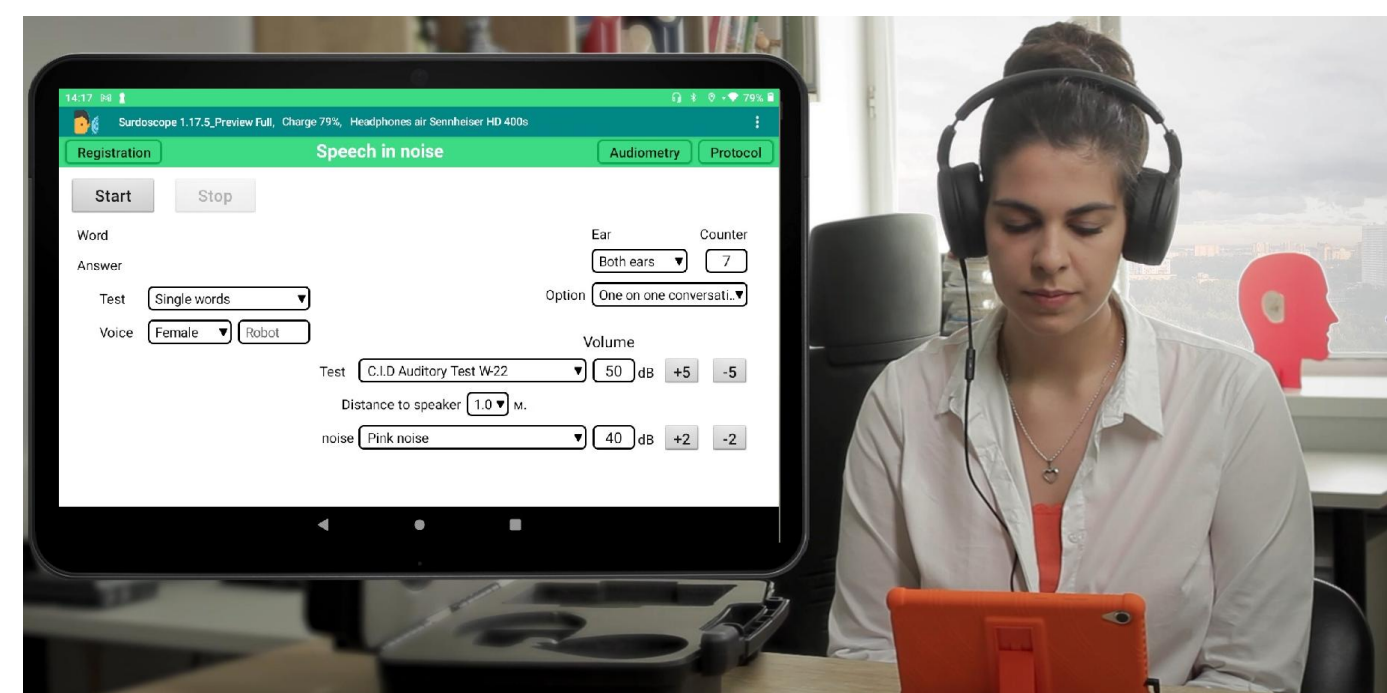


## Abstract

The pure tone audiometry use for hearing screening is limited by economic aspects and its ineffectiveness for speech perception assessment. Thus smartphone-based audiometry was developed as the quick and easy-to-implement economically efficient screening tool in order to detect hearing impaired patients [1,2,3]. The innovative tablet-based diagnostic system "SURDOSCOPE®", which consists of a tablet, connected with Sennheiser HD 400S earphones, was developed for automated pre-medical hearing assessment with functions of both tone and speech audiometry. It provides the automated self-evaluation mode of tone-speech screening as a quick approximate assessment of hearing status.



## Objective

The aim of the research was to test trial "SURDOSCOPE®" version and to evaluate its implementation results as an audiological screening tool in adults.

The correspondence of "SURDOSCOPE®"-screening tone and speech audiometry results with hearing thresholds registered by conventional pure tone audiometry and self-estimation of hearing status was studied.

## Patients and methods

31 volunteers from 24 to 80 y.o. ( $44.8 \pm 17.9$ ) participated in the study. Self-estimation of hearing status; pure tone audiometry (0.5–6 kHz); speech audiometry in noise (speech material consisted of polysyllabic words and three words sentences presented binaurally) were performed. The advanced option (0.125–16 kHz) of "SURDOSCOPE®" was used if needed. After the self-screening, all the patients underwent the conventional pure tone audiometry using the Maico MA42 clinical audiometer in order to reveal the self-evaluation results reliability.

## Results

High compliance between screening pure tone audiometry results and conventional audiometry thresholds (the difference was  $\pm 5$  dB) was found (Fig 1, 2).

Self-estimation of hearing did not always correspond to the results of screening audiometry; speech intelligibility varied in a wide range and mostly correlated with participants' complaints (Fig.3).

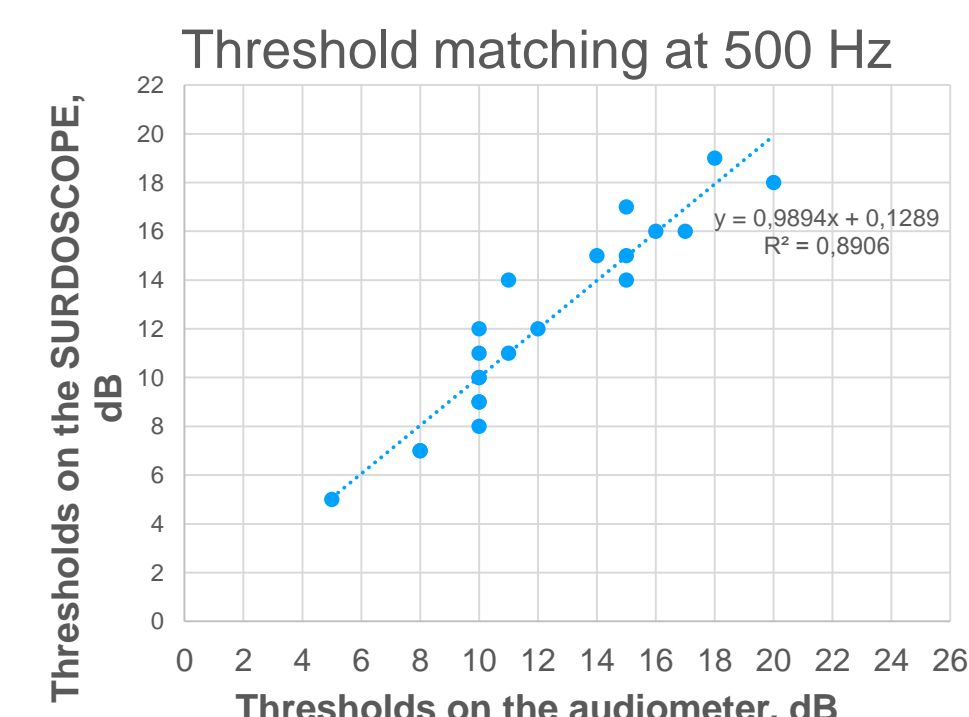


Fig. 1

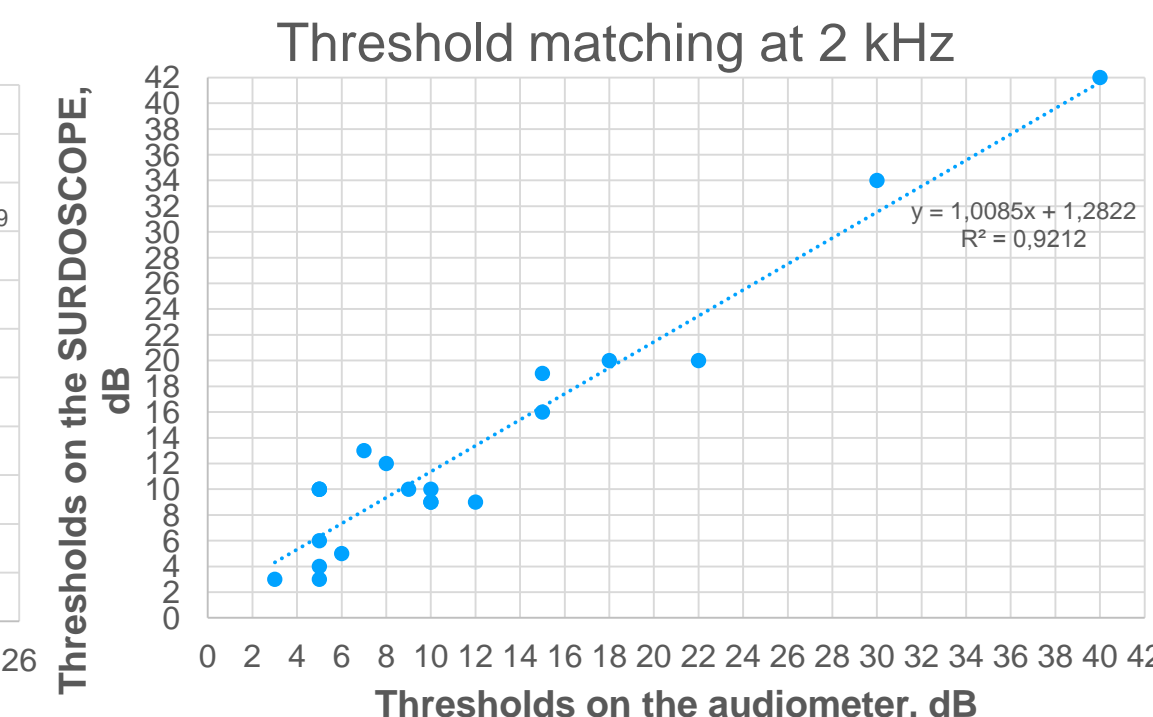


Fig.2

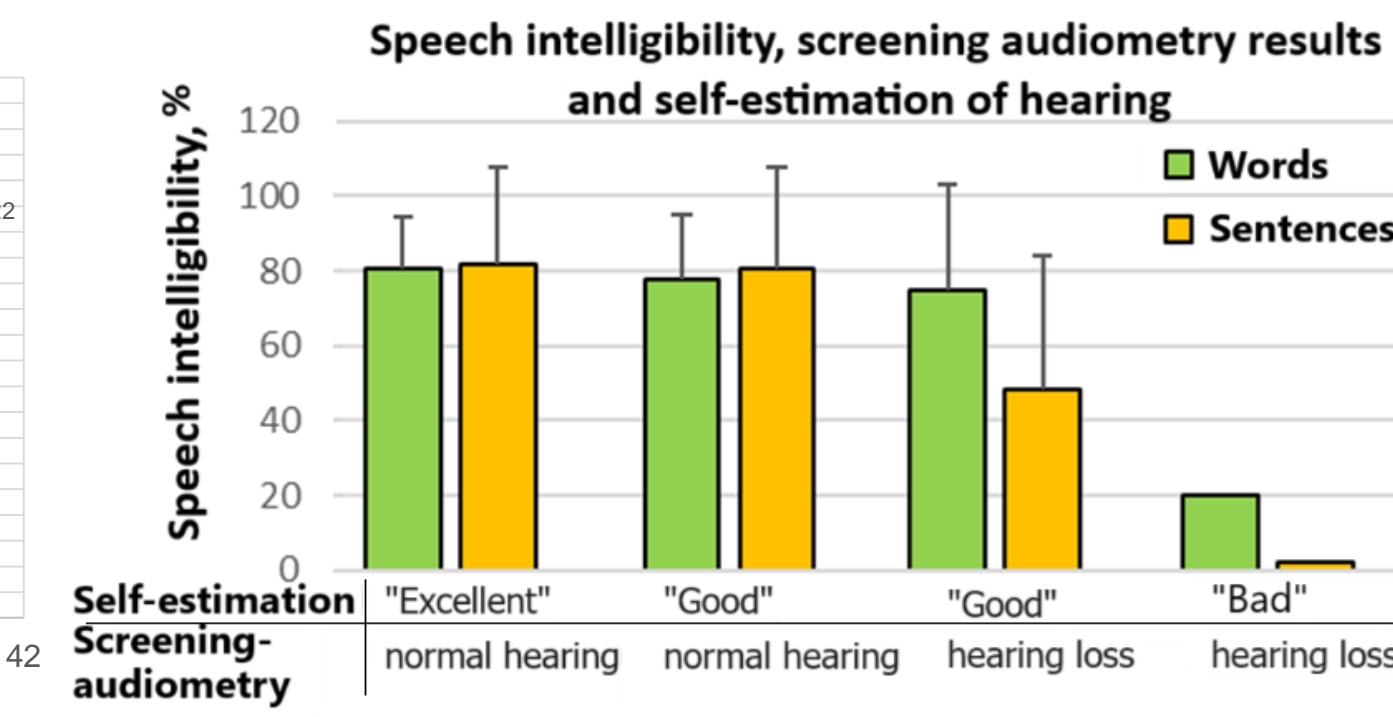


Fig.3

Maximum speech recognition score in noise ranged between 20% and 100% ( $76.5 \pm 20.7\%$ ) for words, and 0 to 100% ( $72.3 \pm 33.0\%$ ) for sentences. The total testing time was  $10.5 \pm 5.7$  minutes.

## Conclusion

The "SURDOSCOPE®" system was proved to be the effective tool for pre-medical hearing status assessment and could be recommended for further implementation and wide use for adults check-up in non-specialist settings. All those with hearing loss or poor speech discrimination detected with the screening method should undergo full audiological evaluation.

Unlike the well-known analogues, "SURDOSCOPE®" allows to evaluate the perception of both tonal signals and speech in noise, which is the crucial indicator of communication abilities.

## References

- Chen C.H. et al. Diagnostic Accuracy of Smartphone-Based Audiometry for Hearing Loss Detection: Meta-analysis. JMIR Mhealth Uhealth. 2021;9(9):e28378. doi: 10.2196/28378
- Hazan A. et al. Home-Based Audiometry With a Smartphone App: Reliable Results? Am J Audiol. 2022;31(3S):914-922. doi: 10.1044/2022\_AJA-21-00191
- Li L.Y.J. et al. Screening for Hearing Impairment in Older Adults by Smartphone-Based Audiometry, Self-Perception, HHIE Screening Questionnaire, and Free-Field Voice Test: Comparative Evaluation of the Screening Accuracy With Standard Pure-Tone Audiometry. JMIR Mhealth Uhealth. 2020;8(10):e17213. doi: 10.2196/17213