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Can personalized listening training reduce tinnitus in adults?

Submission date
26/09/2026

Recruitment status
Recruiting

Registration date
30/09/2026

Overall study status
Ongoing

Last Edited
08/10/2026

Condition category
Ear, Nose and Throat

[X] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol
Background and study aims
Tinnitus is the perception of sound when there is no external sound source. When it lasts for a long time, it can affect sleep, concentration, emotional wellbeing, and daily life. One possible treatment approach is frequency discrimination training, a listening exercise in which people repeatedly practice identifying which of several sounds has a different pitch.
Previous studies suggest that this type of training may improve pitch discrimination and reduce the effects of tinnitus. However, it is not clear whether the benefit depends on improving each person's ability to distinguish between pitches, partly because previous studies have generally used similar training settings for all participants. This study compares three groups: training with difficulty tailored to each participant's pitch discrimination ability, training using fixed pitch differences, and a waiting-list group receiving no training during the study period. The study will examine which approach produces the greatest improvements in pitch discrimination and tinnitus-related difficulties, and whether improvements in these two areas are related.

Who can participate?
Adults aged 19 years or older who have had subjective tinnitus for at least 6 months

What does the study involve?
After an initial assessment of hearing, tinnitus, pitch discrimination, cognitive function, psychological wellbeing, and tinnitus-related difficulties, participants are randomly allocated to one of three groups:
1. Frequency discrimination training tailored to the participant's own pitch discrimination ability
2. Frequency discrimination training using fixed pitch differences
3. A waiting-list group that receives no training during the study period but completes the same assessments
Participants in the two training groups complete online listening sessions using a computer or mobile application for 4 weeks. Each session takes 20–25 minutes, although the duration may vary depending on individual performance. All participants are assessed before the study period, immediately after the 4-week training period, and 1 month later. The waiting-list group will be offered the same frequency discrimination training after completing the study.

Brain activity is also recorded before and after the training period using electroencephalography. This is a non-invasive procedure in which electrodes are temporarily placed on the scalp.

What are the possible benefits and risks of participating?
Participants may improve their ability to distinguish between pitches and may experience reduced tinnitus-related difficulties. However, individual responses may vary, and improvement cannot be guaranteed.
The training sounds are presented at comfortable and safe listening levels. Some participants may experience temporary listening fatigue, tiredness from concentrating, or mild psychological discomfort during training or assessment. Electroencephalography may cause mild and temporary skin irritation or discomfort where the electrodes are attached. Participants may take a break or stop the training or assessment if they feel uncomfortable.

Where is the study run from?
Hallym University (South Korea)

When is the study starting and how long is it expected to run for?
October 2026 to September 2027

Who is funding the study?
National Research Foundation of Korea (South Korea)

Who is the main contact?
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Contact information

Type(s)
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Additional identifiers

Study information

Scientific Title
Effects of individualized frequency discrimination training compared with fixed frequency discrimination training and a wait-list control on frequency discrimination and tinnitus severity in adults with chronic tinnitus: a three-arm randomized controlled trial

Study objectives
1. To compare the effects of individualized just-noticeable difference (JND)-based frequency discrimination training (FDT) and fixed FDT on changes in frequency discrimination thresholds and tinnitus-related outcomes.
2. To evaluate the effects of both FDT approaches on JND and tinnitus-related outcomes, as measured by the Tinnitus Handicap Inventory (THI) and the Korean Tinnitus Primary Function Questionnaire (K-TPFQ), compared with a waitlist control group across baseline, post-intervention, and follow-up assessments.
3. To investigate the association between improvements in JND and improvements in tinnitus-related outcomes, as measured by the THI and K-TPFQ.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 16/07/2026, Hallym University Bioethics Committee (3F, Humanities Building 2, 1Hallymdaehak-gil, Chuncheon-si, Gangwon-do, 24252, Korea, South; +82 (0)33-248-3021~2; de3020@hallym.ac.kr), ref: HIRB-2025-143-R

Primary study design
Interventional

Allocation
Randomized controlled trial

Masking
Blinded (masking used)

Control
Active

Assignment
Parallel

Purpose
Treatment

Study type(s)

Health condition(s) or problem(s) studied
Chronic subjective tinnitus

Interventions
Following confirmation of eligibility and completion of the baseline (pre-intervention) assessment, participants will be randomly allocated in a 1:1:1 ratio to three parallel groups using stratified variable block randomization. Baseline JND, THI, and K-TPFQ scores will be used as stratification variables. Allocation is concealed using a computer-generated randomization sequence. Research staff enter each participant's baseline stratification data (JND, THI, and K-TPFQ scores) into the system, which then provides the group assignment. Upcoming assignments are not available to research staff. Because this sequence is held within the system and is not accessible to research staff in advance, the upcoming allocation cannot be known or predicted before baseline data entry is complete.

1. JND-based FDT: Individualized frequency discrimination training in which task difficulty is initially determined based on each participant's JND and subsequently adjusted according to training performance.
2. Fixed FDT: identical task, application, and schedule, but Δf is fixed at 10% of the reference frequency throughout.
3. Waiting-list control: no training; assessments only.

Both active-training groups will complete online frequency discrimination training over a 4-week intervention period. Each training session will consist of 100 trials and last approximately 20–25 minutes, with some variation depending on individual performance.

Intervention Type
Behavioural

Primary outcome(s)
1. Frequency discrimination threshold (JND; expressed in Hz and as a percentage of the reference frequency) measured using three-interval oddity (3AFC) task with a 3-down/1-up adaptive staircase procedure, continuing until a pre-specified number of reversals is reached; JND calculated as the mean Δf of the final reversal points; at baseline (pre-intervention), immediately post-intervention(after the 4-week training period) and 1-month follow-up

2. Tinnitus-related handicap measured using total score on the Tinnitus Handicap Inventory (THI) at baseline (pre-intervention), immediately post-intervention(after the 4-week training period) and 1-month follow-up

3. Tinnitus-related functional impact measured using the total score on the Korean Tinnitus Primary Function Questionnaire (K-TPFQ) at baseline (pre-intervention), immediately post-intervention(after the 4-week training period) and 1-month follow-up

Key secondary outcome(s)
1. Hearing level measured using air-conduction pure-tone threshold (0.25–8 kHz), measured in dB HL, at baseline and immediately post-intervention (after the 4-week training period)

2. Tinnitus pitch matching measured using frequency (Hz) of the pulsed pure tone (tonal tinnitus) or narrowband noise (non-tonal tinnitus) judged most similar to the perceived tinnitus, determined via a bisection procedure with progressively narrowing frequency comparisons at baseline and immediately post-intervention (after the 4-week training period)

3. Tinnitus loudness matching in dB SL measured using matching intensity minus the audiometric threshold at the matched frequency, obtained via an ascending method at baseline and immediately post-intervention (after the 4-week training period)

4. Tinnitus minimum masking level (MML) measured using lowest presentation level of narrowband noise centered on the tinnitus frequency at which the tinnitus is completely masked, determined via an ascending method at baseline and immediately post-intervention (after the 4-week training period)

5. Subjective tinnitus loudness, annoyance, and distress measured using the Visual Analogue Scale (VAS, 0–100), scored separately for loudness, annoyance, and distress, at baseline and immediately post-intervention (after the 4-week training period)

6. [Exploratory] Resting-state EEG activity measured using spectral power, functional connectivity, signal entropy, and microstate analysis derived from 64-channel resting-state EEG at baseline and immediately post-intervention (after the 4-week training period)

Completion date
30/09/2027

Eligibility

Key inclusion criteria
1. Adults aged 19 years or older
2. Chronic subjective tinnitus persisting for at least 6 months
3. An air-conduction pure-tone threshold of 65 dB hearing level (HL) or better within the individually assigned training frequency band, with audibility of the training stimuli through headphones or earphones confirmed before enrollment
4. Ability to independently use a personal computer or mobile application and complete the frequency discrimination training while wearing headphones or earphones

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit

19 Years

Upper age limit
100 Years

Sex
All

Total final enrolment
0

Key exclusion criteria
1. Participants with middle- or inner-ear disorders, such as otitis media or Ménière’s disease, or those who have received treatment for sudden sensorineural hearing loss within the past 3 months
2. Participants with moderate-to-severe depression or anxiety disorders, cognitive impairment, or neurological conditions that interfere with their ability to complete the training tasks
3. Participants with severe hyperacusis that prevents the safe presentation of auditory stimuli, defined as an uncomfortable loudness level (ULL) below 60 dB SPL

Date of first enrolment
01/10/2026

Date of final enrolment
30/08/2027

Locations

Countries of recruitment
Korea, South

Sponsor information

Organisation
National Research Foundation of Korea

ROR
https://ror.org/013aysd81

Funder(s)

Funder type

Funder Name
National Research Foundation of Korea

Alternative Name(s)
, National Research Foundation (South Korea), NRF

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
Korea, South

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet			28/09/2026	No	Yes
Participant information sheet			28/09/2026	No	Yes