

Influence of Tinnitus Percentage Index of Speech Recognition in Patients with Normal Hearing

Influência do Zumbido no Índice Percentual de Reconhecimento de Fala em Pacientes Normo-ouvintes

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SUMMARY

Introduction: The understanding of speech is one of the most important measurable aspects of human auditory function. Tinnitus affects the quality of life, impairing communication.

Objective: To investigate possible changes in the Percentage Index of Speech Recognition (SDT) in individuals with tinnitus have normal hearing and examining the relationship between tinnitus, gender and age.

Methods: A retrospective study by analyzing the records of 82 individuals of both genders, aged 21-70 years, totaling 128 ears with normal hearing. The ears were analyzed separately, and divided into control group, no complaints of tinnitus and group study, with complaints of tinnitus. The variables gender and age groups and examined the influence of tinnitus in the SDT. It was considered normal, the percentage of 100% correct and changed, and the value between 88-96%. These criteria were adopted, since the percentage below 88% correct is found in individuals with sensorineural hearing loss.

Results: There was no statistically significant difference between the variables age and tinnitus, and tinnitus SDT, only gender and tinnitus. The prevalence of tinnitus in females (56%), higher incidence of tinnitus in the age group 31-40 years (41.67%) and fewer from 41 to 50 years (18.75%) and on the SDT there was a greater percentage change in individuals with tinnitus (61.11%).

Conclusion: The buzz does not interfere with SDT and there is no relationship between tinnitus and age, only between tinnitus and gender.

Keywords: hearing, tinnitus, speech intelligibility, speech audiometry, age groups, sex distribution.

RESUMO

Introdução: A compreensão da fala é um dos aspectos mensuráveis mais importantes da função auditiva humana. O zumbido prejudica a qualidade de vida, prejudicando a comunicação.

Objetivo: Investigar possíveis alterações no Índice Percentual de Reconhecimento de Fala (IPRF) em indivíduos portadores de zumbido que apresentem audição normal e analisar a relação entre zumbido, gênero e idade.

Método: Estudo retrospectivo, através da análise de prontuários de 82 indivíduos de ambos os gêneros, com idade entre 21 a 70 anos, totalizando 128 orelhas com audição normal. As orelhas foram analisadas separadamente, e divididas em grupo controle, sem queixas de zumbido, e grupo estudo, com queixas de zumbido. Foram analisadas as variáveis gênero e faixa etária dos grupos e verificada a influência do zumbido no IPRF. Considerou-se normal, o percentual de 100% de acertos, e alterado, o valor entre 88 a 96%. Foram adotados estes critérios, já que o percentual inferior a 88% de acertos é encontrado em indivíduos com perdas auditivas neurossensoriais.

Resultados: Não se observou diferença estatisticamente significativa entre as variáveis faixa etária e zumbido, IPRF e zumbido, somente entre gênero e zumbido. Encontrou-se prevalência de zumbido no gênero feminino (56%), maior ocorrência de zumbido na faixa etária de 31 a 40 anos (41,67%) e menor ocorrência entre 41 a 50 anos (18,75%) e quanto ao IPRF, houve maior percentual de alterado em indivíduos portadores de zumbido (61,11%).

Conclusão: O zumbido não interfere no IPRF e não há relação entre zumbido e idade, somente entre zumbido e gênero.

Palavras-chave: audição, zumbido, inteligibilidade da fala, audiometria da fala, grupos etários, distribuição por sexo.

INTRODUCTION

There is a strong correlation between tinnitus and hearing loss (1), and the buzz is found in 65% of sensorineural hearing loss, mixed losses of 5% and 4% of conductive hearing loss, but there are data showing the presence of tinnitus also individuals with normal hearing (2). In the latter case, the isolated presence of tinnitus can be the first symptom of a pathology that is only diagnosed after the onset of hearing loss.

Tinnitus is characterized as a disease but as a symptom, however, affects thousands of people worldwide (3).

The speech recognition is one of the most important measurable aspects of human auditory function (4). Tinnitus affect the quality of life, causing impairment in communication (5).

For a complete audiological diagnosis is essential to carry out measures of speech recognition (4). Percentage Index of Speech Recognition (IPRF) aims to measure the intelligibility of speech, being held in a fixed intensity and comfortable for the patient, which should be repeated as many monosyllabic words correctly (6.7). By analysis of the SD, one can observe the degree of difficulty understanding speech. It is considered the result as expected, when the percentage is 88 to 100% accuracy, with the intensity shown at 40 dB above the average three-tone (500, 1000 and 2000 Hz) (6).

The presence of tinnitus and low IPRF can produce significant changes in the individual's communication and consequently the quality of life. The aim of this study is to investigate possible changes in SD from individuals with tinnitus have normal hearing and examining the relationship between tinnitus, gender and age.

METHOD

We performed an exploratory research, to approach the problem quantitatively, covering activities and bibliographical analysis 480 audiological assessment database of the Audiology Clinic of the University Hospital of Santa Maria (HUSM) assisted in the years 2005, 2006, 2007 and January-August 2008.

Inclusion criteria for this study were: to present normal audiological evaluation, presence or absence of tinnitus complaints referred to the audiological history and integrity of tympanic-ossicular system checked by tympanometry (type A tympanogram curve and acoustic

reflexes present). Was considered normal audiological evaluation showed that the hearing thresholds equal to or less than 25 dB at frequencies from 250 to 8000 Hz (8).

The audiological evaluation consisted of:

- Tone audiometry (PTA);
- Speech audiometry (Speech Reception Threshold - LRF and Percentage Index of Speech Recognition - SRI);
- Immittance (tympanometry and acoustic reflexes).

Percentage Index of Speech Recognition (SRI) is a measure of speech intelligibility in a fixed intensity at which the individual can correctly repeat as many words. It uses a list of 50 monosyllabic words, 25 words are presented to each ear at an intensity of 40 dB SL. It is expected that individuals with normal hearing have between 92 to 100%, ie, the individual may submit up to two errors (7).

Of the 480 hearing assessments analyzed, only 82 were in accordance with the criteria for inclusion. These evaluations were divided into the Control Group (CG), composed of individuals without tinnitus and Study Group (SG), composed of individuals with tinnitus, but in this study were analyzed separately in the ears of the above criteria. The two groups were composed of individuals of both sexes.

The sample age ranged from 21 to 70 years of age.

Patients were classified into five age groups:

- Track 1: from 21 to 30 years;
- Track 2: 31 to 40 years;
- Track 3: from 41 to 50 years;
- Track 4: 51 to 60 years;
- Track 5: from 61 to 70 years.

Were statistically analyzed gender or tinnitus, tinnitus and age, as well as the influence of tinnitus in IPRF Study Group.

For statistical analysis, this study classified the results of the SD as IPRF without influence, as the rate obtained was 100% correct answers and how to influence IPRF, when the value was 92 and 96%. These criteria were adopted, since the study was composed only of normal hearing subjects, namely, that IPRF showed above 88%. The percentage of less than 88% accuracy is found in individuals with sensorineural hearing loss (7).

The groups were statistically analyzed through nonparametric tests and *chi-square* test of difference between two proportions, and the significant value of 0.05 (5%), which is statistically significant when the value

calculated significance (*p*) is lower than the level of significance.

This study is linked to the Project “Research and data base on hearing health,” being duly registered with the Ethics Committee under number 0138.0.243.246-06.

RESULTS

By inclusion criteria, 82 individuals were selected, totaling 128 ears with normal hearing. For this study were analyzed separately for each ear within the criteria for inclusion, for each ear is behaving statistically independent.

The control group (CG) comprised 56 ears of patients aged between 22 and 66 years, 42 females and 14 males.

The study group (SG) consisted of 72 ears of patients aged 21 to 70 years, 40 ears were female and 32 male.

Of the 480 records, 17.08% had normal hearing and 7.5% complained of tinnitus, and both analyzed in this study.

The prevalence of female gender in both groups, with percentage of 56% in the study group and 75% in the control group (Graphic 1). With respect to gender and the presence or absence of tinnitus, significant difference was found, using the *chi-square test* ($p=0.023$). This difference found is due to the high number of females in the control group.

We used the *chi-square test* to compare the gender variable with IPRF without influence and with influence, but there was no significant difference ($p=0.787$), however, note that there was a greater number of IPRF with influence in female (Table 1).

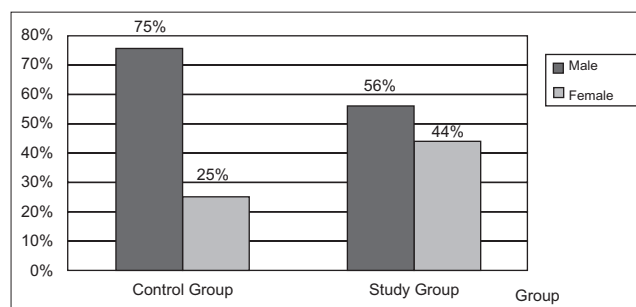
Among subjects of the SG (with complaints of tinnitus), we observed that the age group 31 to 40 years (range 2) showed a higher incidence of tinnitus (41.67%) (Graphic 2), however, the mean age individuals with no influence IPRF (41.43 years) and influence with IPRF (41.57 years) is aged 41 to 50 years (range 3).

Comparing the age of the sample, it was observed that the age group less than complained of tinnitus was 41 to 50 years (range 3), 18.75%. What had more complaints of tinnitus, was the second track (31-40 years) with 23.44%, in agreement with the previous graphic (Graphic 2). The age group 5 (61-70 years) showed the lowest number of ears in both groups (Graphic 3).

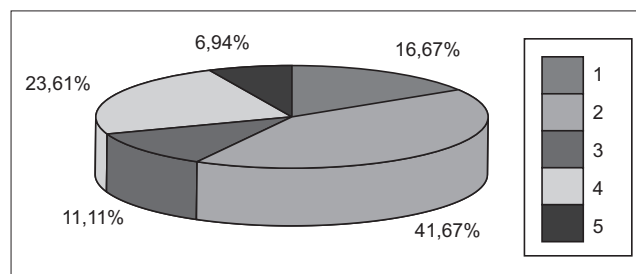
Table 1. X IPRF Gender.

Gender	IPRF without influence	IPRF with influence	p-value
Female	15	25	0,787
Male	13	19	

* Test statistic *chi-square*



Graphic 1. Individuals distributed as to gender.

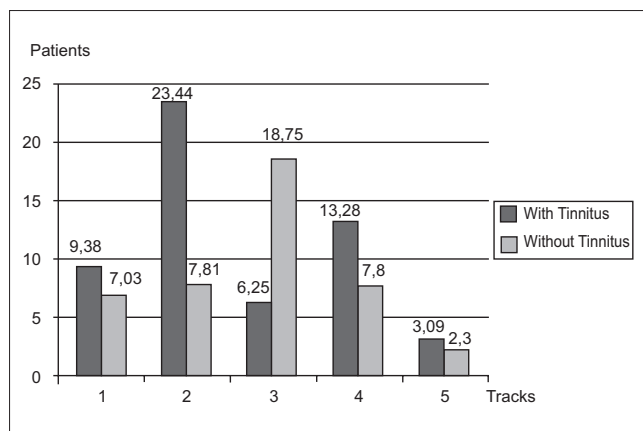


Graphic 2. Sample of tinnitus patients distributed as the variable age.

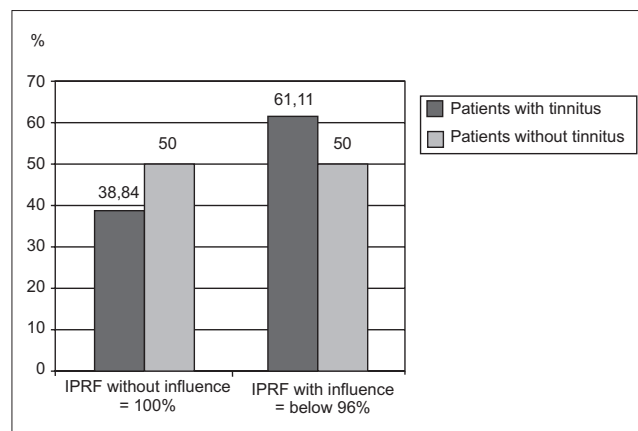
Analyzing the variables tinnitus and IPRF in both groups, there was no statistically significant difference when applied the *chi-square* ($P=0.20$). However, it was found that there is a higher percentage of IPRF with influence in patients with tinnitus (61.11%) compared to non-carriers (50%). Comparing further the influence of IPRF with both groups, by testing for difference between two proportions ($p=0.21$) was not statistically significant difference (Graphic 4).

DISCUSSION

According to the National Institute of Health, tinnitus is a very common symptom, affecting approximately 15% of Americans (9). One study (10) on the prevalence of tinnitus in a random sample of a Brazilian capital, said 25% of respondents had such a complaint, regardless of audiometric configuration presented. However, this study, only individuals with normal hearing, 7.5% of subjects treated in the period studied, with complaints of tinnitus. This finding agrees



Graphic 3. Age group x number of patients.



Graphic 4. Percentage of patients x IPRF.

with the literature, which reports (1, 11) very close to this percentage (7.4% and 8-10%).

Females predominated in both groups (Graphic 1), with no significant differences between groups. These findings corroborate other studies (1) similar, in which the proportion of women was also higher in both groups (67.3% in the study group and 55.6% in control group), but no significant difference between groups.

The study covered a wide age range (21 to 66 years). For some authors (12) tinnitus can affect all age groups. The age group with the highest number of individuals with tinnitus was 31 to 40 years (41.67%). Result similar to that found in the literature (13), which states a greater number of individuals aged below 40 years (46.6%).

Some research (1,14) say that the buzz appears after age 40 and another study reported an average age of the group with tinnitus of 45.62 years (14). Contradicting these studies found that people aged 41 to 50 years (age 3) had fewer complaints of tinnitus.

Regarding age, we found few individuals in the range of 61 to 70 years in both groups. It is believed that this small number of individuals due to the high incidence of hearing loss in this age group, which is not included in the objectives of this study. There is prevalence of hearing loss in elderly patients, usually with an average age of 65 years (2). Literature (15) still shows an increase of tinnitus with increasing age.

About 95% of the normal population has experienced tinnitus, but it is considered important when it becomes continuous and troublesome (16). Cases of tinnitus in normal hearing individuals constitute a significant sample, because their characteristics can be attributed to tinnitus,

and not to hearing loss (17). In these cases the impact is greater, causing anxiety, irritation, tension, insomnia, and sometimes even depression (18,19).

The patient suffering from tinnitus should always be subjected to medical assessment for diagnosis and treatment of possible underlying pathology (20). It is believed that the individuals affected, a loss occurs the modulation of outer hair cells with normal inner hair cells, generating an abnormal activity in the auditory pathways, erroneously interpreted as sound. The outer hair cells more susceptible to injury are those located in the most basal region of the cochlea. Another hypothesis for the occurrence of tinnitus in individuals without hearing loss, could be explained by diffuse damage of up to 30% of outer hair cells throughout the cochlear spiral, with no impairment of the auditory threshold (3).

In view of this and considering that the buzz is in most cases, a debilitating problem (21) may lead to the bearer of a suicide attempt (22), emphasizes the importance of research on tinnitus.

Its cause is still unclear, but there are many hypotheses. It can be a symptom of some diseases, such as ear, metabolic, psychiatric, dental, trauma, cardiovascular, neoplastic, neurological and pharmacological (9, 23,24).

It is known that tinnitus is a disorder that produces discomfort in social life, work performance and even family relationships (25). In most cases, can become intolerable, going to interfere with sleep, concentration and emotional balance (26).

A greater number of IPRF with influence in females, probably due to gender in prevalence since the two groups. The average age of individuals with influence IPRF found himself at the age of 41 to 50 years (range 3). One

possible explanation for this deterioration in speech recognition, especially in this age group, would be the beginning of the aging effect, beyond the influence of tinnitus. One study (27) on aging and speech recognition in normal hearing subjects, the analysis of the thresholds of sentences in quiet and in noise, found that speech recognition of individuals over 50 years was significantly lower than those of adults.

No studies were found relating tinnitus and speech tests. In this study, no significant relationship was found between the presence of tinnitus and the decrease of the SD in patients with normal hearing.

There are reports in the literature (28) correlating tinnitus and difficulty understanding speech in individuals with complaints of hearing loss, and there are few studies in normal hearing subjects.

CONCLUSION

It was concluded that the presence of tinnitus does not interfere with speech intelligibility, analyzed using the IPRF, and there is no relationship between tinnitus and age. A relationship was found between tinnitus and the female gender.

Due to the results found in this study and found little literature, we suggest further studies with larger samples on this subject.

BIBLIOGRAPHIC REFERENCES

1. Sanchez TG, Medeiros IRT, Levy CPD, Ramalho JRO, Bento RF. Zumbido em pacientes com audição normal: caracterização clínica e repercussões. *Rev Bras Otorrinolaringol.* 2005, 71(4):427-31.
2. Moura LOS, Iorio MCM, Azevedo MF. A eficácia da adaptação da prótese auditiva na redução ou eliminação do zumbido. *Rev Bras Otorrinolaringol.* 2004, 70(5):624-631.
3. Figuerêdo RBS, Corona AP. Influência do zumbido nos limiares de altas frequências. *Rev Soc Bras Fonoaudiol.* 2008, 12(1):29-33.
4. Caporali, SA, Silva JA. Reconhecimento de fala no ruído em jovens e idosos com perda auditiva. *Rev Bras Otorrinolaringol.* 2004, 70(4):525-32.
5. Silva RCF, Bandini HHM, Soares IM. Aparelho de amplificação sonora individual: melhora a sensação de zumbido? *Rev CEFAC.* 2007, 9(2):263-68.
6. Gómez MVSG, Pedalini MEB. Testes Audiológicos para a Identificação de Alterações Cocleares e Retrococleares. Em: Lopes Filho O. *Tratado de Fonoaudiologia.* São Paulo: Roca; 1997. p.127-47.
7. Russo I, Lopes LQ, Brunetto-Borgianni LM, Brasil LA. Logaudiometria. In: Momensohn-Santos TM, Russo ICP. *Prática da Audiologia Clínica.* São Paulo:Cortez; 2007. p.135-54.
8. Davis H, Silverman RS. *Hearing and deafness.* 3rd ed. New York: Holt, Rinehart & Winston; 1970.
9. Sanchez TG, Ferrari GMS. O que é zumbido? Em: Samelli AG. *Zumbido: avaliação, diagnóstico e reabilitação: abordagens atuais.* São Paulo: Lovise; 2004. p.17-22.
10. Gomes SJV, Barboza RM, Santos TMM. A incidência de zumbido numa amostra aleatória na cidade de Salvador. *Rev CEFAC.* 2004, 6(1):89-93.
11. Barnea G, Attias J, Gold S, Shahar A. Tinnitus with normal hearing sensitivity: extended high-frequency audiometry and auditory nerve brain-stem-evoked responses. *Audiology.* 1990, 29:36-45.
12. Józefowicz-korczynska M, Pajor A. Evaluation of oculomotor tests in patients with tinnitus. *Int Tinnitus J.* 2002, 8(2):100-3.
13. Almeida LD, Mitre EI, Lemos L, Simões ECC. Vestibulometria em Indivíduos com Zumbido e Exames Audiológicos Normais. *Rev CEFAC.* 2005, 7(3):382-87.
14. Schneider D, Schneider L, Shulman A, Claussen CF, Just E, Koltchev C, *et al.* Ginkgo biloba (Rökan) therapy in tinnitus patients and measurable interactions between tinnitus and vestibular disturbances. *Int Tinnitus J.* 2000, 6(1):56-62.
15. Baguley DM. Mechanisms of tinnitus. *Br Med Bull.* 2002, 63:195-202.
16. Branco F. Tratamento fonoaudiológico do zumbido. Em: I Simpósio de atualização em audiologia da UFMG. Universidade Federal de Minas Gerais. Minas Gerais: Belo Horizonte, 2003.
17. Sanchez TG, Medeiros IRT, Levy CPD, Ramalho JRO, Bento RF. Zumbido em pacientes com audiometria normal: caracterização clínica e repercussões. *Rev Bras Otorrinolaringol.* 2005, 71(4):427-31.
18. Mueller HG, Hall JW. Audiologist desk reference. Em: _____. *Audiologic management, rehabilitation, and terminology.* San Diego: Singular, 1998. p.611-40.

19. Fukuda Y. Zumbido: diagnóstico e tratamento. *Rev Bras Otorrinolaringol.* 1997, 4(2):39-43.
20. Mor R, Azevedo MF. Emissões otoacústicas e sistema olivococlear medial: pacientes com zumbido sem perda auditiva. *Pró-fono.* 2005, 17(3):283-92.
21. Jastreboff P, Hazell JWP. A neurophysiological approach to tinnitus: clinical implications. *Brit Journ of Audiol.* 1993, 27:7-17.
22. Fukuda Y. Zumbido Neurosensorial. *Rev Neurociências.* 2000, 8(1):6-10.
23. Seidman MD, Jacobson GP. Update on tinnitus. *Otology Clin North Am.* 1996, 29(3):455-65.
24. Sanchez TG, Bento RF, Miniti A, Câmara J. Zumbido: características e epidemiologia. Experiência do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo. *Rev Bras Otorrinolaringol.* 1997, 63(3):229-35.
25. Caovila HH, Silva MLG, Munhoz MSL, Gananga MM. Entendendo as tonturas: o que você precisa saber sobre os distúrbios do labirinto. São Paulo: Atheneu; 1999.
26. Sanchez TG. Zumbido: Análise crítica de uma experiência de pesquisa. São Paulo; 2003. (Tese de Livre-Docência, Faculdade de Medicina da Universidade de São Paulo).
27. Soncini F, Costa MJ, Oliveira TMT. Influência do processo de envelhecimento no reconhecimento da fala em indivíduos normo-ouvintes. *Pró-fono.* 2003, 15(3):287-296.
28. Moreira RR, Ferreira Junior M. Testes de fala: aplicação em portadores de perda auditiva induzida por ruído. *Pró-fono.* 2004, 16(3):293-300.