

## Abstract

**Objectives:** Age related hearing loss is a term used to describe hearing loss with age. It can be said that the auditory system is a spectrum analyzer that consists of a series of auditory filters. The output of each filter is like a bandpass filter that contains two forms of information: Envelope, which is the slow fluctuation of the amplitude over time, Fluctuations in the temporal fine structure (TFS). The most important role of TFS is to understand speech in noise. One way to study the role of TFS is to preserve TFS cues and discard envelope cues in speech. This creates TFS speech, which contains only TFS information, and is used to examine the role of TFS in speech perception.

**Materials and Methods:** The study population was the elderly with mild to moderate hearing loss in the age range of 60 to 75 years old. The present study was conducted in four separate sections. Development of stimulus and rehabilitation software by the engineering team, evaluations before the start of the rehabilitation intervention including TFS assessment, word in noise test, questionnaire, implementation of rehabilitation training.

**Results:** The mean thresholds of TFS-LF in all three frequencies before the intervention and after the intervention are significantly different and in all three frequencies after the intervention the thresholds are better and lower and at a frequency of 250 Hz to 58.40 degrees and It has reached 74.33 degrees at 500 Hz and 94.66 degrees at 750 Hz. In addition,

**Conclusion:** It seems with special rehabilitation training based on TFS can improve speech in noise perception in an elderly population with mild to moderate hearing loss.

## Objective

The main aim of the study is to evaluate the impact of special rehabilitation training based on TFS on improvement of speech in noise perception in an elderly population with mild to moderate hearing loss.

## Method and Materials

We conduct a randomized clinical trial of rehabilitation training on speech in noise perception performance on an elderly population with mild to moderate hearing loss. It is hypothesized that the inability to use TFS speech cues is the main cause of speech perception problem in noise in elderly individuals, and it is possible by designing appropriate rehabilitation exercises to reduce the difficulty of speech perception in noise. Participants were recruited from elderly people, aged between 60 and 75 years old.

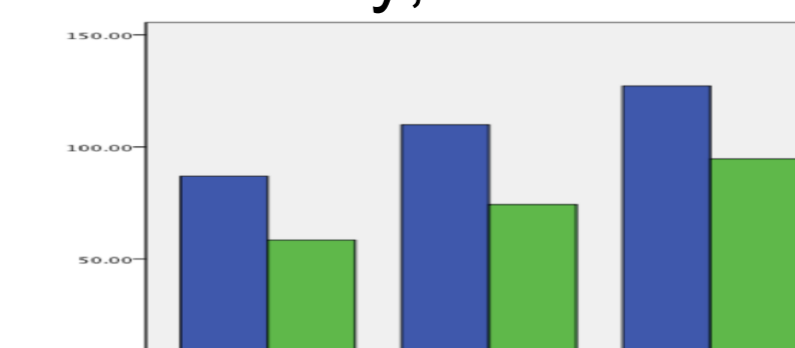
## Results

The mean thresholds of TFS-LF in all three frequencies before the intervention and after the intervention are significantly different and in all three frequencies after the intervention the thresholds are better and lower and at a frequency of 250 Hz to 58.40 degrees and It has reached 74.33 degrees at 500 Hz and 94.66 degrees at 750 Hz. In addition, Eta squared indicates that although there is a statistically significant difference in all three frequencies, the magnitude of the effect of the intervention on the frequency was 250 Hz.

Based on paired t-test, the ability to understand speech in the presence of noise in the elderly of the intervention group increased significantly after the rehabilitation intervention ( $P \leq 0.001$ ). The total score of the intervention group was 6.61, the difference between which was analyzed by analysis of covariance and a correction model was developed, which according to this model and according to the relative coefficient of the rehabilitation training is 41% effective.

## Conclusion

Aging reduces the ability of speech processing in both temporal and spectral coding. It seems in order to improve the verbal communication of the elderly, TFS-based rehabilitation program as a low-cost solution in the clinic audiologists.



## References

- Moore BCJ: The role of temporal fine structure processing in pitch perception, masking, and speech perception for normal-hearing and hearing-impaired people. *J Assoc Res Otolaryngol.* 2008;9(4):399–406. 10.1007/s10162-008-0143
- Fullgrabe C, Moore BCJ, Stone MA: Age-group differences in speech identification despite matched audiometrically normal hearing: contributions from auditory temporal processing and cognition. *Front Aging Neurosci.* 2014;6:347. 10.3389/fnagi.2014.00347