The role of hearing in daily life increases as our civilization develops. At the same time, recent World Health Organization reports suggest a growing number of people experience hearing problems. Although scientists constantly work on new treatments, prevention is better than cure. For hearing, this could be done by frequent testing and changing listening habits, e.g., listening to music at lower volumes or using hearing protection at work. Our body gives us signals to stop harmful activities through noise or beeps after loud sound exposure. These usually fade after a few hours but might preview permanent changes. Therefore, significant improvement in hearing health would be getting information - "Beware! You need to make a break!" – before hearing starts being significantly affected.

The main standard hearing test is pure tone audiometry (PTA), which determines hearing thresholds depending on frequency. However, standard PTA is not especially sensitive to minor hearing changes. One of the most sensitive hearing tests are otoacoustic emissions (OAEs) – low level sounds from the hearing system that can be noninvasively measured in the ear canal. OAEs are proven to be very good for hearing testing and are more sensitive than PTA, showing changes before they are visible in PTA. OAE testing requires no subject cooperation (contrary to PTA), can be done faster and presents no particular difficulties. However, OAE testing is currently done only in medical clinics with limited applications (mainly newborn screening and diagnostics). Hearing monitoring could be the best way to take advantage of OAE benefits, but specialized equipment limits development. Although OAEs are generally stable over time, there is very limited data on OAE fluctuations during longer periods and what changes could indicate the need to prevent hearing loss. Recent research shows that hearing function may vary throughout the day and that aging affects our inner ear in complex, poorly understood ways.

Study aims:

- Determine OAE fluctuation ranges during one year in young adults (18-30 years) compared to older adults (55-70 years).
- Investigate how hearing function varies throughout the day by measuring OAEs morning and evening.

Main goals:

- Extend knowledge about hearing processes, as information on OAE fluctuations and daily variations is very limited.
- Provide evidence that OAEs could be used for smartphone hearing monitoring (like electrocardiogram by smartwatches).
- Better understand how aging affects inner ear mechanisms.

Specific aims:

- Evaluate if OAE fluctuations differ between young and older adults.
- Investigate whether hearing function changes throughout the day and if patterns differ with age.
- Evaluate if OAE fluctuations relate to hearing sensitivity, environmental factors, or music listening habits.

This study could be an important step toward developing guidelines for widespread OAE testing. It may encourage smartphone producers to invest in technologies allowing daily hearing testing. By comparing young and older adults and studying daily hearing variations, this research may lead to new insights about protecting hearing throughout our lives and optimizing timing of activities that could affect hearing.