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# Hearing screening and perceived participation restriction in the elderly

## Triagem auditiva e percepção da restrição de participação social em idosos

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## ABSTRACT

**Introduction:** Portable equipment can now perform screenings that identify possible hearing loss, allowing a greater number of people to be evaluated. Self-assessment questionnaires may also provide an overview of the elderly's perception of their problem. **Purpose:** To examine if the hearing-screening results in the elderly are related to their perceived restriction in social participation, and whether they are influenced by age, gender and schooling. **Methods:** A cross-sectional study was carried out with elderly people of two cohabitation centers. Medical history and participant details were collected, including name, age, and schooling data. Visual inspection of the external auditory meatus and hearing screening using portable equipment were then performed. The Hearing Handicap Inventory for the Elderly – Screening Version (HHIE-S) questionnaire was then administered in the form of an interview. The HHIE-S consists of ten questions divided into two scales—social and emotional - each composed of five questions. The data were then statistically analyzed. **Results:** Sixty-four elderly people, comprising men and women, with a mean age of 70 years and 8 months, were evaluated. Of these, 48 (75%) were classified as without perceived restriction, 12 (18.75%) with mild to moderate perceived restriction, and four (6.25%) with significant perceived restriction, according to the questionnaire criteria. The screening and questionnaire results were not influenced by gender and schooling. Age did not influence the questionnaire score, but was associated with the hearing-screening outcome. There was a relationship between hearing screening and scores on the questionnaire. **Conclusion:** Elderly patients who "failed" the hearing screening had higher scores in the questionnaire and older adults had worse hearing-screening results.

**Keywords:** Hearing; Self-assessment; Aging; Aged; Mass screening

## RESUMO

**Introdução:** Aparelhos portáteis realizam triagem que identifica possíveis alterações auditivas, permitindo maior número de beneficiados. Além disso, questionários de autoavaliação podem oferecer panorama da percepção que o idoso tem do seu problema. **Objetivo:** Verificar se os resultados da triagem auditiva em idosos se relacionam com a percepção da restrição de participação social e se existe influência da idade, gênero e escolaridade, nas variáveis. **Métodos:** Estudo transversal realizado com idosos em dois centros de convivência. Foi realizada uma anamnese, em que constavam dados de identificação, idade e escolaridade. Foi realizada a inspeção visual do meato acústico externo e, em seguida, a triagem auditiva, utilizando equipamento portátil. Em forma de entrevista, aplicou-se o questionário *Hearing Handicap Inventory for the Elderly – Screening Version* (HHIE-S), constituído de 10 questões e dividido em duas escalas, a social e a emocional, cada uma composta de cinco questões. Os dados foram tabulados e analisados estatisticamente. **Resultados:** Foram avaliados 64 idosos, de ambos os gêneros, com média de idade de 70 anos e 8 meses. Destes, 48 (75%) apresentaram-se sem percepção de restrição, 12 (18,75%), com percepção leve a moderada e quatro (6,25%), com percepção significante, segundo classificação do questionário. Os resultados da triagem e do questionário não foram influenciados pelo gênero e pela escolaridade. A idade também não influenciou a pontuação do questionário, porém, houve associação da idade com a triagem e também houve associação entre a triagem auditiva e o questionário. **Conclusão:** Idosos que "falharam" na triagem auditiva apresentaram maior pontuação no questionário e idosos mais velhos apresentaram piores resultados na triagem auditiva.

**Palavras-chave:** Audição; Autoavaliação; Envelhecimento; Idosos; Programas de rastreamento

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## INTRODUCTION

The elderly population is growing considerably and it is therefore necessary for health professionals to be prepared to work with this group. Aging brings morphological and functional changes in the individual, which also reach the inner ear, causing hearing difficulties[1].

*Presbycusis* is bilateral sensorineural hearing loss due to aging[2,3], and is characterized by a descending progression of impairment, initially affecting high frequencies, and progressing more rapidly in elderly males[1,4]. In addition to hearing loss, the most common complaints in this group are difficulties in understanding speech in noisy environments and inadequate sound source location[1,5,6,7].

With hearing loss and difficulties in understanding speech, the elderly may feel insecure, participating less in social activities. Hearing loss and social isolation may also influence cognitive decline, compromising the process of verbal communication[2]. In addition, these factors can lead to anxiety, low self-esteem, depression, and deprivation of daily life activities[2,6,8,9].

Among the existing audiological assessments, pure tone audiometry is the gold standard test for the diagnosis of hearing loss. However, this testing requires specialized, high-cost devices[10], trained personnel[11], and is often difficult to access[12]. There are also portable devices that perform a screening that identifies possible hearing alterations, allowing a greater number of elderly people to benefit. When such alterations are identified, the individual should be instructed to perform the audiometry examination. From the complete evaluation, the presence or absence of hearing loss can be diagnosed, and the necessary assistance provided[13].

These cited evaluations, however, are not able to analyze emotional and social issues that can affect the elderly. Self-evaluation questionnaires may provide an overview of the elderly's perception of their problem[3,14].

One of these questionnaires is the Hearing Handicap Inventory for the Elderly – Screening Version (HHIE-S), a reduced version of the Hearing Handicap Inventory for the Elderly (HHIE)[15], adapted for the Portuguese language[16] and easy to understand for the elderly. From the results obtained, it is possible to assess the individual's perception of their hearing problem, whether it affects their personal relationships, and whether it limits their activities, as well as other restrictions on their social participation (handicap)[5].

In the literature, there is a lack of research on hearing screening in the elderly. There is therefore a need to explore this field, because early detection of possible hearing loss, and a complete evaluation, can allow the implementation of important guidelines and, if necessary, intervention through auditory rehabilitation.

Thus, the objectives of this study were to examine whether hearing-screening results in the elderly are related to the perceived restriction in social participation and whether these are influenced by age, gender and schooling.

## METHODS

This was a cross-sectional study approved by the Research Ethics Committee (CEP) of the *Universidade Federal do Rio Grande do Sul* (protocol number 036/2010). All participants in this study gave informed consent.

The study was explained to older adults from two community centers of Porto Alegre (RS), when they were invited to participate of the research. All those who volunteered to participate with the research were included. These community centers consist of a greater number of women compared to men, as with most places that receive elderly people for sports and/or leisure activities. Individuals who presented total obstruction of the external auditory meatus, unilaterally, or bilaterally, were excluded.

Initially, a medical history was taken for the study, which included the participant's name, age, and schooling. In order to verify external ear conditions, visual inspection of the external auditory meatus was performed. Hearing screening was then performed using the HearCheck Screener portable device (Siemens®). This unit emits a series of six pure tones, at the frequency of 1000 Hertz (Hz) at intensities of 55, 35 and 20 decibels at the hearing level (dBNA), and at 3000 Hz at intensities of 75, 55 and 35 dBNA.

The equipment was positioned on the external ear of the participant, who was asked to signal, for each tone, whether or not the stimulus was heard. The six-tone sequence was played in both ears, one at a time. To be considered to have "passed" the hearing screening, the participant had to notice at least three sounds presented for each ear. If the participant perceived fewer than three sounds, they obtained a "failed" result and had to be referred for complete auditory evaluation[17].

The questionnaire Hearing Handicap Inventory for the Elderly – Screening Version (HHIE-S) (Appendix 1)[15] was then administered by interview. The HHIE-S consists of ten questions divided into two scales, social and emotional, each consisting of five questions. When answering the questionnaire, the participant could only opt for one of three alternatives: yes (4 points), sometimes (2 points), or no (0 points), with a maximum possible score of 40 points[18]. The perceived restriction in social participation (auditory handicap) was classified from the questionnaire score as no perception of restriction (0 to 8 points), mild to moderate perception (10 to 24 points), or significant perception (above 24 points)[18].

After the data collection, the data were tabulated in Microsoft Excel® program (2007 version) and later transferred to the Statistical Package for Social Sciences (SPSS) software for statistical analysis.

Continuous variables were described by minimum, maximum, mean values and standard deviation. Categorical variables were described in absolute and relative frequencies.

Pearson's Correlation Coefficient was used to examine the relationship of age and education with hearing-screening outcomes, and with the HHIE-S questionnaire total scores. The same test was applied to compare the hearing-screening outcome and questionnaire scores by total, and by scores for individual questions. To examine the relationship of gender with hearing-screening outcomes and questionnaire scores, the Chi-Square test was used. The statistical significance level was set at 5% ($p \leq 0.05$) and the results that showed significance were marked by superscript asterisks (*).

## RESULTS

Sixty-four individuals participated in the study, 56 (87.5%) females and eight (12.5%) males. The patients were described by age, schooling, and total score on the HHIE-S questionnaire (Table 1).

**Table 1.** Description of patients regarding age, schooling, and total score on the Hearing Handicap Inventory for the Elderly – Screening Version

| Variables | Minimum | Maximum | Average | SD |
|---|---|---|---|---|
| Age | 60 | 87 | 70.69 | 6.702 |
| Education | 0 | 18 | 8.53 | 4.224 |
| Total HHIE-S score | 0 | 34 | 6.38 | 8.779 |

**Subtitle:** SD = standard deviation; HHIE-S = Hearing Handicap Inventory for the Elderly - Screening Version

The distribution of the results obtained in the auditory screening is portrayed in total and by gender (Table 2), and the total scores of the HHIE-S questionnaire are shown in Figure 1.

As for the associations of gender, age, and schooling with hearing-screening outcomes and HHIE-S questionnaire scores, it was found that the age of the participants predicted hearing-screening results (Table 3).

The average value obtained in each question of the questionnaire was examined in order to provide an overview of the results. Total questionnaire scores and scores for each question individually were both found to be related to hearing-screening results (Table 4).

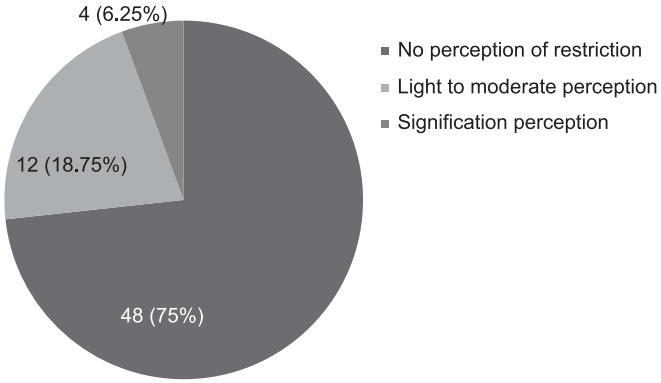


**Figure 1.** Results of the total questionnaire score on the Hearing Handicap Inventory for the Elderly - Screening Version

## DISCUSSION

The results showed that the majority of participants in the study were women, which can be explained by the characteristics of individuals who attend the community centers where the research was conducted. This also shows that women seek healthcare, physical activities, and social interaction more than men do[19].

A study in Santa Catarina performed with elderly dancers, which examined the past and present habits of physical and leisure exercises, confirmed a predominance of females in their sample[20]. This predominance of females has also been noted in other research investigating quality of life in elderly people practicing physical exercises as part of a Family Health strategy[21]. In the state of Ceará, the gender of older adults who attended community centers for the elderly was examined, revealing that 90% of their sample was female[19]. Likewise, a U.S. study examining the differences in physical activity patterns in a group of elderly people also found a high proportion of females (79%)[22].

Mean schooling among participants in the present study was eight-an-a-half years, similar to findings in other studies examining perceived participation restriction in the elderly[1,7,23].

The mean score for the HHIE-S in the present study was 6.38 points. As shown, 25% of participants showed some level of perceived participation restriction (handicap), impacting negatively in their daily life. Other surveys found higher percentages of subjects with handicap presence. A Nigerian study observed that 59.2% of their sample showed some level of perceived restriction[24], whereas another study put this figure

**Table 2.** General and gender distribution of hearing-screening results

| Variables | | Auditory screening | | | |
|---|---|---|---|---|---|
| | | "Pass" | | "Fail" | |
| | | n | (%) | n | (%) |
| General | All (n=64) | 34 | 53.12 | 30 | 46.88 |
| Genre | Male (n=8) | 2 | 25 | 6 | 75 |
| | Female (n=56) | 32 | 57.14 | 24 | 42.86 |

**Table 3.** Association of hearing-screening and the Hearing Handicap Inventory for Elderly - Screening Version by gender, age, and schooling

| Variables | Auditory screening | HHIE-S |
|---|---|---|
| | p-value | p-value |
| Genre* | 0.088 | 0.281 |
| Age | 0.009** | 0.078 |
| Education | 0.588 | 0.805 |

*Chi-square test (p≤0.05)
**Significant values (p≤0.05) - Pearson's Correlation Coefficient
**Subtitle:** HHIE-S: *Hearing Handicap Inventory for the Elderly – Screening Version*

**Table 4.** Mean values of the individual questions and the total score on the Hearing Handicap Inventory for the Elderly - Screening Version and association with hearing screening

| Variables | Average value | Auditory screening | |
|---|---|---|---|
| | | Coefficient | p-value |
| Question 1 | 0.53 | 0.438 | ≤0.001* |
| Question 2 | 0.56 | 0.353 | 0.0010* |
| Question 3 | 1.71 | 0.278 | 0.008* |
| Question 4 | 0.59 | 0.352 | 0.018* |
| Question 5 | 0.22 | 0.174 | 0.113 |
| Question 6 | 0.22 | 0.286 | 0.028* |
| Question 7 | 0.28 | 0.120 | 0.319 |
| Question 8 | 1.30 | 0.117 | 0.278 |
| Question 9 | 0.19 | 0.302 | 0.046* |
| Question 10 | 1.04 | 0.475 | ≤0.001* |
| Total Score | 6.38 | 0.456 | ≤0.001* |

* Significant values (p≤0.05) - Pearson correlation coefficient

at 86%[14]. These data differ from those found in the present study, which may be explained by the populations studied by the researchers. These populations sought clinical care in hospitals, probably because they presented hearing complaints, whereas the sample of the present study was active in many ways, and some had completed health exams. A portion of the present sample did not mention any perception of restriction, suggesting that this did not impact them or that they had adapted their routine in accordance with their limitations.

Although hearing loss is very common in the elderly population, the findings indicated that 30 (43.2%) elderly participants received a "failure" result in hearing screening. The sample consisted of active elderly people with few complaints, which may explain the low percentage of "failures". Another hypothesis for this finding is the method determined by the equipment manual (which defines "passes" for the subject who perceives at least three presented sounds) may be insufficient to identify more subtle hearing changes. Thus, although it shows high specificity, identifying individuals that do not demonstrate hearing loss, the portable device has low sensitivity, failing to point out less pronounced hearing losses, such as mild hearing loss, for example[25].

When analyzing the genders separately, it was observed that 75% of the male subjects "failed" the hearing screening. The results showed that the males showed more signs of hearing loss compared to females, agreeing with findings of other studies that sought to investigate self-reported hearing loss[1,4,26].

The association of hearing screening with age was verified, showing that more older subjects "failed" the test. There was no correlation of screening results with gender, despite the higher percentage of male subjects with a "failure" result. The literature reported a propensity of males to present more hearing loss compared to females[4,26].

As mentioned, age influenced the results obtained in the hearing screening. Due to the aging of the individual, over time, it is suggested that, the greater the age, the greater the chance of hearing loss[4]. However, recent research did not find correlations between age and audiometric means obtained[24], differing from the present study. There was also no association between screening and schooling. It is believed that schooling is not specifically related to the result obtained in hearing screening, since the aging process is natural for any individual[27], regardless of their level of education.

It was also sought to examine the association of the HHIE-S questionnaire scores with different variables and it was observed that there was no difference in the questionnaire regarding gender, age, and schooling. Similarly, the literature consulted also found no association between age and the HHIE-S questionnaire score[24]. Another study observed that older men had a higher prevalence of self-reported hearing loss[1]. Factors such as lifestyle, culture, schooling[1,5], physical health and occupation[26] can determine the level of perception of the perceived participation restriction (handicap), regardless of gender, age, and education.

Finally, the association of the mean values of each question of the HHIE-S questionnaire with the auditory screening results was investigated, in addition to the questionnaire total score. Seven of the ten questions were associated with the results of the screening, as well as the total score.

Questions 1, 2, 3, 4 and 9 are considered to be emotional, and questions 5, 6, 7, 8 and 10 are of a social nature. Questions 3 ("Do you have hearing difficulties when someone is whispering?") and 10 ("Does the hearing problem cause difficulties when you are in a restaurant with relatives or friends?") were the most relevant for the sample in question, since these were two of the highest scores, in addition to their association with hearing-screening results. Understanding whispered speech and speech in an environment with competitive noise are difficulties presented by individuals with hearing loss[28,29]. Question 8 ("Does the hearing problem cause difficulties when watching television or listening to the radio?") also scored higher, but did not present any association with screening. The difficulties of watching television and radio are common, hearing-related complaints in the elderly population, and speech problems are common, even in the absence of hearing loss[30].

There was a significant association between screening results and all issues of an emotional nature, consistent with discomfort, frustration, disadvantage, and limitations in the face of hearing difficulties. There was also an association of screening results with social issues 6 and 10, related to the low frequency of religious cults and hearing difficulties in the restaurant. In fact, older people who "failed" the hearing screening presented higher scores on the questionnaire, demonstrating how hearing difficulties interfere with communicative situations, causing emotional and social problems[7], and possibly also leading to involuntary changes in their routine[1].

There was an association between hearing-screening results and total questionnaire score. Individuals who "failed" the hearing screening had a greater perception of social participation restriction. This restriction impacts on social life, related to the communicative interaction essential for individuals[7].

## CONCLUSION

Older individuals had worse hearing-screening results, and elderly individuals who "failed" the hearing screening presented higher scores in the social participation questionnaire. Therefore, there was a relationship between hearing-screening results in the elderly and their perception of social participation restriction.

The hearing-screening results were influenced by age, but not by gender and schooling. The social participation questionnaire score was not influenced by age, gender, or schooling.

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**Appendix 1.** Questionnaire: Hearing Handicap Inventory for the Elderly - Screening Version (HHIE-S)

| Questioning | Punctuation | | |
|---|---|---|---|
| | Yes | Sometimes | No |
| 1. Does the hearing problem make you uncomfortable when you meet new people? | | | |
| 2. Does the auditory problem make you feel frustrated when talking to family members? | | | |
| 3. Do you have hearing difficulties when someone is whispering? | | | |
| 4. Do you feel handicapped by a hearing problem? | | | |
| 5. Does the hearing problem cause difficulties when you visit friends, relatives, or neighbors? | | | |
| 6. Does the auditory problem make you attend less religious services than you would like? | | | |
| 7. Does the auditory problem make you argue with your family members? | | | |
| 8. Does the hearing problem cause difficulties when you are watching television or listening to the radio? | | | |
| 9. Do you experience any difficulty with your limits / hearing difficulties in your personal or social life? | | | |
| 10. Does the hearing problem cause difficulties when you are in a restaurant with relatives or friends? | | | |
| Sum of points | | | |

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# ERRATUM

In the article **Hearing screening and perceived participation restriction in the elderly**, DOI number: http://dx.doi.org/10.1590/2317-6431-2017-1867, published in journal Audiology - Communication Research, 23:e1867, page 1:

Where it reads:
"Adriane Ribeiro Teixiera"

It should read:
"Adriane Ribeiro Teixeira"