

Dear Colleagues,

The “*Journal of Hearing Science*” is pleased to publish the abstracts submitted for the 7th International Conference on Hyperacusis and Misophonia (ICHM7).

The ICHM7 takes place on 15–17 September 2024 in Warsaw, Poland. Three days of the conference will be filled with talks from a multi-disciplinary group of world-renowned keynote speakers bringing together studies of audiology, ENT, mental health, neuroscience, epidemiology, psychoacoustic, psychometry, neurology, and other areas. The program will feature key medical, surgical, rehabilitative, and mental health opinion leaders from the clinical and laboratory research sphere. We will also hear from persons who have lived with the experience of hyperacusis and misophonia and their families.

We are happy to welcome to Warsaw oto-rhino-laryngologists, audiologists, psychiatrists, psychologists, speech and language therapists, hearing aid dispensers, social workers, neuroscientists, researchers, and other professionals who are involved in research or care for patients with tinnitus, hyperacusis, and misophonia.

We wish you a productive and exciting meeting!



*Prof. Henryk Skarzynski, MD, PhD, dr. h.c. multi  
Honorary President*

# 7TH INTERNATIONAL CONFERENCE ON HYPERACUSIS AND MISOPHONIA, 15–17 SEPTEMBER 2024, WARSAW, POLAND

## Keynote Lectures

### Hyperacusis in Fragile X model of autism and chronic stress-induced hyperacusis

Salvi R.

*Center for Hearing and Deafness, University at Buffalo, NY, USA*

#### Objective 1

**Introduction:** The biological mechanisms underlying hyperacusis are poorly understood, but medical conditions and genetic factors associated with this disorder could provide insights on underlying causes and treatments. Human investigations suggest that chronic stress may contribute to hyperacusis, but experimental evidence for this view is limited.

**Material and methods:** We pharmacologically induced chronic stress in rats by chronically administering corticosterone (CORT) stress hormone in drinking water. Loudness measures were obtained by measuring rat reaction time-intensity (RT-I) functions before and after chronic CORT treatment.

**Results and conclusions:** CORT treatment significantly reduced reaction times at suprathreshold intensities, behavioral evidence of loudness hyperacusis. Electrophysiological studies showed no change in the neural output of the cochlea in CORT-treated rats; however, sound evoked neural responses from higher auditory centers were significantly enhanced, evidence of sound-evoked neural hyperactivity in the central auditory pathway. Rats were tested for sound avoidance hyperacusis using an Active Sound Avoidance Paradigm (ASAP) in which sounds of increasing intensity were used to “drive” a rat from a preferred dark enclosure to a bright, open “avoidance” arena. Following Chronic CORT treatment, a 90 dB broadband noise was much more effective in “driving” the rat from the preferred dark enclosure into the bright, open “avoidance” arena, evidence that chronic stress had induced sound avoidance hyperacusis.

#### Objective 2

**Introduction:** Many individuals with autism and autism spectrum disorder (ASD) exhibit hyperacusis. Fragile X (FX) syndrome, a leading genetic cause of ASD, is associated with CGG expansions near the *Fmr1* gene resulting in FMRP protein deficiency.

**Material and methods:** We tested for loudness hyperacusis in FX syndrome by comparing RT-I loudness growth functions from male rats lacking the *Fmr1* gene with WT rats.

**Results and conclusions:** *Fmr1* knockout and WT rats had similar thresholds in quiet, however, *Fmr1* knockout rats

had significantly shorter reaction times at suprathreshold intensities than WT rats for pure tones and broadband noise, behavioral evidence of loudness hyperacusis in *Fmr1* knockout rats. Temporal integration of loudness was evaluated by measuring reaction time as a function of stimulus duration. Reaction times decreased as duration increased from 50 to 300 ms in WT rats, evidence of temporal integration of loudness. Reaction time in *Fmr1* knockout rats were shorter than WT rats and RTs showed little change with duration, evidence of aberrant temporal integration in *Fmr1* rats. The MTEP-mGlu5 receptor has been implicated in autism. To investigate its role in hyperacusis, reaction-time intensity functions were measured in *Fmr1* knockout rat and WT rats before and after treatment with an MTEP mGlu5 receptor antagonist. The MTEP mGlu5 receptor antagonist had no effect on the reaction times of WT rats, whereas it dose-dependently increased reaction times in *Fmr1* KO rats to values similar to those WT rats. These results suggest that MTEP-mGlu5 antagonists might be clinically effective at suppressing loudness hyperacusis in individuals with ASD.

*Prof. Richard J. Salvi has conducted numerous studies on plasticity of the central auditory system, sensory hair cell loss and regeneration, noise-induced hearing loss, tinnitus, hyperacusis, auditory perception, brain imaging, cell death and neuroprotection.*

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### Exploring the neurochemical and psychophysiological basis of misophonia and hyperacusis

Ward J.<sup>1</sup>, Rinaldi L.<sup>1</sup>, Ronen I.<sup>2</sup>, Agbude R.<sup>1</sup>, Forster S.<sup>1</sup>, Makowski D.<sup>1</sup>, Simner J.<sup>1</sup>

<sup>1</sup> *School of Psychology, University of Sussex, Brighton, UK*

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Misophonia and hyperacusis are typically defined in terms of a narrow versus broad range of trigger sounds and are often linked to different aspects of a sound (sound meaning for misophonia, loudness for hyperacusis). However, co-morbidity between these conditions suggests possible mechanistic overlap. In two studies we examine the neurochemical and psychophysiological basis of misophonia (using a validated questionnaire) and hyperacusis (based on uncomfortable loudness thresholds). The technique of magnetic resonance spectroscopy (MRS) uses MRI to estimate the concentration of excitatory and inhibitory neurotransmitters in the brain, enabling us to explore whether either type of sound intolerance is linked to general levels of excitability in key regions of the brain (auditory cortex, insula). No differences were found. In a separate experimental study, participants engaged in an attention-demanding visual task whilst concurrently measuring responsiveness to task-irrelevant sounds (in terms of level

of distraction, psychophysiological responsiveness). Here we do find that different aspects of the task are differentially sensitive to misophonia and hyperacusis. Misophonia is linked to heightened responsiveness to sounds whereas hyperacusis is linked hyper-vigilance.

**Jamie Ward** is a Professor of Cognitive Neuroscience in the School of Psychology at the University of Sussex, UK. He specialises in individual differences in perception and its neural and cognitive basis.

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### Loudness hyperacusis: mechanisms of loudness perception and their breakdown

Moore B.C.J.

Cambridge Hearing Group, Department of Psychology, University of Cambridge, UK

There may be several different forms of hyperacusis (Tyler et al., 2014). This presentation is concerned with “loudness hyperacusis”, for which sounds with medium and high levels appear to be louder than normal. The normal perception of loudness can be understood using a model that takes into account the processing of sounds in the peripheral auditory system (Moore et al., 1997). This model has been modified to take into account the perception of loudness by people with cochlear hearing loss (Moore and Glasberg, 2004). The model

predicts the loudness recruitment that typically is associated with cochlear hearing loss, and it also predicts that hearing loss can sometimes be associated with “over-recruitment”, so that some sounds appear louder than normal. However, the model does not account for abnormalities of loudness perception, like hyperacusis, that can occur for people with normal or near-normal audiograms. This suggests that factors associated with higher levels in the auditory system need to be taken into account. The effects will be discussed of several factors that are not currently taken into account in the loudness model, but that can influence the perception of loudness. These include: the functioning of the efferent system that regulates the active mechanism in the cochlea; central plasticity and adaptation effects; the influence of visual stimuli; and the influence of the perceived properties of the sound source.

**Brian Moore** is Emeritus Professor of Auditory Perception in the University of Cambridge. His research focuses on the perception of sound by people with normal and impaired hearing, and on the design and fitting of hearing aids. He is a Fellow of several prestigious societies, such as the Royal Society of London and the Academy of Medical Sciences. He has received the Silver and Gold medals from the Acoustical Society of America, and awards from the American Academy of Audiology, the Association for Research in Otolaryngology, and the American Auditory Society. He has an Honorary Doctorate from Adam Mickiewicz University, Poland. He has published 22 books and over 700 refereed journal articles.

## Workshops

### 4C Hyperacusis/Misophonia Management Questionnaires: a method to enhance patient’s readiness for therapy

Aazh H.

Hashir International Specialist Clinics & Research Institute for Misophonia, Tinnitus and Hyperacusis, London, UK

Patients may not choose therapies involving talking, such as cognitive behavioural therapy (CBT), as the first choice for managing issues related to their health, including hyperacusis and misophonia, despite the research evidence supporting the effectiveness of such therapies. The first choice is usually to seek a medical cure. In the absence of a medical cure, patients with hyperacusis and misophonia believe that only way to cope is by using avoidance and ritualist behaviours (e.g., over use of ear protection, isolating themselves, avoiding certain environments or people, telling people not to make noise, and so on). Therefore, the decision to take part in a therapy programme instead of engaging in avoidance and ritualist behaviours constitutes a change. One of the reasons in favour of the status quo and against the change is the patient’s lack of confidence in their ability to make the change (i.e., they are not confident that they can abandon avoidance behaviours and rituals and learn a different way of managing their problem). For example, a patient with misophonia may think that “I do not think that I can control my anger even with CBT. It is easier to avoid people at mealtimes” or a person with hyperacusis may think “I can avoid pain in my ears by avoiding loud sounds, but I doubt that I can use CBT to avoid pain.” This workshop aims to: (1) discuss factors

related to improving patient’s readiness and motivation for therapy, (2) practise utilising 4C Hyperacusis and Misophonia Management Questionnaires. Using 4C questionnaires helps the clinician to encourage the patient to explore their own strengths, motivations and resources that can help them to learn and apply the CBT skills in order to manage their hyperacusis or misophonia without relying on avoidance and ritualist behaviours, (3) report psychometric properties of the 4C questionnaires.

**Dr. Hashir Aazh** is an academic clinician and over the last 20 years he has developed and managed several Tinnitus Clinics in the UK. His clinical and research interest is on rehabilitative therapies for tinnitus, hyperacusis and misophonia for children and adults. He was the head of the specialist tinnitus clinic at the Royal Surrey County Hospital NHS Foundation Trust UK for over a decade (2010–2021). He has written over 50 scientific papers in the field of Audiology and has trained over 1000 audiologists, psychologists and other healthcare professionals in his Tinnitus Masterclass. Hashir is Honorary Hearing Research Consultant at the Royal Surrey NHS Foundation Trust (UK), Affiliate Associate Professor at Florida Atlantic University (USA) and Visiting Research Fellow at the University of Surrey (UK). He has served as Managing Editor of the journal *Noise and Health*, Associate Editor of the journal *International Journal of Audiology*, Editor-in-Chief of the journal *Iranian Audiology*, a member of the Editorial board of the journal *Auditory and Vestibular Research*, and the Secretary of the *British Society of Audiology*.

## Differential diagnosis between misophonia and mental health disorders

Jaffe J.J.

*Private Practice, Sherman Oaks, CA, US*

Assist audiologists in distinguishing misophonia from other mental health issues that would most appropriately be referred to mental health services. Audiologists are increasingly learning to use CBT (cognitive behavioral therapy) to assist their patients with misophonia management, following a structured plan developed for their implementation. While this approach might be helpful for patients, it is incumbent upon providers to recognize limitations when deeper issues may be present. Misophonia typically presents with several features that could also, or instead, indicate a more complex mental health condition. For example, misophonia patients commonly exhibit high degrees of perfectionism, rigidity, and excessive preoccupation with rules, including harsh judgment of others who – in their view – are disrespectful of their rules. But these can also be symptoms of OCD (obsessive compulsive disorder) or OCPD (obsessive-compulsive personality disorder), which need to be addressed by a qualified mental health professional. There are other frequent concurrent symptoms indicative of underlying co-occurring psychological problems involving depression, anxiety, self-injury, and possible history of trauma. Several case studies will illustrate these distinctions and highlight the significant role of psychotherapists in collaboration with audiologists or ENTs in treatment of misophonia and tinnitus.

*Jaelline Jaffe, PhD, has been a licensed psychotherapist in Southern California since 1976, working with individuals, couples, and medical issues, which led to her establishing LemonAidCounseling.com. For the past dozen years, her practice has focused almost exclusively on sound sensitivity disorders, mainly Tinnitus and Misophonia. She has worked with many hundreds of Misophonia patients from age 8 to 70, mostly with teens and young adults, who often find her via her website, SensitiveToSound.com. Dr. Jaffe often works in conjunction with audiologists across the US to assist their patients with the intense emotional and family issues associated with Tinnitus, Misophonia, and Hyperacusis. She has presented on these topics at numerous professional conferences for audiologists as well as for psychotherapists. Dr. Jaffe is a cofounder and Board member of the Misophonia Association, and also program coordinator for their annual convention for hundreds of patients and families. The 11th annual convention will take place in November 2024 in Atlanta, GA. Dr. Jaffe is author of the upcoming book “These Sounds are Driving Me Crazy!” Training for Mental Health Professionals in Treating Sound Sensitivity Disorders.*

## Using the Duke Misophonia Questionnaire and Duke Misophonia Interview in evidence-based treatment planning for adults

Rosenthal M.Z.

*Duke University, Durham, NC, USA*

This 90-minute workshop will provide an overview of clinical procedures used at the Duke University Center for Misophonia and Emotion Regulation to assess and develop treatment plans for adults with misophonia. Dr. Rosenthal will review how to use the *Duke Misophonia Questionnaire* (Rosenthal et al., 2021) and *Duke Misophonia Interview* (DMI; Guetta et al., 2022) as psychometrically validated assessment measures for misophonia in the context of other assessment approaches. Using a combination of quantitative and qualitative measurement, treatment planning will be discussed using an evidence-based transdiagnostic model for behavioral health. Specific candidate interventions will be outlined using approaches that are brand specific (e.g., *Unified Protocol adapted for Misophonia*; McMahon et al., 2023) as well as those that are brand agnostic and individually tailored to each patient (e.g., *Process based therapy for Misophonia*; Rosenthal et al., 2023). All behavioral health treatment planning will be discussed within the broader framework of a multi-disciplinary model of care (e.g., audiology, occupational therapy, psychiatry, etc.). The primary goal of this workshop is to provide attendees with a clear framework to assess and treat misophonia that combines the use of psychometrically validated measures with qualitative functional analyses to develop transdiagnostic and evidence-based individualized treatment plans for adults with misophonia, all within a multi-disciplinary framework.

*Dr. M. Zachary Rosenthal is a clinical psychologist, Associate Professor, and Director of the Duke Center for Misophonia and Emotion Regulation. He is a clinician, scientist, educator, mentor, and advocate and has a lived experience as a loved one of someone with Misophonia.*

## Oral Presentations

### Audiologic assessment in misophonia

Campbell J., Feeley A.

*Department of Speech, Language, and Hearing Sciences, Central Sensory Processes Laboratory, University of Texas, Austin, TX, USA*

The recent misophonia consensus definition states “Misophonia is a disorder of decreased tolerance to specific sounds or stimuli associated with such sounds” (Swedo et al., 2022). Although designated as a decreased sound tolerance disorder, little information is provided on the typical audiologic profile of these patients (Campbell et al., 2023; Ralston and Campbell, 2024). There is some evidence that extended high frequency pure tone testing may reveal significantly better thresholds in adults with normal thresholds and minimal tinnitus (Campbell, 2019), suggesting that in normal hearing, atypical auditory perception may be related to a ‘heightened awareness’ of sound (Campbell et al., 2023). Thus, the goal of this study is to complete an audiologic battery on normal-hearing listeners with misophonia to determine whether heightened awareness of sound may be likely (via extended high frequency thresholds and speech-in-noise outcomes), without hyperacusis being present (via ULL measures and the Khalifa HQ). Twelve individuals with misophonia were compared to twelve normal-hearing controls for right and left PTA, high frequency PTA, extended high frequency PTA, and QuickSIN scores. In the misophonic group, audiometric measures were correlated with the Duke Misophonia Questionnaire subscales. No significant group differences were found, nor correlations between audiometric data and misophonic symptoms. However, it was of interest that all participants with misophonia scored positive on the Khalifa HQ, indicative of hyperacusis, while ULL results were in the normal range. Clinical implications of these preliminary findings and future research are discussed.

**Julia Campbell** obtained a clinical doctorate in Audiology (AuD) and triple research doctorate in Speech, Language, and Hearing Sciences, Cognitive Neuroscience, and Behavioral Neuroscience (PhD) from the University of Colorado at Boulder. Currently she is a Clinical Associate Professor in the Department of Speech, Language, and Hearing Sciences at the University of Texas at Austin, where she serves as the Audiology Program Director and PI of the Central Sensory Processes Laboratory. Julia Campbell also serves as the chair of the scientific advisory board for the Misophonia Research Foundation. Julia’s research interests are focused on the identification of an objective measure of tinnitus using EEG, and she has published on this and related topics in the “American Journal of Audiology”, “Journal of Speech, Language, and Hearing Research”, and the “Journal of the American Academy of Audiology”, among others.

### Clinical assessment of hyperacusis

Branco-Barreiro F.C.

*Department of Phonoaudiology, Federal University of São Paulo, Brazil*

Hyperacusis is a hearing disorder characterized by an increased sensitivity to everyday environmental sounds. There is no objective test to confirm its existence. Therefore, it needs to be assessed by subjective measures. There is no standard protocol for evaluating hyperacusis. A minimum protocol should include audiological tests, loudness discomfort levels and self-report questionnaires.

**Prof. Fátima Cristina Alves Branco-Barreiro** has a degree in Audiology and Speech Therapy, Master’s Degree in Audiology and PhD in Neuroscience and Behavior. She is a Professor of Audiology and Otoneurology at the Federal University of São Paulo, Brazil.

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### Combining psychoeducation, sound exposure and counseling in hyperacusis therapy

Thieren S.<sup>1</sup>, van Dommelen P.<sup>2</sup>, Benard M.R.<sup>1</sup>

<sup>1</sup> *Department of Audiology, Pento Speech and Hearing Centers, Apeldoorn, The Netherlands*

<sup>2</sup> *Department of Child Health, The Netherlands Organization for Applied Scientific Research TNO, Leiden, The Netherlands*

**Introduction:** Hyperacusis is characterized by an increased sensitivity to everyday sounds. Patients with hyperacusis find sounds that are normal to others intolerably loud and uncomfortable. This can cause emotional distress and avoidance of sounds and noisy environments. So far, there is a clinical need in finding a hyperacusis therapy. Extensive efforts have been made to develop treatments for hyperacusis, including cognitive behavioral therapy, tinnitus retraining therapy, counseling, hearing devices, pharmacological therapy, and more. Nevertheless, there is no established clinical treatment for hyperacusis.

**Objective:** Our main objective was to investigate if combining psychoeducation, sound exposure and counseling in a clinical setting could possibly result in a useful clinical tool to help people with hyperacusis.

**Material and methods:** All patients were referred by General Practitioners and Ear, Nose and Throat Specialist to the Speech and Hearing Centers situated in Hengelo and Zwolle, The Netherlands. The patients primary complaint was an intolerance to sounds. A total of 30 patients without hearing loss, 15 males and 15 females, aged between 24 and 76 years were included in this study. First of all, the patients received psychoeducation about the functioning of the auditory system and counseling and information associated with hyperacusis. After the auditory assessment, they made a selection of their five most disturbing sounds from our database with daily sounds. During the therapy sessions, the social worker

carefully fine-tuned the volume to reach a safe maximum level, consistently monitoring the patient's physical and emotional reactions during the procedure. The sound intensity on the audiometer was incrementally raised until a range of 70–80 dB sound pressure level was reached across the sessions. Subsequent therapy sessions occurred biweekly. Short-term effects between the start and the end of therapy were based on tolerable level of sound exposure, subjective level hinderance of hyperacusis and sensitivity to sound using the *Hyperacusis Questionnaire*. The long-term effect was based on *Hyperacusis Questionnaire* six months after the end of therapy. Linear mixed effects and regression models were applied to study outcomes over time.

**Results:** Results showed a significant increase of exposure level, a significant decrease in sensitivity to daily sounds, and a significant decrease in *Hyperacusis Questionnaire* between the start and the end of therapy. The mean number of sessions during therapy was six and ranged between four and eight. There was no significant change in *Hyperacusis Questionnaire* after the end of therapy and 6 months later. This study has been evaluated for people without hearing loss. Furthermore, it is recommended to clarify the influence of both tinnitus and hearing loss on the therapy result.

**Conclusions:** The therapy decreased short- and long-term sensitivity to sound in patients with hyperacusis. The therapy had a positive impact on the daily life of patients with hyperacusis by reducing auditory sensitivity, not only for the sounds used in the therapy sessions, but also a transfer to daily sounds, therefore making this exposure therapy an effective therapy.

*Sandrien Thieren started her study Speech-Language Pathology and Audiology at the University of Leuven, Belgium. After she received her Master's degree in Speech-Language Pathology, she obtained her Master's degree in Audiology. After completing her studies, she started working in the Netherlands as a clinical audiologist. Since 2019, she works as an audiologist at Pento Hearing and Speech Centers, where she sees children and adults from diagnosis to rehabilitation. Her area of expertise and research interests is on tinnitus and hyperacusis.*

### Diagnosis and treatment of misophonia and hyperacusis based on the neurophysiological model

Jastreboff M.M.<sup>1,2</sup>, Jastreboff P.J.<sup>1,2</sup>

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Hyperacusis and misophonia are subcategories of decreased sound tolerance. They may occur individually, but frequently they take place concurrently. In both disorders people exhibit reduced tolerance to sounds normally not bothersome for the average listener and reactions to bothersome sounds are very similar, even identical. However, there are distinctive differences between these conditions which are essential in their differential diagnosis and their treatments. Detailed patients' interview is necessary, with questions focusing on description of bothersome sounds, situations associated with sound, reactions to sound, and how they affect everyday activities,

identifying pleasant sounds and other factors influencing the responses to bothersome sounds. Reactions to sound of hyperacusis patients depend predominantly on physical characteristics of the sound, particularly to sound energy (linked to its intensity). The meaning of the sound is irrelevant as well who/what produces it and in which environment. The loudness discomfort levels (LDLs) are lower than normal average value of 100 dB HL and they are typically below 80 dB HL. Unfortunately, low values of LDLs cannot be used as a proof of hyperacusis presence as low values can be due to misophonia as well. It is postulated that the problems experienced by patients arise from abnormal amplification of sound-evoked activity within the auditory system, with other systems in the brain activated only as secondary consequence. In misophonia sound evoked activity within the auditory system is normal, but improper connections between the auditory system and other systems in the brain develop at subconscious level as a result of temporal association of the presence of misophonic triggers with negative emotional or physical situation. The values of LDLs can be from as low as 20 dB HL to 120 dB HL and cannot be used to diagnose the presence of misophonia. Detailed patients' interview is essential. Desensitization with the variety of sounds has been proposed and successfully used to reverse abnormal gain within the auditory pathways and by this treat hyperacusis for many years already. The sounds and the protocols of their use are modified to follow guidelines of the neurophysiological model. The advice about the use of sound is combined with counseling focusing on explanation of mechanisms of hyperacusis. For misophonia treatment based on passive and active extinction of subconscious conditioned reflexes is implemented, with stress on the principle of complex conditioned stimuli and on involvement of generalization principle. Detailed counseling, tailored to the case of a specific patient, is crucial to achieve a successful outcome of the treatment. The treatments for hyperacusis and misophonia are distinctively different and treatment for hyperacusis is not successful for misophonia and treatment for misophonia has limited effectiveness for hyperacusis. Analysis of over 200 patients with decreased sound tolerance showed an over 80% success rate of significant improvement.

*Margaret M. Jastreboff, PhD has been involved in tinnitus and decreased sound tolerance research since 1984, and on a full-time basis since 1991 while working at the University of Maryland School of Medicine. Her experimental work encompassed the study of the mechanisms of tinnitus using molecular biology, pharmacology, and behavioral techniques, including testing drugs for their effectiveness for tinnitus attenuation. She has been involved in clinical work for over 30 years while working first as an Associate Professor at Emory University, later as a Visiting Research Professor at Towson University and currently at JHDF, Inc. Collaborating closely with her husband Pawel J. Jastreboff, PhD, in 2001 she proposed a concept, name and treatment for specific a version of decreased sound tolerance – misophonia – when patients exhibit negative reactions to specific for a given patient patterns of sound. After over 35 years in academia, where she was involved in basic science and clinical research, teaching Au D students and treating patients, she become a President of JHDF, Inc., a non-profit foundation dedicated to research and education in the field of tinnitus and decreased sound tolerance as well as treating patients.*

**Evaluation of hearing in noise performance in patients with misophonia: preliminary results**

Öztürk Özdeş N.<sup>1,2</sup>, Tokgöz Yılmaz S.<sup>2,3</sup>

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<sup>3</sup> Department of Audiology, Faculty of Health Sciences, Ankara University, Ankara, Turkey

**Introduction:** Misophonia is a condition of showing excessive and negative emotional reactions to certain sounds. People with this condition experience intense emotions such as extreme anger, disgust or anxiety to sounds that are common in everyday life, such as chewing, clicking, breathing, swallowing or clicking a pen. Although it has been reported that misophonia may affect hearing, sleep, concentration and emotional well-being, it has not been determined exactly how hearing skills are affected.

**Aim:** The aim of this study was to evaluate the hearing in noise performance in patients with misophonia.

**Material and methods:** The participants consisted of 8 adult individuals who presented to the Audiology, Balance and Speech Disorders Diagnosis and Rehabilitation Unit of Ibn-i Sina Hospital, Ankara University Faculty of Medicine, Ankara, Turkey, with the complaint of misophonia and 8 adult controls. Each participant underwent audiologic evaluation (pure tone audiometry, speech audiometry, immittance examination, speech tests) and decreased sound tolerance assessment (scales and questionnaires, loudness discomfort level measurement). *Khalifa Hyperacusis Scale* (HQ), *Misophonia Symptom List* (MSL) and loudness discomfort level measurement (LDL) were used together to differentiate decreased sound tolerance. Individuals who were reported to have normal hearing on audiologic evaluation and who were moderately or severely disturbed by at least three sounds on the MSL were included in the misophonia group. The Turkish hearing in noise test (HINT) adaptive, test in noise front condition was administered to all participants in two conditions, with and without the presence of the misophonic stimulus. The HINT test was initiated at 65 dB, whereas the misophonic stimulus was presented at the same level of intensity as in daily life. The signal-to-noise ratio of the two HINT conditions were compared within themselves and with the control group.

**Results:** Hearing in noise performance was worse in the individuals with misophonia compared to the control group ( $p < 0.05$ ). Hearing in noise performance was better in the presence of a misophonic stimulus than in the absence of a misophonic stimulus. However, this difference was not statistically significant ( $p > 0.05$ ).

**Conclusions:** Individuals with misophonia may experience hearing in noise problems, especially in the presence of triggering stimuli. Future studies should be planned to evaluate this situation and should be taken into consideration when evaluating the effects of misophonia.

*Nazife Öztürk Özdeş is a research assistant in audiology at Ankara University, Turkey and a PhD student in her thesis period. Her main academic interests are tinnitus, decreased sound tolerance and auditory processing. She is currently working in the audiology clinic of Ankara University, Turkey, where she is interested in the diagnosis and rehabilitation of tinnitus and decreased sound tolerance. In addition, she has been working on the development of a rehabilitation program for individuals with hyperacusis and misophonia. She is also a volunteer research assistant at Hashir International Specialist Clinics & Research Institute for Misophonia, Tinnitus and Hyperacusis. She is a student member of the International Society of Audiology.*

**Examining cognitive, emotional, auditory, and family functioning in children with misophonia**

Siepsiak M., Turek A., Michałowska M., Gambin M.

Faculty of Psychology, University of Warsaw, Poland

Misophonia typically emerges during childhood, yet research in this demographic is limited. This study aimed to investigate a wide range of characteristics in young individuals with misophonia. We examined 90 Polish children between the ages of 7 and 18, including a control group, along with their parents, utilizing interviews, audiological assessments, questionnaires, and performance-based tests. The first set of results has already been published. Among the main findings, it was observed that children with misophonia did not significantly differ from their peers in terms of developmental disorders, emotional and social competencies, head injuries, epilepsy, tinnitus, or perinatal factors. However, they exhibited higher levels of anxiety and depression, an increased incidence of OCD, migraines, and psychosomatic complaints. Additionally, their mothers more frequently self-reported postpartum depression compared to mothers in the control group. The results not yet published can be categorized into three aspects of functioning: 1) Regarding hearing loss and the seven assessed tests of so-called central auditory processing, no significant group differences were found ( $p > .05$ ). However, the misophonia group demonstrated faster reactions to visual stimuli tests. 2) Concerning cognitive functioning, children with misophonia outperformed the control group in divided attention ( $p = .038$ , Cohen's  $d = .62$ ) and inhibitory control ( $p = .004$ , Cohen's  $d = .76$ ). In logistic regression, better inhibition emerged as a significant predictor for the likelihood of having misophonia, even after adjusting for gender and IQ. No significant group differences were observed in cognitive speed processing, auditory short-term memory, abstract reasoning, verbal reasoning, mean grades for school performance, and behavior. 3) The data on parental stress and the relationship between the child and parent are currently under analysis and will be presented during the conference. The results of this study are in line with most of the previous preliminary reports and the most recent outcomes. However, they also shed light on new aspects of the early development of misophonia and indicate the need for further exploration, particularly in examining better attentional and inhibitory aspects as potential mechanisms underlying misophonia.

*Anna Turek is a PhD candidate in the Individual Differences Department at the Faculty of Psychology, University of Warsaw, Poland. She is actively involved in research on misophonia and provides therapeutic services to individuals affected by the disorder.*

### Exploring hyperacusis through art: a journey of connection and understanding

Lawton I.

*Department of Art and Music, Solent University, Southampton, UK*

As an artist and someone who suffers from Hyperacusis, I have delved into my own creative journey to explore and express my personal experience of living with this condition. My goal is to connect with others through my art, aiming to communicate the intricacies of what it is like to live with Hyperacusis. Arts Based Research, as Barone and Eisner (2012) argue, seeks to create expressive work that allows viewers to empathetically engage with the lives of others, fostering a deeper understanding of the studied situation. Incorporating art forms into research processes, as highlighted by Boydell et al. (2012), serves multiple purposes such as evoking emotional responses, promoting shared storytelling, and constructing alternative forms of representation, thus offering different ways of knowing. In my presentation, I will be sharing the ongoing visual outcomes of my artistic exploration. Barone and Eisner (2012) emphasise that art-based research does not aim to provide a single correct answer but rather to illuminate complex interactions and raise questions about important social and cultural issues. Similarly, Heidegger (1935) posits that art is not merely about creating objects but is a process through which artists engage with the world, deepening their understanding of existence. Through my artwork, I aim not only to understand my own experiences but also to connect with fellow sufferers, as Rubin (2023) suggests that art has the power to transcend language barriers and foster healing connections between the artist and the audience. Additionally, my involvement in the “Sound Off Competition” and running workshops with my students have provided opportunities to explore the transformative potential of participatory arts research. Hogan et al. (2015) and Charon (2021) highlight the benefits of participatory research, including the ability to explore difficult subjects, create something new, and provide relief and recognition for sufferers. By sharing experiences and creating a sense of community, participatory research, including arts-based approaches, plays a vital role in restoring well-being and fostering understanding among individuals with similar experiences (Van Der Kolk, 2014). In summary, my artistic journey not only deepens my understanding of Hyperacusis but also aims to connect with others, foster empathy, and contribute to the broader discourse on health and well-being through the visual arts.

*India Lawton following her graduation with a BA (Hons) in Photography from The Arts University Bournemouth, India pursued further studies, obtaining an MA in Photographic Studies from Westminster University, a Postgraduate Certificate in Education (PGCE) from Oxford Brookes University, and subsequently an MA in Education, also from Oxford Brookes University. India is a full-time lecturer within the Department of Art and Music at Solent University, UK, and a Senior Fellow*

*of the Higher Education Academy. Additionally, she is a part-time research student at Solent University, where she is embarking on a practice-based photography PhD. India’s photographic work encompasses themes of trauma, personal experiences, family history, and more recently, the visualisation of others’ experiences. Her work has been showcased in exhibitions at local, national, and international levels.*

### Hyperacusis and hearing rehabilitation in adults with cochlear implants (CI) – case series

Huber M.<sup>1</sup>, Raffelsberger T.<sup>2</sup>, Weitgasser L.<sup>1</sup>, Keintzel T.<sup>2</sup>, Fischer L.<sup>1</sup>

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**Introduction:** There are cases of hyperacusis (Hy) among CI patients (CI candidates and CI users) and the level of suffering is high. However, prevalence data are not available. Furthermore, unlike tinnitus, little is known about how this condition should be treated in CI aftercare. We have therefore initiated case series with the primary goal of providing information on the frequency with which the diagnosis of Hy is encountered in CI patients in the clinics in Salzburg and Wels, and association between Hy, and CI aftercare, without specific treatment of Hy.

**Material and methods:** At least 10 individual cases are planned. “Cases” of these prospective case series are all adult CI patients with bilateral sensorineural hearing loss and with the additional diagnosis of hyperacusis. Clinical measures are: (1) four frequency hearing thresholds (PTA), (2) Data Logging, (3) *Freiburg Monosyllables*, (4) HSM sentences in noise, (5) uncomfortable loudness levels (ULL), (6) *Abbreviated Profit of Hearing Aid Benefit* APHAB (subjective hearing), (7) HIQ, (8) SSSQ, (9) *Visual Analog Scale* (VAS), (10) *Tinnitus questionnaire*, (11) *Hospital Anxiety and Depression Scale*, (12) *Hearing Stress Questionnaire*.

**Results:** Preliminary results in Salzburg, over a period of 9 months, Hy was observed in 10.3 percent of all CI patients who met the study criteria. All Hy cases were older than 56 years, 83 percent of them were male. Examples are the following two cases (case description not yet complete).

**Case 1:** Man, 57 years old: The causes of progressive hearing loss include chronic otitis media and granulomatosis with polyangiitis (GPA). He was fitted with hearing aids 6 years ago. Before the CI, he had a severe hearing loss on the left and a slight hearing loss on the right, furthermore a strong tinnitus and Hy. Six months after the CI (left), subjective hearing and tinnitus have improved. However, social withdrawal and Hy scores have deteriorated.

**Case 2:** Woman, 61 years old, had her first sudden hearing loss 15 years ago, 13 years ago she was fitted with hearing aids. After a stapesplasty 10 years ago, she lost her residual hearing in her right ear. On the left she suffered from a slight hearing loss. She also suffered from tinnitus (not clear which side). Two months after the CI fitting 8 years ago, Hy



developed and at the same time the left ear deteriorated (moderate hearing loss) and the tinnitus (both sides) increased dramatically. Hearing training and a change in the fine-tuning of the speech processor reduced Hy. After a viral infection, Hy worsened again. At present, five years after the first CI, the second ear is within the CI indications and the impairment due to the recurring Hy has increased to the maximum. The tinnitus had also improved considerably in the meantime. However, it has now increased significantly again, especially without hearing aid and CI (50% speech recognition at quiet, CI ear (Freiburg Monosyllables, 65 dB)). Last year, she had to quit her stressful job because of her hearing problems and the negative impact on her subjective well-being.

*Dr. Maria Huber is a health psychologist, clinical psychologist and psychotherapist (behavioral therapist, psychoanalyst). For many years, she is associated with the CI-Center, Department of Otorhinolaryngology, Head and Neck Surgery, University Clinic Salzburg. As a clinical psychologist, she has many years of clinical experience with normal hearing and hearing impaired children, adolescents and adults. She has also worked for many years as a researcher and leader of multicenter scientific projects. Her current scientific interests include cognitive status, depressive status and hyperacusis in adult cochlear implant (CI) patients.*

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### Hyperacusis and misophonia in the ASD population

Danesh A.A.

Florida Atlantic University, Boca Raton, FL, USA

Is it hyperacusis, sound oversensitivity, or something else? Whatever we want to call it, we have seen children and adults in the ASD population who show over-reaction to auditory signals. This over-reaction can be due to the loudness or the content of the auditory stimuli. The underlying pathophysiology of hyperacusis is not entirely clear. For some, it is due to neuronal and anatomical variations and for others it can be related to a specific reason such as those with Bell's palsy, superior canal dehiscence, or aneurysm of the middle cerebral artery. The pathophysiology of misophonia seems to be totally different. The neurodiversity in the ASD population can cause challenges for clinicians and make it difficult to understand, diagnose and manage hyperacusis and misophonia in this population. This presentation will address decreased sound tolerance (DST) disorders in the ASD and will discuss diagnosis and management strategies.

*Ali A. Danesh, MS, PhD, CCC-A, FAAA, is currently a Professor at the Department of Communication Sciences and Disorders, and also has a Secondary appointment as Professor of Integrated Medical Sciences in the Charles E. Schmidt College of Medicine, Florida Atlantic University (FAU), Boca Raton, Florida. Dr. Danesh has affiliate positions in the College of Science, Department of Psychology and the Department of Electrical Engineering and Computer Science at the College of Engineering and Computer Science. He has faculty appointments at the Audiology Department of Salus University and Department of Otolaryngology, Miller School of Medicine, University of Miami. His research interests are in the areas of tinnitus, hyperacusis, misophonia, auditory evoked potentials, auditory processing disorders, and vestibular assessment.*

*Dr. Danesh obtained his BSc in audiology from Iran University of Medical Sciences, Tehran, Iran, his MS in audiology from Idaho State University, Pocatello, Idaho, and his PhD in audiology, with an emphasis on auditory electrophysiology, from the University of Memphis, Memphis, Tennessee. Dr. Danesh is an American Board of Audiology board certified practicing audiologist. His current clinical work concentrates on patients with tinnitus, vertigo and sound sensitivity disorders (e.g., hyperacusis and misophonia).*

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### Hyperacusis in tonic tensor tympani syndrome (TTTS)

Bezerra C.

São Paulo University, São Paulo, Brazil

One of the symptoms observed in tonic tensor tympani syndrome is hyperacusis. Manual therapy on the palatine aponeurosis can help treat this symptom. The physiotherapist's performance is fundamental for treatment.

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### Hyperacusis Assessment Questionnaire – a new tool for assessment hyperacusis in tinnitus patients

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**Introduction:** Hyperacusis is a kind of decreased tolerance to sound and is difficult to measure objectively. It often co-occurs with tinnitus. There is a need for valid and reliable patient-reported outcome measures to capture this subjective phenomenon.

**Aim:** The aim of the study to create a questionnaire capturing hyperacusis in terms of loudness, fear, and pain and then to evaluate its psychometric properties.

**Material and methods:** The study group consisted of 106 patients, made up of 51 men and 55 women. They were aged between 19 and 72 years, mean 45.2 years ( $SD = 12.4$ ). An initial pool of 33 questions capturing hyperacusis was subjected to expert evaluation and pilot testing. Then, a shortened 19-item version of the tool was checked out. Medical interview, audiological examination and a set of questionnaires: *Tinnitus Handicap Inventory*, *Hyperacusis Questionnaire*, *State-Trait Anxiety Inventory*, and *Visual Analogue Scale* was completed by all subjects.

**Results:** The final 14-item *Hyperacusis Assessment Questionnaire* showed an appropriate three-factor structure that explained 70.5% of the variance. Convergent validity and divergent validity were confirmed by correlations with other measures of hyperacusis, anxiety, tinnitus severity,

misophonia, and hearing thresholds. Internal consistency as assessed with Cronbach's alpha was excellent ( $\alpha = 0.91$ ) as was reproducibility (intra-class correlation, ICC = 0.96).

**Conclusions:** The new *Hyperacusis Assessment Questionnaire* is a psychometrically sound and brief tool that can assess the severity of hyperacusis in terms of loudness, fear, and pain. It can be used in clinical practice and scientific research for patients with hyperacusis and tinnitus.

**Assoc. Prof. Danuta Raj-Koziak, MD, PhD** – otolaryngologist, phoniatician, and audiologist. Chief research interests: tinnitus, hyperacusis. Head of the Tinnitus Department of the Institute of Physiology and Pathology of Hearing; research scientist at the World Hearing Center of the Institute of Physiology and Pathology of Hearing. Member of scientific societies: Polish Society of Otorhinolaryngologists – Head and Neck Surgeons, Polish Society of Pediatric Otolaryngologists, Society of Polish Otorhinolaryngologists Phoniaticists, and Audiologists. Chairwoman of the Bioethics Committee of the Institute of Physiology and Pathology of Hearing, Board Secretary of the Society of Polish Society of Otorhinolaryngologists – Head and Neck Surgeons (Audiology Section). Author of 54 publications and reviewer of several national and international scientific journals. Lecturer at the specialization and postgraduate courses.

**Hyperacusis Questionnaire (Mini-HQ9) – a valid short tool for use in a clinical tinnitus population**

Goebel G.<sup>1</sup>, Berthold L.<sup>2</sup>, Floetzing U.<sup>4</sup>, Bläsing L.<sup>3</sup>, Schöffel J.<sup>4</sup>, Kröner-Herwig B.<sup>3</sup>, Günther S.<sup>4</sup>, Stattrop U.<sup>4</sup>, Koch S.<sup>4</sup>, Voderholzer U.<sup>4</sup>, Lehr D.<sup>5</sup>

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**Introduction:** The demands on psychometric procedures for therapy research in hyperacusis (HC) and their differentiation from phonophobia, misophonia and recruitment have increased. The widely used noise hypersensitivity questionnaires (GÜF, Nelting and Finlayson, 2004, Germany; *Hyperacusis Questionnaire*, HQ, Khalfa et al., 2002, France) are partly invalid and repeatedly criticized (Bläsing et al., 2010; Fackrell et al., 2015), partly without instructions and without quartiles, implausible cut-point of the HQ.

**Material and method:** We retrospectively evaluated 216 tinnitus-inpatients (47% women, age  $49 \pm 10$ ) with the evaluated *Structured Tinnitus Interview* (STI, Goebel and Hiller, 2002): 60% HC; 15% phonophobia/misophonia; 24.4% without HC. At T1 and T2, we evaluated the sensitivity to change of the individual items of GÜF and HQ, numerical analog scales (NAS), *Tinnitus Questionnaire* (TF, Goebel and Hiller, 1998), discomfort thresholds (UBS), factor analysis, internal consistency, retest reliability (rtt), d, convergent and discriminative validity, BDI, BDI-II, BSI.

**Results:** Reevaluation GÜF: reliability:  $\alpha = .93$ ; best test quality item 5, 6, 10, 12, 13; quartiles 0–45, cut-off (AUC) > 16; correlation NAS-HK  $r = .68$ , HQ  $r = .88$ ; TF  $r = 0.44$ ; Pearson: rtt.83; ICC.93; UBS  $\leq .2$ ; d:  $r = .57$ . Reevaluation HQ: reliability:  $\alpha = .92$ ; best test quality item 5, 8, 9, 12t; quartiles 0–42, cut-off (AUC) > 18; correlation NAS-HK  $r = .63$ , GÜF  $r = .95$ ; TF  $r = 0.35$ ; Pearson: rtt.84; ICC.87; UBS  $\leq .2$ ; d:  $r = .47$ . The multidimensional structure of the GÜF and HQ could not be confirmed. Evaluation Mini-HQ9: after a comprehensive individual item analysis, we merged the 9 most change-sensitive (Pearson) and most stable (rit) items from GÜF and HQ into a new “Mini-HQ9”: reliability:  $\alpha = .93$ ; quartiles 0–27; cut-off (AUC) > 11; corr. CFT  $r = .95$ ; HQ  $r = .88$ ; common variance 77%; corr. NAS-HK  $r = .63$ ; TF  $r = .35$ ; Pearson: rtt.83; ICC.79; UBS  $\leq .2$ ; test-retest d:  $r = .48$ . One-dimensional structure.

**Conclusions:** The Mini-HQ9 summarizes the advantages of the GÜF and HQ and has proven itself as a standard instrument for graduation and effect studies of the HK in pilot studies with only 9 items. Women are more sensitive to noise ( $r = .21$ ). HC instruments are not suitable for misophonia. The UBS only for recording relevant side differences.

**Gerhard Goebel (1946)** is Prof. of Otolaryngology at the Medical Faculty of the Technical University of Munich. Since 1985 he has been a senior physician at the Roseneck Clinic, Hospital for Behavioral Medicine in Prien am Chiemsee. He has been a specialist in internal medicine since 1983 and in psychosomatic medicine since 1994. From 1999 to 2012, he was head physician at Prien Hospital and developed cognitive behavioral therapy (CBT) for tinnitus and hyperacusis patients in the inpatient sector. Numerous publications on these topics and habilitation in 1999 (ENT Clinic of the TUM, Prof. Dr. Wolfgang Arnold). Since 2001 lecturer in advanced training for CBT and behavioral medicine at the University of Zurich, supervisor for the Bavarian State Medical Association (BLÄK), German Medical Association for Cognitive Therapy (DÄVT) and the Bavarian Academy for Psychotherapy (BAP). Together with Wolfgang Hiller he published: *Tinnitus Questionnaire* (TF) (1994, 1996), *Structured Tinnitus Interview* (STI) (1999, 2000) as well as *Mini-Tinnitus Questionnaire* (Mini-TF12, 2004) and *Mini-Hyperacusis Questionnaire* (Mini-HQ9, 2014). Since 2013 he has been conducting diagnostic and therapeutic research on hyperacusis and misophonia therapy in his own practice.

**Imaging hyperacusis and misophonia: present and future**

Husain F.T.

University of Illinois Urbana-Champaign, IL, USA

Brain imaging of humans with loudness hyperacusis or misophonia remains one of the primary methods to discover the brain networks underlying these sound tolerance disorders, to differentiate them from each other and to dissociate them from related comorbid conditions of tinnitus or hearing loss. Despite the challenges associated with the expense and noise of some imaging tools, results of such studies have informed the existing experimental and theoretical framework of hyperacusis and misophonia. In a pioneering functional MRI study, Melcher and colleagues (2010) parsed out the contribution of co-occurring hyperacusis to brain imaging findings

of tinnitus. They noted that while both subcortical and cortical auditory areas were responsive in those with hyperacusis (relative to controls), such an elevated response was only noted in the auditory cortex for those with tinnitus. Recent studies (e.g., Hofmeier et al., 2021; Koops and van Dijk, 2021) further explored this dissociation using both fMRI and auditory brain-stem responses (ABRs). Brain imaging studies of misophonia (e.g., Kumar et al., 2021; Schroder et al., 2019) are more recent but have begun to change how we think of the condition, pointing to regions beyond the auditory cortex (such as motor cortex, insula) as playing a key role in this condition. In a recently completed study in my lab, we have collected both auditory brainstem response and fMRI data on young adults with hyperacusis or misophonia and their controls, results of which will be reported at the meeting. In summary, current and future non-invasive brain imaging studies continue to expand our understanding of the pathophysiology of hyperacusis and misophonia and will allow us eventually to develop and test new therapies that help patients.

**Dr. Fatima T. Husain** is a Professor in the Department of Speech and Hearing Science, and Associate Dean in the College of Applied Health Sciences, University of Illinois Urbana-Champaign, United States of America. She is also faculty in the Neuroscience Program and the Beckman Institute for Advance Science and Technology at the same university. Dr. Husain's research program is centered around three major themes: (1) normal audition and speech perception, (2) disorders of the auditory system, particularly hearing loss, tinnitus, hyperacusis and Misophonia, and (3) effects of aging on audition and cognition. She uses a multidisciplinary approach combining behavioral, brain imaging, and computational neuro-modeling tools. She is the immediate past Chair of the Scientific Advisory Committee, American Tinnitus Association and serves on the scientific boards of Hyperacusis Research and SoQuiet Foundation. She is presently an Editor of the "American Journal of Audiology".

### Investigating cognitive reappraisal as a treatment for misophonia

Siepsiak M.<sup>1</sup>, Turek A.<sup>1</sup>, Araszkiwicz W.<sup>1</sup>, Grochowska K.<sup>1</sup>, Śliwerski A.<sup>2</sup>

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Misophonia presents significant challenges for those affected. While potential interventions have emerged and are gaining momentum, there is still no evidence-based treatment for this disorder. Cognitive reappraisal (CR), a psychotherapeutic technique that alters the perception of triggering sounds, sources, and context to regulate emotional responses, holds promise in reducing misophonic reactions. However, its effectiveness in misophonia, as well as the expectations and experiences of misophonia sufferers with this method, remain unexplored. This study aims to address these gaps. The proposed intervention employs a process-based treatment approach, examining one technique at a time in the context of individual needs, possibilities, and characteristics. Preliminary data from the ongoing main study, which includes a control group, will be presented at the conference, along with the pilot quantitative and qualitative data

and protocol characteristics. Below are selected results from the pilot study. Twenty-three participants completed the pilot study. Misophonia, anxiety, and depression symptoms, among others, were assessed at three time points: twice before the four weekly sessions and after the treatment. The first session was a 90-minute online group session focused on psychoeducation about CR and increasing motivation. This was followed by three weekly individual 30-minute sessions tailored to each participant's needs, such as finding the optimal time for CR implementation, the most accessible situations, and the most acceptable types of reappraisals, as well as reinforcing motivation to use CR. All sessions were audio-recorded and analyzed for protocol adherence. After completing the study, volunteering participants engaged in additional audio-recorded focus groups to discuss the most and least valuable and challenging aspects of the study, the most suitable time points for using CR (before, during, or after the trigger), and potential adverse effects of the treatment. The main study, currently ongoing, includes a separate group of 108 participants, including a control group practicing Schultz's Autogenic Training, allowing for more rigorous pre- and post-treatment assessments. In both the pilot and the main study, apart from assessing misophonia symptoms, we conducted semi-structured interviews for psychiatric and personality disorders, cognitive and audiological tests, and various psychological questionnaires. In the pilot study, there was a significant reduction in misophonia symptoms post-treatment. We observed a significant decrease ( $p < .001$ ; partial eta-squared = .41) in the impact of misophonia, as measured by the S-Five scale. There were similar effects on the remaining scales. Eighteen participants (78%) experienced at least a 10% reduction in symptoms, while three showed no change, and two experienced a worsening of symptoms. Qualitative analysis indicated that meeting others with the same disorder was perceived as beneficial, as was the awareness that "somebody is researching Misophonia", "misophonia is real" or "being a part of the misophonia community." Indeed, while misophonia symptoms decreased only after the treatment, we observed a significant decrease in anxiety and depression not only after the treatment but also between the first and second assessments (yet before the treatment began). In addition to the pilot study findings, preliminary results from the ongoing randomized controlled trial (RCT) will be presented at the conference.

**Marta Siepsiak** is a psychologist, CBT psychotherapist, music therapist, and researcher. Over the last 8 years, she has led multiple research projects related to sound over-responsivities, currently examining the effectiveness of psychotherapeutic interventions in Misophonia – a study financed by the REAM Foundation. Outside of academia, she works as a clinician with children, adolescents, and adults, including individuals suffering from misophonia. Her primary research and clinical interests include misophonia and other sensory over-responsivities, so-called central auditory processing disorder, psychology of music, anxiety disorders, abnormal child psychology, and psychotherapeutic interventions.

**Making sense of treatment research for misophonia: an overview and call to the field**

Rosenthal M.Z.

*Duke University, Durham, NC, USA*

There are few studies evaluating treatment approaches for Misophonia, no specific evidence-based treatments known through systematic and replicated research to be efficacious, and no field-wide consensus about how to help patients. At the same time, patients are suffering and need help. What are we to do? As clinicians, we need to follow evidence-based principles of change and, at the same time, be flexible and individually tailor treatments appropriately. In this presentation, (a) published research studies investigating Misophonia will be reviewed and synthesized, (b) recommendations will be made for a research-based agenda to identify appropriate treatments for Misophonia, and (c) pragmatic and reasonable guidelines will be outlined about how to help patients until there are known efficacious treatment protocols. A practical and humane approach will be offered that is multi-disciplinary, client-centered, collaborative, measurement-based, accounts for co-occurring psychiatric diagnoses, and is grounded in known biopsychosocial processes of change and interventions shown to effectively target these processes transdiagnostically.

*Dr. M. Zachary Rosenthal is a clinical psychologist, Associate Professor, and Director of the Duke Center for Misophonia and Emotion Regulation. He is a clinician, scientist, educator, mentor, and advocate and has a lived experience as a loved one of someone with Misophonia.*

**Measurements of sound sensitivity: lessons from the citizen science project**

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<sup>2</sup> Antwerp University Hospital, Edegem, Belgium

**Introduction:** Environmental noise is recognized by the World Health Organization as a significant public health concern, negatively impacting human health and well-being. To address and better understand these effects, the “De Oorzaak” citizen science project was initiated in Flanders, Belgium.

**Objective:** This study aims to assess the effects of environmental noise on health, stress, and sleep among the Flemish population. It also seeks to explore the relationship between sound sensitivity and sociodemographic factors.

**Material and methods:** A comprehensive population-level questionnaire was administered to thousands of Flemish residents over a one-month period. This survey included questions on quality of life, health status, stress levels, sleep quality, and detailed sociodemographic information. Additionally, a subset of 100 participants from Antwerp underwent an extensive audiological test battery. This included

self-report questionnaires, audiometry, and a newly developed diagnostic test for hyperacusis utilizing natural sounds. Participants were categorized into two groups based on their scores from the *Hyperacusis Questionnaire* (HQ): with or without hyperacusis.

**Results:** Data collection is ongoing, and preliminary analysis focuses on the correlation between various measures of sound sensitivity and other demographic variables.

**Conclusions:** The “De Oorzaak” project leverages citizen science to generate a rich dataset that will enhance our understanding of the public health implications of environmental noise.

*Prof. Dr. Laure Jacquemin is an audiologist with clinical and research experience at the Tinnitus Treatment and Research Centre Antwerp (TINTRA). Her clinical work focuses on psycho-education and cognitive behavioural therapy for patients with tinnitus, hyperacusis and misophonia. Her current research focuses on diagnosis and treatment of hyperacusis.*

**Metacognitive Interpersonal Therapy for Misophonia: a single-case study**

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Misophonia is a chronic condition in which the exposure to specific sounds increase the arousal and the recurrence of specific intense negative emotions. Patients generally think that the trigger sounds are intentionally produced by others and because of this interpretation they usually feel anger and disgust. We hypothesized that misophonia may be strongly related to maladaptive interpersonal schemas which create difficulties in interpersonal relationships. Maladaptive interpersonal schemas are typically present in personality disorder. Persons with maladaptive interpersonal schemas think that other people try to subjugate, criticize, dominate, exploit, deceive, disregard and humiliate them. Furthermore, these patients typically endorse a representation of self as mistreated, constricted, harmed, damaged, humiliated, impotent, inadequate or fragile. We describe the course of a treatment of Metacognitive Interpersonal Therapy (MIT) with a young man presenting misophonia and co-occurrent obsessive-compulsive personality disorder (OCPD) and avoidant personality disorder (AVP), with narcissistic traits. He presents self-criticism, perfectionism and emotional overcontrol. Therapy aimed increasing awareness of maladaptive interpersonal schemas and promoting a healthy self. Behavioural experiments were used to increase quality of social relationships and tolerance to the trigger sounds. Qualitative and quantitative (*Amsterdam Misophonia Scale*, structured clinical interview for DSM-IV personality disorders, *Beck's Depression Inventory-II*, *State-Trait Anxiety Inventory*) outcomes at the intervention are summarized.

*Eleonora Natalini is a Psychologist and a Cognitive Behavioural Therapist. She is also a Metacognitive Interpersonal Therapist and EMDR Therapist. Her main areas of expertise*

are: *Personality Disorders, Anxiety and Mood Disorders, Misophonia and Tinnitus*. She works with adolescents and adults.

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**No time for triggers: objective misophonic avoidance measurement using behavioral timing data**

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This study presents and evaluates the *Misophonic Behavioral Avoidance Test* (M-BAT), a standardized tool designed to objectively measure misophonic avoidance behavior towards trigger sounds. Employing recent psychometric models, the M-BAT leverages response times and behavioral decisions in assessing reactive and anticipating avoidance strategies. Reactive avoidance, characterized by immediate escape from triggers, is measured through auditory exposure to triggers, affording respondents the choice to voluntarily stop or endure the exposure. Anticipating avoidance, involving the prevention of expected trigger exposure, is assessed through responses to sound descriptions, where respondents decide to approach or omit a trigger exposure. The central behavioral measures are denoted as sound endurance and anticipating sound avoidance tendency. The study aims to evaluate and optimize the M-BAT, assessing psychometric properties and evaluating the validity of the behavioral measures. An online survey and behavioral testing procedure were employed to collect data from a large sample of individuals clinically or sub-clinically experiencing misophonia. The extensive validation approach gives insight into various dimensions of validity including nomological, differential, and criterion validity. Beyond clinical characterization and advances in understanding the nature and causes of misophonia, the findings hold potential implications for informing treatment approaches and tailored strategies to alleviate the impact of misophonia. This research establishes a foundation for advancing and refining the measurement and understanding of misophonic avoidance behavior. The M-BAT introduces a valuable tool for researchers and clinicians, fostering avenues for future investigations into misophonia and its treatment.

*Nico Remmert* is a researcher and fourth-year PhD candidate in psychology at Freie Universität Berlin, specializing in the department of Methods and Evaluation/Quality Assurance. Nico earned his MSc in Psychology from Freie Universität Berlin in 2020. His research revolves around advancing psychometric methods to assess misophonia, with a specific emphasis on understanding misophonic avoidance behavior through the analysis of process data, including response times. Currently, Nico is engaged in collaborative work with the Misophonic Clinical Academic Research Group at King's College London

and Svetlana Shinkareva's research group at the University of South Carolina. This multidisciplinary collaboration underscores Nico's dedication to fostering innovative approaches to misophonia research. Nico is known for his pivotal role in developing the Berlin Misophonia Questionnaire Revised, a symptom-oriented tool for the comprehensive assessment of misophonia.

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**Noise sensitivity: strategies for a systematic review**

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In the psychological, psychoacoustical and public-health literature, noise sensitivity is seen an important predictor of human attitudes and behaviour towards noise. But what exactly is noise sensitivity, and how is it measured? To address this question, we are currently performing a systematic review of the different conceptualizations and ways of measuring noise sensitivity. That is done across different domains of investigation (e.g., engineering, environmental science, medicine, physics, psychology, and public health). In a first step, we are aiming to establish a comprehensive overview of the psychometric quality of the different noise-sensitivity measures currently available. To that effect, documentation written in the English, French, German or Korean language is scrutinized, including grey literature and unpublished materials. The search is implemented with a wide focus, not limited to scientific journal databases: it includes querying experts, governmental and funding agencies, as well as scanning pertinent conference proceedings. The synthesis will yield a map of instruments available to measure noise sensitivity in different languages and cultures, as well as identify gaps of conceptual specification. The outcome of this study may be used to hone the definition of noise-sensitivity and to differentiate it from related concepts such as noise annoyance, hyperacusis, phonophobia and misophonia.

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**Objective functional biomarkers to find druggable targets for tinnitus and hyperacusis**

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Currently, conflicting views on the neural correlate of tinnitus hinder the development of effective diagnosis and therapy for tinnitus (Knipper et al., Ruttiger, 2020). Although hyperacusis often co-occurs with tinnitus, it is until now considered neither in clinical diagnosis nor for targeted, individualized therapies. On the basis of findings with objective functional biomarkers (PTT, ABR, fMRI, EEG) used in patients, we challenge the hypothesis that co-occurrence of hyperacusis worsens tinnitus percept towards a disease that most requires treatment and therapy. In this context, the hypothesis of the successful use of cognitive therapies for hyperacusis and tinnitus is particularly interesting for future therapy development.

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**Marlies Knipper** has been a Professor at the Hearing Research Center of the Ear, Nose and Throat Clinic, Eberhard Karls University of Tübingen, since 2008 and has headed the “Molecular Hearing Physiology” working group since 1993. Marlies Knipper has been working in the field of hearing research for over 30 years. Her research focuses on auditory processing disorders, age-related hearing loss and neuropathies, as well as tinnitus and hyperacusis in animals and human clinical studies. Her research aims to contribute to the relationship between cognition and hearing. She is also particularly interested in creating an infrastructural platform for more efficient use of cross-system research into the various senses. She is a member of the Leopoldina – National Academy of Sciences (Halle/Saale), Leibniz-Sozietät der Wissenschaften zu Berlin and AcademiaNet.

**Preliminary results of tinnitus therapy using bimodal stimulation with the Lenire device in patients with tinnitus and reduced sound tolerance**

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**Introduction:** Tinnitus is defined as the perception of sound without an external acoustic stimulus. Currently, there is no single effective treatment method for tinnitus that works for all patients. One of the newer approaches is bimodal stimulation, which combines acoustic stimulation with somatosensory pathway stimulation. The goal of therapy is to reduce the severity of tinnitus and improve the quality of life for patients suffering from tinnitus.

**Aim:** The aim of this study was to evaluate the effectiveness of bimodal stimulation using the Lenire device in reducing tinnitus severity in 15 patients.

**Material and methods:** The authors present the results of their own research on the use of bimodal stimulation therapy in 15 patients. The results of the *Tinnitus Handicap Inventory* (THI) questionnaire were analyzed.

**Results:** The results of the authors own research on the use of bimodal stimulation with the Lenire device showed an effectiveness of 78%, with an average decrease in THI score of 34 points.

**Conclusions:** Bimodal stimulation using the Lenire device may be an effective treatment method for tinnitus in patients with reduced sound tolerance.

## Quality of sexual life in individuals with misophonia and their partners

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**Introduction:** Misophonia, a selective 'hatred of sound' has been often misunderstood new mental disorder which is characterized by intense negative emotional reactions, feelings, thoughts with or without impulsive behavior to a source of specific irritating trigger sound. Triggers usually produced by the human mouth, throat or nose and include chewing, crunching, slurping, sniffing etc. Cutlery, environmental, or machine sounds can also be the triggers. The term 'misophonics' has been used for the name of misophonia sufferers. One of the main self-reported effects in misophonics is destructive impact on constant close romantic relationships with aggression, 'fight or flight' response and worsening/ruining love affair.

**Objective:** We aimed to study the quality of sexual life (QoSL) in misophonics both sexes and their close partners.

**Material and methods:** Into our study we enrolled 88 misophonics with male-to-female ratio 1:2.9 (23/65) and 88 their partners with male-to-female ratio 2.9:1 (65/23) aged  $25.1 \pm 5.6$  years old. For evaluation of the quality of sexual life in males we used *International Index of Erectile Function* (IIEF) and *Sexual Quality of Life-Male* (SQOL-M) self-report questionnaires. In females we used the *Sexual Quality of Life-Female* (SQOL-F) self-report questionnaire and *Female Sexual Function Index* (FSFI). Obtained total scores according to questionnaires in misophonics we compared with the survey results of controls, their peers (88 males and 88 females who were couples in love) without misophonia or any distinct mental/urological/gynecological pathology aged  $25.3 \pm 4.9$  years old. Mann-Whitney *U*-test to compare two groups was used. Statistical significance was judged at  $p < 0.05$ .

**Results:** Misophonia only, without concomitant mental disorders was diagnosed in 30 (34.1%) individuals: 20 (66.7%) females and 10 (33.3%) males. Comorbid mental disorders in misophonics were registered in 58 (67.4%) patients: 45 (77.6%) females and 13 (22.4%) males, and included generalized anxiety disorder (GAD),  $n = 21$  (23.6%): 17 females, 4 males; depressive disorder (DD),  $n = 12$  (13.5%):

8 females, 4 males, panic disorder (PD),  $n = 11$  (12.4%): 8 females, 2 males; obsessive compulsive disorder (OCD),  $n = 8$  (9.0%): 6 females, 2 males; and relationships obsessive-compulsive disorder (ROCD),  $n = 6$  (6.7%): 6 females, 0 males. We noted that Individual total scores distinguishing QoSL in female and male misophonics as well as in their sexual partners were statistically lower comparing with Controls, their peers without misophonia or any distinct mental disorder. Total score of *International Index of Erectile Function* scale in males with misophonia only was  $40.9 \pm 5.4$  vs  $68.1 \pm 3.7$  in Controls,  $p < 0.05$ . These findings show decreased erectile function in misophonic males. Moreover, we have found that healthy males without misophonia who are the partners of females misophonics also have decreased IIEF total score comparing with Controls  $49.3 \pm 4.9$  vs  $68.1 \pm 3.7$  respectively,  $p < 0.05$ . The small sample of enrolled males with misophonia might be considered the main limitation of our study.

**Conclusions:** Misophonia, a selective sound sensitivity syndrome, is decreasing the quality of sexual life in sufferers both sexes and their partners. Males misophonics are suffering from erectile dysfunction as well as healthy males who are the partners of females misophonics. We consider that these aspects should be taken into account by psychiatrists, psychotherapists, psychologists during the management of couples with misophonia in one of the partners.

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## Relationship between hyperacusis and anxiety in men and women with tinnitus

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**Introduction:** Some research has indicated a possible link between hyperacusis and anxiety, suggesting that psychological factors may play a role in the severity of auditory sensitivity. However, the nature of this relationship in subjects with tinnitus and how it may differ between men and women remains unclear.

**Aim:** The aim of the study is to investigate the relationship between hyperacusis and anxiety in men and women with tinnitus.

**Material and methods:** The study group consisted of 51 men and 55 women with tinnitus and hyperacusis in similar age (men:  $M = 45.4$ ;  $SD = 12.4$ ; women:  $M = 44.9$ ;  $SD = 12.8$ ). The study was conducted in the Tinnitus Clinic of the tertiary Ear, Nose, and Throat Center in Kajetany (near Warsaw, Poland). The audiological examination included pure-tone audiometry, impedance audiometry, and measurement of uncomfortable

loudness level. The *Hyperacusis Assessment Questionnaire* (HAQ), *State-Trait Anxiety Inventory* (STAI), and *Tinnitus Handicap Inventory* (THI) were used.

**Results:** Men and women exhibited similar levels of hyperacusis, anxiety, and tinnitus severity. However, gender differences emerged in the relationship between hyperacusis and anxiety. The correlation was stronger in men ( $\rho = 0.57$ ;  $p < 0.001$ ) than in women ( $\rho = 0.27$ ;  $p = 0.073$ ). Anxiety was a significant predictor of hyperacusis ( $\beta = 0.35$ ;  $p = 0.05$ ) only in men, while in women the significant predictor of hyperacusis was tinnitus severity ( $\beta = 0.32$ ;  $p = 0.046$ ).

**Conclusions:** The relationship between hyperacusis, anxiety, and tinnitus severity in individuals with tinnitus varies by gender. In men, anxiety plays a more significant role in hyperacusis, whereas in women, tinnitus severity is a more crucial factor.

**Assoc. Prof. Elżbieta Gos, PhD** is a psychologist specializing in psychometrics. She works in the Teleaudiology and Screening Department of the Institute of Physiology and Pathology of Hearing. She develops and validates measurement tools and research methodology and performs statistical analyses. Her scientific interests involve the subjective aspects of hearing disorders, especially in tinnitus, hyperacusis, and misophonia.

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### The neurophysiological model for hyperacusis and misophonia

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Based on the observations of several hundred patients with decreased sound tolerance the existence of unrecognized earlier auditory disorder with distinctive and different from hyperacusis characteristics has been identified. Patients with this disorder exhibited negative emotional and autonomic reactions evoked by a specific for a given patient patterns of sound. Consequently, the name “misophonia” for this previously not described disorder and its definition based on data gathered from our patients was proposed in 2001. Furthermore, clinical observations pointed out that misophonia requires a different approach for diagnosis and treatment than hyperacusis. Although the proposed definition was independent of the etiology of misophonia, nevertheless, on the basis of analysis of its features, including reported reactions to bothersome sounds (“misophonic triggers”) it was possible to propose potential mechanisms of misophonia and the neurophysiological model for both misophonia and hyperacusis. The model postulates that a key characteristic of misophonia is the formation of inappropriate, pattern-specific subconscious connections between the auditory system and other systems of the brain, particularly with the limbic and autonomic nervous systems. These connections are governed by the principles of conditioned reflexes. Notably, the brain systems and connections involved in misophonia are the same as in the case of tinnitus. However, in the case of tinnitus the abnormal neuronal activity is generated within the auditory pathways and spreads to other systems in the brain, while in case

of misophonia normal sound-evoked activity which is the same as in case of subjects without misophonia, is spreading and incorrectly activates various systems in the brain, yielding emotional and autonomic reactions to misophonic triggers. The mechanism of hyperacusis is based on abnormally increased gain within the subconscious part of the auditory pathways. This yields a high level of neuronal activity, equivalent to activity evoked by much stronger sound in normal subjects. The activation of the other systems in the brain is a consequence of spreading this abnormally enhanced sound-evoked activity by normally functioning neuronal connections from the auditory to other systems in the brain. In misophonia sound-evoked signals within the auditory pathways are normal, but incorrect pattern-specific connections yield abnormally strong activations of various systems in the brain.

**Pawel J. Jastreboff, PhD, ScD, M.B.A.** is currently Professor Emeritus of Otolaryngology – Head and Neck Surgery at Emory University School of Medicine, Atlanta, Georgia, and Visiting Professor sine die at University College London, London, UK. Dr. Jastreboff is recognized for his development of the first accepted animal model of tinnitus, the neurophysiological model of tinnitus and based on its clinical method of tinnitus and DST treatment, known as TRT. Furthermore, collaborating with Dr. Margaret M. Jastreboff, PhD, he proposed a concept, name and treatment for specific version of DST – misophonia – when patients exhibit negative reactions to particular for a given patient patterns of sound. Dr. Jastreboff received a PhD in Neurophysiology and Doctor of Sciences degree (habilitation) in Neuroscience from the Polish Academy of Sciences. He is a co-author of over 140 papers, 180 abstracts and three books. In 1993 he received the prestigious Robert W. Hocks award for his contribution to the field of tinnitus and in 2014, at 11th International Tinnitus Seminar the Award for Clinical Excellence, for 25 years of work with TRT. Currently he continues his work in JHDF, Inc.

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### The role of family dynamics in misophonia: proposed topics for formal study

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As a solo practice clinician, over the past dozen years I have seen many hundreds of individuals and families affected by misophonia. I have taken their stories to heart and have conducted several informal surveys to consider whether their experiences are shared by others dealing with this complex condition. As I am not in a university or medical setting, I do not have the equipment or staff to conduct formal studies to test my observations, questions, and conclusions. This session will present the results of some of my informal surveys in the hope that researchers might take this raw data and conduct studies to verify or dismiss my informal results. Included will be my observations and surveys in the US addressing the following questions:

1. Is there a larger percentage of people with misophonia in the US who were raised in families of origin with more highly structured religions (mainly Catholicism, but also other more rigidly structured religions such as Orthodox Jewish, Seventh Day Adventist, Southern Baptist, etc.) than



- in other less structured religions? [Reasoning: Possibly more rigidity in family rules around behavior, especially at the table, emphasis on right/wrong, guilt, shame].
2. Is there a larger proportion of Neanderthal DNA in people with misophonia than those without misophonia? [Reasoning: Misophonia appears to be survival brain interpretation of certain sounds as danger, as ancient peoples would have reacted].
  3. Are people with misophonia more likely to have Myers-Briggs types IJ (Introversion/Judgment) than the average reported percentages of those types in the general population? Would they have been in those categories prior to or only resulting from misophonia?
  4. Are people with misophonia more likely to have a family lineage including this or other neurological disorders, as compared to families without misophonia? [Reasoning: there may be a genetic component to misophonia].
  5. Do people with misophonia have higher ACEs (Adverse Childhood Experiences) scores than comparison groups? Is misophonia related to occurrence of a traumatic event or ongoing? [Reasoning: may be a genetic link, but epigenetics – stressful family circumstances – may have set off initial reactivity].
  6. Is the area of the brain in which misophonia has been mapped to occur in some way connected to the areas that have been mapped in earlier OCD studies? [Reasoning: there are many similar symptoms that may be related].
  7. Are girls more often affected by misophonia in part because they are acculturated to be less assertive and to have weaker boundaries around other people? [Reasoning: girls tend to suppress negative emotions until they overflow].

My hope is that researchers may take an interest in exploring some of these speculations that have grown from observations and informal surveys to determine if any validity to these theories.

*Jaelline Jaffe, PhD, has been a licensed psychotherapist in Southern California since 1976, working with individuals, couples, and medical issues, which led to her establishing LemonAidCounseling.com. For the past dozen years, her practice has focused almost exclusively on sound sensitivity disorders, mainly Tinnitus and Misophonia. She has worked with many hundreds of Misophonia patients from age 8 to 70, mostly with teens and young adults, who often find her via her website, SensitiveToSound.com. Dr. Jaffe often works in conjunction with audiologists across the US to assist their patients with the intense emotional and family issues associated with Tinnitus, Misophonia, and Hyperacusis. She has presented on these topics at numerous professional conferences for audiologists as well as for psychotherapists. Dr. Jaffe is a cofounder and Board member of the Misophonia Association, and also program coordinator for their annual convention for hundreds of patients and families. The 11th annual convention will take place in November 2024 in Atlanta, GA. Dr. Jaffe is author of the upcoming book “These Sounds are Driving Me Crazy!” Training for Mental Health Professionals in Treating Sound Sensitivity Disorders.*

## Posters

### Creating and using mobile applications for tinnitus and hyperacusis assessment and therapy – a scientific literature review

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**Introduction:** Audiological ailments like tinnitus and hyperacusis require multidisciplinary care. Therapy for these ailments should be available on a daily basis because of their troublesomeness in everyday functioning. To meet this challenge, specialists are looking for solutions in increasingly common access to the Internet and increasingly widespread use of mobile devices. Furthermore, smartphones have an application ecosystem that can be extended by new apps programmed for a particular health problem.

**Aim:** Assessment of the scale and direction of creating and using mobile applications to diagnose and treat tinnitus and hyperacusis.

**Material and methods:** Google Scholar and PubMed were searched for the 13 years 2010–2023. The search strategy

used the following keywords: “tinnitus mobile applications”, “hyperacusis mobile applications”, “smartphone-based treatment tinnitus/hyperacusis”, “smartphone-based diagnostic tinnitus/hyperacusis”, “CBT apps”, “sound and relaxation therapy apps”, “tinnitus/hyperacusis therapy smart”. The results of the review were catalogued and organized into themes.

**Results:** Results were organized into the following themes: (1) ranking evaluation and analysis of applications supporting tinnitus/hyperacusis therapy existing in the Internet space, (2) applications supporting the diagnosis of tinnitus, with particular emphasis on the EMAs (*Ecological Momentary Assessments*), (3) applications supporting the therapy of tinnitus/hyperacusis (4) a look into the future – the use of sensors built-in or connected with mobile devices, the use of artificial intelligence (AI), big data technology.

**Conclusions:** Smartphone-based applications with EMAs, sensors, possibility of using different wearable diagnostic devices can be helpful in better understanding the tinnitus variability and its causes. Combining the mobile applications with a mobile crowdsensing, central database and the support of AI techniques is a valuable source for developing scientific research. Clinically verified methods provided by mobile applications can become a part of the therapeutic process proposed by specialists and enable easy, cost-free and wide range of therapeutic support in dealing with tinnitus and hyperacusis. In tinnitus/hyperacusis therapy multifunctional smart devices managed by mobile applications such as: smart hearing

aids, cochlear implants, hearables may be equally important. The development of mobile technologies and AI techniques will contribute to the creation of smart therapy platforms for tinnitus/hyperacusis in the future.

**Cross-cultural adaptation and validation of the Danish version of *Inventory of Hyperacusis Symptoms (IHS)***

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<sup>†</sup> David M. Baguley passed away in 2022. This work is dedicated to his memory.

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**Objective:** As there are currently no validated hyperacusis questionnaires available in Denmark, the aims of the present study were to (i) cross-culturally adapt a Danish version of the *Inventory of Hyperacusis (IHS)* and (ii) investigate its usability, validity, and reliability for Danish adults with hyperacusis.

**Material and methods:** The *Inventory of Hyperacusis Symptoms* was translated into Danish using recently established good practice guidelines. We carried out a two-phase study to translate and culturally adapt the IHS into Danish and to evaluate its clinometric properties (test-retest reliability and convergent construct validity). Procedure and study sample: the IHS consists of 25 items grouped into five dimensional factors. We followed a six-step guideline for the process of translating and culturally adapting questionnaires. Steps 1-3 included translation into Danish, step 4 involved a committee review to achieve cross-cultural equivalence in the forward translation, step 5 involved cognitive debriefing interviews to investigate the participants’ comprehension of the questions, and step 6 finalized the process. In the second phase, the adjusted questionnaire was tested for consistency over time in a small sample of patients ( $n = 32$ ).

**Results:** The overall scale exhibited high internal consistency, indicated by a Cronbach’s alpha coefficient of 0.95, suggesting good internal reliability. The internal reliabilities of the subscales *Psychosocial*, *Functional impact*, *Communication*, and *Emotional arousal* were deemed adequate, with coefficients of 0.92, 0.85, 0.80, and 0.75 respectively. However, the subscale *General loudness* displayed lower internal reliability with a coefficient of 0.66. The test-retest reliability analysis revealed a strong positive correlation between the test and

retest of the IHS ( $r = 0.93, p < 0.001$ ). A paired *t*-test indicated no significant difference between the total scores of the test and retest ( $p = 0.10$ ). Most items demonstrated acceptable test-retest reliability, with Cohen’s Kappa coefficients ranging from 0.40 to 0.82. However, eight items did not meet the recommended cut-off, with one item (item 2) having a kappa value of 0.19, and seven items (items 3, 4, 5, 9, 10, 11, 22) having kappa values ranging from 0.25 to 0.40. Four factors showed acceptable reproducibility based on the ICC analysis.

**Conclusions:** We have demonstrated that the Danish translation of the IHS seems to be a reliable and valid general measure of hyperacusis-related issues with potential for clinical use. With respect to the subscales, further studies using the IHS-DK and similar measures should clarify whether specific hyperacusis distress measures can be identified.

*Susanne Steen Nemholt is a Senior Researcher, PhD, with a background in audiology and psychotherapy. With extensive experience in the field of communication disorders, particularly in tinnitus and hyperacusis among children and adolescents, she has been involved in various research projects, presentations, and advisory boards. Susanne has focused on clinical guidelines, prevalence studies, and interventions for these conditions in her publications. Her academic journey includes a PhD from the University of Southern Denmark and a Master’s degree from the University of Copenhagen.*

**Effectiveness of combined psychological and behavioural therapy in a person with audiological and neurological ailments**

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**Introduction:** The aim of this study was to evaluate the effectiveness of psychological and behavioural therapy in improving the quality of life of a person after tetraparesis with comorbidities: tinnitus, hypersensitivity.

**Case report:** This case study concerns a 37-year-old patient with tinnitus, hypersensitivity to noise and chronic arm pain. The complaints occurred after a cervical spine reoperation. The reoperation was performed because of a C1 to TH 2 epidural haematoma and tetraplegia after the first surgery. The patient’s quality of life and psychosocial functioning were perceived to be significantly impaired. A diagnostic audiological, psychological and neurophysiological assessment (QEEG study) was performed. The patient was qualified for HRV (heart rate variability) therapy and ACT (acceptance and commitment therapy). After the interactions, changes in brain bioelectrical activity in terms of Alpha-Beta1 and Beta2 waves and an improvement in psychosocial state were observed.

**Conclusions:** The individualized, holistic approach applied to the patient’s problems related to chronic complaints allowed an improvement in his quality of life.

**Małgorzata Fludra** is Psychologist employed at the Department of Tinnitus of the Institute of Physiology and Pathology of Hearing, Warsaw/Kajetany, Poland.

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### Evidence of validity for the English-translated MisoQuest

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**Introduction:** Although misophonia is characterized by distress and impairment, it is not yet classified as a psychological disorder in diagnostic manuals, largely because it is unclear how it should be defined and assessed. The MisoQuest, developed by Siepsiak and colleagues (2020), is a psychometrically promising self-report measure for misophonia. However, the MisoQuest was written in Polish and validated in Polish-speaking samples before being translated into English.

**Objective:** The current study aimed to evaluate the psychometric properties of the English MisoQuest, establish preliminary evidence of convergent and discriminant validity of the MisoQuest, and investigate whether MisoQuest scores predict meaningful outcomes.

**Material and methods:** We recruited participants with ( $n = 44$ ) and without ( $n = 95$ ) misophonia to complete a series of psychological measures, including the MisoQuest, the GAD7 for anxiety, and the SHS for sensory hypersensitivity. Participants also completed an online cognitive task where they read three short stories, one in each sound condition (silence, aversive, and trigger). Following each story, participants answered ten multiple-choice questions about the content of the story. Their reading comprehension accuracy was quantified as the percentage of questions answered correctly.

**Results:** We demonstrated that the English MisoQuest has excellent internal consistency, strong test-retest reliability, and that scores specifically tap misophonia symptom severity rather than generalized anxiety or broader sensory sensitivities. Additionally, we established evidence of criterion validity, demonstrating that higher MisoQuest scores predict lower reading comprehension accuracy in the presence of trigger sounds, but not aversive sounds or silence. Overall, this study indicates that the MisoQuest is a reliable and useful measure for identifying misophonia in English-speaking individuals and that scores on this measure are related to clinically relevant outcomes.

**Kate Raymond**, *I learned about misophonia through my own lived experience. For as long as I can remember, I have been enraged by the sound of chewing gum. In high school, I found the label for that experience, and during my undergraduate degree at McMaster University, I began to study it. I quickly realized that there was little empirical research on misophonia and that the condition affected many other people. My motivation to understand my own experience turned into scientific curiosity and a drive to make an impact through research. I earned a Master of Science degree in clinical psychology at Western University, where I evaluated the reliability and validity of misophonia assessments. I am currently a PhD student at Western University, aiming to investigate the neural*

*mechanisms underlying misophonia using naturalistic paradigms that emulate real-world listening. Through this work, I hope to contribute to a better understanding and treatment of misophonia.*

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### Exploring the cognitive dimensions of misophonia: affective inflexibility and rumination

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Misophonia is an under-researched condition characterized by a sensitivity to certain sounds and related stimuli. Misophonic reactions depend heavily on the context surrounding the triggers and their sources, pointing to the importance of a cognitive aspect of the disorder, which is not yet fully understood. Thus, the primary aim of this study is to explore the relationship between misophonia and affective inflexibility, a hypothesized cognitive feature of the disorder that involves difficulties in shifting the way one responds in the face of emotional stimuli. A secondary focus is a potential association between misophonia and different forms of rumination, which is a mental process associated with affective inflexibility that involves repetitive negative thinking. In the current study, 140 participants (mean age = 29.98 years;  $SD = 6.72$ ; 49 female/ 91 male) with and without symptoms of misophonia were recruited online via Prolific and misophonia-related newsletters. Participants completed the recently developed *Memory and Affective Flexibility Task* (MAFT), designed to assess affective flexibility, as well as a battery of self-report measures to evaluate misophonia severity, rumination, and cognitive inflexibility, as well as symptoms of anxiety and depression. We found positive correlations between affective inflexibility indices – specifically, decreased accuracy and increased reaction time on the MAFT – and overall misophonia severity. Honing in on specific symptom domains of misophonia as measured by the S-Five, we found a significant correlation between the affective inflexibility index of decreased switch accuracy and the impact, externalizing, and (although outlier-dependent) internalizing domains of misophonia severity. Further, self-reported cognitive inflexibility was also positively associated with misophonia severity. Based on multivariate regression analyses, three forms of rumination – perseverative cognition, anger rumination, and brooding – were all positively associated with misophonia severity, even when controlling for symptoms of anxiety and depression. These findings contribute to the understanding of misophonia from a cognitive perspective, potentially elucidating avenues for targets of future treatments.

**Vivien Black** *is a recent graduate of the University of California, Berkeley, where she earned an undergraduate degree with Honors in Psychology. She is presenting her thesis project where she investigates affective flexibility and rumination as they relate to misophonia symptoms. Outside of her research, Vivien is involved with misophonia advocacy and helps lead a peer support program with the organization SoQuiet.*

**Investigating sensory gating in misophonia: evidence from a paired-click EEG paradigm**

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**Introduction:** Modern environments are filled with a complex array of sounds. Since humans cannot attend to all these auditory inputs simultaneously, the brain must suppress irrelevant sounds (Kaya and Elhilali, 2017). Typically, people suppress repetitive sounds like chewing and pen clicking, but these same sounds can elicit strong emotional reactions in people with misophonia (Enzler et al., 2021). This suggests that misophonia may be characterized by deficits in auditory processing related to the suppression of repetitive sounds. Auditory sensory gating is a neural process wherein behaviourally irrelevant sounds are filtered out to retain cognitive resources for meaningful sounds (Mayer et al., 2009). Notably, reduced sensory gating capacity is observed in clinical samples with sensory and emotional deficits, such as autism spectrum disorder (Crasta et al., 2021).

**Objective:** The current study used EEG to investigate reduced sensory gating capacity as a mechanism underlying the experience of misophonia.

**Material and methods:** We recruited individuals with varying degrees of self-reported misophonia severity (assessed using the MisoQuest) to complete questionnaires about their sensory and emotional experiences. Additionally, they participated in a standard paired-click ERP paradigm, which is commonly used to assess sensory gating capacity (Boutros and Belger, 1999). EEG data were acquired using a 32-channel Biosemi system while participants sat upright and listened to paired clicks delivered binaurally through headphones. Sensory gating was quantified as a reduction in the P50 potential evoked by the second of the two consecutive click sounds. A reduction in the amplitude of the second P50 waveform (S2) relative to the first (S1) is taken as a measure of sensory gating capacity.

**Results:** We demonstrated that higher MisoQuest scores are associated with larger S2:S1 ratios in the P50 amplitude, suggesting that greater misophonia severity is associated with poorer sensory gating. MisoQuest scores were also positively correlated with scores on the sensory gating inventory, indicating that misophonia severity is associated with subjective sensory gating deficits.

**Conclusions:** This research demonstrates that misophonia may be characterized by reduced sensory gating capacity, suggesting that people with misophonia may have bottom-up deficits in auditory processing that influence the way they perceive sound.

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*a drive to make an impact through research. I earned a Master of Science degree in clinical psychology at Western University, where I evaluated the reliability and validity of misophonia assessments. I am currently a PhD student at Western University, aiming to investigate the neural mechanisms underlying misophonia using naturalistic paradigms that emulate real-world listening. Through this work, I hope to contribute to a better understanding and treatment of misophonia.*

**Misophonia and school functioning of children and adolescents: teachers' and parents' perspectives**

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Misophonia, characterized by hypersensitivity to specific sounds, significantly impacts family dynamics and children's school experiences. This study aims to understand this condition from teachers' and parents' viewpoints, providing insights into coping strategies within educational and family contexts. Research Questions: 1. Are teachers able to recognize symptoms of misophonia in students at school? 2. How do teachers manage the challenges posed by misophonia? Do they view it as a challenge affecting their professional experience? 3. How do parents perceive and respond to their children's symptoms of misophonia at home? 4. What coping strategies do parents employ to manage misophonia in both family and school settings? 5. What support and intervention strategies do teachers and parents prefer for dealing with misophonia? Research Methodology: Participant Selection: The study involves teachers and parents. Teachers working with students of various age groups and parents of school-aged children are included. Sample: Approximately 300 individuals will be surveyed, including parents (both mothers and fathers). Additionally, 20 participants will be selected for in-depth interviews. Surveys: Participants will complete anonymous surveys. In-Depth Interviews: Selected participants will engage in detailed interviews to discuss their experiences and coping strategies. Expected Outcomes: This study aims to provide information on how teachers and parents perceive misophonia and identify effective coping strategies for managing this disorder in school and family settings. This exploratory research addresses a significant gap, as little is known about the experiences of those dealing with misophonia in children and adolescents. Study Objectives: The primary objective is to investigate the perceptions and experiences of misophonia in children and adolescents from the perspectives of teachers and parents. The study will explore its impact on family functioning and children's school performance. Significance of the Study: 1. Children with Misophonia: Highlighting the need for support due to the disorder's relative obscurity and the subsequent impact on students. 2. Parents' Experience: Examining how parents perceive their children's symptoms and their connections with school functioning, including interactions with teachers regarding misophonia. 3. Teachers' Perspective: Assessing teachers' awareness of misophonia, their experiences with affected students, and their observations on how these children function in the school environment. Project Outcomes: 1. Final Report. 2. Conference Presentations. 3. Scientific Publication. 4. Public Dissemination. Dissemination: The study's findings will be shared through participation in student conferences, promotion on social media by student organizations, and

dissemination among students at the Faculty of Psychology, University of Warsaw. By the time of the conference, preliminary results on parents' and teachers' perspectives and their coping strategies for dealing with misophonia symptoms in children will be available, with the qualitative interview phase still to be conducted.

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**Reliability and validity of the Sound Sensitivity Symptoms Questionnaire (SSSQ) and Hyperacusis Impact Questionnaire (HIQ) in adults with hyperacusis**

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**Introduction:** Hyperacusis is defined as a reduced tolerance to sound(s) that are perceived as normal to the majority of the population or were perceived as normal to the person before their onset of hyperacusis. It can be complicated and challenging to live with as every aspect of life, work, education, can be affected. A clear measure of sensitivity to sound is important. Several questionnaires for hyperacusis have been developed, including the *Hyperacusis Impact Questionnaire* (HIQ) and *Sound Sensitivity Symptoms Questionnaire* (SSSQ). However, these questionnaires need to be assessed for use online.

**Objective:** To independently evaluate the validity and reliability of these questionnaires in a general adult population reporting hyperacusis.

**Material and methods:** We evaluated the factor structure using exploratory factor analyses, internal consistency using Cronbach's Alpha, convergent and discriminant validity through their correlations with established measures (e.g., *Inventory of Hyperacusis Symptoms* (IHS), *Hyperacusis Questionnaire* (HQ), *Tinnitus Function Index* (TFI), *Patient Health Questionnaire-9* (PHQ-9), and *General Anxiety Disorder Scale-7* (GAD-7)) and floor and ceiling effects.

**Results:** Exploratory factor analyses revealed the HIQ has unidimensional structure with high internal consistency (Cronbach's  $\alpha = 0.93$ ). The SSSQ had a two-factor structure (item 4 on 1 factor measuring misophonia) with moderately high internal consistency (Cronbach's  $\alpha = 0.64$ ). Discriminant validity was established for both HIQ and SSSQ with low to moderate correlations with the TFI ( $r = 0.1$ ), PHQ-9 ( $r = 0.4$ ), and GAD-7 ( $r = 0.4$ ). Convergent validity was demonstrated for both HIQ and SSSQ through moderately high correlations with the HQ ( $r = 0.6$ ) and IHS ( $r = 0.6$ ). Both questionnaires also showed potential sensitivity issues with floor and ceiling effects.

**Conclusions:** Overall, both instruments demonstrated acceptable internal consistency and construct validity, confirming their utility for assessing sound sensitivity and hyperacusis impact. However, SSSQ item 4 measured a different construct than the other items in the SSSQ due to it being misophonia-based, although its inclusion could be deemed as informative for clinical use but should not be included in the overall score.

Future studies should explore additional validations and conduct longitudinal assessments to enhance these tools further.

**Magdalena Sereda** is an Associate Professor at the NIHR Nottingham Biomedical Research Centre, University of Nottingham. Her research focuses on assessing the effectiveness of NHS contracted sound therapy options for tinnitus, clinical management of hyperacusis, and non-invasive brain stimulation for tinnitus. Magdalena graduated from Warsaw University in Biology and obtained a PhD in Neuropsychology from the Institute of Experimental Biology, Warsaw. As a Guest Researcher at Humboldt University, Berlin, she researched animal models of tinnitus. Later, she worked as a Career Development Fellow at the MRC Institute of Hearing Research in Nottingham to look at objective characterisation of tinnitus using magnetoencephalography. Over the years Magdalena's research has concentrated on several aspects of the functioning of the auditory system, including cochlear implant technology and tinnitus. She has over 20 years' experience of working with people with different hearing disorders including tinnitus sufferers, cochlear implant users and deaf adolescents. She has gained experience in various audiological, neuropsychological and psychophysiological techniques as well as in vitro animal electrophysiology and brain imaging methods (MEG).

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**Investigation of the relationship between hyperacusis and misophonia severity and depression and anxiety**

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**Objective:** Hyperacusis and misophonia are frequently associated with psychiatric comorbidities. The relationship between symptom severity and depression and anxiety has not been directly demonstrated.

**Aim:** The aim of this study was to investigate whether there is a correlation between the severity of hyperacusis and misophonia and depression and anxiety.

**Material and methods:** Participants consisted of 12 adults who presented to the audiology clinic with complaints of decreased sound tolerance. Each participant underwent audiologic evaluation (pure tone audiometry, speech audiometry, immittanceometric examination, speech tests) and decreased sound tolerance assessment (scales and questionnaires, loudness discomfort level measurement). The *Khalfa Hyperacusis Questionnaire* (HQ), *Misophonia Symptom List* (MSL) and loudness discomfort level measurement (LDL) were used together to differentiate decreased sound tolerance. Individuals with both hyperacusis and misophonia who were reported to have normal hearing on audiologic evaluation were included in the study. *Hyperacusis Handicap Questionnaire*, *Misophonia Scale*, *Beck Depression Scale* and *Beck Anxiety Scale* were administered to all participants. The correlation

between the severity of hyperacusis and misophonia and anxiety and depression scores were evaluated.

**Results:** A moderate positive significant correlation was found between hyperacusis severity and depression score ( $r = 0.633$ ;  $p = 0.03$ ). No significant relationship was observed between hyperacusis severity and anxiety score ( $p > 0.05$ ). No significant correlation was observed between the number of misophonic triggers and the score of misophonia scale and depression and anxiety ( $p > 0.05$ ).

**Conclusions:** Increased severity of hyperacusis may increase depression. Future studies should be continued by increasing the number of data for a reliable interpretation of the findings. Keywords: anxiety, depression, hyperacusis, misophonia.

*Nazife Öztürk Özdeş is a research assistant in audiology at Ankara University, Turkey and a PhD student in her thesis period. Her main academic interests are tinnitus, decreased sound tolerance and auditory processing. She is currently working in the audiology clinic of Ankara University, Turkey, where she is interested in the diagnosis and rehabilitation of tinnitus and decreased sound tolerance. In addition, she has been working on the development of a rehabilitation program for individuals with hyperacusis and misophonia. She is also a volunteer research assistant at Hashir International Specialist Clinics & Research Institute for Misophonia, Tinnitus and Hyperacusis. She is a student member of the International Society of Audiology.*

### Multidisciplinary management of misophonia: our algorithm

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**Introduction:** Misophonia as a selective sound hypersensitivity has been relatively new recognized mental disorder that characterized by different negative emotions and behavior inspired by specific triggering sounds. Among medical specialists misophonia sufferers have been called "misophonics". Misophonics have been experiencing different grades of anxiety, disgust, rage and/or fear as well other negative feelings when they hear individual specific sound triggers. The negative emotions of sufferers complicate or even destroy their

ability to perform usual daily activities and thus may impact their quality of life. Although there is a certain quantity of misophonics in general population, many general practitioners, ear, nose and throat (ENT) doctors, and other medical specialists face the difficulties of diagnosing and management misophonia. It is newly recognized pathology without strict diagnostic/treatment protocol and follow-up. Basing on our own experience we aimed to assess the quality of life in misophonics and create a multidisciplinary algorithm for misophonia management.

**Material and methods:** We analyzed our experience of management 293 individuals with sound hypersensitivity. The results of routine audiological tests and self-report questionnaires were gathered retrospectively from the records of the patients. Measures included pure tone audiometry, uncomfortable loudness levels (ULLs), and responses to the tinnitus impact questionnaire (TIQ), the hyperacusis impact questionnaire (HIQ), and the screening for anxiety and depression in tinnitus (SAD-T) questionnaire.

**Results:** Audiological testing with subsequent ENT counseling let us separate misophonics from people with other hearing disorders characterized sound hypersensitivity. We revealed hyperacusis 212 (72.4%) pts with sound hypersensitivity. Their average A-MISO-S total score was 0. Other 81 (27.6%) pts were characterized by normal audiometric parameters while their average A-MISO-S total score was  $9.6 \pm 4.8$ .

**Conclusions:** Misophonia can occur both in isolation and in combination with certain mental illnesses. It is worsening overall quality of life as well as quality of sexual life in sufferers. Proposed own multidisciplinary algorithm of management can be a helpful tool for doctors in different specialties to provide proper care for misophonics. Considering the negative influence of misophonia on the quality of overall and sexual life in sufferers, urologists/gynecologists and sexologists should be included into the multidisciplinary team for correct medical support of sufferers.

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### Tinnitus reduction after stapedotomy

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**Introduction:** Otosclerosis is a bone remodeling disorder within the otic capsule of the temporal bone. According to the literature, 65–90% of patients with otosclerosis experience

tinnitus. The most commonly used and most effective treatment for otosclerosis is surgery, including stapedotomy or formerly stapedectomy, with both these techniques providing satisfactory results in hearing improvement. Many clinicians and investigators report a substantial reduction of tinnitus after stapes surgery in patients with otosclerosis.

**Aim:** To assess tinnitus reduction after stapedotomy.

**Material and methods:** The study population was 95 patients with otosclerosis suffering from tinnitus. They completed the *Tinnitus Functional Index* (TFI) before stapedotomy and 3 months after the surgery. The minimal important change was estimated with the *Clinical Global Impression* (CGI) scale as the external criterion (anchor). The mean change method and the receiver operating characteristic (ROC) method were used to determine a minimal important change in tinnitus sensation.

**Results:** The improvement in tinnitus after stapedotomy was reported by 69.4% of the patients with otosclerosis. Minimal important change in tinnitus was estimated as a reduction of 8.8 points in the TFI.

**Conclusions:** The value of 8.8 points in the TFI can be used as a benchmark of stapedotomy effectiveness in otosclerosis patients suffering from tinnitus.

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### The use of heart rate variability (HRV) biofeedback therapy in the treatment of misophonia

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**Introduction:** Misophonia is characterized by an extreme sensitivity to specific sounds that provoke intense emotional and physiological responses. Despite significant interest, many questions about the origins of misophonia and effective treatment methods remain unresolved. Current treatment approaches often include cognitive behavioral therapy, relaxation techniques, and sound therapy, which collectively aim to diminish hypersensitivity and enhance patients' quality of life.

**Objectives:** This study aimed to evaluate the potential efficacy of heart rate variability (HRV) biofeedback therapy in the treatment of misophonia, based on a case study of a 30-year-old woman.

**Material and methods:** The case study focuses on a patient with auditory hypersensitivity and misophonia, who is irritated by specific sounds such as slurping, gurgling, dripping water, clattering shoes, and barking dogs. She has been experiencing these symptoms for about 15 years and has noticed an increase in sensitivity to sounds during her pregnancy, leading to tension, anger, and helplessness. Due to the patient's pregnancy, pharmacological treatment was not an option. Instead, a quantitative analysis of brain bioelectrical activity

(quantitative electroencephalogram, QEEG) was conducted, revealing an overexpression of fast Beta 1 and Beta 2 waves in most recordings. The patient underwent heart rate variability (HRV) therapy, with optimal respiratory parameters (7.5 breaths/minute) determined and applied during therapy. Fifteen HRV training sessions were conducted in three series of five sessions each, held from Monday to Friday with a weekly break between series (1.5 months in total). Concurrently, the patient participated in psychological therapy. QEEG testing was repeated after the therapy.

**Results:** After therapy, there was a reduction in the relative power of QEEG in the Theta (4–8 Hz) and Alpha (8–12 Hz) waves and fast Beta2 (20–34 Hz) waves in the frontal and central brain regions, which was particularly evident in the signal recorded with the eyes closed. These changes were consistent with the patient's subjective feelings – she sleeps better, is relaxed and calm. She is also able to ignore sounds that previously irritated her.

**Conclusions:** The utilization of HRV therapy led to a prompt enhancement in the patient's daily functionality as well as changes in QEEG, with a notable improvement observed within a period of 1.5 months. The potential application of HRV biofeedback therapy in the treatment of misophonia is a promising avenue for further investigation.

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### What would be the factors linked to hyperacusis in schools?

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**Introduction:** The integrity of the auditory system is crucial for students to have optimal settings for the learning process. Nevertheless, certain auditory alterations can impede this progress, such as hyperacusis, which is characterized by a diminished ability to tolerate common and/or ambient sounds.

**Objectives:** The aim of this study was to examine the occurrence of sound intolerance and identify the related factors in school-aged children.

**Methods:** The present investigation was conducted as a cross-sectional, prospective, and descriptive observational study, involving the evaluation of 60 youngsters of both genders. The evaluation was conducted via a questionnaire that was completed by parents and/or guardians via the virtual platform.

The inquiries centered on sociodemographic information on past and present health, as well as auditory well-being. Additionally, it is noteworthy that the children were also inquired about their self-perception of tinnitus, hearing, and hypersensitivity to sounds.

**Results:** The findings of the current study revealed that 48% of the students assessed experience annoyance from certain sounds, and in 15% of them, the discomfort is triggered by more than five auditory stimuli. The sounds that were most frequently reported as causing discomfort were screams, accounting for 17.4% of the reports, followed by motorbikes at 7.8%. In addition, there was an observed correlation between various discomforts such as odors/lights (15%) and motion sickness (23.3%). An analysis comparing auditory hypersensitivity and parents' opinion of their children's perception revealed that 8.3% of children exhibited hypersensitivity.

**Conclusions:** The findings indicated that 8.3% of schoolchildren have a sound intolerance. When it comes to elements

linked to hyperacusis in children, it has been noted that students who experience discomfort from light or scents also exhibit higher levels of aural hypersensitivity. Furthermore, motion sickness had no bearing on hyperacusis instances.

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