

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

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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

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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

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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

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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.