

Analysis of participation restriction and high-frequency audiometry in adults and elderly people with mild hearing loss

Análise da restrição de participação e da audiometria de altas frequências em adultos e idosos com perda auditiva leve

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ABSTRACT

Purpose: to compare the responses of adults and elderly people with mild hearing loss in the participation restriction inventory and relate the degree of restriction with hearing loss at high frequencies, as well as to evaluate whether there is a difference between the responses of men and women in relation to participation restrictions. **Methods:** the sample of 38 participants was made up of adults and elderly people with an average of 67 years of age, of both sexes, enrolled in a hearing health service. High Frequency Audiometry was performed and the Hearing Handicap Inventory for Adults or Hearing Handicap Inventory for Elderly questionnaires were administered. The statistical study applied to the data was the Mann-Whitney test, oneway analysis of variance and Chi-Square. **Results:** significant differences were found between the elderly and adult groups in relation to the degree of participation restriction, but no correlations were found between high frequency audiometry and the degree of participation restriction. It was also possible to observe that women have a greater degree of participation restriction than men. **Conclusion:** adults have higher rates of perception of participation restrictions when compared to the elderly and there is a difference between the perception of handicap according to gender, but the results of the questionnaires are not related to hearing loss in high frequencies in this population.

Keywords: Audiometry; Questionnaires; Elderly; Adult; Hearing

RESUMO

Objetivo: comparar as respostas de adultos e idosos com perda auditiva de grau leve no inventário de restrição de participação e relacionar o grau de restrição com a perda auditiva em altas frequências, bem como avaliar se há diferença entre as respostas de homens e mulheres em relação à restrição de participação. **Métodos:** a amostra foi composta por 38 adultos e idosos, com média de 67 anos de idade, de ambos os gêneros, matriculados em um serviço de saúde auditiva. Foi realizada audiometria de altas frequências e foram aplicados os questionários *Hearing Handicap Inventory for Adults* ou *Hearing Handicap Inventory for Elderly*. Os estudos estatísticos aplicados foram o teste de Mann-Whitney, análise de variância unidirecional e teste Qui-Quadrado. **Resultados:** foram encontradas diferenças significativas entre os grupos de idosos e adultos em relação ao grau de restrição de participação, mas não foram encontradas correlações entre a audiometria de altas frequências e o grau de restrição de participação. Ainda, foi possível observar que as mulheres apresentaram maior grau de restrição de participação que os homens. **Conclusão:** adultos apresentam maiores índices de percepção de restrição de participação quando comparados com idosos e há diferença entre a percepção do *handicap* conforme o gênero, porém, os resultados dos questionários não estão relacionados com a perda auditiva em altas frequências na população estudada.

Palavras-chave: Audiometria; Questionários; Idoso; Adulto; Audição

Study carried out at Divisão de Saúde Auditiva, Hospital de Reabilitação de Anomalias Craniofaciais – HRAC, Universidade de São Paulo – USP – Bauru (SP), Brasil.

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Conflict of interests: No.

Authors' contribution: LGD study development, data collection, analysis and interpretation, writing; HMCA data analysis, article writing and submission; EATC schedule development, major article revision, and article procedures; MPN writing, research elaboration, correction of the article's writing; MFCGM advisor, research preparation, correction of article writing and approval of the final version.

Funding: Ministry of Health - Resolution CNS n° 287/1998.

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Received: August 05, 2023; **Accepted:** March 06, 2024

INTRODUCTION

Untreated hearing loss can cause harm to the patient's quality of life such as restricted participation in social activities and cognitive changes. There is evidence in the literature that adults and elderly people with mild to moderate hearing loss also benefit from the use of amplification since they present an intensification of neural plasticity with the use of an individual hearing aid (IHA)⁽¹⁾.

However, a study carried out with the aim of establishing criteria for adapting this population, identified the need to evaluate beyond the average quadrilateral thresholds to recommend hearing aids. The most important factor listed was the patient's own perception of their hearing⁽²⁾.

Some instruments can be used to try to guide the hearing aid indication process, in addition to pure tone audiometry, such as inventories and a questionnaire to assess social and emotional impairments. The *Hearing Handicap Inventory for the Elderly* (HHIE) was published with the aim of being a self-assessment tool to measure the restriction of participation experienced by elderly individuals with hearing loss, in addition to being able to be used during follow-ups after hearing aid adaptations to help verify the benefit in the quality of life⁽³⁾.

The authors described the participation restriction assessed by the HHIE (originally called *handicap*) as a complex phenomenon since a person's response to their hearing loss is not only related to their hearing thresholds, but also to several other factors, such as personality, age, physical health and the psychosocial context⁽³⁾.

The *Hearing Handicap Inventory for Adults* (HHIA) is a modification of the HHIE to be applied to adults, having in its composition questions focusing on the occupational effects of hearing loss. To date, both inventories are instruments commonly used in clinical practice due to their reliability, simplicity, little time required and ease of application and interpretation of the results⁽⁴⁾.

Another parameter that can help to better understand the difficulties of people with mild hearing loss are high frequency hearing thresholds (HF). High-frequency audiometry (HFA) assesses hearing thresholds via the air between 9k Hz and 20k Hz, and can be a diagnostic tool capable of detecting initial damage⁽⁵⁾ and important data regarding difficulties in understanding speech⁽⁶⁾.

A literature review study observed that HF thresholds are correlated with increasing age, however, the heterogeneity between the methodologies of the studies found demonstrates the need for more studies in the area to better understand how the HF thresholds influence personal hearing needs⁽⁷⁾.

Considering that the variables of age and hearing loss at high frequencies can influence the perception of restricted participation of individuals with mild hearing loss, the need for studies on the subject is evident, aiming to assist the professional in becoming aware of the disability and providing guidance on the need for treatment and adaptation itself⁽⁸⁾, reducing the possibility of abandoning hearing aid treatment and the consequent worsening of the quality of life⁽⁹⁾. Thus, the objective of the present study was to compare the responses of adults and elderly people with mild hearing loss in the participation restriction inventory and relate, in this same population, the degree of restriction with hearing loss in HF, as well as evaluating whether there is a

difference between the responses of men and women in relation to the participation restriction.

METHODS

Cross-sectional study carried out in a highly complex hearing health service and approved by the institution's Research Ethics Committee under number 2,597,189. All research participants signed the Free and Informed Consent Form (FIFC).

The study sample was obtained by convenience among users of the aforementioned service. Participants who agreed to the research, who were chronologically over 18 years old and diagnosed with bilateral mild sensorineural hearing loss were recruited⁽¹⁰⁾, and consequently, speech therapy indication for hearing aid adaptation. Among those recruited, individuals who had no previous experience with hearing aids were selected for the research. Individuals who presented tympanometric curves different from normal standards were not selected⁽¹¹⁾ in either ear, such as type B or C curves. Individuals who had a medical diagnosis of cognitive impairment reported in an interview and/or in medical records were also not included.

For assessment of pure tone audiometry and HFA, the Interacoustics® AC40- audiometer was used. The participants responded to the *Hearing Handicap Inventory for the Elderly Screening version* (HHIE-S)⁽³⁾, or the *Hearing Handicap Inventory for Adults* (HHIA)⁽⁴⁾, according to their chronological age and were separated into groups. Group 1 (G1) was composed of adults and Group 2 (G2) by the elderly. The questionnaire was applied by the researcher via an interview for both groups. Although the questionnaires are adapted for each age group, the two versions of the inventory are scored by two subscales (social and emotional) and by the total score. As a result, it was possible to standardize the measurement method since both instruments assess the degree of perception of the handicap on the same scale.

For the audiological evaluation, visual inspection of the external auditory canal and tympanometry were performed in both ears to rule out conductive character changes on the date of the evaluation. This procedure was carried out using the middle ear analyzer (immittance meter) Interacoustics® AT235. Subsequently, the individuals underwent pure tone audiometry and HFA, evaluating hearing acuity at frequencies of 9; 11.2; 12.5; 14; 16 and 18k Hz using the descending-ascending method, bilaterally. A Madsen® Astera² audiometer was used of the Otometrics brand to carry out the audiometry.

For the correlation analysis, the HFA responses were considered according to the best ear - considering the lowest arithmetic mean of the responses in each of them⁽¹²⁾. This choice was justified by the fact that, in subjective perception, the better ear tends to compensate for the worse ear.

The data obtained was tabulated in the Excel® - Microsoft® spreadsheet editor- and subjected to statistical analysis using the Mann-Whitney test to compare the two unpaired groups. The One-Way Analysis of Variance test was used to compare the variance between the HF medians and the correlation degree of participation restriction. The Chi-Square test was also used to compare proportions and the residual test was used to validate the significance of the value found. The alpha power assumed to determine significance was 0.05 for all tests.

RESULTS

The sample consisted of 38 participants, of which 55% (n=21) were female and 45% (n=17) male, aged between 32 and 85 years (average of 68 years).

Among the sample participants, 79% (n=30) were 60 years old or over with an average age of 72 years and 6 months, while 21% (n=8) were under 60 years old with an average age of 50 years and 7 months. Thus, G1 responded to the HHIA questionnaire, while G2 responded to the HHIE-S.

By analyzing the Mann-Whitney test, it was possible to verify that the two independent groups presented significant differences between them ($p=0.001$), demonstrating that G1, composed of young adults, presented a greater perception of auditory handicap for the emotional and social subscales, as well as for the total score, as can be seen in Figure 1.

However, when analyzing the variables relating to the perception of handicap correlated with hearing loss in HF, it was possible to observe that no statistically significant correlations were found ($p=0.084$), as explained in Figure 2.

For a second analysis, the groups were dismembered and participants were separated by gender. Thus, it was also possible to analyze the difference between the degrees of participation restriction and gender. For this verification, the Chi-Square test was used. Since there was statistical significance ($p=0.029$), the adjusted residuals test was applied. The proportions of observations in different columns of the contingency table varied from row to row. The two characteristics that define the contingency table were significantly related (Figure 3).

DISCUSSION

One of the objectives of the present study was to compare the responses between the group of adults and the group of elderly people with mild hearing loss on the participation restriction inventory. Through the application of the HHIE-S and the HHIA, a significant difference was observed between the responses of the two groups as shown in Figure 1, indicating a greater perception of the restriction of participation of adult individuals.

Such findings are consistent with those of a study that aimed to better understand the variables that affect the HHIE/HHIA responses. The authors found that adults had higher scores than the elderly. They also raised the hypothesis that this difference between the groups occurred due to the way participants were recruited since younger people applied to participate in the research because they had more hearing and general health complaints⁽¹³⁾. The findings of the present study do not converge with this hypothesis, considering that the entry of all participants was by spontaneous demand in a service that only addresses hearing health issues.

The same article also explains that other aspects of the patient's life can influence the hearing aid adaptation process, such as the use of the device and the individual's mental health status. Complementing these data, a sociodemographic research study observed a positive association between the degree of participation restriction and socioeconomic situation⁽⁹⁾. Considering that the adult population is still in the job market and that the adequacy of this factor directly impacts the socioeconomic aspect, quality of life and, consequently, the HHIA responses⁽¹⁴⁾, it is believed

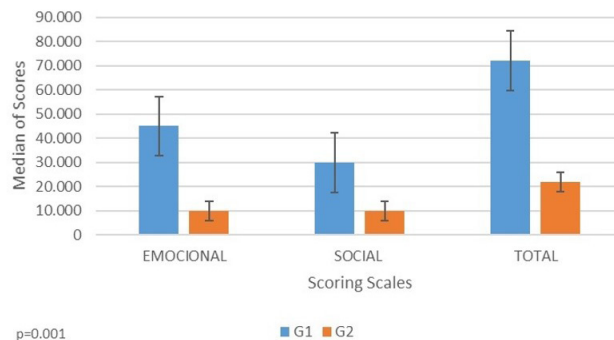


Figure 1. Comparison between the medians of Group 1 and Group 2. Significant values ($p \leq 0.05$), the Mann-Whitney test
Subtitle: G1 = Group 1; G2 = Group 2

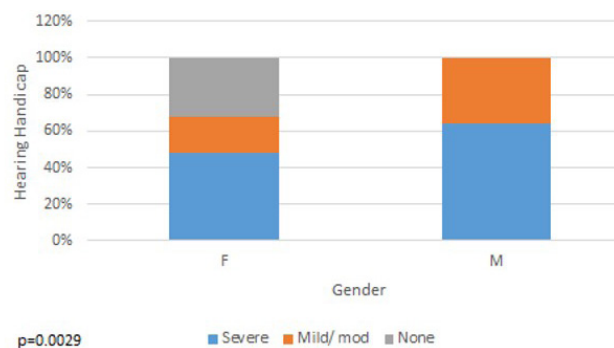


Figure 2. Relationship between average high-frequency hearing thresholds and degree of participation restriction. Significant values ($p \leq 0.05$), One-Way Analysis of Variance test
Subtitle: Sev perc = Severe perception; Mld to mod perc = Mild to moderate perception

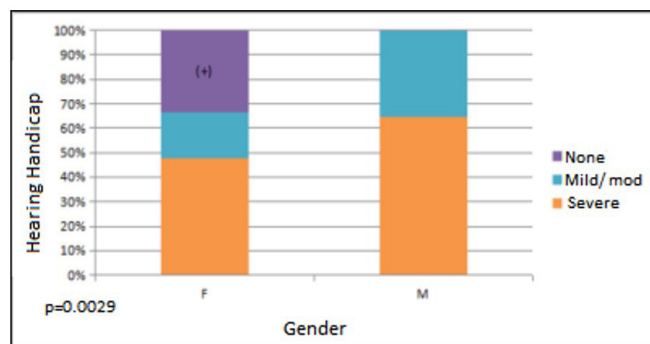


Figure 3. Relationship between participation restrictions and gender. Significant values ($p \leq 0.05$), Chi-Square test
Subtitle: Sev perc = Severe perception; Mld to mod perc = Mild to moderate perception; F = Feminine; M = Masculine

that for this reason, adults, even though they were a small sample in the present study, presented higher scores on the inventory.

Another objective of the present research was to relate the degree of restriction with hearing loss in HF in adults and elderly people with mild hearing loss. Statistical analyses indicated that

the loss of HF did not significantly affect the social participation of these individuals, as shown in Figure 2.

Studies that analyzed the relationship between increasing age and increased hearing loss in HF observed that thresholds between 9k Hz and 20k Hz are more sensitive to the aging process than lower frequencies⁽⁷⁾.

Analyzing the same aspect, a study used otoacoustic emissions evoked from HF to verify the prevalence of hearing loss in this region and found that age influences hearing loss from HF, and may even be a predictor of presbycusis⁽¹⁵⁾. There is also a record in the literature that indicates differences in HFA results between genders, noting that men presented worse thresholds than women⁽⁷⁾.

However, the findings of the current study indicated that women had higher HHIE/HHIA values than men, demonstrating a greater perception of the restricted participation of this group. The divergences between the aforementioned findings reinforce the hypothesis that not only hearing thresholds, whether from conventional audiometry or HFA, but also social and environmental factors influence the way in which hearing loss is perceived by the individual⁽⁹⁾.

A study suggests that the *handicap* perception may be more correlated to the time of sensory deprivation than to gender or age variables⁽¹⁶⁾. There are positive correlations between the degree of sensorineural hearing loss and the degree of *handicap* perception, which substantiates the previous assumption⁽¹⁷⁾.

From the perspective of the data presented in the present work, such results can contribute to a more in-depth understanding of how each population behaves in the face of hearing loss and how this can affect the hearing rehabilitation process.

CONCLUSION

Adults have higher rates of perceived participation restrictions when compared to the elderly, however, the HHIE and HHIA results are not related to hearing loss at high frequencies in the studied population. Furthermore, it was possible to observe that women tend to have higher levels of social participation restrictions than men.

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