

Ladies and Gentlemen, Dear Colleagues,

One of the goals of the current APtA Governing Bodies was to continue the growth cycle of the profession and science of Audiology at national and international level. Thus, we tried to build this Congress so that Audiologists and other professionals with whom we work as a team, could share experiences, quality professional practices and reflect on the profession in the various intervention areas.

The scientific program resulted mainly from the work developed by the APtA Interest Groups – Tinnitus, Applied Audiology, Pediatric Audiology, Primary Health Care, Ethics, Central Auditory Processing and Auditory Rehabilitation – which even though newly created and at the very beginning of their activity, still trying to find their way, did not hesitate to embrace the challenge of organizing a scientific panel, seeking to address current and highly interesting topics. We think that these Groups are only the first ones to be created. We believe that these Groups will be able to boost not only science and share what we know how to do but also enhance the development of our professional practice as healthcare professionals, allowing us to better fulfill our mission towards people.

Therefore, we intended for this Congress to be a starting point. May we all have a closer look and involvement in Audiology, whether from a technical-scientific or from a political and organizational stand point. May we collectively and as one raise Audiology and Audiologists in Portugal.

So far we have received positive and successful feedback from this Congress but let us not forget that this success is not only due to the work of the Organizing and Scientific Committees, but also to:

- the participants – we reach the highest number of participants and abstracts submissions;
- the speakers – who were willing to share their knowledge and experiences;
- the sponsors – we had the largest number of sponsors, some for the first time, but we will certainly all have the opportunity to continue collaborating.

It was all these actors combined that made it possible to achieve this Congress, so we would like to thank everyone for their interest, participation and presence. We hope to count on your continued participation and involvement.

President of the Portuguese Association of Audiologists (APtA),

Dr. Melissa Cravo



Organizing Committee (from left to right):  
David Tomé, Diogo Ribeiro, Tatiana Marques,  
Nicole Santos, Melissa Cravo, Carla Gonçalves,  
Odete Batista, Bruno Gonçalves, Ana Catarina  
Barbosa, Sofia Costa, Cláudia Reis, Vasco de  
Oliveira, (Tetyana Trofymets)

## III INTERNATIONAL CONGRESS OF APTA (ASSOCIAÇÃO PORTUGUESA DE AUDIOLOGISTAS), BATALHA, PORTUGAL, 14–15 OCTOBER 2022

### Presentations

#### Acute unilateral vestibulopathy – audio-vestibular assessment

Ana Filipa Varzim

*Centro de Otorrinolaringologia de Coimbra, Sanfil Medicina, Coimbra, Portugal*

The evaluation and diagnosis of an acute unilateral vestibulopathy is performed through a set of auditory and vestibular exams. Primarily, the assessment of auditory function with otoscopy and tympanogram/ impedance should always be performed to screen for pathology of the outer ear and middle ear, as well as a pure tone audiogram which allows us to differentiate between two acute unilateral vestibular disorders, labyrinthitis and vestibular neuritis. Secondly, the vestibular evaluation of these patients begins with patient evaluation through clinical history and bedside examination, involving simple tests as spontaneous nystagmus test, head impulse test (HIT), study of eye movements, Romberg test, Fukuda test and positioning maneuvers.

Nevertheless, to confirm the diagnosis of acute unilateral vestibulopathy, more complex and specific vestibular tests should be carried out. For example, video head impulse test (vHIT) and videonystagmography (VNG) are the most widely used methods of recording eye movements. vHIT allows the assessment of vestibulo-ocular reflex (VOR) in all the semi-circular canals for high frequencies through the analysis and evaluation of gain, symmetry and refixation saccades (overt and covert). Clinically, a partial (upper or lower branch) or global affection of the vestibular nerve, confirmed by vHIT, is sufficient to confirm acute vestibular deficit (vestibular neuritis), allowing the accurate diagnosis of acute unilateral vestibulopathy. VNG, in turn, evaluates the VOR for low, medium and high frequencies, which permits the differential diagnosis between peripheral, central and mixed vestibular disorders, and therefore, confirm the existence of vestibular dysfunction, such as identify the type and side of the lesion. Even considering that protocol may vary across clinical centres, for a complete approach, oculomotricity, spontaneous nystagmus test, positioning maneuvers, pre- and post-rotational nystagmus, head-shaking test (HST), vibratory nystagmus and caloric test should be performed. In patients with acute unilateral vestibulopathy, spontaneous nystagmus (grade I, II or III) is observed, which inhibits ocular fixation and may influence the remaining evaluation, leading to positive uncompensated HST, as well as a positive vibratory nystagmus. Mostly, vestibular neuritis occurs in the superior vestibular branch and therefore affects the lateral semi-circular canal, resulting in vestibular hypovalence on the injured side, with directional preponderance and a fixation index greater than 50%. In cases of inferior vestibular branch injury, we may have a typically normal caloric response.

Furthermore, computerized dynamic posturography (CDP) can also be performed, which allows us to assess the dynamic balance and study the vestibulospinal reflex. In acute unilateral vestibulopathy, CDP is an important guide to optimize vestibular rehabilitation therapy and to compare the pre- and post-vestibular rehabilitation.

#### Auditory rehabilitation and cognitive impairment

José Luís Blanco

*University of Salamanca, Spain*

Cognition is the set of all mental skills and processes related to knowledge: attention, memory, working memory, judgment, evaluation, reasoning, problem solving, decision making, understanding and production of language.

Hearing loss is more than an audiogram:

- changes in the synapses of the auditory nerve due to deprivation;
- changes in the organization of the brain;
- synaptopathy related to noise exposure;
- changes in brain substance;
- hyperacusis and memory impairment.

These are some of the problems related to hearing loss that are related to cognitive impairment.

This “chain reaction” underlines the fact that the audiogram is only a small part of the problem for people with a hearing loss. In isolation, audiogram may seem straightforward but in reality, it is only the tip of the iceberg for a person with a hearing loss.

There is a direct relationship between hearing loss and cognitive impairment as demonstrated by different authors since:

- the deprivation of auditory stimulation favors inter-modal brain reorganization;
- the correlation between brain reorganization and speech discrimination, especially in noise, has been established in cochlear implant users.

In a study by F. Lin and others. 2015, subjects with hearing loss > 25 dB aged between 56 and 86 years, compared to normal hearing people, have accelerated the decrease in volume throughout the brain and localized volumes of the right temporal lobe.

Another long-term study (25 years) conducted by H. Amieva (2015), concluded that hearing loss is associated with the acceleration of cognitive decline in adults. The use of hearing aids attenuates deterioration. Hearing loss impacts the

quality of the sound information that the brain has to work with. The brain will adapt (plasticity) to this lower quality of information or under-stimulation. It was documented that for people with a hearing loss, vision can recruit parts of the brain that are typically used for sound processing (functional reorganization).

Together, these factors can lead to a change in people's behaviour, such as avoiding family gatherings, restaurants or other noisy environments which are difficult to cope with. This can ultimately lead to a certain degree of social isolation and a higher risk of depression. Research has even shown that long-term untreated hearing loss is associated with a greater risk of dementia. The rationale is that when we are not socially active, our brain doesn't get as much stimulation, potentially accelerating the risk of accelerated cognitive decline. Even though these are linked together, the causality is still poorly understood and documented. However, there is a growing corpus of evidence showing that hearing loss is linked to health problems.

The use of hearing aids or cochlear implants can reduce the effects of hearing loss on the hearing system or of slow cognitive decline and it can improve quality of life.

---

#### **Auditory Processing Assessment Battery – European Portuguese (BABA-PE) a tool for auditory processing assessment**

Jorge Humberto Martins

*ENT Department, University Hospital Center of Coimbra, E.P.E., Coimbra, Portugal*

The presentation is a summary of the work carried out for the development of the central auditory processing assessment battery, which was published by Martins et al. 2021.

**Background:** There is an increasing need for state-of-the-art Central Auditory Processing assessment for Portuguese native speakers, applicable as early as possible. As a contribution to answering this need, this paper presents a new battery for Central Auditory Processing assessment for European Portuguese applicable to children aged 5 and above, named BABA-PE, providing information regarding test selection and development.

**Material and methods:** The normative data for children aged 5 to 12 are also reported. A sample was obtained of 217 subjects without ear pathology and with typical development. The battery consists of six behavioral tests: Staggered Spondaic Words (SSW) for European Portuguese, Filtered Speech, Speech in Noise, Detection Interval in Noise, Duration, and Frequency Pattern. The normative data for children aged 5 to 12 are also reported.

**Results:** Each age group was composed of at least 30 children. All children were evaluated using pure tone audiometry, speech audiometry, impedance, and otoacoustic emissions. Normative scores are reported for each of the six auditory processing tests. The assessment is applicable to young children (aged 5 and 6).

**Conclusions:** The statistical analyses showed significant effects in scores of Ages for all tests and of Ear for several tests. The main result from the work presented, the Auditory Processing Assessment Battery – European Portuguese (BABA-PE), is available for clinical use with normative data. This battery is a new tool for behaviorism assessment of European Portuguese speakers with suspected central auditory pathology and for monitoring the results of auditory training.

---

#### **Building our professional future**

Melissa Cravo

*President of the Portuguese Association of Audiologists (APtA)*

Professional growth is the result of the articulation between training, regulation and professional practice. These three areas need to walk hand-in-hand in order to create a solid professional development.

**Training.** In Portugal, formal training courses in Audiology began in the 80's as a 3-year degree, were interrupted for a few years and re-opened for just one class in the 90's. It was only after the year 2000 that training courses in Audiology as a 4-year degree started continuously, rapidly raising the number of Audiologists. What these professionals have quickly come to realize is that more training is necessary and have increasingly turned towards Master's and PhD programs. In a voluntary survey done by APtA in the beginning of this year, of the 305 Audiologists who answered, about a third had completed a postgraduate, Master's or PhD degree. Although general practicing Audiologists continue to be necessary, the urge for specialized knowledge Audiologists is increasing. The patient's demand to have their needs met and the scientific and technological development have growingly pushed Audiologists to strive for in-depth knowledge.

**Regulation.** Audiology in Portugal is regulated by the Central Administration of the Health System however, as a public institute, it has other major functions within the health system, leaving room for much needed improvement regarding regulatory activities and responsibilities. As such, over the years APtA has been collaborating with other healthcare professional associations in order to create a common self-regulatory body which will allow for adequate regulation of Audiology practices, guarantee quality standards of audiological care and ensure ethical and deontological professional practice. It will also foster for more precise data regarding these professionals leading to a closer and more productive collaboration with Audiology Schools and governmental bodies.

**Professional practice.** In 2018, a report from the Portuguese national healthcare system showed that there were 80 Audiologists practicing in public hospitals. From our survey, we found that it was mainly the older Audiologists who worked (not exclusively) in public hospitals and younger Audiologists were mainly in the private sector (mostly exclusively) particularly in hearing rehabilitation. The demand for Audiologists is high and unless we can change this imbalance access to audiological services in the public sector will become rapidly scarce in a country that defends and promotes free universal access to healthcare services. This is a worrying situation. We must also seek to increase the variety of

audiological services provided in hospitals and develop primary healthcare services, for example, moving towards pre-school and adult screening.

Reflecting on the path we need to take as a profession is essential to build a solid foundation for growth and development. Continuous (specialized) training in Audiology, an effective regulatory body and improvement of access to Audiologists are essential to improve the quality of the audiological health of the population in Portugal. As we build our professional future, we must keep in mind the responsibility that each Audiologist's holds - our profession will be what we want it to be.

---

### Challenges of audiological assessment in children with atypical development

Ana Santos, Rita Fonseca

*Centro Hospitalar Universitário Coimbra, Hospital Pediátrico, Coimbra, Portugal*

In Portugal the incidence and prevalence of global retardation of psychomotor development is unknown, but the World Health Organization estimates that at least 10% of the population in different countries is composed of individuals with any type of disability, namely 4 to 5% of children under 5 years. According to the ASHA 2004 guidelines, audiologists should perform both behavioural and physiological tests. Behavioural tests are the most important in that they test the entire auditory system, determines the type and degree of hearing loss over a wide range of frequencies. The most commonly used tests are the Block-test and Visual Reinforcement Audiometry. In our clinical practice the primary challenges we face for audiological evaluation are the child's cooperation, parental intervention, changes in motor, cognitive and social development, and evaluation by one or two audiologists. These challenges can be exacerbated if the audiologist doesn't have experience with children with developmental changes. We mention three types of developmental disorders in children that are very common in our service, autism, trisomy 21 and cerebral palsy. Contrary to the common perception of audiologists, children with autism can perform behavioural tests. It can be difficult to condition the child, especially if the language used isn't simple and objective, doesn't include visual models, and the approach isn't appropriate. Relying only on electrophysiological tests in detriment of behavioural tests gives an incomplete picture of the child's hearing. In Portugal there are about 15,000 people with trisomy 21. In general, their characteristics are disturbances in intellectual development, language and/ or speech, and attention deficit. However, they're affectionate, stubborn, persistent, happy, talented, and have a great sense of humour. Cerebral palsy affects approximately 2 in every 1000 individuals. It's the most common developmental problem in children. A child with cerebral palsy has a disturbance in the control of posture and movement as a result of a brain lesion or abnormality affecting the developing brain. They may have normal or even higher intelligence, but they may also have intellectual retardation, not only because of the brain damage, but also because of the lack of experience resulting from their disabilities. Our experience has developed with the progressive complexity and frequency of "difficult" cases increasing the challenge and our persistence.

It's not at all easy and we don't always succeed! It's necessary to build trust, to play, to give the child time to adjust, and to respect their fears. However, it's important to establish clear rules and limits to "lay". In conclusion, one must look at the child as a whole. The evaluation may not go as planned, it's important to be calm, have a plan B, and adjust our behaviour according to the child. Hearing may not be the top priority compared to other problems the child has. We are part of a team, along with the family that works with the goal of evaluating the child. The results aren't always "black and white"... The important thing is NEVER TO GIVE UP!

---

### Ethics in audiology

Carla Matos Silva

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

Ethics is an area of knowledge transversal to all other scientific areas, not only because of the ethical principles inherent to the practice of a profession, but also because of all the ethical commitments that must be fulfilled in order to safeguard respect for human dignity. The Audiologist works with people who have their own beliefs and convictions, who are in vulnerable situations and therefore need specialized and individualized health care. The person is the focus of our action, respecting their values and principles. Communication with the patient is fundamental! Explaining what we are going to do, the purpose of the examination we are going to carry out and its possible risks enhances trust and promotes a better relationship between the Audiologist and the patient. Sometimes there is a tendency to omit information to the patients, based on the principle of beneficence, because we understand that this information may have a negative impact on the clinical situation; other times there is a paternalistic attitude in the communication with the patient, which is not always well accepted. Communication is also a structural element of the free and informed consent which is not yet applied in the Audiologist's clinical practice, but which, due to the development of Audiology, namely in the scope of vestibology and vestibular rehabilitation, needs further reflection in order to guarantee a climate of greater safety and responsibility, not only for the patient but also for the Audiologist.

In the area of paediatric audiology other ethical challenges arise, counselling should include all possible options, their risks and benefits with a view to timely and informed decision-making. The process of informed consent in minors is complex and is granted by parents, who always decide according to their own value judgement, in the conviction that the alternative they have chosen is the best solution for their children. However, in the future we will not know if this choice will meet the options of the children who in the meantime grow up and have their own value judgement.

Hearing rehabilitation is perhaps the area of audiology where ethics is or should be most present. The process of sharing sensitive data in compliance with the legal requirements imposed by the General Regulation on Data Protection, the issue of professional confidentiality and the professional relationship between Audiologists, whether within the same work

circle or from competing rehabilitation centres, or with other professionals from the interdisciplinary team, knowing and respecting their scope of action. Hearing rehabilitation is in full expansion, with new challenges and opportunities for the Audiologist in what concerns his/ her relationship with the commercial/ marketing area, as well as in new models of intervention.

Regarding research, the fulfilment of ethical requirements has always been a priority, however there is little dissemination of the research carried out and a reduced number of publications, so there should be greater investment in research grants and funded projects. In light of the above we conclude that ethics is and will always be present in Audiology!

---

### **Hearing rehabilitation – intervention in mixed/ conductive hearing loss**

João Ferrão

*Widex, Portugal*

Mixed hypoacusis is a combination of sensorineural hearing loss and conduction hearing loss. This means that there is simultaneous impairment of the hearing function of the outer and/ or middle ear and also of the inner ear. This type of dysfunction has pathological conditions such as chronic otitis media, cholesteatomas, otosclerosis and congenital causes, among others.

Its clinical specificity suggests that the process of hearing rehabilitation must be analyzed not only according to the rehabilitation potential of the auditory function – aiming at having auditory thresholds as close as possible to normality; but also considering existing anatomical-pathological conditions – to avoid worsening the individual's auditory and general health condition.

Thus, it is important to consider the different existing technologies of auditory stimulation: acoustic, electrical, and vibratory in the rehabilitation of mixed/ conductive hearing loss. Technological developments today ensure that the quality of the processors is similar regardless of the type of stimulation. Likewise, developments in surgical processes and hearing implants also permit clinical feasibility criteria for more flexible surgical hearing rehabilitation methods. This allows these solutions to be considered for clinical situations which in the past would have been excluded.

In hearing rehabilitation with hearing aids, it must be assessed whether their use is anatomically and pathologically feasible and whether these conditions allow for correct fitting and effective benefits for the patient. Criteria such as the correct insertion gain for compensation of the air-bone GAP, together with limitation (due to the risk of feedback) and attenuation (due to energy dispersion) of the necessary venting must be considered in the analysis of the rehabilitation potential in the use of acoustic stimulation in auditory rehabilitation in Mixed or Conductive Losses.

It is concluded that cases should be assessed individually, identifying and analyzing the rehabilitation potential of all the different types of stimulation and technologies for a better quality of life, but also to ensure the best possible peripheral response by getting as close as possible to the reference values of normality of intensity and frequency. This will be decisive to reduce the risk of cognitive aging associated with hearing loss, in addition to reducing cochlear and retrocochlear changes, which can have a negative impact on central auditory processing.

---

### **Mild hearing loss: the challenges in auditory rehabilitation**

Mónica de Sá Ferreira

*WS Audiology, Portugal*

In some European countries that, on average, 33% of people who self-report hearing loss have a slight difficulty. And we know that the impacts of mild hearing loss may not be perceived by the general population and also that the information contained in a conventional audiogram does not show us speech skills in noise, listening effort, the presence of tinnitus. Given this and the low rate of adoption of hearing aids in this group, we need to rethink the approaches used in the auditory rehabilitation. The EuroTrak report also shows us interesting data from Europe. Approximately 17% of people with mild hearing loss use hearing aids. This is slightly higher than the previous report of 15%. An article published by Powers & Carr (2022) shows that the main reasons people reject using hearing aids are because: (1) Not having insurance to cover the costs; (2) Ignorance of the impacts of hearing loss and (3) The stigma associated with the use of hearing aids. The first reason is related to the investment that needs to be made. The other two are related to hearing loss awareness and its impacts. And, in this same article, the authors mention that 19% of people who said they did not adopt the use of hearing aids would not accept even if they were free. So this shows how much we still have to do to make these people aware. In another research, this time carried out in Brazil by Ferreira (2020), the reasons were very similar. The largest number of people said they still could not afford hearing aids. But a large number of people appeared to be unconvinced of the impacts of hearing loss on quality of life and health in general. So, what can we do to rehabilitate more people with mild hearing loss? (1) More awareness campaigns on the impacts of hearing loss, (2) More awareness campaigns on the importance of annual hearing check-up; (3) More robust protocols with needs assessment questionnaires and speech-in-noise tests and (4) Greater knowledge about the solutions provided by the industry to attract this audience. Therefore, we expect that in the near future we will have an increasing adoption rate due to our greater knowledge about the impacts of hearing loss, due to greater awareness and also due to a greater effort by the hearing aid industry to develop more and more attractive products.

## Communications

### Cognition in relation to hearing loss in the elderly population

Mónica Neves, Margarida Serrano

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** Aging is a natural phenomenon associated with the accumulation of several changes that result in an increased risk for various dysfunctions, examples being hearing loss and cognitive impairment. This study aimed to investigate the relationship between cognition and sensorineural hearing loss in the elderly population.

**Material and methods:** The study was approved by the Ethics Committee of the Polytechnic Institute of Coimbra. The sample consisted of 31 individuals, non-users of hearing aids, who attended a Day Care Center and had a median age of 81 years. All individuals underwent the simple tonal audiogram, the Montreal Cognitive Assessment Questionnaire (MoCA) and the auditory effort test (adapted from Sommers & Phelps, 2016).

**Results:** There was a correlation of  $-0.318$  between the mean thresholds of 500 + 1000 + 2000 + 4000 Hz and the language component of the MOCA questionnaire, in the right ear, and a correlation of  $-0.358$  between the mean thresholds of 2000 + 4000 Hz and the abstraction component of the MOCA questionnaire, in the left ear. Lower auditory effort corresponds to higher scores on the MOCA questionnaire in all its components, with a moderate correlation in the executive visuospatial, language, abstraction, and MOCA questionnaire components.

**Conclusions:** In this study, there does not seem to be a significant relationship between hearing thresholds and cognitive impairment as assessed by the MOCA questionnaire, except for the language and abstraction components. However, the relationship between hearing effort and cognitive impairment is clear, thus highlighting the importance of lower hearing effort by each individual for better cognition.

### Humanitarian mission at Simão Mendes National Hospital (Guinea-Bissau) – an audiology perspective

Ana Patrícia Silva<sup>1</sup>, Bárbara Carvalho<sup>1</sup>, Vítor Sousa<sup>1</sup>, Maria Luísa Monteiro<sup>1</sup>, João Subtil<sup>2</sup>, Tiago Caneira<sup>2</sup>

<sup>1</sup> *Department of Otorhinolaryngology, Hospital Lusíadas Lisboa, Portugal*

<sup>2</sup> *Department of Otorhinolaryngology, CUF Descobertas, Lisboa, Portugal*

**Background:** Humanitarian missions are a way of providing necessary medical care to a particularly needy and vulnerable population. Guinea-Bissau is a country facing chronic and constraining health challenges. The health profile is characterized by marked regional asymmetries and financial

precariousness, leading to the need for intervention of external identities to maintain a minimum level of health care provision. When humanitarian missions cover the area of otorhinolaryngology, the population has access to differentiated health care, specifically ENT appointments and surgery, hearing evaluation, fitting of hearing aids and training for the local team.

**Material and methods:** With this work we intend to share the experience of the Otorhinolaryngology/Audiology team in humanitarian missions carried out by the non-governmental organization Saúde Sabe Tene (SSTENE). Generally, our missions last a week and are centred at Simão Mendes Hospital in Bissau. We intend to share the experience of the ENT teams (doctor and audiologist) of the missions carried out between 2019 and 2022.

**Results:** In the 5 missions carried out, approximately 750 ENT appointments, 382 hearing tests, pre-school and school hearing screenings for 62 children from Aldeias SOS, fitting of 32 hearing aids and 22 surgeries. The patients who came for examinations were aged between 11 months and 69 years, with a mean age of 52.5 years, and 64.5% were female. The prevalence of deafness found is of sensorineural loss, which may be justified by taking malaria therapy (ototoxic).

**Conclusions:** Over the years, ENT missions have been evolving, but there are still many goals to meet, since the needs of this population are extensive. Missions are always an authentic personal and professional challenges because they put to the test the basic principles of audiology and the values of what it means to be a health professional.

### Innovation of RANU-Platform Online Registration – 1st year of experience at Hospital Garcia de Orta

Lisete Santos<sup>1</sup>, Rita Nunes<sup>1</sup>, Rosario Mendes<sup>1</sup>, Helena Rosa<sup>2</sup>

<sup>1</sup> *Audiologist at the Otorhinolaryngology Department of HGO, Almada, Portugal*

<sup>2</sup> *Physician at the Otorhinolaryngology Department of HGO, Almada, Portugal*

**Background:** The Universal Newborn Hearing Screening (RANU) assumes particular importance in the detection and early intervention of deafness. In this context, we intend to highlight the advantages obtained with the registration of the RANU results and respective protocol used in the Otorhinolaryngology Department of the Garcia de Orta Hospital, in an “on line” platform. The HGO was the pioneer in the development and use of this “on line” platform, intending, through its access at national level to health professionals, to make available enough clinical information, to follow the audiological evolution of all the children included in this registry and the stage in which they are.

**Material and methods:** 2167 newborns were registered in this online platform in the HGO maternity in 2020 plus 17 newborns from abroad. Several variables were recorded: RANU results (OEA1, OEA2, PEAA) referral to ENT consultation, risk factors for deafness.

**Results:** The protocol established allowed us to obtain a 99.6% rate of hearing screenings and a false positive rate of 0.4%. The platform contains the information inherent to the newborn at all stages of the RANU. In the year 2020, screenings were performed, of these 5 cases (0.3%) with sensorineural hypoacusis were detected.

**Conclusions:** The results obtained allow us to conclude that in 2020, the RANU program implemented in our hospital, met the guidelines of the Infantile Deafness Screening and Intervention Group (GRISI).

---

### Platinum compound-induced hearing loss in the treatment of cancer in pediatric age

Catarina Paiva, Carla Matos Silva

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** Platinum compounds are often used in chemotherapy treatments for various cancers due to their high efficacy. Unfortunately, they are drugs with adverse effects, namely hearing loss that can occur not only during treatment, but also years after its termination. This consequence, especially during the first years of life, can have repercussions on the overall development of the child. The aim of this systematic analysis and literature review focuses on analyzing and identifying the effects of platinum compounds (cisplatin and carboplatin) on the auditory system of children diagnosed with cancer.

**Material and methods:** The search of articles for this systematic review was carried out in different electronic databases: B-on, Google Scholar, PubMed and SciELO. The original articles published in the last ten years addressed the prevalence of hearing loss in children with cancer undergoing chemotherapy with platinum compounds, as well as their audiological results, were considered. Twenty-five articles were found, and only five met the defined inclusion criteria and were selected.

**Results:** The studies demonstrated a high incidence of sensorineural hearing loss, being highlighted as a higher risk factor the administration of cisplatin, greater than 400 mg/m<sup>2</sup>.

**Conclusions:** Sensorineural hearing loss is a potential side effect of platinum-based chemotherapy. Pediatric patients receiving cisplatin chemotherapy with a cumulative dose of more than 400 mg/m<sup>2</sup> are at increased risk of developing hearing loss, which increases when radiotherapy is associated with treatment. However, gender, age and administration of potentially ototoxic drugs concomitantly are also important clinical biomarkers in this evaluation.

### School-age auditory processing of premature children

Ana Caracitas, Margarida Serrano

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** Central auditory processing consists of the efficiency and effectiveness with which the Central Nervous System uses auditory information. Central auditory processing disorders are some of the consequences that can result from prematurity. The development of phonological memory is not only decisive in the development of language, but also in learning to read and write. The study aimed to compare the performance on an auditory processing test and on a memory test among school-age children born prematurely and to correlate the results with an Auditory Behavior Scale (SAB).

**Material and methods:** The study was approved by the Ethics Committee. The sample of this study consisted in 2 groups of children who attended the 2nd year of schooling, 10 children who were born prematurely and 34 children born at term. Teachers filled out the SAB scale and a test to assess phonological memory (repetition of pseudowords) and an assessment test for auditory processing (SSW) were performed.

**Results:** There were no statistically significant differences between the two groups, both in the repetition of pseudowords and in the SSW. However, children born premature had better performance in the phonological memory test. Regarding the SSW, there was a greater number of errors in premature children. In premature children, there was a moderate correlation between the repetition of pseudowords and the SSW (lower number of errors in the SSW corresponded to a higher percentage of correct answers in the repetition of pseudowords) and between the repetition of pseudowords and SAB.

**Conclusions:** In this study, we can conclude that in the 2nd year of schooling, premature children have an identical performance to full-term children both in the phonological memory test and in the auditory processing test, but premature children depend on auditory processing to have a better phonological memory.

---

### Temporal auditory processing in young people who listen to music

Juelma Tavares, Cristina Nazaré

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** Currently, with technological advances, it has become easier and more practical to listen to music wherever and whenever you want. Studies indicate that listening to music can help the central auditory processing, as it is very important in brain development, demonstrating the existence of a relationship between musical rhythm, expressive speech and temporal processing. The objective of the study is to evaluate the temporal auditory processing of young people who use earphones to listen to music very often or occasionally

and observe if there is a temporal processing benefit from listening to music frequently.

**Material and methods:** The sample was constituted by 2 groups, each with 15 students in higher education, aged between 18 and 24 years, who use earphones to listen music every week (Group 1 using earphones occasionally; Group 2 using earphones very often). All participants had normal hearing confirmed by pure tone audiogram and all performed monaurally the Duration Pattern Test (DPT) with sequences of 3 and 4 stimuli from BAPA-PE.

**Results:** It was found that in both ears there are statistically significant differences in DPT between the groups, both in the sequence of 3 and 4 stimulus ( $p < 0.001$ ), with higher performance in DPT in Group 2.

**Conclusions:** Listening to music very often seems to improve temporal auditory processing and these results reinforce the importance and role of auditory training in young people. Given the scope and ease of access for young people to listen to music with earphones (if within safe levels for hearing) these results seem to be significant. It would also be relevant to verify the role of this type of auditory training as a way of preventing central auditory processing disorders with age.

### The importance of evaluation of the vestibular system in cochlear implant surgery

Inês Araújo<sup>1,2</sup>, Luis Rama<sup>2</sup>, António Paiva<sup>2</sup>

<sup>1</sup> Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal

<sup>2</sup> Research Centre for Sport and Physical Activity, Faculty of Sport Sciences and Physical Education, University of Coimbra, Portugal

**Background:** Cochlear implant (CI) candidates are more likely to exhibit vestibular alterations.

When the surgical intervention is unilateral, the decision of the side to be implanted must take into account the duration and degree of hearing loss, the anatomy of the inner ear and the results of the assessment of vestibular function. Due to the risk of bilateral iatrogenic vestibulopathy, in patients with unilateral vestibular deficit, implanted in the ear with normal vestibular function, it is essential to evaluate the function of the vestibular system, in candidates for CI surgery, in order to contribute to the decision of which ear to implant.

**Material and methods:** Twenty-eight subjects between 19 and 64 years old, with severe to profound bilateral hearing loss, submitted to CI unilateral surgery. One day before surgery, anamnesis and vestibular system evaluation were performed through VEMP (cVEMP and oVEMP) and caloric test.

**Results:** The ear to be implanted showed absence of cVEMP waves in 46.4% of the sample and 60.7% in the oVEMP. In the contralateral ear, there was absence of cVEMP waves in 42.8% and 57.2% in oVEMP. In the caloric test, the ear to be implanted showed a decrease in response of 57.1%, in the contralateral ear it was 50%. Of the 4 subjects with ear surgery with better caloric response, 3 began to have bilateral vestibulopathy after CI surgery.

**Conclusions:** In this study, the ear to be implanted showed normal responses in 17.6% of the candidates and 25% in the contralateral ear. Bilateral iatrogenic vestibulopathy occurred after surgery in three subjects implanted in the ear with better vestibular function. Subjects who had vestibular system changes before surgery are more likely to get worse after surgery.

## Posters

### Audiological evaluation in teachers of the music conservatory

Mariana Moura<sup>1</sup>, Carla Matos Silva<sup>2</sup>

<sup>1</sup> O meu doutor – Reabilitação Auditiva, Coimbra, Portugal

<sup>2</sup> Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal

**Background:** Exposure to sounds of high intensity for long periods of time can cause hearing alterations. Music teachers are daily exposed to high intensity sounds and depend on their listening skills to perform their professional activity.

**Material and methods:** The sample was composed by 25 music teachers, teachers for at least 5 years. All study participants realized an anamnesis, otoscopy, tympanogram, pure tone audiogram (PTA) in the frequencies of 0,5, 1, 2, 3, 4, 6 and 8 kHz and distortion-product otoacoustic emission (DPOAE).

**Results:** Music teachers present a higher mean of the hearing threshold at the frequency of 6 KHz, in the PTA and a decrease in the average value of the mean value of the distortion product of DPOAE, as the frequency increases. With regard to exposure time, the results demonstrate a statistically significant correlation between weekly exposure and the result of hearing thresholds, at frequencies of 1, 3, 4 and 6 kHz, in the right ear with  $p = 0.041$ ,  $p = 0.000$ ,  $p = 0.002$ ,  $p = 0.003$  respectively and in the left ear at frequencies of 1, 3, 4, 6 and 8 kHz, with  $p = 0.026$ ,  $p = 0.001$ ,  $p = 0.016$ ,  $p = 0.049$  and  $p = 0.011$  respectively.

**Conclusions:** Although there is no evidence of hearing loss in the majority of the studied sample, we can see alterations in hearing thresholds in the highest frequencies, in the PTA and in the DPOAE, suggestive of alteration of the cochlear function. The weekly exposure time seems to have an influence on the hearing threshold.



### Audiological profile of the oncological patient with tinnitus

Ana Carvalho<sup>1,2,3</sup>, Ana Paula Amaral<sup>1</sup>, Margarida Pocinho<sup>1</sup>

<sup>1</sup> Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal

<sup>2</sup> Portuguese Institute of Oncology of Coimbra, Francisco Gentil, E.P.E., Coimbra, Portugal

<sup>3</sup> OuveSonus, Coimbra, Portugal

**Background:** The oncological patient may present, due to the location of the pathology or oncological treatments, different symptoms, including tinnitus. The presence of tinnitus, in turn, can be a triggering factor for anxious and depressive symptoms, with a negative impact on the healing process of cancer patients, which can affect their well-being and quality of life. The aim of this study was to understand the audiological profile of cancer patients with complaints of tinnitus, who attend the otorhinolaryngology consultation of an oncology hospital.

**Material and methods:** Forty-eight oncological patient with tinnitus from the otorhinolaryngology consultation in a oncological hospital participate in this study. A sociodemographic questionnaire, tympanogram, pure tone audiogram, tinnitogram test and the Mini-Tinnitus Questionnaire – Portuguese version scale was used to assess the impact of tinnitus.

**Results:** Forty-eight cancer patients with tinnitus (60.4% male), with a mean age of 57 years ( $SD = 8.5$ ) were evaluated. Many patients had head and neck tumors and they are polymedicated. Most had sensorineural hearing loss, with a representation of 50% in the right ear and 66.7% in the left ear, followed by mixed hearing loss, with 27.1% in the right ear and 18.8% in the left ear. Tinnitus was described as bilateral in 81.3% of subjects. All subjects reported continuous and subjective tinnitus. In the Mini TQ-PV 48% get the rating of “extremely distressing”, 44% of “severely distressing” and no one gets the rating of “compensated”.

**Conclusions:** This study demonstrates that cancer patients who go to the ENT consultation complaining of tinnitus have, for the most part, hearing loss, which justifies the need to carry out an effective follow-up in patients undergoing cancer patients. It also demonstrates that the negative impact of the presence of tinnitus, associated with hearing loss, can lead to a worsening of the patient’s physical and psychological well-being. It is extremely necessary to establish a follow-up plan and an intervention to be applied to cancer patients.

### Auditory brainstem response in children with risk factor for hearing loss: comparative analysis between the use of different acoustic stimuli in electrophysiological findings

Lara Quintela<sup>1</sup>, Fernanda Gentil<sup>2</sup>, João Manuel R.S. Tavares<sup>3</sup>

<sup>1</sup> Hospital Pedro Hispano, E.P.E., Matosinhos, Portugal

<sup>2</sup> Department Of Audiology, School of Health, Polytechnic Institute of Porto, Portugal

<sup>3</sup> Faculdade de Engenharia da Universidade do Porto, Portugal

**Background:** The auditory brainstem response (ABR) is classically evoked with the click stimulus. New stimuli, such as chirp, have been proposed with the aim of improving the identification of different types and degrees of hearing loss.

**Material and methods:** 30 children aged between 4 and 11 months participated in this study, with one or more risk factors for hearing loss. The study participants were submitted to the electrophysiological hearing assessment by ABR, with click and LS CE-chirp stimuli, at different intensities, with different waves identification (I, III and V) as a function of the intensity been evaluated. The data was acquired using a clinical equipment with the Eclipse software, module EP25, of Interacoustics, which was used for data analysis. The latency and amplitude values obtained in the evaluations of each stimulus were compared, and the respective electrophysiological hearing thresholds obtained analyzed.

**Results:** It was verified that there was a difference in the results of the evaluations due to the use of click and LS CE-chirp stimuli, being statistically significant in the latency of wave I at intensities of 80 and 90 dB, in the latency of wave III at the intensity of 80 dB and wave V latency at intensities of 90, 80, 30 and 20 dB. As for the amplitudes, this difference proved to be statistically significant for wave V at the intensity of 80, 60, 30 and 20 dB. No statistically significant differences were found by comparing the electrophysiological hearing threshold between click and LS CE-chirp stimuli.

**Conclusions:** The differences observed in amplitude facilitate the identification of waves using the LS CE-chirp stimulus. In latency, the found differences did not present constraints to the electrophysiological assessment, as they were superior, except at 60 dB, using the LS CE-chirp stimulus in the assessments, also allowing the identification of the electrophysiological hearing threshold efficiently. Electrophysiological hearing threshold evaluation is facilitated by the use of the LS CE-chirp stimuli, although there was no statistically significant difference at the level of the electrophysiological hearing threshold between stimuli.

### Benefits of bimodal auditory stimulation

Tània Couceiro, Cristina Nazaré

Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal

**Background:** Bimodal stimulation is an aural rehabilitation method that uses bimodal hearing devices and consists of a combination of electrical stimulation of one ear through a

cochlear implant with acoustic stimulation of the contralateral ear with residual hearing by a conventional hearing aid. This study aims to explore the benefits of bimodal auditory stimulation.

**Material and methods:** A literature review with research in databases as Google Scholar and Medline using twenty-two articles with the keywords: bimodal hearing, binaural hearing, cochlear implants, and hearing aids, was carried out with the aim of obtaining the contribution of original studies of the last fifteen years on this topic.

**Results:** The analysis demonstrates that bimodal hearing can overcome the barriers of a unilateral electrical stimulation, as it combines the advantages of both types of devices. Indeed, authors agree that this bilateral stimulation mode potentiates some psychoacoustic effects such as acoustic shadow effect, interaural time and level differences or binaural summation, providing many benefits to its users due to binaural hearing that improves speech discrimination abilities, especially in noise, sound localization and musical perception, since the different signals received are complementary in terms of auditory processing.

**Conclusions:** Studies suggest differentiated processing in bimodal listeners and are consensual that bimodal stimulation provides better hearing and improves speech discrimination. In addition, it preserves the functional response of the contralateral ear and due to auditory stimulation will provide better hearing performance in the case of a future cochlear implantation in that ear. However, there are disadvantages related to binaural integration. We suggest for future studies that the benefits obtained by simultaneous electrical and acoustic stimulation in the same ear should also be explored; and to evaluate the preservation of the functionality of the auditory pathways due to bimodal auditory stimulation through electrophysiological studies.

---

### **Congenital hypothyroidism as a risk fact for childhood hearing loss**

Inês Araújo, Joana Alves

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** The maturation of all systems, including hearing, depends on thyroid hormones. In patients with congenital hypothyroidism (HC) it is possible to find hearing alterations, even if the hearing thresholds are within normality. Through a systematic review, we aimed to investigate the impact that congenital hypothyroidism has on hearing in children aged 6 months to 12 years.

**Material and methods:** A search was conducted in the B-on, SciELO, Medline, and Google Scholar databases from March to May 2021 using the keywords: congenital hypothyroidism, auditory system, and infantile hearing loss in English and Portuguese.

**Results:** Sixteen articles were found, after reading the abstract, eleven were excluded for not addressing the topic under study and one for being a review, leaving four articles for

analysis. The results of the audiological exams of children with HC present alterations. In the articles analyzed, it was found that although no significant differences were found, a decrease in the amplitudes of the acoustic otoemissions (AOA) was noticed, which may indicate a compromise of the cochlear mechanisms; children with the pathology also need a greater intensity to be able to trigger the acoustic reflex response. Although the hearing thresholds of children with the pathology are within normal limits, they have higher values when compared to those of healthy children.

**Conclusions:** In this study we found that congenital hypothyroidism does not cause significant changes in hearing in children between 6 months and 12 years of age; however, the etiology, the age of diagnosis, and the start of hormone replacement therapy are not clear factors that can affect the auditory system; however, the studies analyzed indicate that children with HC may be more susceptible to developing changes in the auditory system.

---

### **COVID-19 and central auditory processing**

Rita Saraiva, Carla Matos Silva

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** The novel coronavirus called SARS-CoV-2 triggered a respiratory illness known as coronavirus disease 19 (COVID-19) causing an outbreak of unusual viral pneumonia, spreading rapidly around the world. The most frequent symptoms are cough, sore throat, fever, dyspnea and fatigue. Besides, loss of smell and taste may also occur. After some studies and the appearance of new symptoms, it was realized that it also affects other functions of the human body, namely hearing and the central nervous system (CNS), causing difficulties in concentration, memory and auditory processing. This study aims to assess the effects that COVID-19 has on central auditory processing.

**Material and methods:** The sample consisted of 38 individuals of both sexes, aged between 18 and 35 years, of which 20 tested positive for COVID-19 and 18 never tested positive. All subjects in the sample answered a questionnaire and underwent otoscopy, tympanogram and simple tonal audiogram for exclusion criteria and central auditory processing tests: duration pattern and Staggered Spondaic Word Test (SSW). For this purpose, it was used the Evaluation Battery Software of Auditory Processing – European Portuguese (BAPA-PE).

**Results:** In the standard duration test, statistically significant differences were found in all conditions and in both ears. In the right ear, the significance values were in the condition of 3 stimuli  $p = 0.05$ , in the condition of 4 stimuli and in the last condition  $p = 0.00$ . Regarding the left ear, the values were, in the condition of 3 stimuli  $p = 0.04$ , in the condition of 4 stimuli  $p = 0.03$ , and, in the last condition  $p = 0.01$ . In the SSW test, differences were found between the groups, with the experimental group presenting the worst performance, however without statistically significant differences. They were only found to be marginally significant in the SSW\_OD and SSW\_T conditions with  $p = 0.07$ .

**Conclusions:** In this study, the impact of COVID-19 on central auditory processing is verified, more evident in the standard duration test.

---

### Distal renal tubular acidosis – hearing and vertigo: a case study

Ana Patrícia Silva, Bárbara Carvalho, Joana Luís, Maria Luísa Monteiro, Tânia Delgado

*Audiology Department, Hospital Lusíadas Lisboa, Portugal*

**Background:** Autosomal recessive distal tubular acidosis is a genetic disorder characterized by the inability to acidify urine. This mutation originates from the ATP6V1B1 or ATP6V0A4 genes, both expressed by the kidney and cochlea. The pathology may be characterized by the appearance of progressive bilateral sensorineural loss and early manifestation.

**Material and methods:** Description of the case from a young woman with distal renal tubular acidosis disease with auditory and vestibular alterations, with mutation in the ATP6V1B1 gene. Retrospective analysis of the patient's clinical record. Bibliographic research using the keywords: distal renal tubular acidosis, sensorineural hearing loss, and vertigo.

**Results:** Patient with 15 years old, female gender, without family history for the pathology and diagnosed with hearing loss at the age of 5 years. She currently has bilateral, asymmetrical, fluctuating and progressive hearing loss (occasionally with conduction component), with tinnitus and rotatory vertigo (most recent symptom). Magnetic resonance imaging (MRI) showed dilatation of the right vestibular aqueduct, corresponding to the side with the greatest hearing loss. In 2018, 2021 and 2022 he performed hyperbaric oxygen therapy cycles after sudden hearing loss, mostly in the right ear, and with slight improvement. Since 2014 she has been using bilateral hearing aids, with functional gain.

**Conclusions:** The case of this patient presents, mostly, all the typical characteristics of this genetic mutation, however the hearing fluctuation isn't described in any of the articles we have read. As there is a progressive hearing loss, the fluctuating nature of this is a condition for the cochlear implant, however it is still a future solution.

---

### Effectiveness of auditory training in elderly hearing aid users: a systematic review

Nuno Paulo, Cristina Nazaré

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** The use of hearing aids as a result of sensorineural hearing loss provides a sound amplification of the environment, improving communication. The benefit of using hearing aids does not, however, prevent difficult situations, namely speech perception, which may be associated with central auditory processing disorders. The objective is to evaluate

the effectiveness of auditory training in elderly people with hearing loss and who are users of hearing aids.

**Material and methods:** This study consisted of a systematic review of the literature in which the research intended to answer to the clinical question: “What is the effectiveness of auditory training in elderly users of hearing aids?”. In the bibliographic research, the academic databases, B-On, SciELO, PubMed and Google Scholar were consulted with the keywords: hearing aids, hearing loss, elderly, auditory training and effectiveness, and focused on studies published from 2011 onwards.

**Results:** After applying the inclusion and exclusion criteria, five articles were selected in which the participants performed auditory training related to the skills of auditory closure, figure-ground and temporal ordering. In three articles there was an improvement in the performance of the auditory processing assessment, after performing auditory training, with statistically significant differences when compared to individuals who did not undergo auditory training.

**Conclusions:** The auditory training performed by the elderly proved to be effective, because it provided an improvement in auditory skills, especially auditory closure and figure-ground, improving selective attention and speech perception in noise. The effectiveness of auditory training was particularly noticeable in new hearing aid users. These results seem to indicate a more robust response to hearing training by new hearing aid users. In this sense, the association of auditory training with the use of hearing aids should be considered in the aural rehabilitation process.

---

### Effectiveness of hearing aids in the treatment of tinnitus in individuals with hearing loss

Carla Pereira<sup>1</sup>, Tatiana Marques<sup>2,3</sup>, António Miguéis<sup>4</sup>

<sup>1</sup> *Faculdade de Medicina, Universidade de Coimbra, Portugal*

<sup>2</sup> *Centro de Imagem Biomédica e Investigação Translacional de Coimbra, Universidade de Coimbra, Portugal*

<sup>3</sup> *Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

<sup>4</sup> *Clínica Universitária de Otorrinolaringologia, Faculdade de Medicina, Universidade de Coimbra, Coimbra, Portugal*

**Background:** Tinnitus is defined as a perception of sound in the absence of an external sound source and is clinically classified as a symptom. Despite the high prevalence and impact of tinnitus on a person's quality of life, treatment options are limited. For example, hearing aids (HA) are a possible therapeutic approach for patients with tinnitus-associated hearing loss, however, there is a paucity of relevant findings on the effectiveness of these devices in reducing tinnitus and improving quality of life. Nevertheless, in the current absence of a cure for tinnitus, auditory amplification seems to contribute to reducing the perception of tinnitus sound and the discomfort associated with it, due to the amplification of external sounds that may mask or cover up the tinnitus. Therefore, we examined the effects of this amplification approach in patients with tinnitus associated with sensorineural hearing loss (SNHL).

**Material and methods:** Eleven patients (9 females, 2 males; mean age  $62.36 \pm 5.89$  years) with both hearing loss and tinnitus were enrolled. Study eligibility criteria specified SNHL, based on a pure tone average of hearing thresholds at 0.5, 1, 2 and 4 kHz  $> 20$  dB, as well as not having previously received any counselling or cognitive therapy for tinnitus. Tinnitus was examined using tinnitogram test and 25 items of the Tinnitus Handicap Inventory (THI). Data management and analyses were performed using IBM SPSS Statistics 27. Correlations between the THI and the use of hearing aids, as well as between THI scores and perceived tinnitus intensity, were evaluated using Spearman's correlation coefficient. Statistical results were considered significant at the alpha level  $< 0.05$ .

**Results:** Tinnitus was bilateral in 54.5% of the patients and unilateral in 45.5%. Hearing aids were worn by 6 patients (63.64%) for a mean time of 9.69 years. For patients who wore hearing aids, significantly lower scores were found on the THI compared to unfitted participants (mean THI scores of 19.10 vs 49.50;  $R_p = 0.66$ ;  $p = 0.03$ ). Likewise, a moderate correlation was found between tinnitus intensity and THI, with higher tinnitus intensity associated with higher scores of THI ( $R_p = 0.70$ ,  $p = 0.02$ ).

**Conclusions:** Marked effects on tinnitus were observed in participants with hearing aids, showing significant improvements with auditory amplification. Acoustic therapy using hearing aids seems to be effective for tinnitus-associated hearing loss.

#### Impact of the use of mask on speech perception

Ana Carvalho<sup>1,2,3</sup>, Ana Luísa Rodrigues<sup>1</sup>, Daniel Matos<sup>1</sup>, João Ferreira<sup>1</sup>, Regina Cardoso<sup>1</sup>, Tânia Tomás<sup>1</sup>

<sup>1</sup> Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal

<sup>2</sup> Portuguese Institute of Oncology of Coimbra, Francisco Gentil, E.P.E, Coimbra, Portugal

<sup>3</sup> OviSonus, Coimbra, Portugal

**Background:** The COVID-19 pandemic, caused by the SARS-CoV-2 virus, triggered the need to use several preventive measures, which brought new challenges to communication, such as complying with social distancing and the use of face protection systems. Although there is a relief in the mandatory measures, the use of masks is still frequent, especially in health units. This study evaluated the impact of mask use on speech perception, by performing vocal audiometry in live voice, without using a mask and using three different types of masks (Surgical, KN95, FFP2).

**Material and methods:** The study was observational, analytical, and cross-sectional. It had a sample of 25 individuals with normal hearing, between 35 and 55 years old, to whom vocal audiometry was performed without a mask and with 3 types of face protection masks.

**Results:** 80% of the individuals considered that they heard well and 68% of the individuals considered that they hear worse with a mask than without a mask. The mask preferred by most participants is the KN95 (56%), while 44% prefer to

use the surgical mask. There were statistically significant differences in the vocal audiogram when using the FFP2 mask, with a percentage of correct answers of 82.08%.

**Conclusions:** It was concluded with this study that, of all the masks used, it was with the FFP2 that there were statistically significant differences in speech perception. It was concluded that all masks affect speech perception, with greater impact on FFP2, which is most used in a hospital environment, requiring greater care and adopting alternative strategies to ensure that the message is understood by the other person.

#### Importance of auditory training in the development and stimulation of skills in hearing aid users – a systematic review of the literature

Maria José Pereira, Ana Catarina Barbosa, Vera Faria

Department of Audiology, School of Health, Polytechnic Institute of Porto

**Background:** Auditory rehabilitation performed by psychoacoustic amplification allows for an increase in audibility, however, there may be difficulties in sound perception. Auditory training can be used to improve auditory performance, consequently improving auditory skills affected by hearing loss. This study aims to understand which skills are developed and/or stimulated by auditory training in hearing aid users and the importance of this type of training in these individuals.

**Material and methods:** Systematic review of the qualitative literature. The search was applied in the electronic databases PubMed, Web of Science and B-on using the expression “auditory training” for “hearing loss” AND (abilities or skills) AND hearing aids”.

**Results:** After applying the eligibility criteria, 23 articles were analysed, published between 2013 and 2021.

**Discussion:** The main skills affected by hearing loss and stimulated by training are mainly related to speech perception, especially in noisy environments. There was greater evidence of the effectiveness of formal auditory training, compared to informal auditory training.

**Conclusions:** Auditory training has an influence on the auditory skills affected by hearing loss; however, there were some differences in the results, thus it is important to invest in further studies in this area.

#### Influence of chronic obstructive pulmonary disease and ventilotherapy on hearing

Rita Graça, Vasco de Oliveira

Department of Audiology, School of Health, Polytechnic Institute of Porto, Portugal

**Background:** Chronic Obstructive Pulmonary Disease is a disease that affects the airways, characterized by its chronic and progressive inflammation, resulting in obstruction of the respiratory flow. It's pathogenesis leads to states of hypoxia

and hypercapnia (states of low oxygen content and high carbon dioxide content, respectively, in the bloodstream), which several authors advocate as causes for the development of hearing loss. At the same time, ventilation therapy is commonly used in the treatment of this pathology, as it prevents this same respiratory obstruction. In doing so, this therapy is thought to have the potential to counteract the effects of the disease on hearing ability. This study aims to investigate whether chronic obstructive pulmonary disease has any influence on the auditory system, and therefore whether it can be considered a risk for the development of hearing loss, and also to assess the possibility of ventilation therapy, indirectly, effect on its attenuation or reversal.

**Material and methods:** The investigation is classified as a case series study, in which the sample, of three participants, is divided into two groups according to the parameter to be evaluated. For each participant, pure tone tonal audiograms were compared prior to diagnosis or to the initiation of ventilation therapy, with audiograms after diagnosis or the initiation of ventilation therapy, according to the parameter under analysis.

**Results:** Regarding the analysis of the influence of chronic obstructive pulmonary disease on hearing thresholds, the respective participants had minor, and sometimes inconstant, changes in hearing thresholds. As for the question concerning the analysis of the influence of ventilation therapy on hearing thresholds, the participants involved showed improvements, quite notorious in one case of the hearing ability.

**Conclusions:** The results of this study do not allow us to give a concrete answer to the first part of the question, inasmuch as it is not possible to attribute, without a doubt, the responsibility to chronic obstructive pulmonary disease for the alterations observed. On the other hand, the results referring to ventilation therapy support the hypothesis that this therapeutic action can positively influence hearing in these clinical conditions.

---

### Intervention in people with tinnitus: Widex Zen Therapy Program

Marta Gomes

*Widex, Portugal*

**Background:** Tinnitus is the perception of a sound in the absence of an external sound source. It is estimated that 12 to 30% of the adult population suffers from tinnitus with different levels of severity, in the most severe cases it can lead to anxiety, depression and changes in sleep patterns. Widex Zen Therapy (WZT) emerges as an alternative therapeutic approach in cases where causal treatment has not been possible or successful. It has four therapeutic components – counselling, amplification (in the case of hearing loss), Zen fractal tones and relaxation, with the aim that the tinnitus has the least possible negative impact on the patient's quality of life. This study aims to evaluate the effect of the WZT approach in people in whom the main complaint is Tinnitus

**Material and methods:** Thirty-six individuals with significant tinnitus impact (Tinnitus Handicap Inventory (THI)

> 18) and with at least three months of WZT protocol. Of which 14 female (39%) and 22 male (61%), with a mean age of 52.7 years. The sample was divided into two groups: 14 participants (39%) have normal hearing and 22 have hearing loss (61%). All subjects were referred by an ENT doctor. THI was used pre-intervention and after three months of WZT intervention.

**Results:** All subjects received counselling, 92% used the Zen fractal sounds and 75% completed the relaxation exercises, all members of the hearing loss group received amplification (61%), according to hearing loss. The average total THI score of both groups' pre-intervention was 57 points ( $N = 36$ ), with a significant reduction of 21 points on THI after the three months WZT program. 78% decreased at least one level on the five-level THI scale and 19% decreased more than one level. In the group segmented analysis: people with normal hearing had an average THI score of 54 points pre-intervention and reduced 21 points after 3 months of WZT. Participants with hearing loss had an initial mean THI score of 58 points, which reduced 22 THI points after 3 months of WZT.

**Conclusions:** The WZT Program significantly reduces the negative impact of tinnitus regardless of having or not hearing loss. However, its long-term benefits need to be evaluated.

---

### Preschool Hearing Screening Program: first evidence study

Vanessa Neves<sup>1</sup>, Diana Ribeiro<sup>1</sup>, Natália Oliveira<sup>1,2</sup>,  
Alexandra Correia<sup>1</sup>, Carlos Carvalho<sup>1</sup>

<sup>1</sup> Department of Otolaryngology, Centro Hospitalar de Entre o Douro e Vouga, Santa Maria da Feira, Portugal

<sup>2</sup> Department of Audiology, School of Health, Polytechnic Institute of Porto, Portugal

**Background:** According to the World Health Organization in 2020, 34 million children around the world have deafness or hearing loss, in which 60% of cases can be prevented. This study intends to identify hearing changes in preschoolers who attend the cluster of schools in the Centro Hospitalar Entre Douro e Vouga, CHEDV's region and to emphasize the value of preschool hearing evaluation in order to prevent long-term effects on the child's overall development. Currently, this type of screening is not carried out in our country.

**Material and methods:** 46 children (92 ears), aged between 4 and 6 years old, were evaluated by Santa Maria da Feira school educators using anamnesis, otoscopy, tympanogram, pure-tone air-conduction at 0.5–4 kHz and vocal audiometry. Children who displayed changes in these assessments were alerted to the assistant doctor and directed to an ENT consultation.

**Results:** We found that 28% of the ears tested had mild hearing loss and 3% had moderated hearing loss, according to BIAP 02/1. In 57% of the instances (40% type C and 17% type B), the tympanogram appeared altered, meaning that the middle ear was altered in more than half of the examined ears. Additionally, 20 of 46 children (43.47% of the cases) were found to have hearing disorders.

**Conclusions:** The high prevalence of children with hearing disorders found emphasizes the significance of the Pre-School Hearing Screening in the hearing assessment of pre-school aged children to minimize the detrimental effects of hearing on their development, cognition, communication, and interpersonal relationships. It is important to note that such initiatives highlight the necessity to design hearing health education programs in addition to the diagnosis and treatment of middle ear disorders.

---

### Prevalence of sensorineural deafness caused by cytomegalovirus in children

Gabriela Peres, Cláudia Reis

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** Congenital cytomegalovirus is the most common congenital infection worldwide. This infection can be classified as symptomatic or asymptomatic. In developed countries, the mean prevalence of this infection is 0.58–0.70% and is responsible for 15–20% of sensorineural deafness. Screening for cytomegalovirus allows the detection of asymptomatic children to later audiological follow up, due to the possible late appearance of hearing loss. It was verified whether there is a higher prevalence of the onset of sensorineural deafness in asymptomatic children.

**Material and methods:** The research of the articles for this literature review was carried out in Portuguese and English, through electronic databases, such as: Google Scholar and PubMed, with the following keywords: cytomegalovirus, hearing, infection, and sensorineural hearing loss, thus obtaining a total of 20 articles. The inclusion criteria were applied: age of participants up to 18 years, original articles of the last 10 years, in which the theme of the article addressed the sensorineural hearing loss caused by cytomegalovirus in symptomatic and asymptomatic children, and that part of the audiological tests used were identical between articles. After the inclusion criteria were applied, five articles were selected to carry out this study.

**Results:** When children asymptomatic by congenital cytomegalovirus were evaluated at 18 years of age, the prevalence of hearing loss was 25%, while in the group of non-infected children, the prevalence was 8%. It was found that 65% of the asymptomatic group with sensorineural deafness presented progressive hearing loss. When compared to asymptomatic children with children symptomatic of congenital cytomegalovirus, hearing loss occurred in 10.6% of symptomatic children and in 7.8% of asymptomatic children.

**Conclusions:** It was found that children asymptomatic by cytomegalovirus have a lower prevalence of the appearance of sensorineural deafness compared to symptomatic children. However, when compared with non-infected children, asymptomatic children have a higher prevalence in the appearance of sensorineural deafness, which is in agreement with the fact that children with cytomegalovirus have a higher risk in the development of hearing loss. It was also found that there was progression of hearing loss in children with cytomegalovirus.

### Spatial notion in swimmers

Maria Malaguerra

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** Athletes make successful decisions, in their sporting practice, by perceiving information related to the physical properties that reflect their interaction with the environment in which they perform in. The human body's ability to balance itself is effected when reality is analyzed and information received by peripheral receptors is integrated. The aim of this study is to verify whether the practice of long-term high-intensity swimming has effects on the spatial notion. Spatial notion is understood as the way in which the integration of peripheral information is carried out in the function of postural balance.

**Material and methods:** The study's population consists of 27 individuals (18 federated young swimmers and 9 non-swimmers). After the anamnesis, otoscopy and tympanogram, the Modified Clinical Test of Sensory Interaction on Balance was performed. Additionally, to force imbalance while performing the study of postural balance, the Freeman's Table (eyes open and eyes closed) was used in the plan anterior-posterior and in the right-left plan and the oscillation of individuals was also measured. Data at the center of gravity of each individual were also obtained.

**Results:** Although there were no statistically significant differences ( $p > 0.05$ ), in somatosensory, visual, and vestibular systems, there were greater oscillation and a different integration of peripheral information in the group of swimmers, compared to the group of non-swimmers. These reasons characterize the sensory balance problem and refer to the fact that, although the vestibular and visual systems are intact, which are not often used by swimmers to maintain postural balance.

**Conclusions:** The practice of long-term high-intensity swimming has effects on the spatial notion, as an integration of peripheral information, in the study of postural balance. Despite of verifying a bigger oscillation in the group of swimmers in every studied position, while characterizing the sensorial balance, the smallest difference between the group of swimmers and the control group was noted in somatosensory ratio. This information indicates that of the three peripheral systems, this is the one that swimmers most use. This fact maybe due to the central nervous system automatically executing the choice of preferential information input for each individual, in each different situation. This automatic choice can be influenced by the intensity of the swimming practice. Whilst swimming, the visual information is affected and the vestibular information is not the most sought after, and the somatosensory information is being preferred.

## Tinnitus and health

Sandra Ferreira<sup>1,3</sup>, Ana Paula Amaral<sup>2</sup>, Carla Silva<sup>3</sup>

<sup>1</sup> *OuviSonus, Coimbra, Portugal*

<sup>2</sup> *Politechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Departament de Ciências de Base, Coimbra, Portugal*

<sup>3</sup> *Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** Anxiety and/or depression contribute to the individual's inability to perform daily tasks, affecting sleep and causing constant insomnia. Sleep disorders are associated with the occurrence of tinnitus and mental disorders. Tinnitus, a symptom characterized by the perception of a sound, touch or whistle, in the absence of an external stimulus. This study aims the prevalence of tinnitus in the general population, its connections to sleep and mental health, as well as the repercussions on quality of life.

**Material and methods:** This study was conducted on Google-Forms where the following questionnaires were applied: Sociodemographic and Health Questionnaire, Tinnitus Handicap Inventory Questionnaire (THI), Anxiety, Depression and Stress Scale, 21 items (EADS-21) and Abbreviated Quality of Life Assessment Instrument (WHOQOL-Bref). The collection lasted 3 months.

**Results:** The sample was composed of 459 individuals, mostly female (76.9%), single (74.3%), from the central area (75.6%), aged between 18 and 25 years (46.4%) in which 28.1% have stress. The prevalence of tinnitus is 22.0%, with 14.2% being bilateral and 13.1% having a reduced degree of severity (grade I). As for the EADS-21 questionnaire, the three categories (stress, anxiety, and depression) improved their values, decreasing them stress:  $M = 6.77 \pm 4.89$ ; anxiety:  $M = 3.64 \pm 3.75$  and depression:  $M = 4.64 \pm 4.06$ . Finally, as for the WHOQOL-Bref questionnaire, the physical domain has lower values ( $M = 1.86 \pm 0.40$ ), contributing negatively to the quality of life of the individual.

**Conclusions:** The present study made it possible to perceive the prevalence of tinnitus in the general population, 22%, having a negative impact on quality of life and mental health.

---

## Study of otolithic organs in competitive swimmers

Beatriz Dias, Inês Araújo

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** The otolithic organs are highly sensitive to linear movements and the force of gravity and are important for sports practice. Since competitive swimming is a sport that takes place in a horizontal position, in an aquatic environment,

the need to better understand the behavior of otolithic organs and the balance of these individuals arises. The aim was to evaluate the function of otolithic organs in individuals who swim and compare it with individuals that don't swim.

**Material and methods:** Eighteen competitive swimmers and 18 non-swimmers were analyzed. The cVEMP and oVEMP tests were performed to assess the otolithic organs and to assess postural balance, the mCTSIB.

**Results:** There was a significant increase in the p13-n23 amplitude, in the cVEMP, in the right ear. Regarding oVEMP, there were differences in the n10-p15 interval in the right ear and in the latencies of n10 and p15 waves in the left ear. For mCTSIB, no changes were recorded between groups.

**Conclusions:** It was found that swimming athletes present changes in the behavior of the saccule and/or inferior vestibular nerve and of the utricle and/or superior vestibular nerve.

## The impact of hearing Loss on children's balance

Bruna Joaquim, Margarida Serrano

*Polytechnic Institute of Coimbra, ESTeSC – Coimbra Health School, Department of Audiology, Physiotherapy and Environmental Health, Coimbra, Portugal*

**Background:** According to the embryological and anatomical connection between the cochlea and the vestibular organs, the population with profound sensorineural hearing loss may present alterations in vestibular function and balance. We compared the results in postural balance between deaf children (severe and profound hearing loss) and normal-hearing children.

**Material and methods:** The study was approved by the Ethics Committee of the Polytechnic Institute of Coimbra. The sample consisted of ten normal-hearing individuals and four deaf individuals. The test used for data collection was the modified Clinical Test of Sensory Integration and Balance (mCTSIB).

**Results:** The deaf group, when compared to the normal hearing group, showed higher values of body sway in three of the four conditions, and in condition four there was a greater difference, with a difference of 0.19%/sec. Unilaterally deaf children with cochlear implants have greater oscillation than bilaterally qualified deaf children and normal hearing children of the same age.

**Conclusions:** This study concludes that deaf children have worse results than normal-hearing children, that is, greater body sway during the mCTSIB, especially in the condition in which the vestibular system is in dominance in relation to the visual and proprioceptive system (condition 4). Additionally, deaf children who are unilaterally enabled with cochlear implants have greater difficulty in maintaining postural balance compared to children who are bilaterally adapted.