Results of a Test of Temporal Resolution in Elderly With Different Levels Socioeconomic Cultural

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Abstract- Purpose: to apply, analyze and discuss the results of the Random Gap Detection Test (RGDT) in two groups of elderly people with hearing loss, consistent with presbycusis, who wear hearing aids, but are in different socioeconomic and cultural levels. Methods: cross-sectional descriptive study. The study included 85 elderly people with presbycusis, divided into: Group A (those in a higher cultural socioeconomic level); and Group B (subjects with less favored socioeconomic cultural status). All participants responded to a specific interview, underwent pure tone audiometry for air and bone conduction and underwent a Random Gap Detection Test.

Results: the group with higher socioeconomic and cultural status responded significantly better to the test, while the less favored group had significant difficulties in understanding the purpose of the test.

Conclusion: The RGDT seems to be influenced by socioeconomic and cultural issues. We suggest caution in its use in disadvantaged cultural and socioeconomic populations.

Keywords: presbycusis; elderly; temporal resolution; hearing test.

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Results of a Test of Temporal Resolution in Elderly With Different Levels Socioeconomic Cultural

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I. Introduction

Aging may affect the processing of auditory information, either by peripheral changes, in the case of presbycusis, for central alterations, in the case of decreased efficiency of auditory skills.[1]

One of the complaints that most annoys elderly individuals with cochlear hearing loss, a characteristic of presbycusis, is the difficulty in understanding speech sounds even when wearing hearing aids.[2] Such complaints may be associated with temporal processing, which in turn, is the ability to process minimum acoustic events that are fundamental to the perception of speech and music, or changes in the sound within a restricted period, translating into an essential component of a larger capacity for auditory processing.[3-4]

Temporal resolution (RT) is defined as the minimum time required for the central nervous system to differentiate two acoustic stimuli. The ability of the auditory system to detect rapid changes in sound stimulus is an important factor in speech perception because it contributes to the identification of small phonetic elements in speech, and alterations in this auditory ability suggest interference in the perception of normal speech and the recognition of phonemes.[5] The minimum interval identified by the patient is called the temporal resolution threshold.[3]

Currently there is a growing interest by healthcare professionals who treat elderly patients with hearing aids to expand audiological research and include tests of auditory processing in order to identify conditions favorable or unfavorable to the use of sound amplification.

A test used in speech-language therapy to investigate RT is the Random Gap Detection Test (RGDT). The test consists of the production of pure tones randomly paired with time intervals ranging from zero to 40ms, and the test subject is oriented to respond upon hearing one or two stimuli. According to the test's author[6], it is expected that individuals without RT alterations can identify gaps up to 20ms.

Individuals with higher thresholds than 20ms can have difficulty in understanding speech because if the subject's RT threshold is greater than the duration of the sounds formed in the word, there is a reduction of the extrinsic redundancies in speech and thus this person may have hearing differentiation difficulties.[7]

The RGDT has been used in research on populations of different age groups.[1,8-9] Because of this, it is known, for example, that the RT threshold increases in elderly individuals.[10]

Also investigated has been the variable of "social level", and surveys show that auditory processing tests and RT may be influenced by socioeconomic factors in the infant population.[9,11]

Could such data be extrapolated to the elderly? After all, it is known that individuals in the lower income strata, regardless of age, have worse health and poorer use for health services.[12]

As the authors of this article develop their activities with elderly people, an objective of this work has become to apply, analyze and discuss the results of RGDT in two groups of elderly subjects with hearing loss consistent with presbycusis, and who are hearing aid users, but are of different socioeconomic cultural backgrounds.

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II. Methods

This is an exploratory, descriptive study. The research was approved by the Research Ethics Committee under number CEP/027/2008. All participants signed a consent form, authorizing the use of the collected data.

The participants were 100 individuals divided into two groups:

Group A - 46 individuals of both genders, suffering from presbycusis, hearing aid users, and of a higher socioeconomic and cultural class (all with degrees of higher learning and personal assets).

Group B - 39 individuals of both genders, suffering from presbycusis, hearing aid users, and of a lower socioeconomic and cultural class (with an education only until primary school).

It was established as inclusion criteria to have a diagnosis of symmetrical sensorineural hearing loss, mild to moderately severe, consistent with presbycusis, and bilateral hearing aids indicated for more than six months.

Data collection occurred in two speech-language clinics – one private and the other public and accredited to the Unified Health System (SUS). The sample was selected from the follow-up visits of the service users.

All participants responded to a specific interview, which collected data on their hearing and the effective use of hearing aids.

Following that, they underwent threshold audiometry by air and bone conduction and were subjected to the RGDT at 50dbSL.

The RGDT results were classified according to the following categorization: up to 5ms, from 5.1 to 9.9ms, from 10 to 14.9ms, from 15 to 19.9ms and greater than 20ms. Subjects were considered normal if the RGDT results were between 2 and 20ms.

The studies were performed in an audiometric booth and the audiometer was evaluated according to the standards of the Federal Council of Speech Therapy (CFFa).

The results were statistically analyzed using descriptive methods (mean, standard deviation, figures) and inferential methods (Chi-square), adopting a 0.05 significance level (5%).

III. Results

In Group A, 42% of the respondents were women and 58% were men. The minimum age was 61, the maximum age 83, and the mean age 68. In Group B, 47% were women and 53% were men, with a minimum age of 60, a maximum of 79, and an average age of 71.

The categorization of the sample according to the degree and configuration of hearing loss is recorded in Table 1. Hearing loss from mild to moderate was significantly higher in both groups.

Table 1 : comparison of the sample by level and configuration of loss (n = 85)

HEARING LOSS	GROUP A		GROUP B		P
	Frequency	%	Frequency	%	
LEVEL					
Light to Moderate	46	100	32	82	0.0000*
Moderately Severe	-	0	7	18	
TOTAL	46	100	39	100	
CONFIGURATION					
Horizontal	1	2	4	10	0.1684
Sloping	44	96	34	87	
U-Shaped	1	2	-	0	
Notched	-	0	1	3	
TOTAL	46	100	39	100	

Note: Chi-square test (p<0.05). For the application of statistical tests, only two variables were considered: Horizontal and Sloping.

The comparison between the groups according to the results of the RGDT is described in Table 2 and 3.

Table 2 : comparison of the sample by rgdt results

Results in ms	GROUP A		GROUP B	
	Frequency	%	Frequency	%
Up to 5ms	7	15	0	--
5.1 – 9.9ms	10	21	0	--
10 - 14.9ms	11	23	0	--
15 - 19.9ms	16	34	0	--
Over 20ms	2	4	39	100
TOTAL	46	100	39	100

Table 3 : comparison of the sample by rgdt results

GAPS	GROUP A		GROUP B		P
	Frequency	%	Frequency	%	
Less than 20ms	44	96	-	0	0.0000*
More than 20ms	2	4	39	100	

Note: Chi-square test (p<0.05)

There is a significant difference between the groups, and the measured intervals in Group A were predominantly less than 20ms, while for Group B measured intervals were mostly higher than 20ms.

All subjects underwent training prior to the test in order to understand the methodological process. Group A showed no difficulties in understanding the way the test worked, with the prior training being sufficient. However, Group B, made up of individuals with lower socioeconomic and cultural levels, required at least three training sessions.

IV. DISCUSSION

In both groups, the predominant type of hearing loss was sensorineural of a mild to moderate degree, and downward sloping, i.e., results compatible with hearing loss that may be associated with aging, considering the age of the sample. This type of loss interferes greatly in the auditory discrimination of speech, especially in noisy or degraded environments.[3,13-14]

The RGDT allows for a training session prior to the application of the test. Normally at this time, the speech therapist guides the examinee about the type of stimulus to be heard and the type of response to be given. Respondents in Group A received the guidelines only once, while in Group B there was need for three training sessions. This greater difficulty in understanding the test may be related to the hearing loss itself; however, this possibility could be ruled out because in Group A, which also had hearing loss, this was not an impediment in the exam. We therefore believe that socioeconomic and cultural class may influence the understanding of the examination in question.

In the same way, we can make this inference in the analysis of the answers to the test presented by the two studied groups, since in Group A the score ranged from 5ms to 20ms and in Group B it was higher than 20ms. This difference was significant from a statistical point of view.

Making a purely auditory analysis, it is clear through the evidence[15], that the elderly often demonstrate the need for more time to process the information received and the speed with which these processes are carried out, which can affect hearing abilities.

Queiroz et al.[10] state that temporal resolution thresholds are increased in the elderly compared to young adults with the same peripheral auditory conditions, as recorded in this work, where more than 38% of Group A and 100% of Group B showed RGDT results that were greater than 14ms.

However, in our study we found that socioeconomic and cultural conditions can also affect the quality of answers in auditory perception, because the less favored group had worse RGDT results. This fact is supported by the literature. Balen et al.[9] investigated the influence of socioeconomic status in the temporal resolution of schoolchildren in two evaluation protocols. 44 children were evaluated and divided into three groups: Group 1: high socioeconomic status; Group 2: average socioeconomic status; Group 3: low socioeconomic status. The RGDT was applied as well as a Gaps-In-Noise (GIN) test. The average performance of Groups 1, 2 and 3 were higher in the RGDT in GIN. Regarding socioeconomic level, both tests showed statistically significant differences among the groups, i.e., there was an influence by socioeconomic status on the temporal resolution measured by the above tests.

The RGDT is an important tool in assessing the functional integrity of temporal processing in the elderly.[10]

V. Conclusions

From the data obtained in this study, it is concluded that socioeconomic and cultural factors influence the quality of the responses in the RGDT because:

a) The group with lower socioeconomic-cultural conditions showed worse results and;

b) The same group had difficulty understanding the proposed examination.

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