophotometer test of oligoelements and minerals on each patient before to start irradiation therapy process in order to know any pattern of metabolic unbalance of them.

Results: Hyperacusis was significantly improving in all patients after Laser Photo Therapy protocol. Among hyperacusis patients 99% of the observations have a large improvement of auditory capacity and 78.9% of them reached normal Loudness Discomfort levels (no hyperacusis) and improving their sound tolerance. **Conclusions:** Irradiation of the cochlea with a specific dose of Low Level Laser Light produces an obvious improvement in hyperacusis and other auditory disorders. This research describes effects of treatment by laser light irradiation on hyperacusis disease and recognizes that hyperacusis is mainly a cochlear homeostasis dysfunction.

BIOGRAPHY

Dr. Eugenio Hack, ENT specialist, MA, Rotger Hospital Palma de Mallorca, Spain, began as specialist doctor in Otolaryngology, Head and Neck Surgery at the German Hospital of Buenos Aires, in 1995. He obtained also an Aesthetic Medicine MA by Balearic Islands University and now he is making a Master in Nutrigenomics and Personalized Nutrition. From 2007, he practices in the ENT Unit of the Rotger Clinic of Palma de Mallorca.

As credentialed Director in Radiodiagnosis, in the last years, he has been interested in the PDT (Photo Dynamic Therapy by irradiation with light) and the effects of the LLLT (Low Level Laser Therapy) for the treatment of the internal ear disorders.

Dr. Hack has a very ample knowledge in implementation of procedures to make arrive at the patient the technologies already proven successfully and he has added the knowledge and benefits of the micro-nutrition in the cochlear homeostasis, like guideline of aid in potential auditory regeneration. Last Posters presentation "Effective management of Menière and vestibular disorders with Photo-biostimulation Light Laser" and "Hyperacusis and other ear disorders are improving after irradiation with Photobiostimulating Laser" were in the American Academy of Otolaryngology-Head and Neck Surgery Foundation, Inc. Orlando, Florida, U.S.A. 2014.

POSTERS

THE HYPERACUSIS SCALE (HS): A NEW TOOL FOR THE CLASSIFICATION OF HYPERACUSIS BASED ON THE SCORE OBTAINED FROM THE ITALIAN VERSION OF THE KHALFA'S QUESTIONNAIRE, F. TORTORELLA, A. FIORETTI, S. PAVACI, F. MASEDU, M. FUSETTI

Introduction: The Hyperacusis Questionnaire (HQ) is a self report questionnaire based on the items obtained from the Khalfa's Questionnaire on hyperacusis. In a previous study we validated the italian version of the HQ and we found a cut-off of 16 indicative of hyperacusis instead of 28, the cut-off proposed by Khalfa. The present study aims to set appropriate cut-off scores for hyperacusis, given the uncomfortable loudness level (ULL) scores, to identify an Hyperacusis Scale (HS) for the classification of hyperacusis in mild, moderate and severe.

Methods: From November 2011 to December 2012, we recruited 117 consecutive outpatients 64 male (54.7 %) and 53 female (45.3%), age range 14 -88 years, (mean = 53 years), with a primary complaints of tinnitus to improve population homogeneity. All the patients had tinnitus at least from 3 months and the exclusion criteria were the presence of recruitment, Ménière's disease and previous psychiatric disease. Informed consent was obtained from each participant before examination. All patients were submitted to the Italian version of the HQ and underwent audiometry, pitch and loudness tinnitus matching, otoacoustic emissions with distortion products (DPOAE) and the uncomfortable loudness level (ULL). Given LDL score, a kth nearest neighbor discriminant analysis has been carried out, providing both resubstitution classification table and the error rate estimates within each group.

Results: From our statistical analysis, we found a scale for the evaluation of the hyperacusis as mild (score <

22), moderate (score comprised between 23 and 29) and severe (score > 29), given a cut-off of 16 to detect the hyperacusis.

Conclusion: Depending on the score obtained from the Italian version of the HQ, used for the identification of patients with hyperacusis, we found a scale to differentiate the hyperacusis in mild, moderate and severe. It's interesting to observe a quite complete overlapping of the score found for the severe hyperacusis, with the score previously proposed by Khalfa to identify the hyperacusis.

NOISE SENSITIVITY AND MISMATCH NEGATIVITY, MARJA HEINONEN-GUZEJEV

Introduction: Noise sensitivity increases the degree of reactivity to noise in general and predicts noise annoyance. It also increases the harmful health effects of noise. Noise sensitivity has been associated with both poor somatic and mental health and poor sleep quality.

The mismatch negativity (MMN) is a negative component of the auditory event-related potential (ERP), which is usually peaking at 100–250 ms from stimulus onset. The MMN is a marker of sound-discrimination accuracy.

Method: We studied how the neural discrimination of sound changes as indexed by MMN is associated with noise sensitivity as indexed by the Weinstein's Noise Sensitivity questionnaire. Subjects of this study were 61 healthy adults. The age range was from 19 to 46 years. Data of all 61 subjects were used for MEG analysis, and 57 were accepted for EEG analysis.

Results: The results show that noise sensitivity affects the MMN response and the cortical sound discrimination process underlying its elicitation. Noise sensitive individuals are compromised in discriminating small changes in sound spectra but have enhanced reactions to temporal changes.

HYPERACUSIS: A TENSOR TYMPANI SYNDROME CASE, JOAQUÍN PRÓSPER

Introduction: The Tensor Tympani Syndrome (TTS) it's a slightly well-known disorder. Many times the typical symptoms may be confused and attributed to other pathologies. The abnormal activity of the tensile muscle of the eardrum (or TTS) usually happens as a result of the environment with exposition to sudden and unexpected loud noise or acoustic shock injury (ASI). Other authors also mentioned some temporomandibular joint disorder in stressed people.

We present a report of a case in which the main symptoms were Hyperacusis with a little bit of disturbing Tinnitus. Perception of these symptoms happened after an accident in his factory by a loud sound of explosion or AIS. Both tinnitus and hyperacusis symptoms disturbed and firing the anxiety of person affected.

Treatment Method: Patient was treated by irradiation of a dose of Low Level Laser Light. A domestic laser device of 650 nm wavelength was used to irradiate through the ear canal with light power output of 5 mWatts, and 0.6 Joules/cm² each minute of fluence irradiance. Every day patient applied a total dose of 12 -15 joules. In that case improvement is obtained after 60 days or more. We use for this treatment a commercial medical laser (CE mark pen-device). Several test controls, were used to evaluate improvement of patient. Mainly THI (Tinnitus Handicap Inventory) and Hyperacusis Questionnaire, Audiological control of ULLs (Uncomfortable Loudness Levels), Dynamic Range and also Annoyance VAS Questionnaire were clinical tools of test and measurement. Results: We actually find that successful hyperacusis treatment results are after a time irradiation of low level light therapy (LLLT), for a typical domestic protocol.

FROM THE PLOTT TEST TO GAIN THEORY ...35 YEARS OF CLINICAL EVOLUTION IN THE TREATMENT OF TINNITUS, HYPERACUSIS AND HEARING LOSS, SUSAN GRENNES

My Audiological career was etched early with a recently diagnosed profoundly deaf two year old. This little toddler had no language. This inventive child had already flushed four hearing aids down the toilet. Another two sets of formula prescribed hearing aids were subsequently fitted... only to have them suffer the same fate. Clearly she hated wearing her hearing aids. A different outcome was needed. At work were some recently published auditory rehabilitation programs. Applying these programs resulted in this little girl happily wearing her hearing aids. The answer was not in the compulsory prescription process Listening and working with clients for 35 years has been a privilege. Together we have experimented to remove the barriers preventing the successful use of hearing aids. For over 30 years we have observed clients reporting that the sound continually "faded on them".

However, for this to happen it was essential that the client found the aided sound to be comfortable. In 2012 at the London University Master Class for Tinnitus and Hyperacusis, Brian Moore presented the Gain Theory Hypothesis. An explanation of the observed "fading effect" had finally been found. This put into context the effective use of hearing aids as a tool to manage tinnitus, hyperacusis and hearing loss with the gradual, managed, re-introduction of controlled, comfortable sound. Three clinical case studies will be presented in the context of Gain Theory. The management of tinnitus, hyperacusis and hearing loss will be covered along with individual client reflections of their experiences.

TREATMENT OF HYPERACUSIS IN CHILDREN: GINKGO BILOBA WITH NIGHTLY ENVIRONMENTAL SOUND, TANIT GANZ SANCHEZ AND ISABELLA MARQUES PEREIRA

Introduction: Hyperacusis is underestimated in children. The author's previous study with 506 children showed that 42% had abnormal annoyance to sounds, 3.2% had low Loudness Discomfort Levels (LDL) and 9% had phonophobia. Moreover, 50% of those with hyperacusis had tinnitus. Our aim is to describe the successful treatment of hyperacusis in 2 pre-adolescent males with Ginkgo biloba (Gb) extract plus nightly environmental sounds (ES).

Methods: 1) PFB, 12 y-o male, with sound intolerance to voices of family, friends, teachers, radio, TV, traffic, in constant use of ear protection and aggressive reactions to sounds. He also complained of constant high-frequency bilateral tinnitus. Initial audiological battery (Feb 2013) showed normal thresholds from 250-16000Hz, with LDL at 40-65 dBHL range, tinnitus pitch at 12500Hz, loudness at 18dBSL, masking at 24dBSL. We prescribed Ginkgo biloba extract P246 (based on its safety when used for vertigo in children and tinnitus in adults) and nightly low level environmental sounds for 2 months. He didn't adhere to using sound, but felt better with the medication. The new exam (May 2013) showed tinnitus loudness at 7dBSL, masking at 15dBSL, and LDL increase to 55-65dBHL. He was advised to keep the medication for 3 months. He felt improved even more from hyperacusis, rarely using ear protection and barely perceiving tinnitus. The third exam (Aug 2013) showed tinnitus loudness at 4dBSL, masking at 8dBSL, with LDL at 60-70dBHL. His mother was pleased with his new behavior at home and school. Treatment was interrupted and hearing tests were stable 6 months later (Feb 2014); 2) BGA, 11 yo, male, living abroad, complained of sound intolerance with friends, family, school, traffic and frying food, needing daily ear protection for the last 8 months at school, street and home. Audiological exams (Dec 2013) showed normal bilateral thresholds from 250-8000Hz, with LDL at 85-100dB and normal reflexes. Due to previous success, he was also prescribed Gb extract plus nightly ES for 3 months. In May 2014, his mother emailed us telling about his improvement with both treatments, with no need of ear protection. No new exam was performed. In Aug 2014, she emailed us again, very pleased because BGA was able to celebrate birthday with friends and music for the first time, confirming the change of behavior.

Results: In both cases, the behavior when facing daily sounds improved dramatically after a few months using Ginkgo biloba extract. One of the cases used associated nightly environmental sounds, while the other gave up soon and kept only the medication. No side effects were reported.

Conclusion: So far, there is no clear rationale for using Ginkgo biloba in patients with sound intolerance. However, isolated or in association with environmental

sounds, it contributed to improve dramatically restrictive symptoms of sound intolerance in two pre-adolescents. As this age range is difficult to medicate and to adhere to treatments, future studies are welcome to confirm benefits.

AN EXPLORATION OF LINKS BETWEEN VERY HIGH AND ULTRASONIC FREQUENCIES IN AIR AND HYPERACUSIS, JENNI BAGE

Introduction: Literature has linked very high and ultrasonic frequency sound in air to temporary changes in hearing threshold, tinnitus and other "subjective" effects, including headache and nausea, for over 40 years. Very little attention has been paid to the subject in the last 30 years, however the use of these frequencies is rapidly becoming more common, and increasing numbers of adults and children are exposed to these frequencies daily, often without their knowledge. Interest is growing in the health effects of prolonged exposure to these frequencies, and the safety legislation that should surround them.

Method: This poster explores a case study where a member of the public can directly attribute their sudden onset of hyperacusis to very high frequencies in the region of 15kHz. It describes the symptoms of the individual, illustrating how their daily life was affected, and how they suddenly found that previously tolerable or inaudible sounds were now louder and caused them discomfort or pain. The most painful sounds for the individual are explored, along with mitigating actions they took to make daily life more manageable and their gradual improvement in Loudness Discomfort Levels after the event. It then looks at subsequent later very high frequency/ultrasonic noise exposures which were again accompanied with temporary threshold shifts, tinnitus and other "subjective" effects. The poster reviews the published historical literature that links exposure to very high/ultrasonic frequencies to temporary threshold shifts, including improvements in hearing. It considers some of the equipment in regular daily use in the home and the workplace that produce constant tones at similar frequencies and which a person prone to hyperacusis or tinnitus might find exacerbates their condition. Finally it summarises the current legislative position in the UK for very high and ultrasonic frequencies, looks at current work in safety around these frequencies of sound and looks at some of the major questions on the impact of these frequencies on children or those with hyperacusis or tinnitus.

Conclusions: The effect of very high frequency and ultrasonic noise is an under-researched area, and research is urgently required. Safety guidelines, especially for those with more sensitive hearing such babies, children and those with hyperacusis, are of particular importance.

DAILY LIFE WITH HYPERACUSIS, LINDA STRATMANN

I have both hyperacusis and tinnitus and am co-moderator of a Facebook support group with membership worldwide exceeding 1,000. Most members have hyperacusis, a few are parents of children with hyperacusis and there are also some medical professionals. The purpose of this presentation is to share the life experiences of people with this condition, and the challenges they face on a daily basis, in their homes, work and places of education. I will especially highlight the fact that the general public is largely unaware of the condition, which results in sufferers being treated with derision and abuse. Many doctors have never heard of it, and treat patients as psychiatric cases. We would all like a cure, of course, but while we are waiting for that the single biggest improvement that can be made in the daily lives of people with hyperacusis is educating others as to the condition so that sufferers can be treated with more consideration. I will also share my own method of dealing with noisy environments in a way that does not exacerbate either my hyperacusis or tinnitus.

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