Efeito da prática musical no reconhecimento da fala no silêncio e no ruído***

The effect of musical practice on speech recognition in quiet and noisy situations

Fabiana Soncini*
Maristela Júlio Costa**

*Fonoaudióloga. Mestre em Distúrbios da Comunicação Humana pela Universidade Federal de Santa Maria. Endereço de correspondência: Av. Castro Alves, 785/191 - Curitiba - PR - CEP 80240-270 (fabianasoncini@terra.com.br)

**Fonoaudióloga. Doutora em Ciências dos Distúrbios da Comunicação Humana: Campo Fonoaudiológico pela Universidade Federal de São Paulo - Escola Paulista de Medicina. Professor Adjunto do Departamento de Otorrino-Fonoaudiologia da Universidade Federal de Santa Maria.

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Abstract

Background: auditory training improves the perception of complex acoustic signals as well as the perception of speech. Aim: to verify if auditory training, through the practice of music, has an influence on the ability to recognize speech in quiet and noisy situations. Method: participants of this study were 55 individuals, with no musical experience (non-musicians) and 45 professional musicians who had been playing at military bands for at least 5 years (musicians). All of the participants were male right-handed military volunteers, with normal hearing thresholds and with ages varying between 25 and 40 years. Using the Portuguese Sentence Lists (LSP) test, sentence recognition threshold was investigated in quiet (SRTQ) and in noise (SRTN). Based on the obtained data, the signal/noise ratio (S/N) was calculated. The sentences and noise (fixed to 65 dB HL) had a monoaural presentation using headphones. Results: when comparing the performances of both groups, the statistical analysis pointed no significant difference between the mean values obtained for the SRTQ. However, a statistically significant difference was verified between the mean values obtained for the S/N ratio. Conclusion: in a quiet situation, musicians and non-musicians had similar performances. However, in the noise situation, musicians presented better performances, indicating that musical practice is an activity that improves the ability of speech recognition when in a noisy environment.
Key Words: Audiology; Speech Discrimination Tests; Noise; Perceptual Masking; Training.

Resumo

Tema: o treinamento auditivo melhora a percepção de sinais acústicos complexos como a fala. Objetivo: verificar se o treinamento auditivo proporcionado pela prática musical é um fator que exerce influência na habilidade de reconhecer a fala no silêncio e no ruído. Método: participaram do estudo 55 indivíduos sem experiência musical (não músicos) e 45 indivíduos que atuavam como músicos profissionais em bandas militares há, no mínimo, 5 anos (músicos). Todos os voluntários eram militares, do sexo masculino, destros, normo-ouvintes e com idades variando entre 25 e 40 anos. Utilizando o teste Listas de Sentenças em Português (LSP), realizou-se a pesquisa do limiar de reconhecimento de sentenças no silêncio (LRSS) e do limiar de reconhecimento de sentenças no ruído (LRSR), a partir do qual foi calculada a relação sinal/ruído (S/R). As sentenças e o ruído (fixo a 65 dB NA) foram apresentados monoauralmente, por fones auriculares. Resultados: ao serem comparados os desempenhos dos grupos estudados, a análise estatística dos resultados não evidenciou diferença significante entre os valores médios obtidos para os LRSS. No entanto, foi constatada diferença estatisticamente significante entre os valores médios obtidos para as relações S/R. Conclusão: no silêncio, músicos e não músicos apresentaram desempenhos semelhantes, porém, em tarefas de reconhecimento de sentenças apresentadas diante de ruído competitivo, músicos apresentaram melhores desempenhos, indicando que a prática musical é uma atividade que melhora a habilidade de reconhecimento da fala, quando esta ocorre diante de ruído.
Palavras-Chave: Audiologia; Teste de Discriminação da Fala; Ruído; Mascaramento Perceptivo; Treinamento.

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Introduction

The speech sounds arriving to ear are rarely interferences free, for the most environments are repercussive and have background noises which interblended to them. The exact effect of these factors which interferes to the speech perception depends on the parameters like noise level, reverberation and the individual sense of hearing condition.

Concerning to the individual hearing condition, it is known that peripherical and central hearing integrity is a basical pre-requirement for the communication process running satisfactorily. If the hearing is not perfect the noise effects are exacerbated, compromising expressively the process. In contraposition normal hearing individuals present a good performance in mostly day by day acoustic situations.

Though there are situations even when the basical auditory evaluation is satisfying the subject insists claiming to feel difficulty comprehending speech, mostly in noisy environments. According to De Paula et al. (2000), the conventional normal audiogram result does not always show the reality concerning to the speech comprehension, being necessary speech recognition evaluations against competitive noise, so that it is possible defining hearing conditions in patients who presents that sort of complains.

Besides that, this fact also points out to the necessity of investigating some factors which can act as speech recognition helpers. They are able to be used like therapeutical strategies for normal listener adults who in spite of presenting normal audiogram complain about speech incomprehension, mostly in noisy environments.

The auditory training can be a recognition speech helper agent since representing specific hearing experiences which exercises and improves hearing abilities. It is known the auditory training improves complex acoustical signals perception like speech. The plasticity of the central audio nervous system in adults consists in one of this practicing fundamentals (Schochat et al., 2002).

Ample debates has been registered about the flexibility of the mature perception system throughout the years as well as studies has been investigating the adult auditory cortex, its reorganizing capacity against new experiences (Lotze et al., 2003; Trainor and al., 2003; Johansson, 2004; Peretz and Satorre, 2005).

These studies corroborated the adult cerebral auditory system is really flexible and so the transfer abilities can be demonstrated through comportamental measures (Roth et al., 2001), as well as neuro-physiologycal measures (Lin and al., 2002).

The confirmation of plasticity in adults auditory system has motivated researches in order to investigate the speech recognition abilities improvement through auditory techniques training in adults with neuro-sensorial hearing loss (Dominguez Ugidos et al., 2001) as well as in normal hearing ones (Thompson et al., 2003; Schon et al.,2004).

Regarding to the cerebral plasticity in adult individuals studies were also developed trying to identify connections between musical skills and psycho-acoustic abilities (Gil et al., 2000; Brennan and Stevens, 2002).

It is known the musical practice stimulates the harmonic and melodic audio perception improvement with the help of perceptive training of intervals, rhythm and other acoustic parameters.

Considering the generalization occurrence these audio-perceptive abilities could act like helpers in speech recognition tasks against competitive acoustic signals, since studies has confirmed the auditory training realized for a type of sonorous stimulus can be generalized for other ones or listening situations that have not being used in training situations (Oxenham et al., 2003).

Though, few can be reported on researches realized to investigate the influence of non therapeutical musical training which is a form of auditory training in discrimination abilities and verbal sounds recognition (Humphrey, 1980).

In this basement, the actual study was accomplished trying to verify whether the auditory training provided by musical practice is an influent factor concerning to the speech recognition in quiet and noise.

Method

Ethical Aspects:

The practical procedures in this research have just been accomplished after receiving the favorable opinion from Research Ethical Committee (nº 083/03) from Projects Office (nº 14320) of Health Science Center, Federal University of Santa Maria.

Have taken part in the research only the individuals who agreed to the necessary proceedings after being clarified about the goals, justificatory and the proposed study methodology by signing the Free and Clarifying Agreement.

Study Group Characterization:

Among the musicians groups from Santa Maria we have decided to work on Military and Aeronautical Bands constituting the experimental group (Musicians Group), believing this was the most homogenous one concerning to the variables which could interfere in the research results, as gender, age, professional working time as a musician, other parallel professional activity, musical instrument, musical practice type, daily work time, acting out sites, and so on.

Trying still to control the variables which could interfere to the results, the control group of this research, formed by non musical experienced people (Non Musicians Group), was also integrated by militaries from Santa Maria /RS Army.

The volunteers inclusion in the Non Musician Group (Group A) as well as the Musicians Group (Group B) was based through the following criteria: maximum tone audiometric threshold of 25 dB AL over 250 to 8000Hz frequency; age between 25 to 40; no articulatory phonetic alterations and/or verbal fluency which can interfere on the speech stimulus repetition, no external acoustical meatus alterations, bilaterally.

Have neither experience related to the musical study or musical instrument or vocal practices was the specific criteria for taking part on the Non Musicians Group. To be professional Military Band Musician having the minimum of 5 years playing (Gil et al., 2000), was the specific criteria to take part on the Musicians Group.

Among 184 appraised voluntaries, only 100 fulfilled the inclusion criteria defined for the actual research. All of them were male gender, from the Army, dexterous.

In this amount, 55 men integrated the Non Musicians Group (Group A), medium age 31,69: 35 from the selected men (63,63%) presented high school as the maximum level and 20 from them (36,36%) presented incomplete university courses as the minimum level .

The left 45 individuals integrated the Musicians Group (Group B), medium age between 30,93. From them 23 (51,11%) brought high school as the maximum level and 22 (48,89%) brought incomplete university courses as the minimum level.

Proceedings:

The evaluation procedures has been accomplished at the Audiology Ambulatory at Federal University of Santa Maria (UFSM), period from April to August, 2003.

Initially the study group participants were subject to an anamnesis, to a visual inspection of the external acoustical meatus, a pure tone audiometry through air conduction on 250 to 8000Hz frequency and through bone conduction on 500 to 4000Hz frequency, and also to the determination of speech recognition threshold (SRT), with dissyllabic words and speech recognition percentual index with monosyllabic words. At the end, a research about recognition in sentences in the quiet and the noise threshold was accomplished having the signal/ noise ratio calculated (S/N).

The research measures were obtained in acoustically treated cabinets, using a two channels digital audiometer, Fonix, FA-12 model, type I and aural phones TDH-39P, Telephonic. The sentences were presented through a Compact Digital Disc Player Toshiba- 4149, connected to the audiometer described above.

To obtain the sentences recognition threshold in quiet (SRT - Q) and in noise (SRT - N), it was used the Sentences in Portuguese Lists Test (SPL) developed by Costa (1998). This material is introduced in CD records containing sentences lists in Portuguese and a speech spectrum noise, recorded on independents channels allowing the introduction of the sentences in the quiet as well as in the noise.

A 7dB difference between the recorded volume of two signals presented on CD (quiet and noise) was observed by the author of the test in her first essay realized using the aural phones (Coser et al., 2000). Afterwards a computerized spectrographical analysis on the CD recorded material was accomplished and it demonstrated that the sentences are recorded on medium intensity 7dB below the noise intensity. Here at the author has related in the evaluations using aural phones it is necessary to deduct 7dB from the speech values observed in the device dial to calculate the SRT - Q (quiet) as well as calculating the SRT - N (noise) (Costa, 2002). This proceeding has been used along this research.

Before beginning each subject test, the equipment exit has been calibrated using the Audiometer VU-meter. The 1000HZ tone showed on the same channel where the sentences are

recorded as well as the disguised noise on the other channel, were at zero level.

The SRT - Q and SRT- N were obtained from aural-phones in a mono-aural form in order to evaluate each ear apart. On the SRT - N, noise and sentences were presented ipsilaterally.

The sentences lists followed the next order (Daniel, 2004):

a) presenting sentences 1 to 10 from List 1A, on the left ear, without competitive noise to familiarize the subject to the test;

b) presenting list 1B on the right ear without competitive noise;

c) presenting list 2B, on the left ear, without competitive noise;

d) presenting sentences 11 to 20 from list 1A, on the left ear, with competitive noise ipsilaterally, for the individual familiarization to the test;

e) presenting list 3B, on the right ear, with competitive noise ipsilaterally;

f) presenting list 4B, on the left ear, with competitive noise ipsilaterally;

While the material was presented whenever noticing any difference equal or major than 2dB between the two tested ears, the one having poorest result on SRT - Q research were evaluated against list 5B; SRT- N research against list 6B, presented under the same hearing conditions. When testing under this proceeding the best result obtained on the re-tested ear was considered for the analysis goal (Soncini et al., 2003b).

The patient answer to the test was the sentences verbal repetition. An answer was only considered correct when the individual has repeated, without errors, the whole presented sentence.

To determine the sentences recognition threshold (SRT), it means, the necessary level for the individual correctly identified around 50% of the presented speech stimulus, as in the quiet (SRT-Q) as with competitive noise (SRT-N), the proceeding described by Levitt and Rabiner (1967), called "adaptative or ascending-descendant sequencial strategy".

According to this strategy, the test application consisted in presenting the speech stimulus on determined intensity. When the answer was correct the intensity on the next stimulus was decreased. In case of incorrect answer the next stimulus intensity was increased.

The sentences presentation intervals used in this research were 5 dB and 2,5dB, respectively, in face of the available equipment technical possibilities. At this rate, the sentences were presented on 5dB intervals till the answer pattern first alteration. Since then the intervals between the sentences were on 2,5dB till the end of the list.

In the presentation of the sentences without competitive noise (SRT-Q research) the first sentence of each list was presented on 10dB AL up the value found on the SRT for dissyllabic.

In the presentation of the sentences with the competitive noise, (SRT-N research) it was used 70dB intensity on the equipment dial for the each list first sentence presentation. The noise intensity was hold constant on 65dB AL (Smoorenburg, 1992), changing S/R ratio since the intensity alteration in the sentence presentation.

The intensity presentation of the next sentences has been increased or decreased according to the individual answers. So, when the first answer was correct the intensity presentation of the next stimulus has been decreased on 5dB as far as the patient presented an incorrect answer (first alteration on the answer pattern), and from now on the stimulus presentation changed on 2,5dB till the end of the list.

It is important pointing out it was chosen an initial intensity for each list first sentence presentation, as in quiet as in noise, that guaranteed the evaluated subject succeed in recognition and maintained himself motivated for the test achievement. The intensities described above are enough for obtaining the correct answer for the first sentence presented to normal hearing individuals, since it was observed, on previous researches using the same material (Coser et al., 2000; Pagnossim et al.,2001; Soldera, 2001; Machado, 2002; Daniel et al., 2003; Soncini et al., 2003b), that the intensities described below are enough to obtain the correct answer in the first presented sentence to normal-hearing individuals.

Along the test application the level of each sentence presentation was registered. The medium value has been calculated since the intensity level where has occurred the first alteration in the type of answer until the presentation intensity level on the last sentence from the presented list. 7dB were deducted from the values found out since the medium calculation. This way it was obtained the value of quiet sentences recognition threshold (SRTQ) and the noise sentences recognition threshold (SRT-N).

To obtain the signal/noise ratio value (S/N) it was deducted the noise intensity level (65dB AL) from SRT-N. So it keeps characterized that the S/R ratio corresponds to the difference in dB between the SRT-N value and competitive noise value.

Statistical Analysis:

The Kruskal - Wallis Test was applied in order to compare the Non Musicians and Musicians performance as the data obtained on SRT-Q research, the S/R ratio and in order to verify the importance on eventual differences between the groups. The rejection level for the nullity hypothesis has been fixed on a minor or equal value to 5%. The significant statistical results were signaled (*) and the not significant were (**).

Results

The charts 1 and 2 present the obtained data since the comparative analysis on the SRT-Q Non Musicians and Musicians medium results. The charts 3 and 4 present obtained results from the comparative analysis on the medium results of the S/R ratio on the groups.

The comparative analysis of the results obtained between the studied groups did not evidence significant statistical difference among the SRT-Q medium values on both the tested ears. However, it has evidenced significant statistical difference between the medium values obtained for the S/R ratio as between the right ears as the left ones. Musical practicing individuals presented better performance than non musical practicing ones.

Chart 1 – SRT-Q Comparison obtained on the non musicians right ears (N=55) and musicians (N= 45).

SRT-Q (dB AL) – Right Ear		
Estatistics	**Non Musicians**	**Musicians**
Medium	6,58	6,82
Standard Deviation	3,39	3,21
Minimum	1,21	1,93
Maximum	17,44	15,22
p-value	0,6544**	

** There is no significant statistical difference (p > 0,05) - Kruskal-Wallis Test

Chart 2 – SRT-Q Comparison obtained on non musicians left ears (N=55) and musicians (N= 45).

SRT-Q (dB AL) – Left Ear		
Estatistics	**Non Musicians**	**Musicians**
Medium	4,94	6,03
Standard Deviation	3,40	3,66
Minimum	- 1,58	- 0,21
Maximum	14,67	14,67
p-value	0,0839**	

** There is no significant statistical difference (p > 0,05) - Kruskal-Wallis Test

Chart3 – S/R Comparison S/R ratio obtained on non musicians right ears (N=55) and musicians (N= 45).

S/R (dB AL) – Right Ear		
Estatistics	**Non Musicians**	**Musicians**
Medium	- 5,70	- 7,22
Standard Deviation	1,31	1,95
Minimum	- 9,50	- 12,36
Maximum	- 3,67	- 4,78
p-value	<,0001*	

* There is significant statistical difference ($p < 0,05$) - Kruskal-Wallis Test

Chart 4 – S/R Comparison S/R relations obtained on non musicians (N=55) and musicians (N= 45).

S/R (dB AL) – Left Ear		
Estatistics	**Non Musicians**	**Musicians**
Medium	- 5,94	- 7,09
Standard Deviation	1,13	1,46
Minimum	- 8,87	- 9,96
Maximum	- 3,11	- 4,50
p-value	0,0002*	

* There is significant statistical difference ($p < 0,05$) - Kruskal-Wallis Test

Discussion

CThe mediums SRT-Q obtained on the Non Musicians and Musicians right ears were 6,58dB AL and 6,82dB AL (Chart 1). On the Non Musicians and Musicians left ears were 4,94dB AL and 6,03dB AL (Chart 2). Comparing these values there were not significant statistical differences between the groups, as on the right ears results as the left ears ones.

Since this analysis it was possible discover that Non Musicians and Musicians performance has been similar on the silence sentences recognition test.

On the literature there are no essays comparing Non Musicians and Musicians individuals performance on tests evaluating the ability of spoken message recognition in a quiet environment to be compared to the results described above.

However, comparing SRT-Q results on Non Musicians (6,58dB AL - RE and 4,94dB AL - LE) and Musicians groups (6,82dB AL - RE and 6,03 dB AL - LE) to the results from other studies using the same test material on normal hearing adults agreement was verified along this essay findings. Soncini et al. (2003a) checked that the medium SRT-Q found on 200 examined ears was 6,15dB AL. On other study the same authors (Soncini et al., 2003b) found out the medium SRT-Q 3,12dB AL on RE and 4,74dB AL on LE among hearing normal youngsters. On the essay accomplished by Daniel (2004), the medium SSRL 6,20dB AL was found analyzing 480 ears.

According to Plomp (1978), the only acoustic parameter keeping influence on the silence sentences recognition threshold is the audibility limit. Other authors has also made reference to the existence of relations between tonal threshold and the SRT-Q, emphasizing SRT-Q is generally better than the one predicted through the pure tone threshold on 500,1000 and 2000 Hz frequency pointing this would have a good relation in predicting SRT-Q (Smoorenburg,1992). Soncini et al., 2003 discovered the SRT-Q values medium were 2,40dB AL better than the values of the tonal threshold medium of 0,5, 1 and

2 kHz and referred that the threshold tonal medium 0,5,1 and 2 kHz could be used as a reference for the SRT-q analysis and interpretation results when utilizing PSL Test.

Then the fact that all the evaluated individuals present similar audiometric threshold on normal patterns would justify the similarity of the groups performance on the evaluation accomplished in silence.

Beyond that the SRT-Q research is accomplished on a ideal listening, it means, on the contestant sonorous stimulus absence. Since both groups presented different SRT-Q below to the normal speech intensity that is around 65dB SPL (Fletcher,1953, apud Russo and Behlau,1993), it can be supposed non musicians individuals as well as the musicians ones present a good performance on habitual speech in situations occurring in silence environments.

Comments about S/R ratio - Musicians x Non Musicians

The medium S/R ratio obtained on non musicians and musicians right ears were -5,70 dB AL and -7,22 dB AL (Chart 3) and non musicians and musicians left ears were -5,94 dB AL and - 7,09 dB AL (Chart 4). From then on these statistical analysis results has verified significant statistical difference between the groups.

It was observed the S/R ratio medium values obtained on the musicians were better than the S/R ratio medium values obtained on non musicians. Comparing these values it was verified the musicians were able to recognize 50% of the speech stimulus presented on competitive noise in a less favorable S/R ratio.

Besides that when analyzing the S/R ratio individual results it was verified that between the musicians 44,44% (20) were able to recognize 50% of the presented speech material, on an equal or more adverse S/R ratio than -7 dB AL on both ears, finding out values from -12,36 dB AL on these group individuals. On the other side, on non musicians group only 9,09% (5) achieve these performance on a S/R ratio (-7 dB AL) on both ears. Then a S/R ratio -9,50 dB AL was the best result obtained for these individuals. This has evidenced once more musician's superiority on the sentence recognition in noise task when comparing to the non musician individuals on age and auditory characteristics alike.

Going on through the analysis on the S/R ratio individuals results it was verified relating to the minimum values that between non musicians 12,73% (7) needed more favorable S/R ratio than -5 dB AL on both ears to recognize 50% of the presented speech material while between musicians this result occurrence was minor yet, it means, only 8,89% (4) needed more favorable S/R ratio than this as on the right ear as on the left one for reaching the same performance.

On the literature there are several essays analyzing musicians psycho-acoustical abilities (Gil et al., 2000; Kishon-Rabin et al., 2001; Brennan and Stevens, 2002; Crawley et al., 2002). However researches evaluating these individuals ability on the recognition tasks of sentences in the noise were not found. This fact turned impossible realizing quantitative comparisons to the results found in this research. Though it was intended to accomplish qualitative analysis on these data against the ones found out on the compulsive literature.

Investigating the musicians audio abilities Kishon-Rabin et al. (2001) observed the frequency threshold difference medium for musicians was approximately the half values for non musicians. Through Brennan and Stevens study (2002) it was verified the subjects having higher musical training level realized the presented sonorous stimulus more precisely.

Humphrey (1980) verified the errors index in the audio discrimination tasks for verbal stimulus were significantly higher than on a non musical trained youngster group as in the quiet as in the noisy condition comparing to a trained group. On Gfeller et al. (2002) essay the authors verified the musical training group presented significant improvement tone recognizing as well as on the speech perception measures when comparing to the no aural training group. Schön et al. (2004) observed the musical training improves the frequency variations perception not just for the musical stimulus as for speech stimulus.

Such being the case on the quality angle there is an absolute agreement between the results on the actual essay and those obtained through the studies described above. They ran to the same conclusion, it means, musicians present better performance than non musicians on auditory tasks and the musical practicing is a facilitator factor on the speech recognition task.

It is also important pointing out that when analyzing the numerical differences obtained between the medium results on the S/R relations of the tested groups (1,52dB AL on the RE: -5,70dB AL for Group A and -7,22dB AL for the Group B (Chart3) and the differences 1,15dB AL on the LE: -5,94dB AL for the Group A and -7,09dB AL for the Group B (Chart 4) these values seemed to be little expressive. Though according to the data found out on the specialized literature, the difference of 1dB on the S/R ratio, comparing individual results, is significant, having

considerable auditory importance and therefore it can not be unknown or inconsiderate.

Smoorenburg´s essay (1992) verified that 1dB decrease on the S/R ratio obtained on competitive noise sentences tests corresponds to an approximate alteration of 18% on the speech intelligibility score on different individuals groups, implying considerable impact on the listening daily communication when the environment is noisy. Such a discovery shows how important are little S/R ratio differences and how could they damage the speech recognition on noisy environments.

It is also important commenting that in spite of non musicians medium S/R ratio had been statistically lower than the musicians ones it does not mean non musicians group will present a low performance on the daily communication situations in noisy environments. According Killion (1993) normal hearing individuals evaluated on the speech/noise ratio of -5dB can identify approximately 95% of the sentences on a conversation. This means it is possible holding an adequate conversation on a speech/noise condition of -5dB, similar to the value found for the non musicians group (-5,70 and -5,94dB AL - Charts 3 and 4). The author also exposed that as the conversation situations occurring in lower relation than -5dB are few, individuals having hearing problems can present good performance on the most daily acoustical situations.

The literature refers to innumerable factors influencing the speech recognition tests results as different speech experiences, auditory system conditions, age, between others (Wilson and Strouse 2001). However this essay has considered these factors on the tested groups. Thus the S/R ratio results obtained on non musician group confirm the musicians present higher performance indeed which can be ascribed to the musical practice since this is the only differencing factor between the two studied groups.

Studies prove training is essential for constituting high competency level and the formal practice is the most important performance determinative. On Dominguez Ugidos et al. (2001) essay the results indicated hearing training on background noise developed verbal discrimination measures. Roth et al. (2001) discovered audio training individuals presented significant improvement on sonorous stimulus detecting against noisy background. Drennan et al. (2003) observed auditory trained listeners presented higher abilities for isolating simultaneous sonorous sources, it means, higher ability for realizing an auditory background-figure function essential for comprehending the speech against noise.

It is known musical practice develops an audio melodic and harmonic perception through several acoustical patterns training. Though the musical practice can be considered an auditory training form for representing intensive audio-experiences promoting the auditory process and ability strengthening (Gielow, 1997). It is proved one of the auditory basical principles is the central nervous system plasticity (Schochat et al.,2002).

The auditory system plasticity capacity has already been deeply studied and evidenced (Rüsseler et al., 2001; Pantev et al., 2003; Trainer et al., 2003; Kim et al., 2004; Johnsson, 2004). The neuronal plasticity involves the generalization process, it means, the ability of transferring a trained ability to another not trained situation (Roth et al., 2001; Oxeham et al., 2003; Rager et al., 2004)

This way, it is believed the adult musicians higher performance on the speech in the noise recognition task is, effectively a musical training result and, consequently, of all the factor involved in this process: training, auditory central nervous system plasticity, generalization, audio training transference realized for sonorous stimulus type (musical stimulus) to other not used on the training situation as verbal stimulus or listening situations (noisy environment) not used on the training.

So considering all the aspects approached and studied above, it is observed the musical practice favors the speech recognition on the adverse listening situations. Therefore this essay discoveries allow the encouragement of therapies using auditory training strategies for patients presenting speech comprehension difficulties, mostly in noise.

Conclusion

The critical analysis results obtained through this study allow the next conclusions:

. musical practicing individuals and non musical practicing individuals present similar performance on quiet sentence recognition tasks, not observing significant statistical difference when comparing SRT-Q on the observed groups;

. musical practicing individuals present higher performance than non musical practicing ones on recognizing sentences presented against competitive noise. It was found significant statistical difference when comparing the S/R ratio on the studied groups;

. the musical practicing improves the speech recognition ability when occurring in noisy environment.

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