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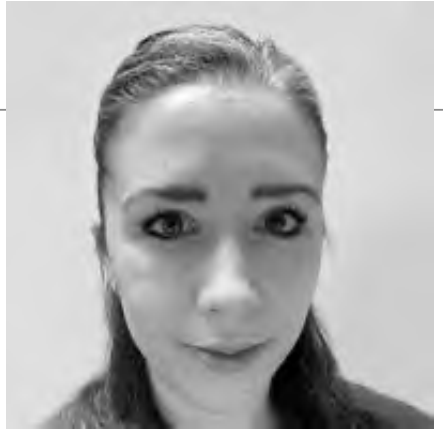
Tinnitus Treatment Trends in 2023

Lori Zitelli, Au.D., CH-TM

Tricia Scaglione, Au.D., CH-TM

David Jedlicka, Au.D.

Lori Zitelli, AuD



Lori Zitelli, AuD, joined the UPMC audiology department in 2012. She became Managing Audiologist in 2021. She received her clinical doctorate in audiology from the University of Pittsburgh, where she is now an Adjunct Instructor. Her areas of expertise include amplification, evaluation and treatment of tinnitus/decreased sound tolerance, clinical education, and interventional audiology. She is licensed to practice audiology in the Commonwealth of Pennsylvania. She is a member/volunteer of the American Academy of Audiology, a Jerger Future Leaders of Audiology (JFLAC) alumna, and a member of the American Speech-Language Hearing Association. Dr. Zitelli is also a Certificate Holder in Tinnitus Management.

Tricia Scaglione, AuD

Tricia Scaglione, AuD, F-AAA, CCC-A, CH-TM, CH-AP is a tinnitus expert, consultant, and clinical audiologist. She is Board Certified in Audiology (ABAC) and served as an invited validation panelist for the national American Board of Audiology's Certificate Holder in Tinnitus Management (CH-TM) program. She is the current chair of the American Academy of Audiology Foundation, is involved in numerous committees for the National Academy of Audiology, and is currently serving on the American Tinnitus Association's (ATA) Scientific Advisory Committee (SAC) and Tinnitus Practitioners Association (TPA) Board of Directors.
Dr. Scaglione is an invited speaker for state, national, and international meetings.

David Jedlicka, AuD

David Jedlicka, Au.D., is an advanced practice audiologist at the Pittsburgh VA Healthcare System specializing in auditory processing disorder assessment and treatment. Dr. Jedlicka also specializes in amplification, diagnostics, osseo-integrated devices, vestibular assessment, and tinnitus. In addition to his role at the Pittsburgh VA, Dr. Jedlicka is an adjunct faculty member in the University of Pittsburgh's doctor of audiology program. Dr. Jedlicka is currently a 2nd year PhD student at the University of Pittsburgh with a focus on self-perceived hearing difficulties despite normal audiometric configurations. Dr. Jedlicka is a former president of the Association of VA Audiologists, former AAA Early Career Audiologist award winner, and is a current member of AAA, AVAA, ATA, and ASHA.

Disclosures

- **Presenter Disclosure**:
  - Financial: Lori Zitelli is employed by the University of Pittsburgh Medical Center, is an adjunct instructor at the University of Pittsburgh, and is a C&P examiner at Cranberry Hearing & Balance. Dr. Zitelli is a consultant for Treble Health. She received an honorarium for presenting this course. Non-financial: Lori Zitelli is a member/volunteer of AAA and ASHA.
  - Financial: Tricia Scaglione is a tinnitus consultant for True Silence Therapeutics. She received an honorarium for this presentation. Non-financial: Tricia Scaglione is non-compensated remote research assistant at VA Pittsburgh Healthcare System. Tricia Scaglione is a current MBA Healthcare Management student at Western Governors University. She is also the chair of the American Academy of Audiology Foundation and scientific advisor for the American Tinnitus Association. Dr. Scaglione is a member/volunteer of AAA, AAAF, ATA, and TPA.
  - Financial: David Jedlicka is an audiologist at the VA Pittsburgh Healthcare System and an adjunct faculty member at the University of Pittsburgh. Non-financial: David Jedlicka is a current PhD student at the University of Pittsburgh. Dr. Jedlicka is a member of AVAA, AAA, ATA, and ASHA.
- **Content Disclosure**: This learning event does not focus exclusively on any specific product or service.
- **Sponsor Disclosure**: There is no external sponsor for this course.

Learning Outcomes

After this course, participants will be able to:

- Discuss how to classify tinnitus treatment articles into collections that describe the category of treatment employed.
- Describe 3 different treatment approaches for tinnitus.
- Explain the methods and results of at least one tinnitus treatment-related article published in 2023.

Tinnitus Treatment Trends: 2023

Topic	# of Publications
Animal Models	11
Author Response / Corrections / Letter to the Editor / Editorial	10
Case Studies	43
Comorbidities	80
Epidemiology	18
Measurements	80
Mechanisms	39
Pediatrics	8
Pharmacotherapy	21
Questionnaires	23
Telemedicine	4
Treatment	**173**
Wildcard	108

618 Tinnitus Publications in 2023

Telemed Behavioral Strategies

OPEN ACCESS | American Journal of Audiology | Research Article | 1 Mar 2023

Healing From Home: Examination of an Online Mindfulness-Based Tinnitus Stress Reduction Course During the 2020 COVID Pandemic

Jennifer J. Gans, Jennifer Holst, Corrie Holmes and Daniel Hudock

https://doi.org/10.1044/2022_AJA-22-00063

Objectives:

1) Investigate changes in tinnitus intrusiveness after participation in iMBTSR course
2) Examine whether changes were retained at 6-month follow-up

Mindfulness Based Stress Reduction focuses on nonjudgmental awareness and acceptance of chronic conditions.

- Dr. Jennifer Gans developed MBSR that includes a tinnitus-focused treatment component (MBTSR)

Goals of MBTSR:

- Help participants feel less anxious about tinnitus
- Provide accurate, evidence-based tinnitus education
- Establish the beginning of a mindfulness meditation practice

MBTSR has proven effective in previous research

- Components:
  - 8 weekly asynchronous online lessons comprised of video and audio recordings with written content
    - Tinnitus education
    - Mindfulness practice content
    - Gentle yoga content
    - Meditation recordings and videos
  - 30 mins of daily meditation on days between weekly lessons, with a day-long session between the 6th and 7th weeks
- Offered for free during the COVID-19 shelter-in-place period (3/25/20 – 6/8/20)
  - Can it be effective over a tele-platform?
  - How do we assess this?

Table 1. Participant characteristics.

Characteristic	Male	Female	Not provided	Total
Total number who enrolled in course	290	283	4	577
Completed 8-week course	22	21	0	43
Subgroup that completed 8-week course and 6-month follow-up questionnaire	8	4	0	12
Ethnic origin of those completing the course, including follow-up subgroup				
African American or Black	1	0	NA	1
Asian/Pacific Islander	0	1	NA	1
Hispanic or Latino/a	1	0	NA	1
Native American or American Indian	0	0	NA	0
White	10	7	NA	17
Other	0	0	NA	0
Not provided	10	13	NA	23

Note. NA = not applicable.

- Note the low completion rate (n=43) compared to those who enrolled (n=577): 7%
  - Are we noticing a theme?
- Low completion rates for free online courses are not unusual (Coffrin et al, 2014)

Outcome Measurements:

Tinnitus Intake Questionnaire

- Initial only
- Demographic information

Tinnitus Functional Index

- Initial, midpoint, completion, 6-month f/u
- Functional impact of tinnitus (intrusiveness, control, cognition, sleep, hearing, relaxation, QOL, emotions)

Perceived Stress Scale

- Initial, midpoint, completion, 6-month f/u
- Assessing degree to which situations are perceived as stressful

Initial, midcourse, completion

Initial, midcourse, completion, 6 mos later

Figure 1. Tinnitus Functional Index (TFI) subscale scores for the Completer and Follow-Up Groups. QOL = quality of life.

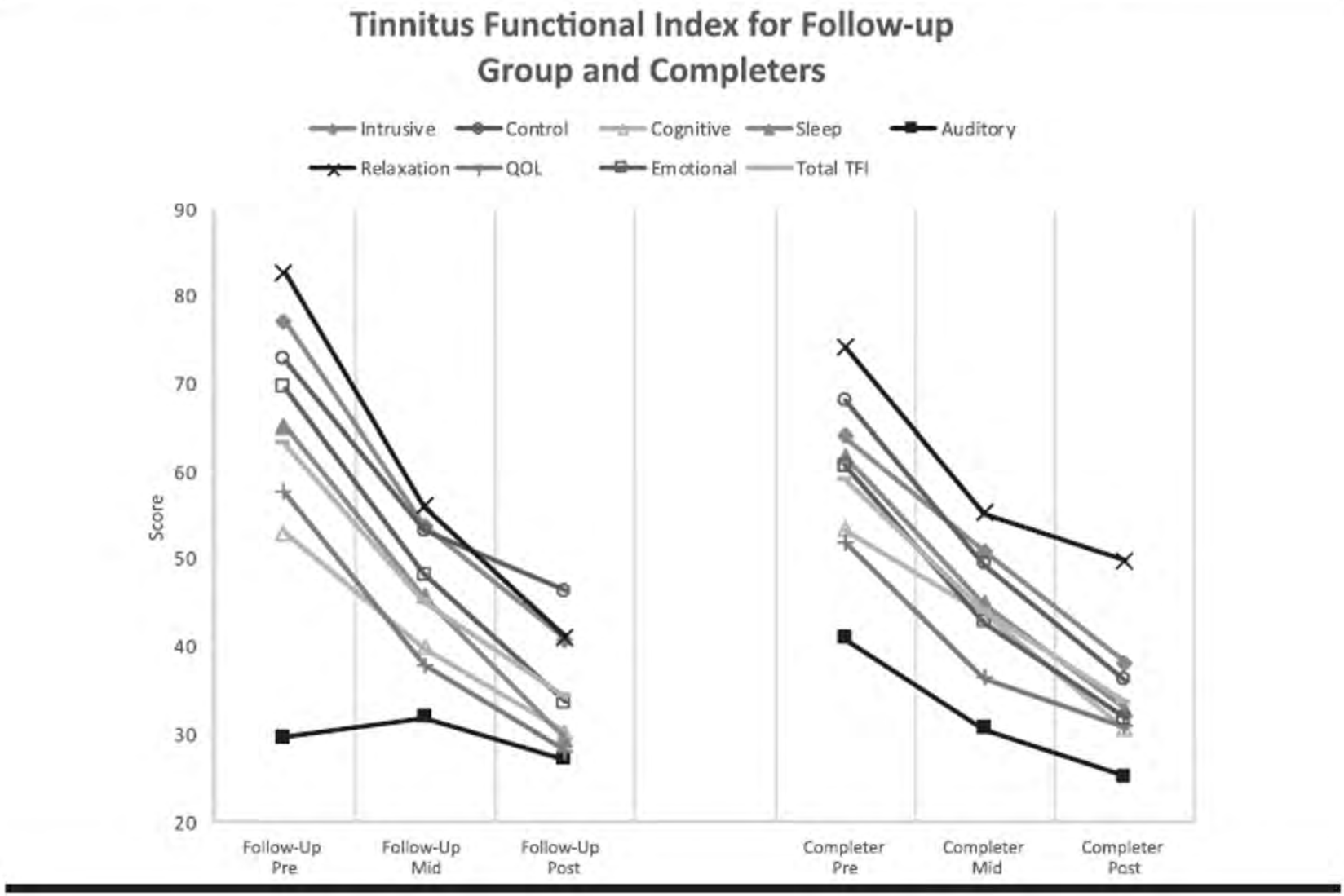


Figure 2. Perceived Stress Scale scores for the Completer and Follow-Up Groups.

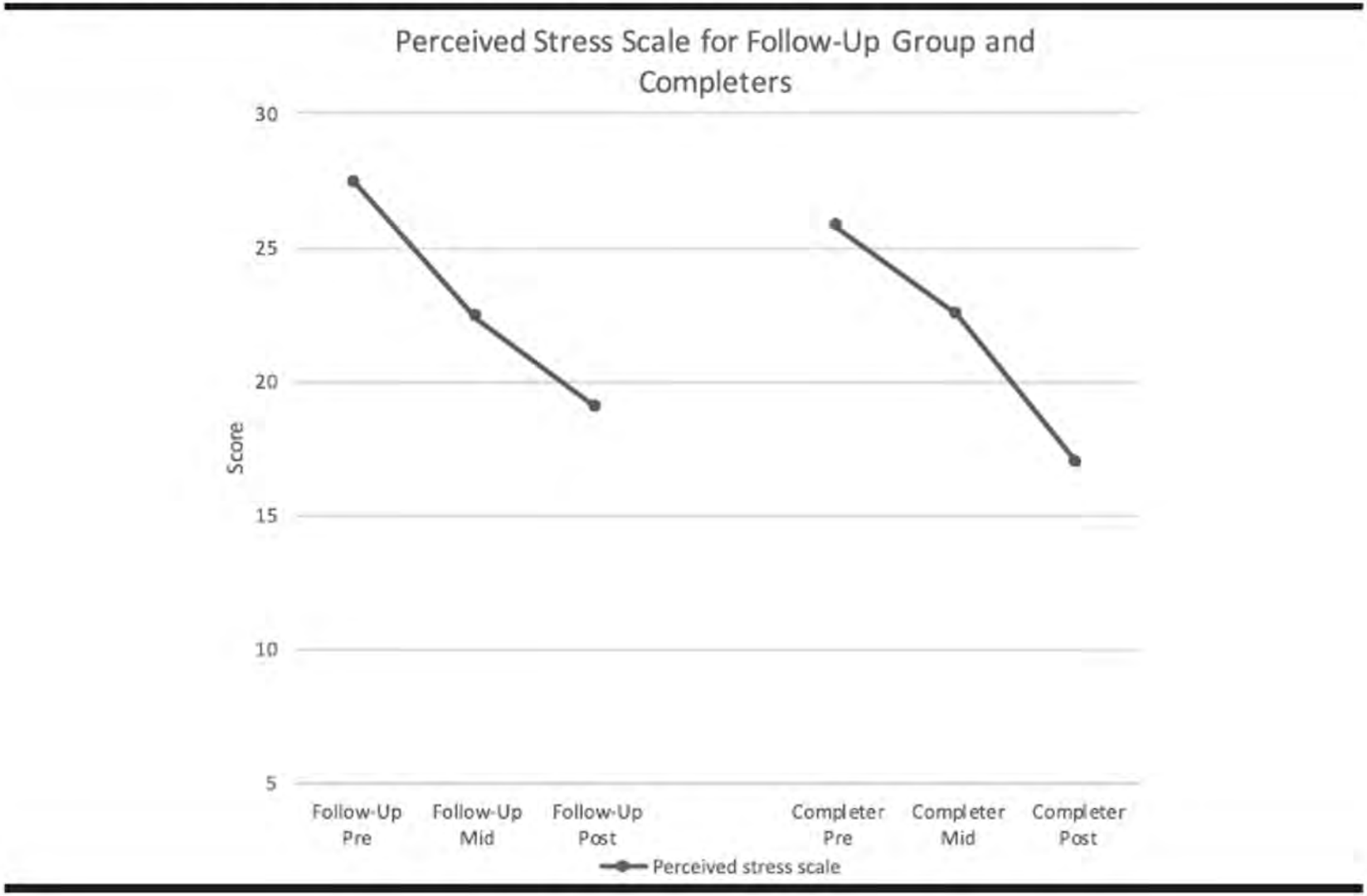


Figure 3. Change in Tinnitus Functional Index subscale scores from pre to mid. TFI = Tinnitus Functional Index.

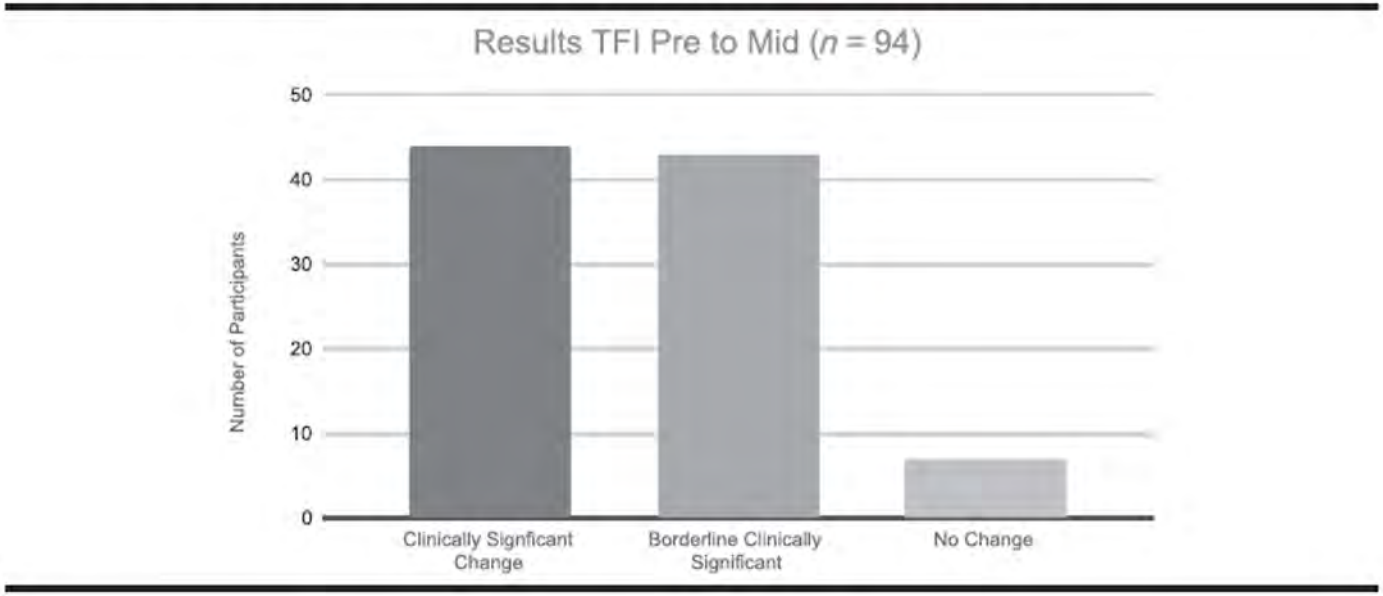
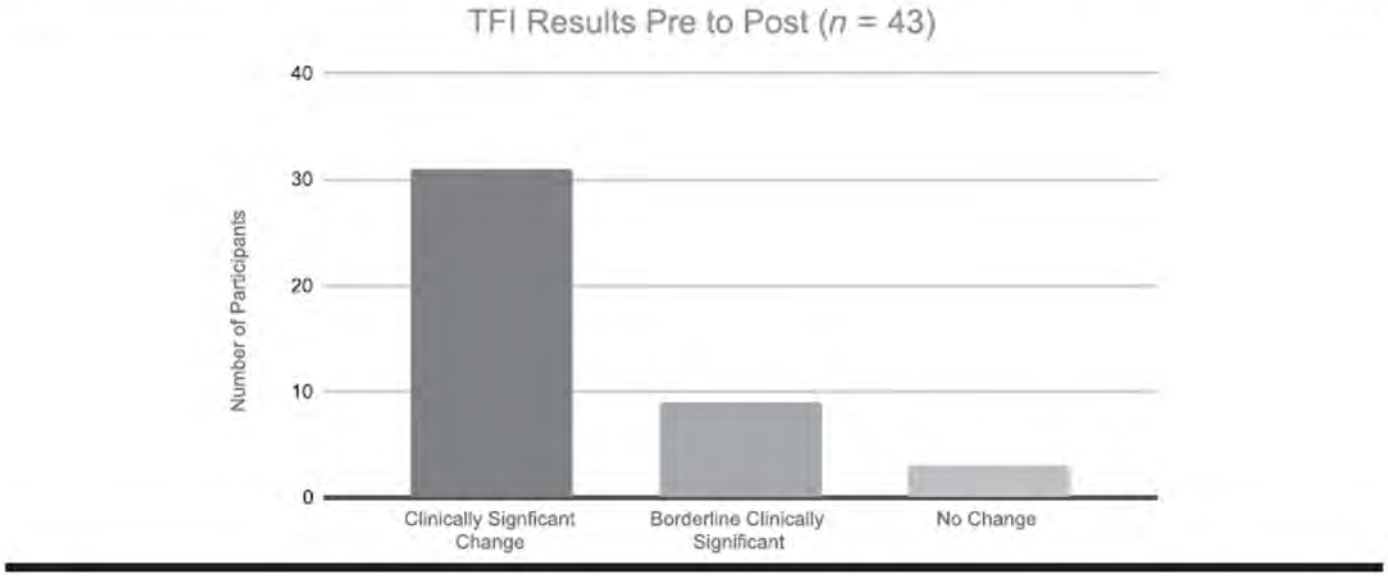


Figure 4. Change in Tinnitus Functional Index subscale scores from pre to post. TFI = Tinnitus Functional Index.



Ultimately…

- An 8-wk iMBTSR program alleviates symptoms of bothersome tinnitus (particularly when in isolation)
- Participants benefitted across all TFI subscales
- Greatest changes occurred in early in the program with continued gains to the final measurement and maintained after course completion
  - A 3-week program may be effective for treating tinnitus intrusion?
  - No improvement for sleep or cognition in this timeframe, which both improved from midpoint to end
  - For those without sleep or cognitive function issues, a reduced program may be effective?

Limitations:
10% completion rate
No control group

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Bardy F, Jacquemin L, Wong CL, Maslin MRD, Purdy SC and Thai-Van H (2024) Delivery of internet-based cognitive behavioral therapy combined with human-delivered telepsychology in tinnitus sufferers through a chatbot-based mobile app.
Front. Audiol. Otol. 1:1302215.
doi: 10.3389/fauot.2023.1302215

Delivery of internet-based cognitive behavioral therapy combined with human-delivered telepsychology in tinnitus sufferers through a chatbot-based mobile app

Fabrice Bardy[1,2]*, Laure Jacquemin[3,4], Cara L. Wong[5], Michael R. D. Maslin[1,2,6], Suzanne C. Purdy[1,2] and Hung Thai-Van[7,8,9]

Objective:

Examine the benefit of incorporating telepsychology into an iCBT program delivered through a chatbot

We all know CBT has the most evidence of efficacy in reducing tinnitus distress…

- Limitations of traditional delivery of CBT:
  - Labor-intensive (requires trained personnel)
  - Costly
  - Limited accessibility
- Can we use a chatbot to improve access?
  - Meet Woebot! Examples:
    - Pointing out cognitive distortions such as mind-reading in response to a statement like “nobody likes me”

How do you feel right now?

I’m panicking.

Oh no, I’m sorry. Breathe along with me for a minute and then we’ll talk more about it OK?

https://www.youtube.com/watch?v=ZGBtQw3_Pbo&list=PPSV

Fitzpatrick et al (2017)

Figure 2. Change in mean depression (PHQ-9) score by group over the study period. Error bars represent standard error.

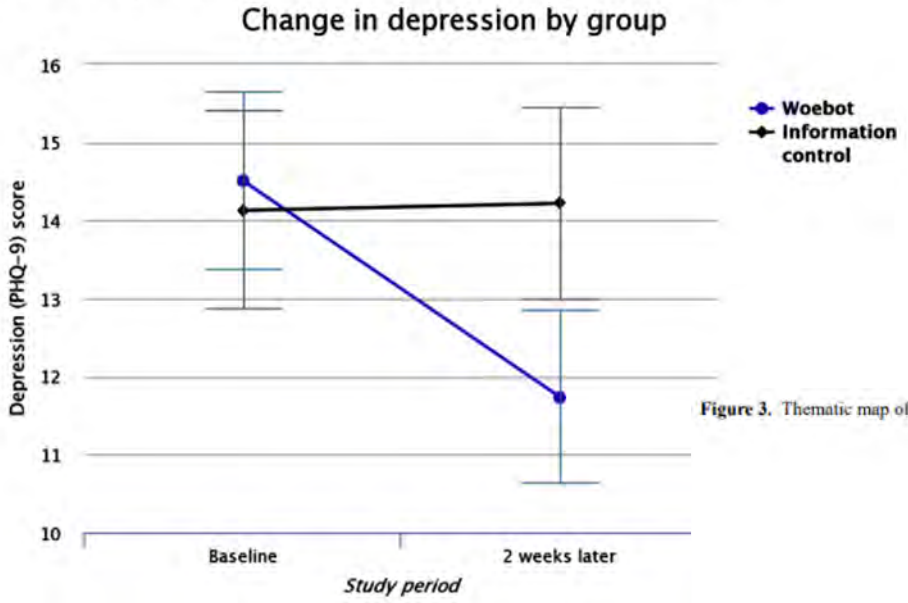
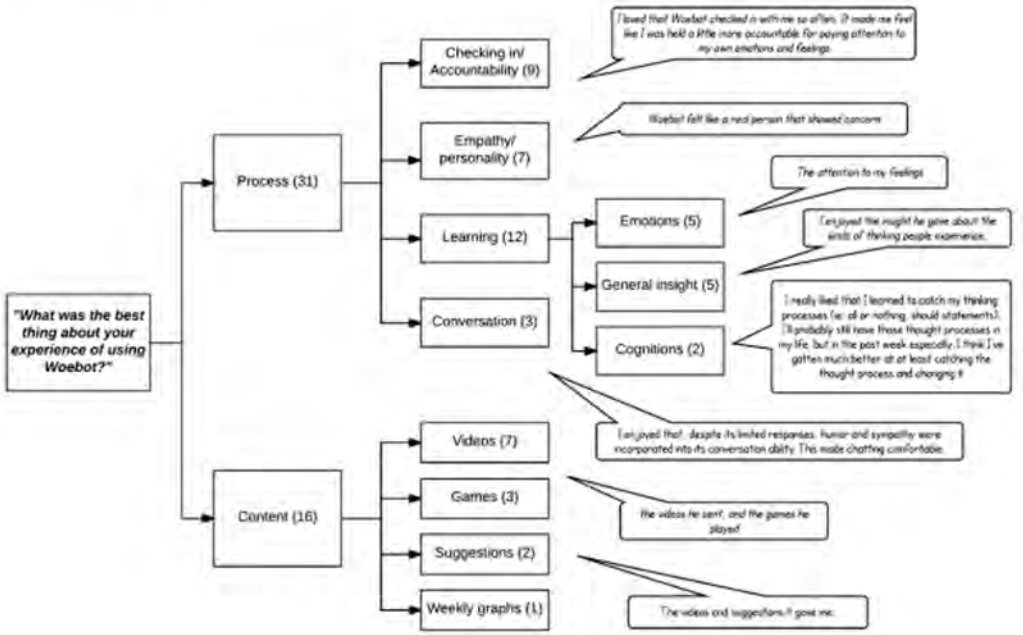


Figure 3. Thematic map of participants' most favored features of their experience of using Woebot.



Back to Bardy et al (2023)

- Can we incorporate telepsychology into an iCBT program for tinnitus delivered through a chatbot?
- Meet Tinnibot!

Tinnibot | Tinnitus Relief 17+
Sound Therapy & Sleep Relief
Odio Tech Pty Ltd
Designed for iPhone
★★★★★ 4.5 • 18 Ratings
Free · Offers In-App Purchases

https://apps.apple.com/us/app/tinnibot-tinnitus-relief/id1510756641

2 study groups:

Tinnibot Only (n=14)	Hybrid (n=14)
• iCBT only	• iCBT • Video calls w/ clinical psychologist (4 30-min calls)

8-week study period: pre, post, and 2-month follow up assessments

What did Tinnibot do in the study?

Conversations & exercises

ID & challenge negative thoughts	Behavior activation	Relaxation
Mindfulness	Acceptance	Gratitute

Exercises

Also: relaxing soundscapes

Outcome Measures

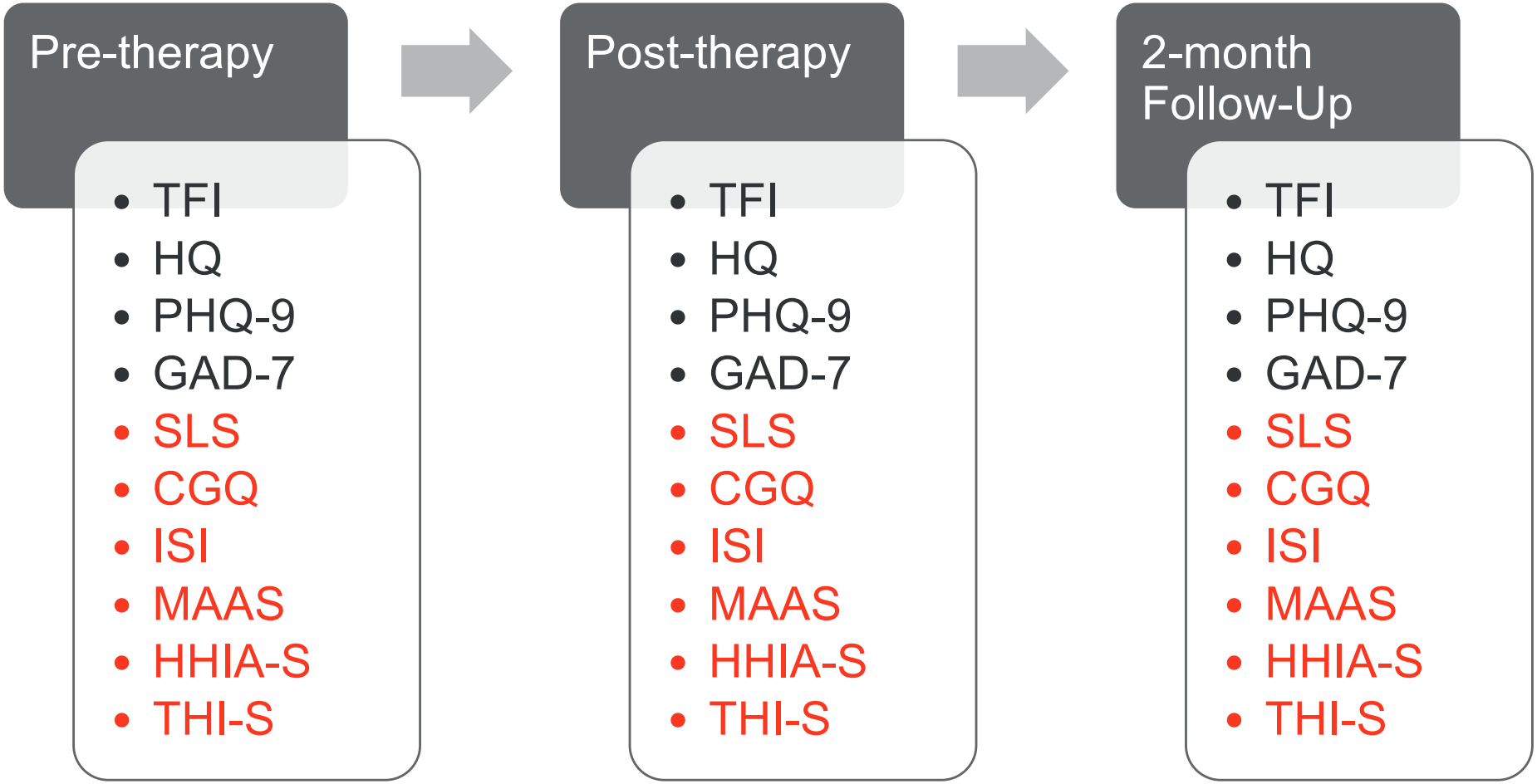


TABLE 1 Participant Characteristics for age, TFI, HQ, and PHQ-9 reported mean (SD).

Intervention	Tinnibot only	Hybrid (Tinnibot + telepsychology)	Overall
Male	7 (50%)	8 (57%)	15 (54%)
Female	7 (50%)	6 (43%)	13 (46%)
Age in years	57.5 (16.6)	57.5 (10.2)	57.5 (13.5)
TFI	39.83 (19.75)	51.71 (19.92)	45.77 (20.39)
HQ	15.50 (9.46)	19.08 (4.97)	17.22 (7.71)
PHQ-9	5.36 (5.06)	5.54 (3.21)	5.44 (4.19)
GAD-7	3 [1–14]	5 [2–20]	4 [1–20]

For GAD-7 median [range]. One outlier was removed from HQ and PHQ-9 data.

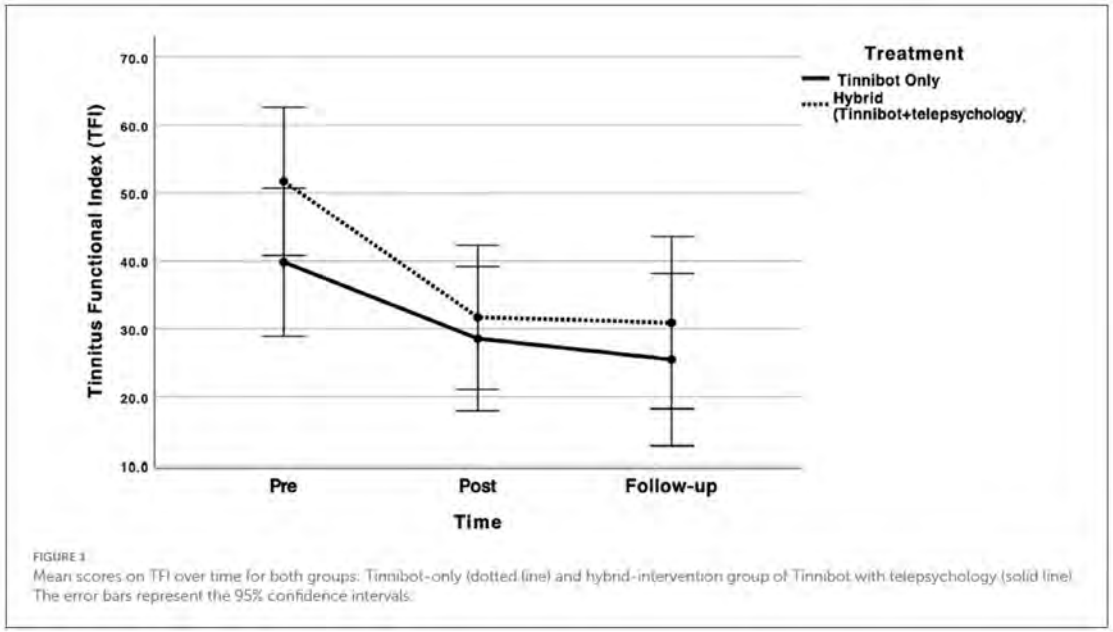


FIGURE 3
Mean scores on TFI over time for both groups: Tinnibot-only (dotted line) and hybrid-intervention group of Tinnibot with telepsychology (solid line). The error bars represent the 95% confidence intervals.

Original Paper

Current Status and Trends in mHealth-Based Research for Treatment and Intervention in Tinnitus: Bibliometric and Comparative Product Analysis

Yuanjia Hu[1], BSc; Yang Lu[1], BSc; Chenghua Tian[1*], MM; Yunfan He[2], MSc; Kaiyi Rong[3], MBBS; Sijia Pan[1], BSc; Jianbo Lei[4,5,6*], MD

Objective:

Understand the research trends in tinnitus treatment software, including the characteristics and limitations of the apps available in the market.

Table 1. Ranking of authors with >4 publications.

Rank by number of articles	Author's name	Articles (n=153), n (%)
1	Andersson G	22 (14.4)
2	Beukes EW	14 (9.2)
2	Manchaiah V	14 (9.2)
3	Schlee W	13 (8.5)
4	Pryss R	12 (7.8)
5	Reichert M	10 (6.5)
6	Allen PM	9 (5.9)
6	Baguley DM	9 (5.9)
7	Langguth B	8 (5.2)
8	Probst T	7 (4.6)
8	Spiliopoulou M	7 (4.6)
9	Greenwell K	6 (3.9)
9	Hoare DJ	6 (3.9)
9	Neff P	6 (3.9)
10	Mehdi M	5 (3.3)
10	Sereda M	5 (3.3)

Figure 4. Productivity of the top authors over time.

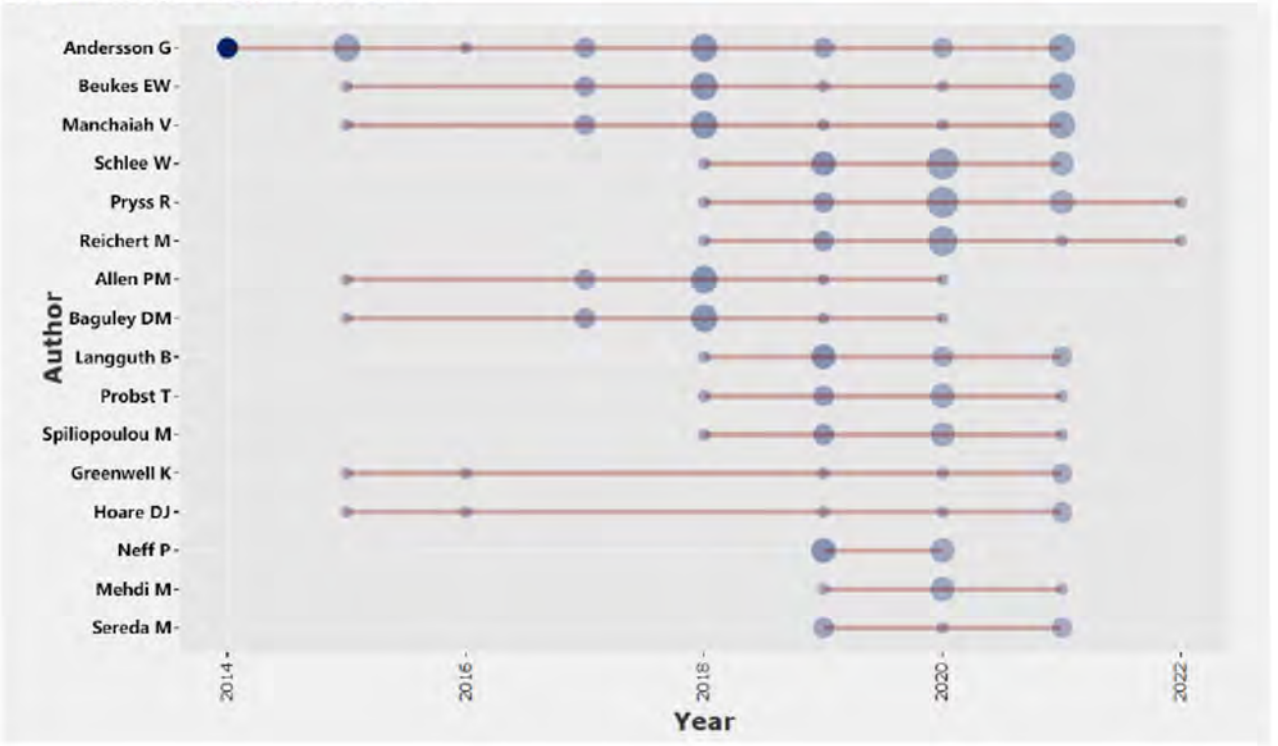


Figure 5. Articles by country of corresponding author. MCP: multicountry publication; SCP: single country publication.

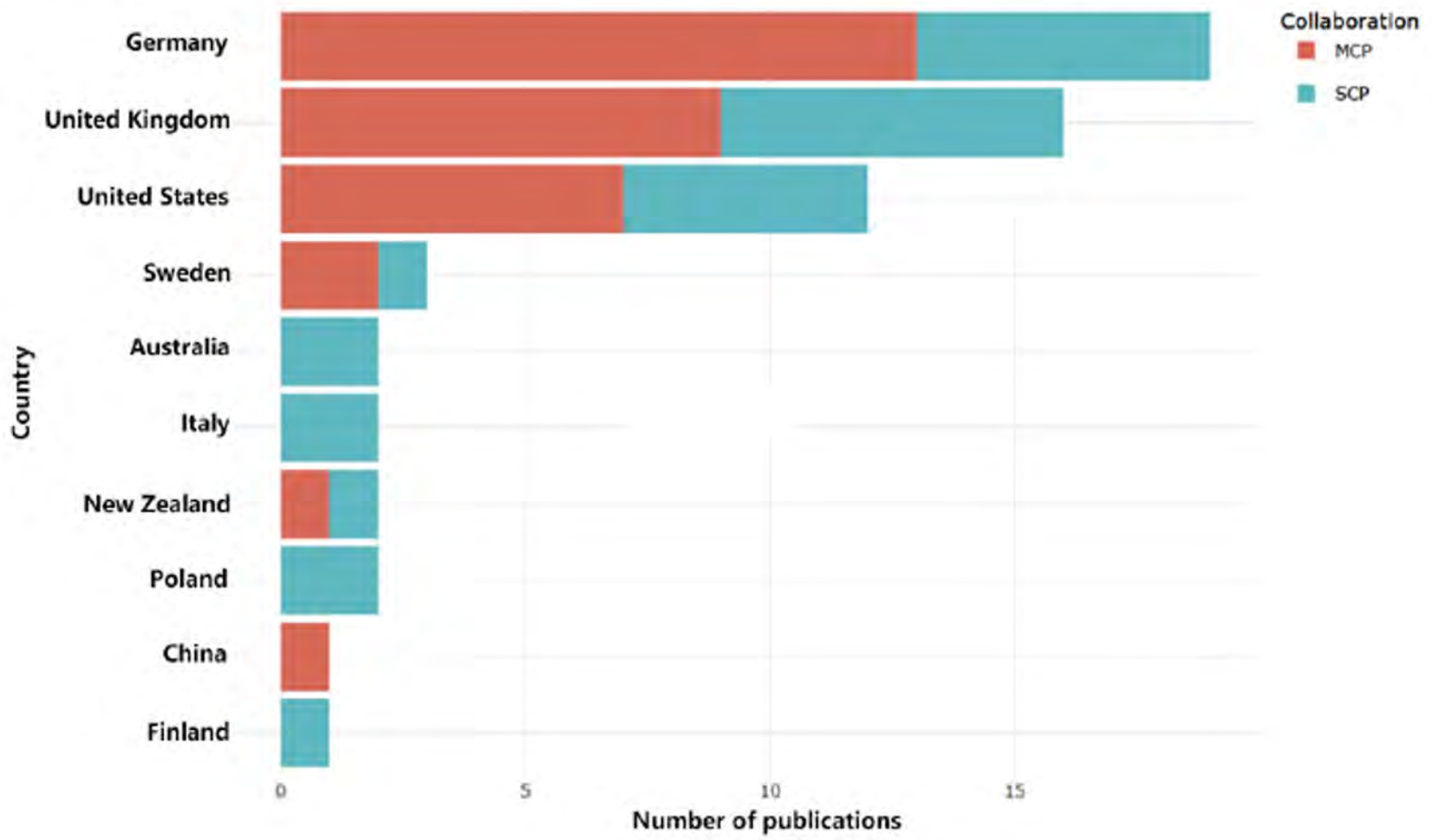


Figure 6. Keyword co-occurrence network diagram produced using VOSviewer [21].

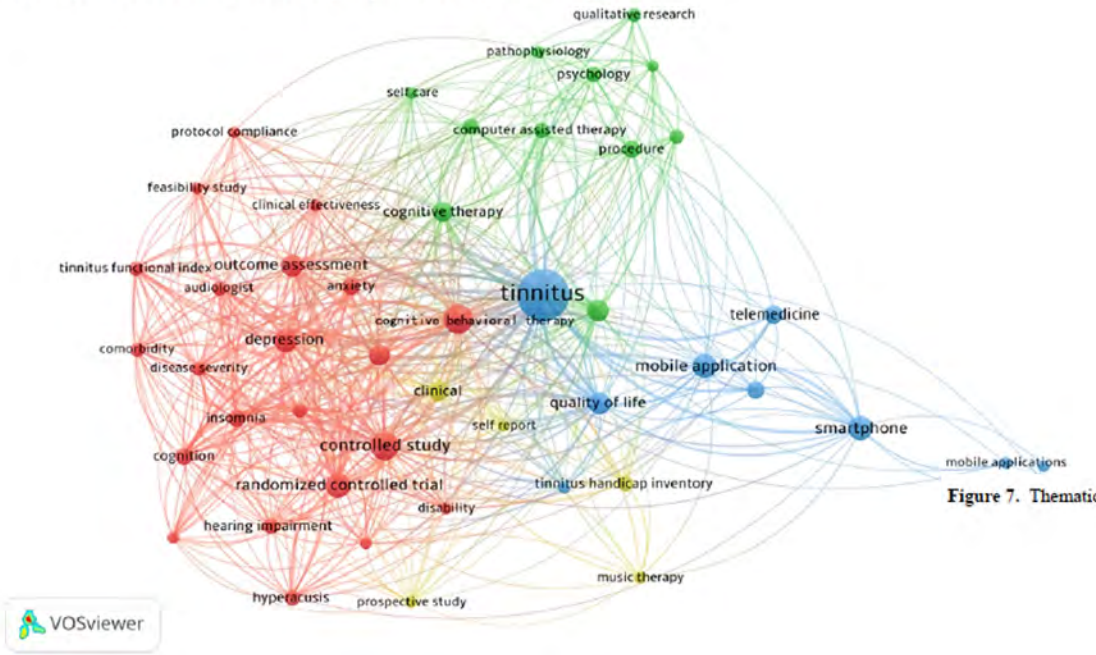
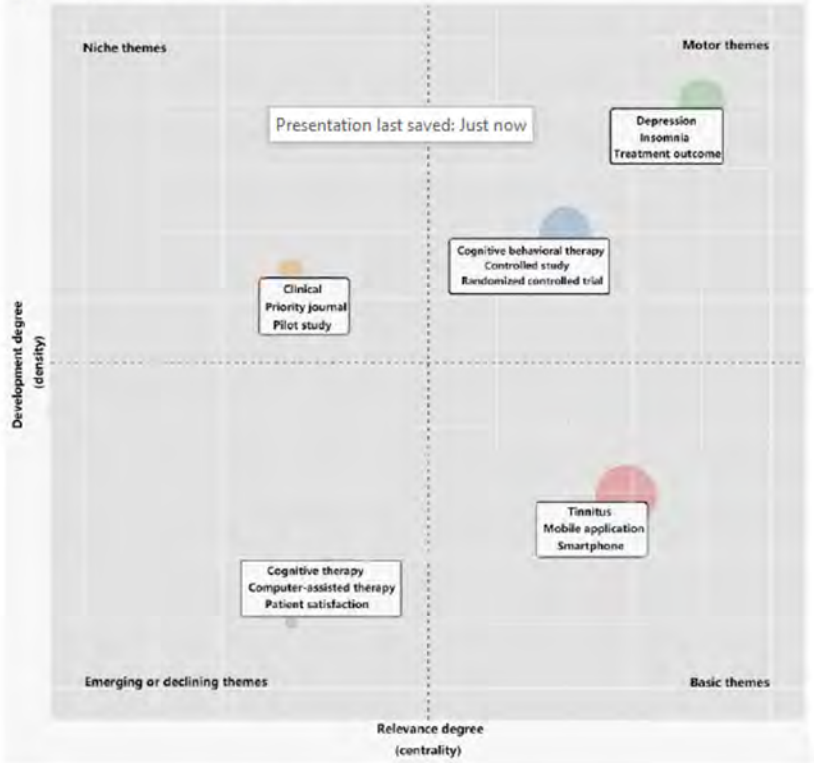
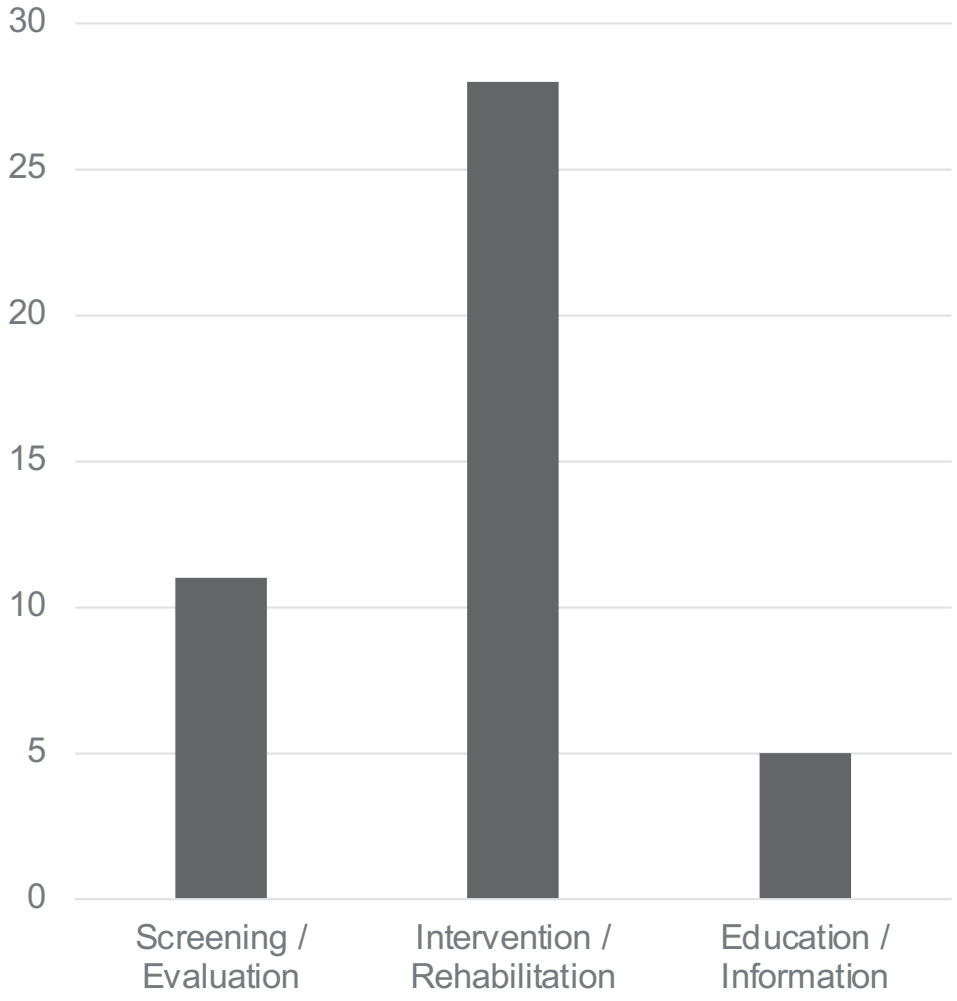


Figure 7. Thematic map with keywords divided into 4 domains.



3 main categories of tinnitus apps:



Included treatment components:

Masking	Habituation	CBT
Sound Therapy	Neuromusic	Play therapy / Freq discrimination therapy
Transcallosal vagus nerve microcurrent stimulation	Neuromodulation	Other

Trends in the literature…

- Growth patterns
- Acceptance rates
- Author productivity
- Geographic region

Issues with the apps…	Ratings
	Lack of uniform treatment protocol

Lightning Round! Smartphone-based therapies

PLOS DIGITAL HEALTH

OPEN ACCESS

Citation: Walter U, Pennig S, Kottmann T, Bleckmann L, Röschmann-Doose K, Schlee W (2023) Randomized controlled trial of a smartphone-based cognitive behavioral therapy for chronic tinnitus. PLOS Digit Health 2(9): e0000337. https://doi.org/10.1371/journal.pdig.0000337

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Funding: The study was funded by mynoise GmbH. The funders participated in study design, decision to publish, and review of the manuscript, they had no role in data collection and analysis. WS is coordinator of EU (Horizon 2020 framework) funded "Unification of Treatments and Interventions for Tinnitus Patients" (UNITI, grant no. 848261; Schlee et al., 2021); TK, CEO of CRO

RESEARCH ARTICLE

Randomized controlled trial of a smartphone-based cognitive behavioral therapy for chronic tinnitus

Uso Walter[1], Stefan Pennig[2], Tanja Kottmann[3], Lothar Bleckmann[4], Kristina Röschmann-Doose[5]*, Winfried Schlee[6,7]

JMIR MHEALTH AND UHEALTH Suh et al

Original Paper

The Treatment Outcome of Smart Device–Based Tinnitus Retraining Therapy: Prospective Cohort Study

Myung-Whan Suh[1,2*], MD, PhD; Moo Kyun Park[1,2*], MD, PhD; Yoonjoong Kim[3,4], MD; Young Ho Kim[2,3], MD, PhD

“Smart” TRT

- **n=84**
- **Tablet-based lessons on ear anatomy, neurophysiological model of tinnitus, habituation, and sound therapy**
- **3-month study period**

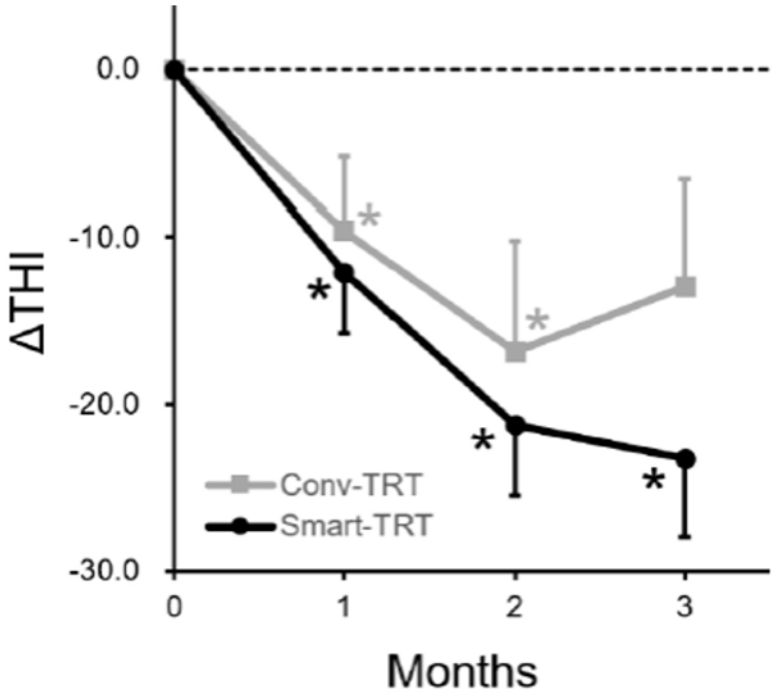
THI, VAS
0, 1, 2, 3 mos after

“Smart” CBT

- n=187
- App focusing on attention/relaxation, mindfulness, acceptance, self-efficacy
- 3-month study period

TQ, PHQ-9, PSQ20
3 mos after

"Smart" TRT



"Smart" CBT

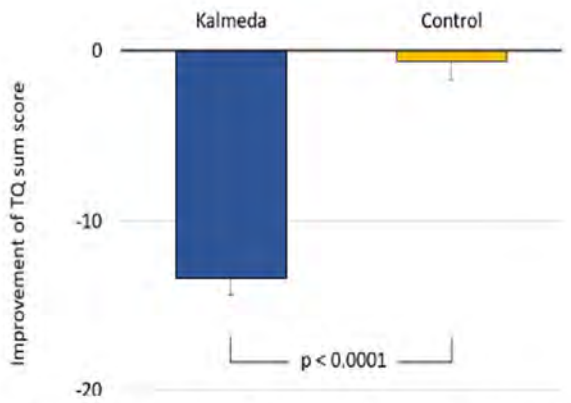


Fig 2. Change of the primary endpoint Tinnitus Questionnaire (TQ) sum score based on the intention to treat (ITT) population of patients (imputation: multiple imputations).

Transcranial Magnetic Stimulation

Open Access | Feature Paper | Review

Journal of *Clinical Medicine*

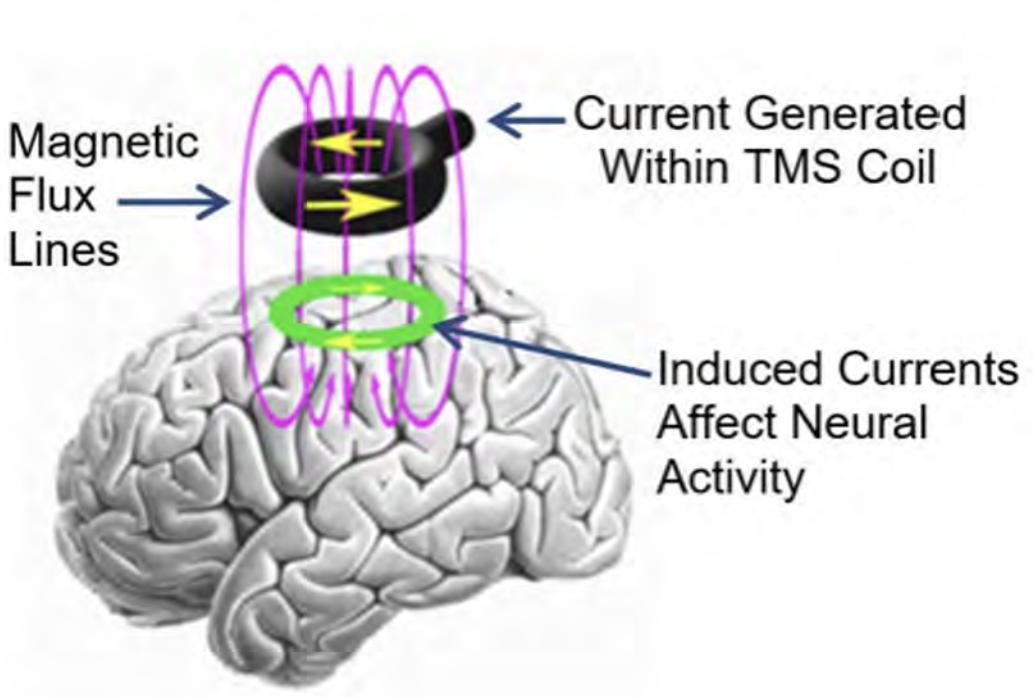
MDPI

Review

Unresolved Issues Associated with Transcranial Magnetic Stimulation (TMS) Treatment of Chronic Tinnitus

Robert L. Folmer [1,2]

Non-invasive intervention



Materials & Methods

Databases

- PubMed
- Medline

Terms

- repetitive Transcranial Magnetic Stimulation Tinnitus
- TMS
- rTMS

Variables

- Control/placebo condition
- TMS stimulation parameters
- Tonic versus burst stimulation
- Placement of the TMS coil
- Characteristics of the tinnitus population
- Sample size

Results

- It’s Effective!

Results

- It's Effective!

Not So Fast…

rTMS Equipment
- Type/Brand of TMS System and Its Configuration.
- Coil Type
- Coil Orientation

Coil Placement/Scalp Target
- Temporal Lobe Stimulation
- Neuronavigation vs. Coil Placement via Scalp Landmarks
- Frontal/Dual Site Stimulation
- Laterality of rTMS Application

Outcome Measures and Follow Up
- Follow up

Stimulation Parameters
- Stimulation Frequency and Number of Pulses Per Session
- Number of Sessions
- Stimulation Intensity and Determination of Resting Motor Threshold (rMT)
- Placebo/Sham Control Condition and Blinding

Characteristics of the Study Population
- Study Population Size
- Etiology of Tinnitus
- Duration of Tinnitus
- Tinnitus Severity
- Age of Study Participants
- Co-Occurring Conditions
- Hearing Sensitivity of Participants

Discussion

- *"more large randomized double-blind multi-centre trials are needed for further verification"*

- Why is there a dearth of large, multi-site clinical trials of rTMS for tinnitus?

Naturopathy

JOURNAL OF DIETARY SUPPLEMENTS
2023, VOL. 20, NO. 1, 1–14
https://doi.org/10.1080/19390211.2021.1944947

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ARTICLE

OPEN ACCESS

Check for updates

Effectiveness of Tinnitan Duo® in Subjective Tinnitus with Emotional Affectation: A Prospective, Interventional Study

Jennifer Knäpper*, M. Victoria Girauta, and Jordi Coromina

Centro Médico Teknon (Quirón Salud), Barcelona, Spain

Aim

- To assess the effectiveness of this food supplement at improving the perception of tinnitus and emotional-related responses, and its safety profile.

- Tinnitan DuoV®
  - 5-hydroxytryptophan (5-HTP), Ginkgo biloba, magnesium, melatonin, vitamin B5 and B6, and zinc

- **STATEMENT 11. DIETARY SUPPLEMENTS: Clinicians should not recommend Ginkgo biloba, melatonin, zinc, or other dietary supplements for treating patients with persistent, bothersome tinnitus.** *Recommendation (against) based on RCTs and systematic reviews with methodological concerns, with a preponderance of benefit over harm.*

Methods

- Study design
  - Prospective, non-controlled, single-center, interventional study
  - 2xdaily oral supplement x 3 months
  - 1xAM breakfast, 1x PM 30min before bed
- Visit 1 (month 0, baseline)
  - Audiometry, Tinnitus Handicap Inventory (THI), Tinnitus Distress Rating (TDR) scale
- Visit 2 (month 1)
  - evaluated potential changes in the characteristics of tinnitus, and recorded adverse events (AEs), concomitant medications and treatment adherence
- Visit 3 (month 3, end of study)
  - Same as visit 1 and 2

Study Design Continued

Inclusion

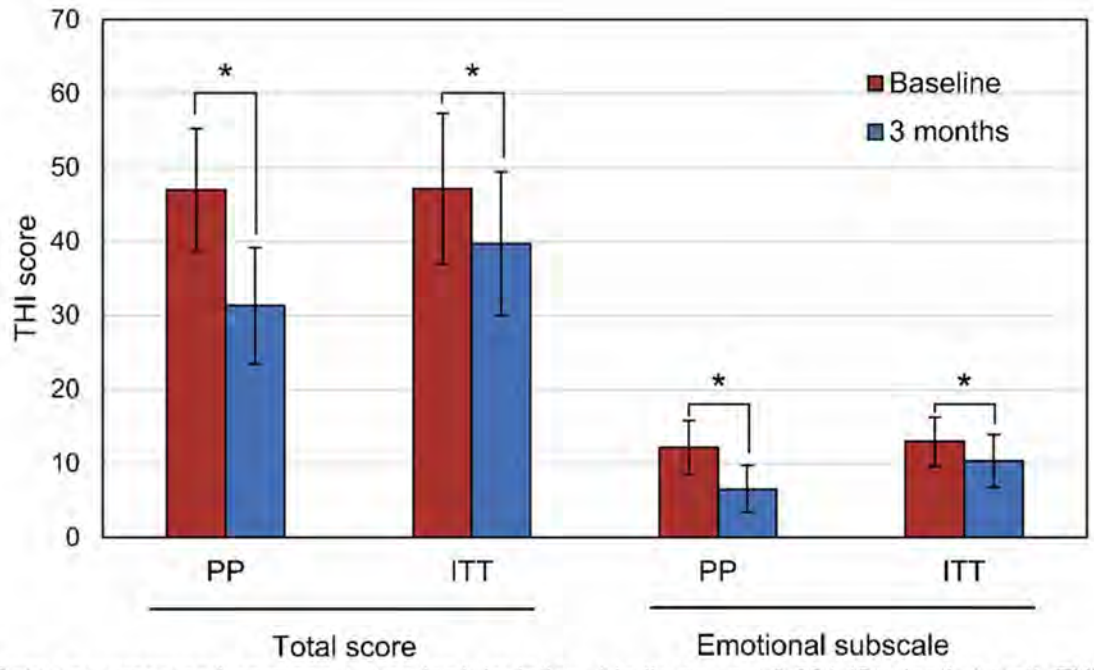
- **Adult patients**
- **Subjective tinnitus that lasted > 6 months**
- **THI score > 20 and at least 4 out 7 positive items in the emotional sub-scale of the THI**
- **Provided written informed consent**

Exclusion

- Current or previous treatment with antidepressants or anxiolytics
- Concomitant tinnitus pharmacological treatment within the previous 3 months
- Anticoagulant treatment
- History (within the previous 6 months) of or current alcohol or drug abuse
- Significant audio-otologic diseases such as Meniere's syndrome, otosclerosis, tympanic membrane perforation, or otitis media,
- Diagnosis of psychiatric disorders such as depression or psychosis
- Disease whose exacerbation, according to the investigator's criteria, could alter the interpretation of results
- Presence of acoustic neuroma, otologic lesions/surgery or pulsatile tinnitus
- Hypersensitivity or allergy to any component of the study treatment
- Severe kidney insufficiency
- Planned surgery
- Pregnant or lactating women,
- Treatment with any investigational product within the previous month of this study

Results

N= 61 (42 males, 19 females)



Data are expressed as mean ± standard deviation. * indicates p ≤ 0.001 (Student's t-test). THI, Tinnitus Handicap Inventory; PP, per-protocol; ITT, intention-to-treat.

Figure 1. Change in the THI total score and emotional subscale after 3 months of treatment.

Table 3. Change in the Tinnitus Distress Rating Scale after 3 months of treatment.

	PP population ($N = 29$)	ITT population ($N = 61$)
Baseline, mean ± SD	6.59 ± 1.59	6.61 ± 1.56
Month 3, mean ± SD	5.04 ± 1.81	5.99 ± 1.83
ΔTotal score	−1.55 ± 1.87	−0.62 ± 1.40
% of reduction	23.5 %	9.4 %
***P*-value**	0.001	0.001

Data are expressed as mean ± SD or difference from baseline to month 3.
Statistical significance was calculated with the Student's *t*-test.
PP, per-protocol; ITT, intention-to-treat; SD, standard deviation.

Results

Table 5. Change in hearing status after 3 months of treatment.

Hz	Right Ear (ΔdB)	p-value	Left Ear (ΔdB)	p-value
500	−0.96 ± 4.00	0.232	−0.19 ± 2.64	0.713
1000	−0.96 ± 4.90	0.327	−1.15 ± 4.08	0.161
2000	−1.73 ± 4.68	0.071	−1.35 ± 3.89	0.090
4000	−0.19 ± 13.23	0.941	3.46 ± 11.29	0.131

Statistical significance was calculated with the Student's *t*-test.
Hz, hertz; dB, decibels.

Table 4. Adverse events throughout the study.

	PP population ($N = 29$)
Adverse events	5
Severity	
Mild	2 (40 %)
Moderate	3 (60 %)
Severe	0
System Organ Class Preferred Term	
Ear and labyrinth disorders	
Tinnitus	1 (1.6 %)
Musculoskeletal and connective tissue disorders	
Muscle tightness	1 (1.6 %)
Nervous system disorders	
Headache	2 (3.3 %)
Dizziness	1 (1.6 %)

Data are expressed as N (%).
PP; per-protocol.

Conclusion

- Tinnitan Duo was associated with a reduction in tinnitus-related psychological impact and disability and in the perception of tinnitus loudness with a good safety profile.
- Further randomized, controlled studies are needed to confirm these preliminary results.

Laser Therapy

Open Access Article

Journal of *Personalized Medicine*

MDPI

Article

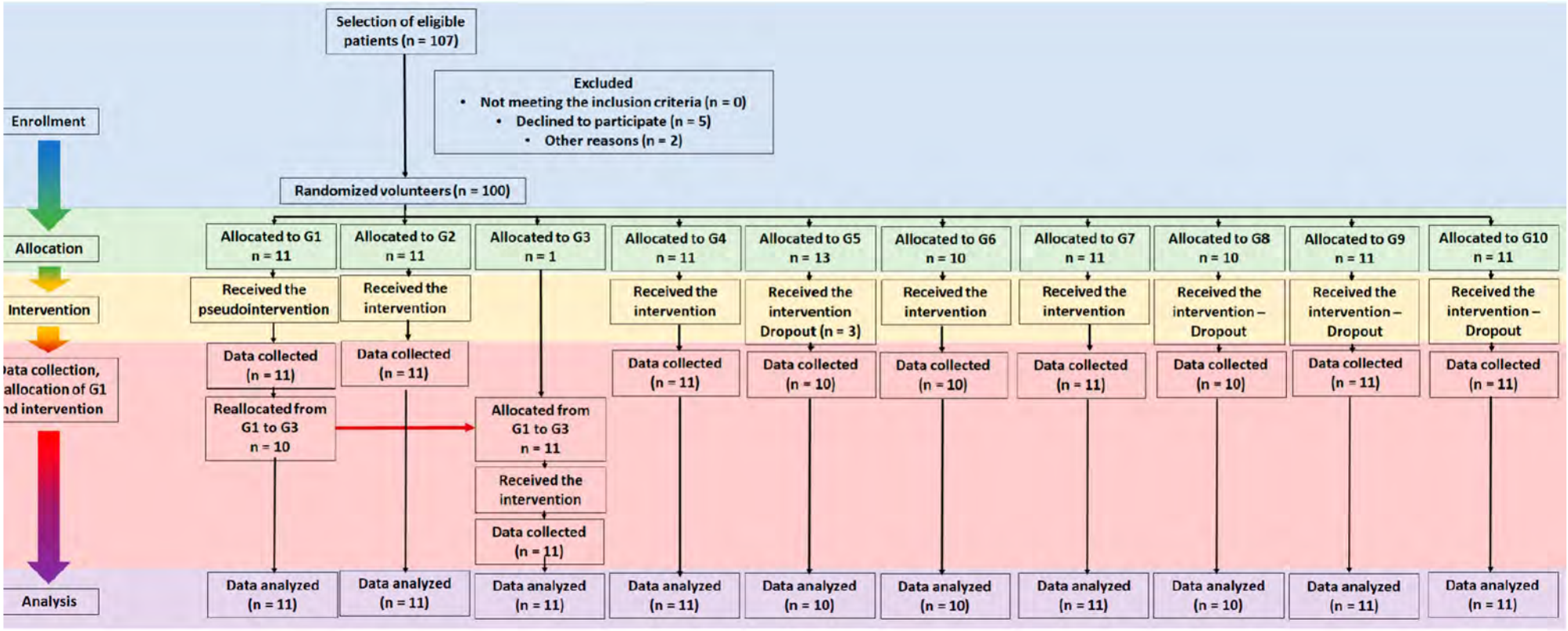
Effects of Red and Infrared Laser Therapy in Patients with Tinnitus: A Double-Blind, Clinical, Randomized Controlled Study Combining Light with Ultrasound, Drugs and Vacuum Therapy

Vitor Hugo Panhóca [1,2,3,†], Antônio Eduardo de Aquino Junior [1,2,3], Viviane Brocca de Souza [1,3,4], Simone Aparecida Ferreira [1,3,4], Lais Tatiane Ferreira [1,3,4], Karina Jullienne de Oliveira Souza [5], Patricia Eriko Tamae [4], Marcelo Saito Nogueira [1,2,6,*,†] and Vanderlei Salvador Bagnato [1,2,†]

Purpose:

- To investigate the outcome of potential alternative and complementary treatment modalities for idiopathic and refractory tinnitus patients.

Methods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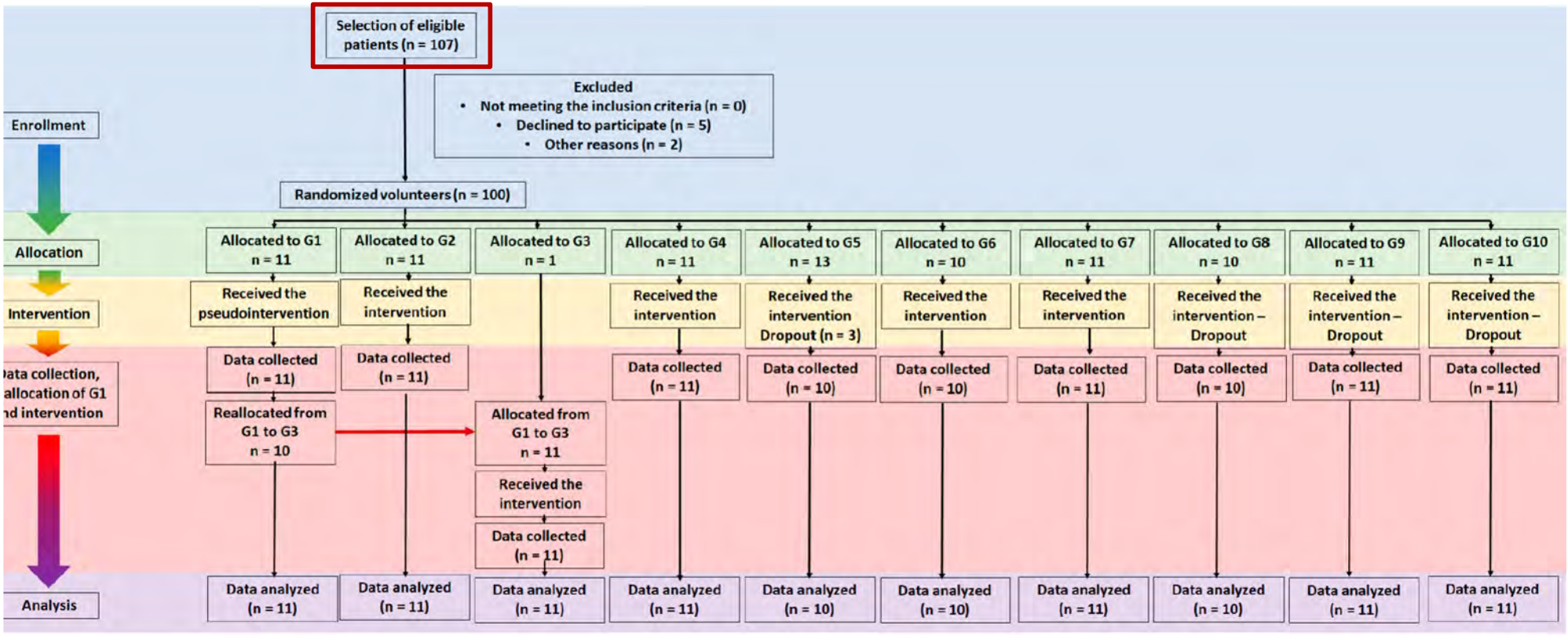
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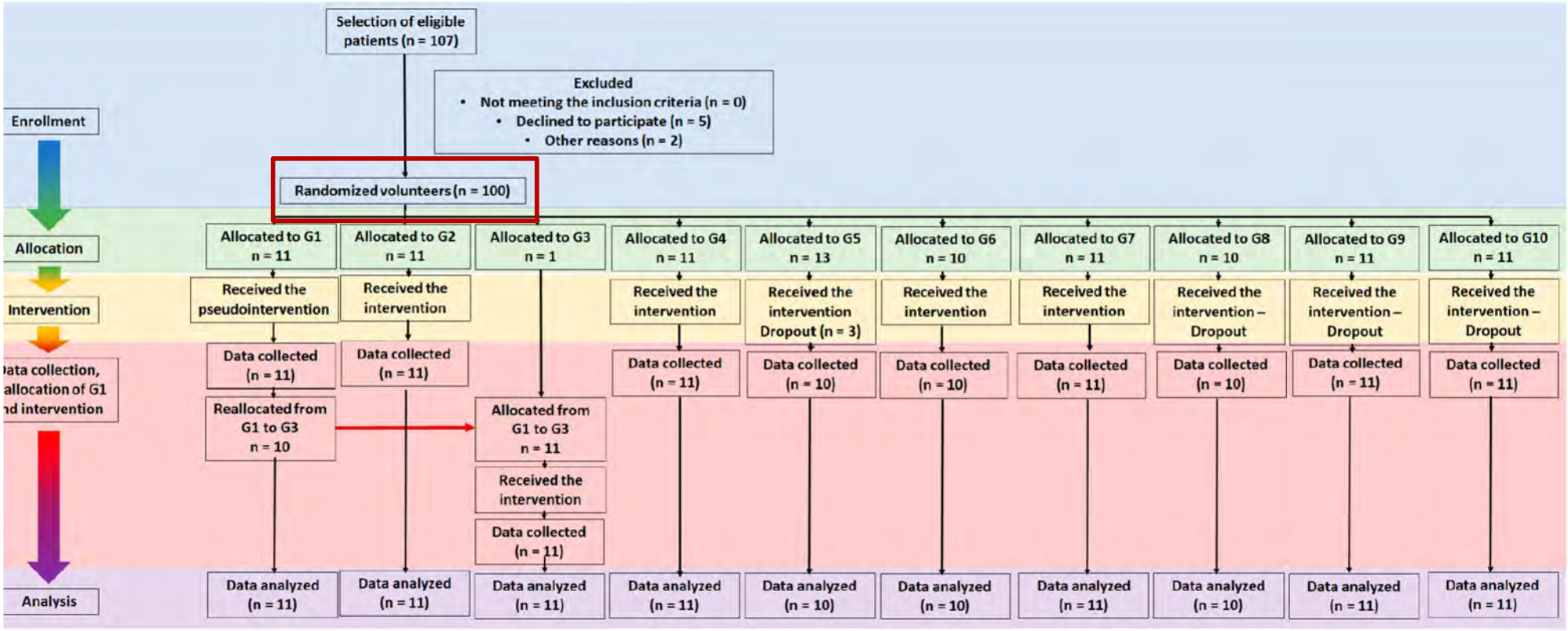
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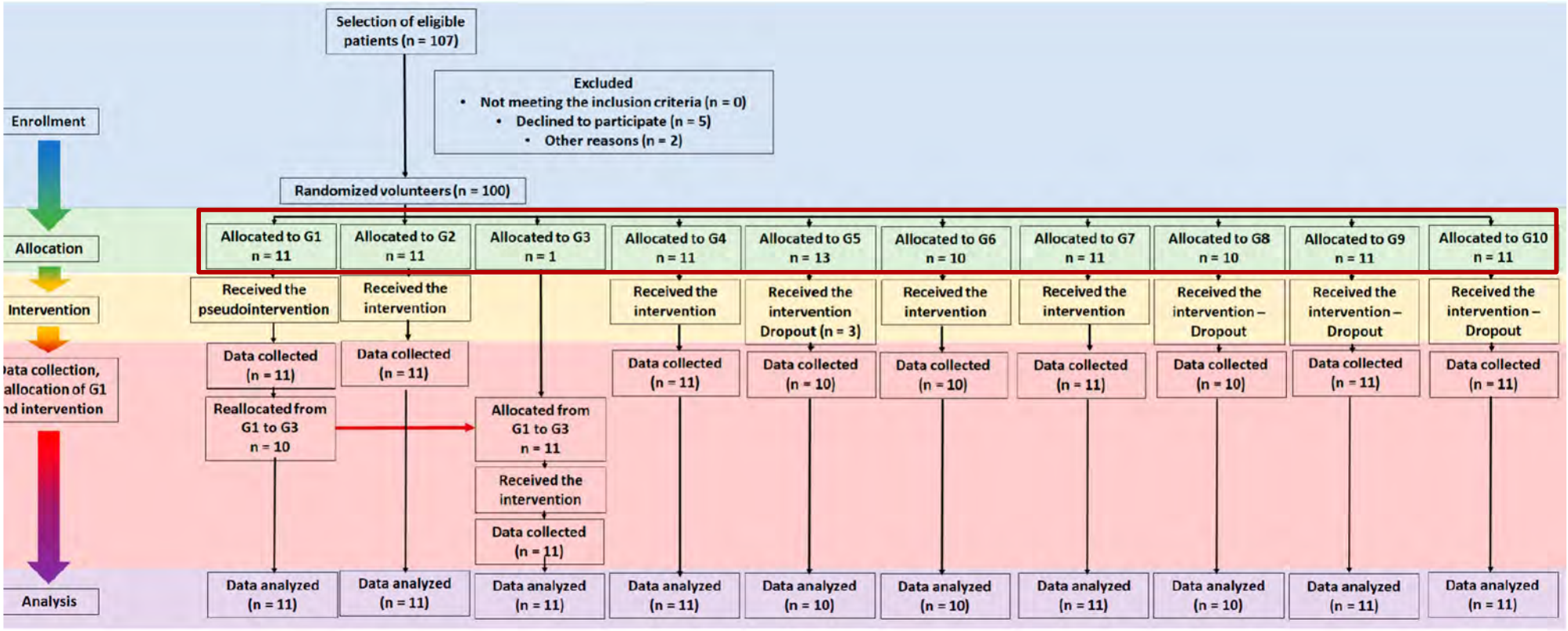
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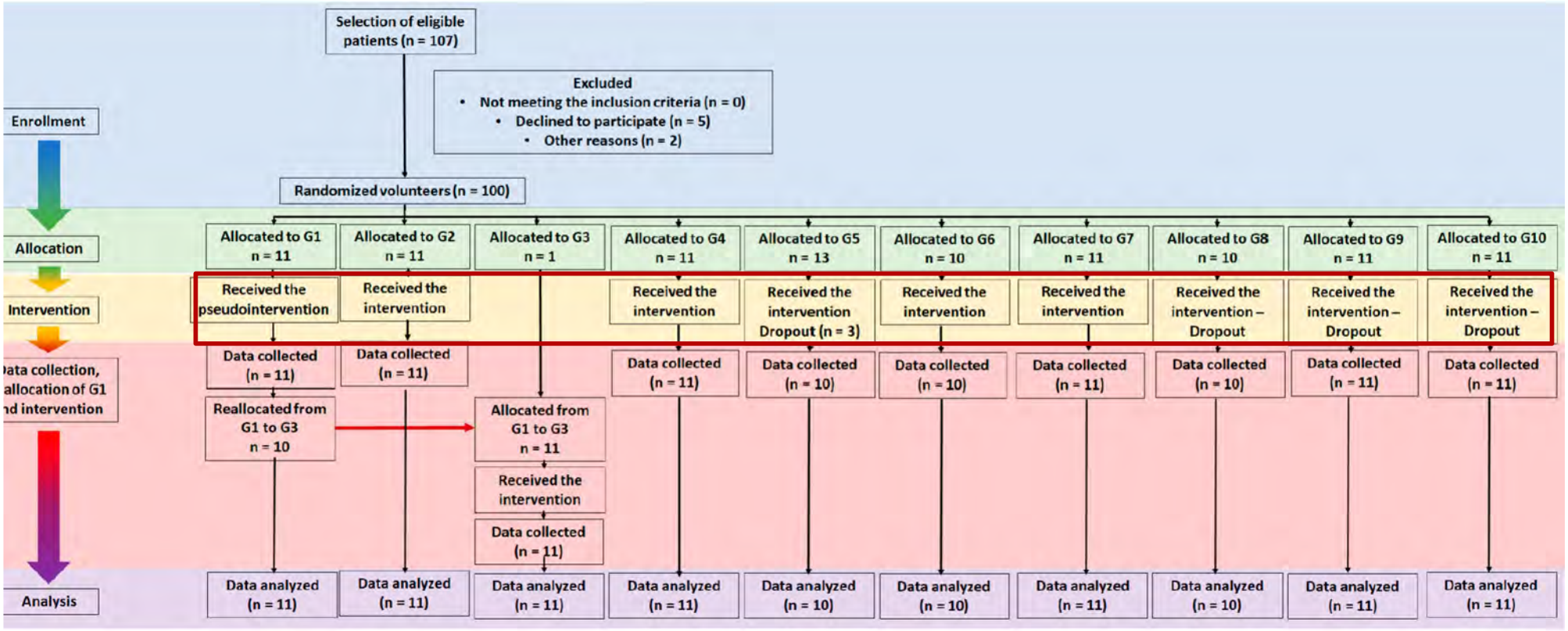
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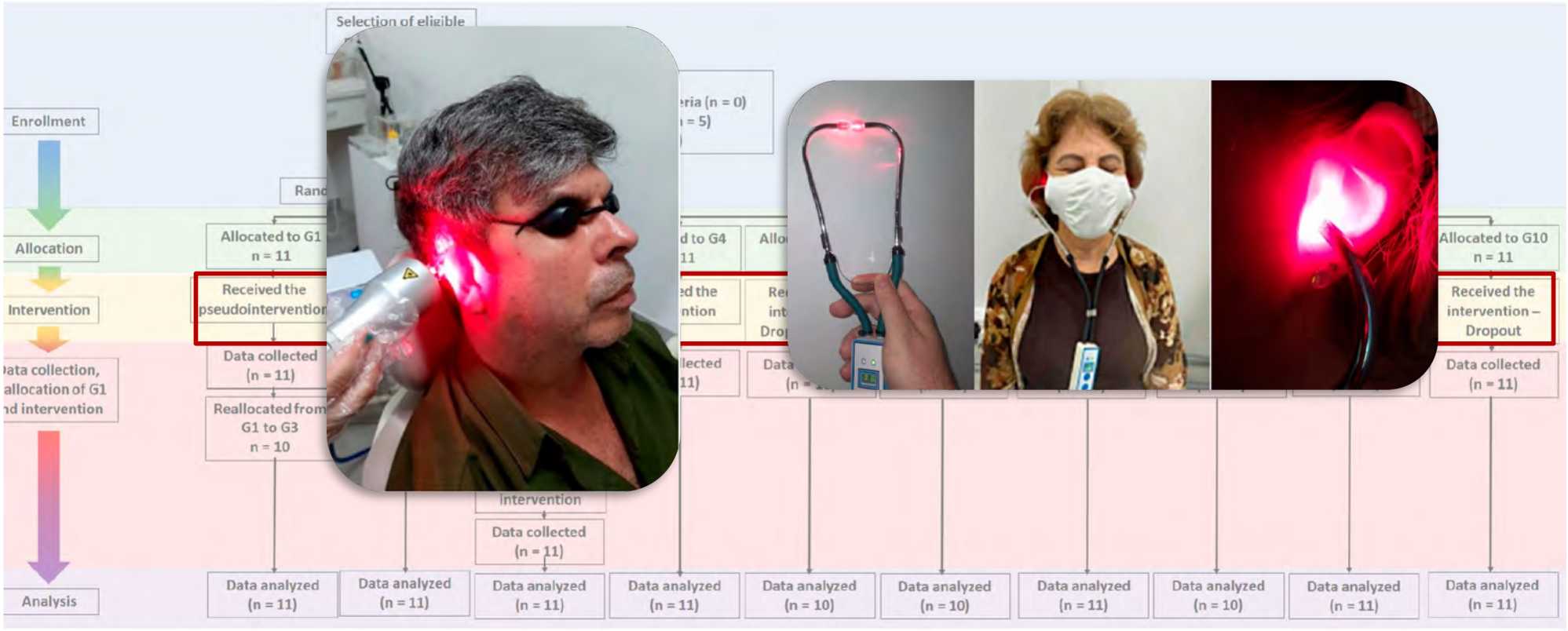
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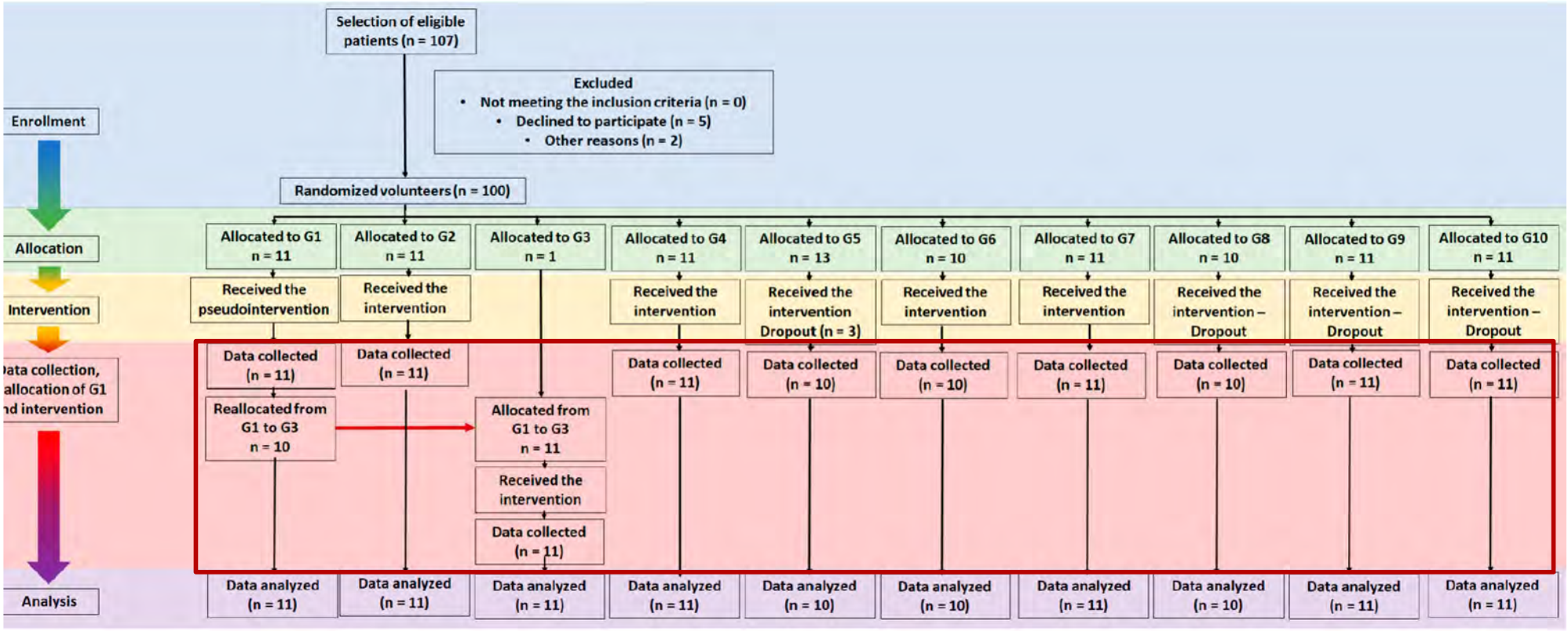
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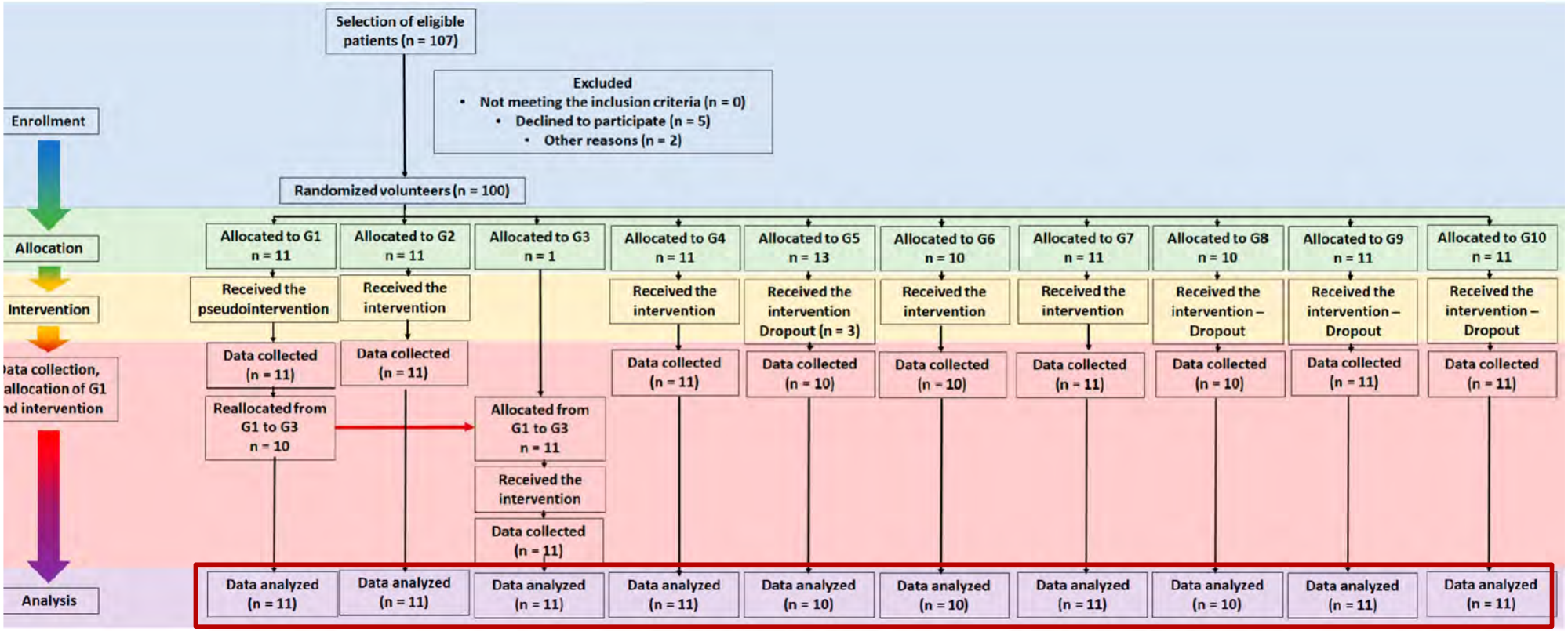
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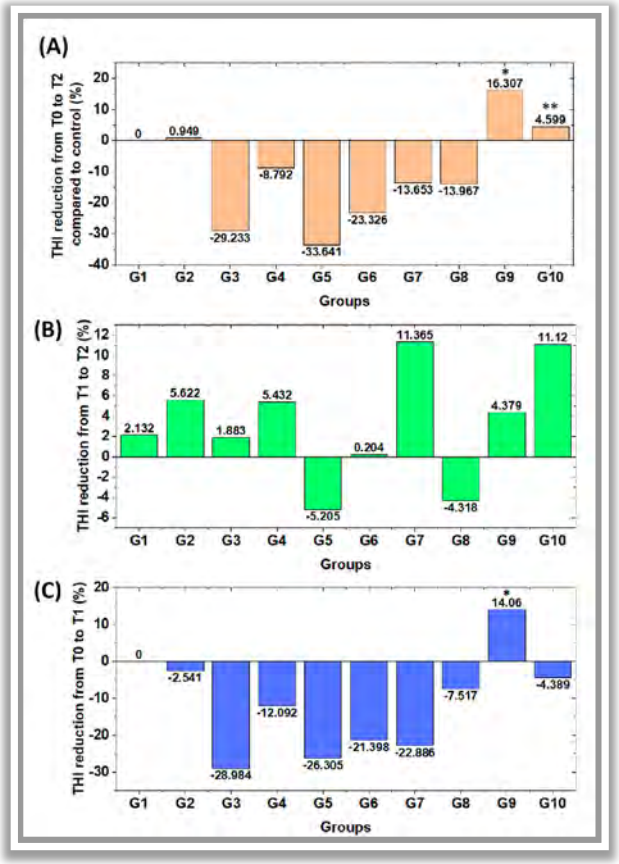
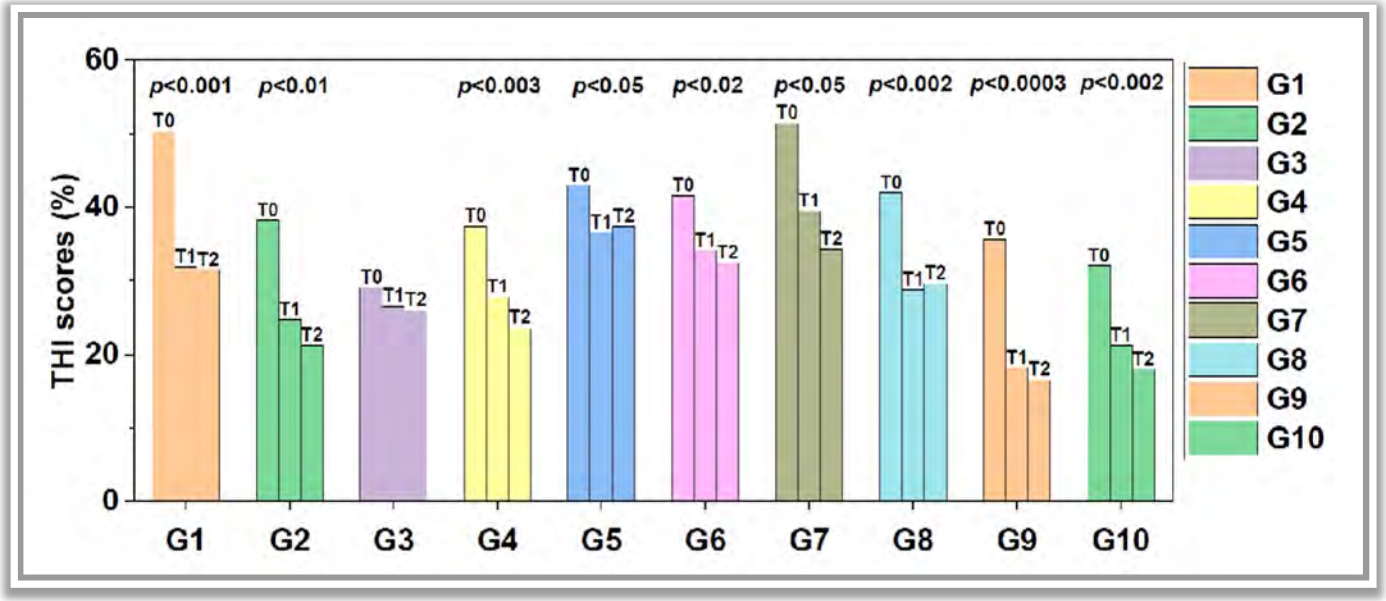
Clinical Evaluation

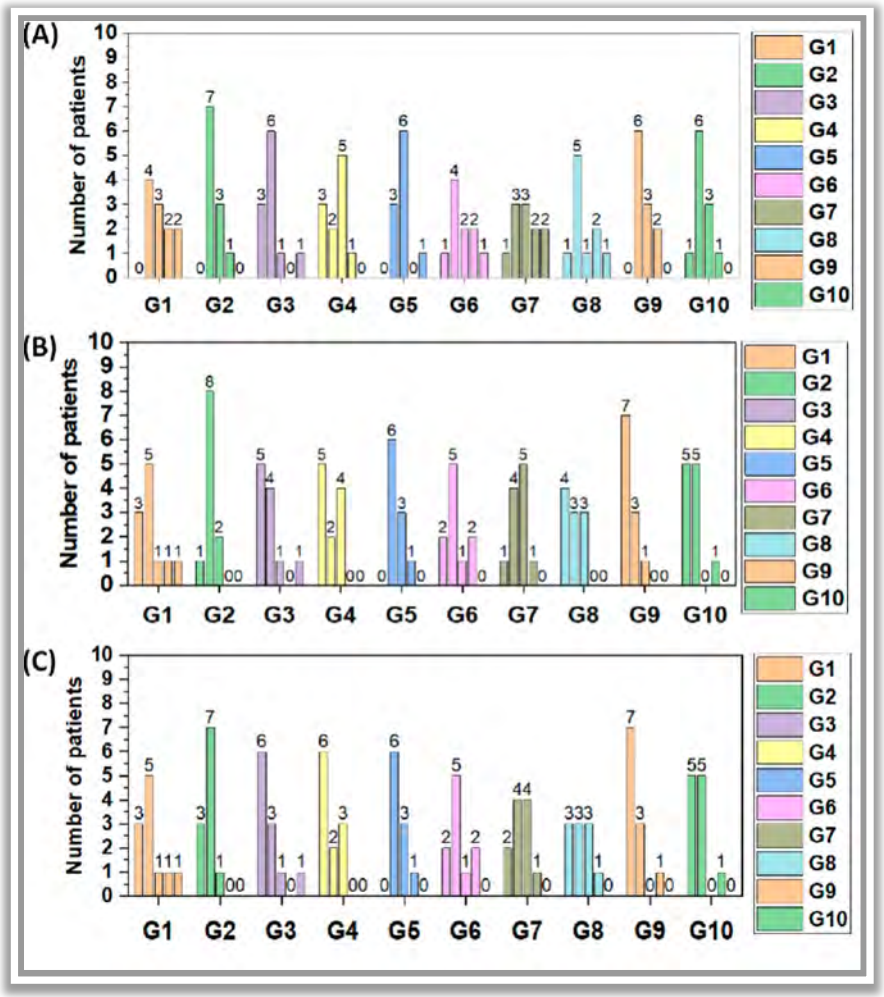
- THI pre (T0) and post (T1 after 8th session) tx period and 15 days after tx completely suspended (T2) for each group.

Results


(A)
THI reduction from T0 to T2 compared to control (%)
0
0.949
-29.233
-8.792
-33.641
-23.326
-13.653
-13.967
16.307
4.599
G1 G2 G3 G4 G5 G6 G7 G8 G9 G10
Groups
(B)
THI reduction from T1 to T2 (%)
2.132
5.622
1.883
5.432
-5.205
0.204
11.365
-4.318
4.379
11.12
G1 G2 G3 G4 G5 G6 G7 G8 G9 G10
Groups
(C)
THI reduction from T0 to T1 (%)
0
-2.541
-28.984
-12.092
-26.305
-21.398
-22.886
-7.517
14.06
-4.389
G1 G2 G3 G4 G5 G6 G7 G8 G9 G10
Groups


THI scores (%)
60
40
20
0
p<0.001
p<0.01
p<0.003
p<0.05
p<0.02
p<0.05
p<0.002
p<0.0003
p<0.002
T0
T1
T2
G1 G2 G3 G4 G5 G6 G7 G8 G9 G10

Results



Conclusion

- LP and Transmeatal LLLT can be promising alternative treatments for idiopathic and refractory tinnitus patients.

- Future studies should investigate the long-term effects of LLLT in tinnitus patients, as well as the dosimetry and wavelength of transmeatal LLLT.

Physical Therapy

AUDIOLOGY

Somatosensory Stimulation Therapy in Patients with Somatosensory Tinnitus: A Pilot Study

Hong, Guowei

Author Information

Otology & Neurotology 44(5):p 418-424, June 2023. | **DOI:** 10.1097/MAO.0000000000003878

- Purpose:
  - To explore the efficacy and safety of EMS (Exercise to improve muscle strength, Motion of joints, and Stretch training) in somatosensory tinnitus symptoms.

- **Participants**:
  - Patients with somatosensory tinnitus.
- **Study Design:**
  - A randomized delayed-start controlled trial at the Department of Otorhinolaryngology, Eye and Ear, Nose, and Throat Hospital between February 2019 and May 2019.
- **Methods**:
  - In the immediate-start group, the participants received EMS somatosensory stimulation therapy for 3 weeks and were followed up for 3 weeks.
  - In the delayed-start group, the participants first waited for 3 weeks and were treated with EMS somatosensory stimulation therapy for 3 weeks.
  - The primary endpoint was the changes in Tinnitus Handicap Inventory (THI) and the visual analog scale (VAS) scores after 3 weeks of treatment.
  - The secondary endpoint was the proportion of patients achieving improvements in VAS and THI scores.
  - THI and VAS were collected at baseline and at 3, 6, 9, and 12 weeks.

- **Results:**
  - Sixty-four patients were randomized to the immediate-start group and delayed-start treatment with each 32.
  - After the 3-week treatment, the immediate-start group showed significant lower in VAS (25.7 ± 3.3 versus 38.9 ± 5.8, $p < 0.001$) and THI (29.1 ± 5.1 versus 42.8 ± 6.6, $p < 0.001$).
  - There were no differences in VAS and THI between the two groups after treatment (i.e., at weeks 6, 9, and 12).
  - All patients were followed up for 6, 9, and 12 weeks, and the therapeutic effect was stable.

- **Conclusion**:
  - The EMS somatosensory stimulation therapy might be an effective and safe treatment for improving symptoms, and the therapeutic effect was still stable in 3, 6, 9, and 12 weeks.

Weight Loss

Auris Nasus Larynx 50 (2023) 40–47

Contents lists available at ScienceDirect

Auris Nasus Larynx

journal homepage: www.elsevier.com/locate/anl

The effects of dietary and physical activity interventions on tinnitus symptoms: An RCT

Ümüş Özbey-Yücel[a,*], Aslı Uçar[a], Zehra Aydoğan[b], Suna Tokgoz-Yilmaz[b,c], Süha Beton[c]

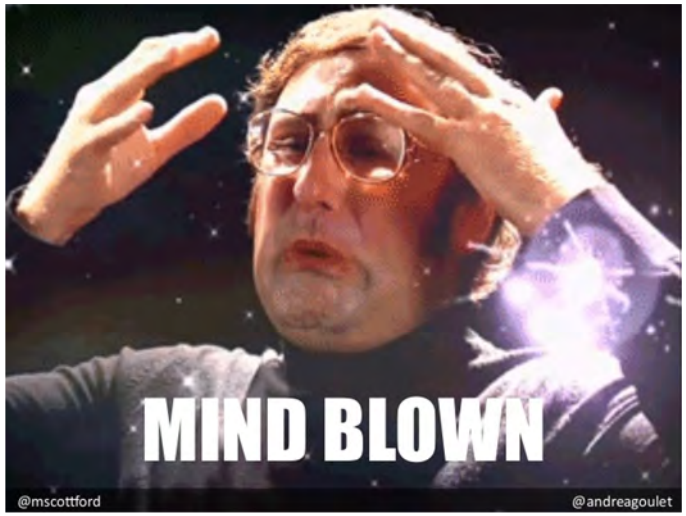
[a] *Nutrition and Diet Department, Faculty of Health Science, Ankara University, Ankara, Turkey*
[b] *Audiology Department, Faculty of Health Science, Ankara University, Ankara, Turkey*
[c] *Otorhinolaryngology Department, Medical School, Ankara University, Ankara, Turkey*

- Objective:
  - The present study aimed to determine the effects of dietary and physical activity interventions on tinnitus symptoms.

- **Methods**:
  - Sixty-three obese subjects with tinnitus aged 20 to 65 years were divided into diet + physical activity (P.A.) (n = 15), diet (n = 16), P.A. (n = 15), and control (n = 17) groups.
  - Dietary records, anthropometric measurements, Tinnitus Handicap Inventory (THI), Beck Depression Inventory (BDI), Short-Form Health Survey (SF-36), and Visual Analogue Scale (VAS) of all individuals were recorded and compared at the baseline and at study completion.

- **Results**:
  - Body weight decreased in the diet + P.A. (-5.9 (3.5) kg), diet (-3.4 (0.9) kg), and P.A. (-2.0 (2.1) kg) groups compared to the baseline ($p < 0.05$).
  - There was a more significant decrease in tinnitus frequency, tinnitus severity, and VAS scores in individuals with a weight loss of ≥ 5.0% than in those with < 5.0% ($p < 0.05$).
  - A decrease of 1 kg/m2 in BMI decreased the BDI score by 0.485 units and the THI score by 0.523 units.
  - Step counts were increased in the diet + P.A. (3562.3±739.9) and P.A. (3797.1 ± 1801.1) groups compared to baseline ($p < 0.01$).
  - Each increase of 1000 steps increased the SF-36 score by 1.592 units and decreased the THI score by 0.750 units ($p < 0.05$)

- **Conclusion**:
  - Dietary and physical activity interventions, alone or in combination, alleviated tinnitus symptoms and increased quality of life in individuals with tinnitus.
  - Due to its contribution to obesity prevention and positive effects on tinnitus, organizing dietary and physical activity programs for obese individuals with tinnitus would improve these individuals' quality of life.



Combination Devices: Hearing Aids & Sound Therapy

A Pilot Study to Evaluate a Residual Inhibition Technique in Hearing Aids for Suppression of Tinnitus (Quinn et al., 2023)

- **2 Objectives**
  - Evaluate the feasibility of residual inhibition technique therapy through daily use of hearing aids
  - Determine its effects by measuring reactionary changes in tinnitus with the Tinnitus Functional Index
- **Study Design:**
  - 20 Adults with chronic tinnitus (14 male, 6 females, mean age 58 years)
  - 4 Visits
    - Visit 1 – Baseline measures and initiation of the intervention period
    - Visit 2 – 1-month post-intervention visit
    - Visit 3 – 2-month post-intervention visit
    - Visit 4 – 3-month posit-intervention visit to measure wash out effects / intervention effects
  - A residual inhibition stimulus was individually created for participants and delivered via hearing aids fit bilaterally.
  - Instructed to wear the aids for 2 months during all waking hours

A Pilot Study to Evaluate a Residual Inhibition Technique in Hearing Aids for Suppression of Tinnitus (Quinn et al., 2023)

- **Study Design (cont):**
  - A washout period was completed after the residual inhibition treatment where users continued to use the aids for amplification purposes only but the residual inhibition treatment program was removed from the devices
  - The Tinnitus Functional Index (TFI) was completed at every visit
  - Participants also completed study specific tinnitus self-report measures, tinnitus loudness / pitch matching, and minimum masking / minimum residual inhibition level testing

A Pilot Study to Evaluate a Residual Inhibition Technique in Hearing Aids for Suppression of Tinnitus (Quinn et al., 2023)

- **Findings:**
  - TFI scores improved from the initial visit to visit 1
  - The TFI improvements remained stable through all visits including the washout period
  - Measured tinnitus loudness did not change significantly throughout the study
  - The majority of participants reported positive experiences from the tinnitus treatment
- **Discussion / Future Directions**
  - The authors attribute the self-perceived positive experience due to a sense of control over the tinnitus
  - The authors recommended a larger scale replication study for validation purposes

Hearing aids with tinnitus sound support reduce tinnitus severity for new and experienced hearing aid users

Philip J. Sanders[1,2], Reena M. Nielsen[3], Josefine J. Jensen[3] and Grant D. Searchfield[1,2*]

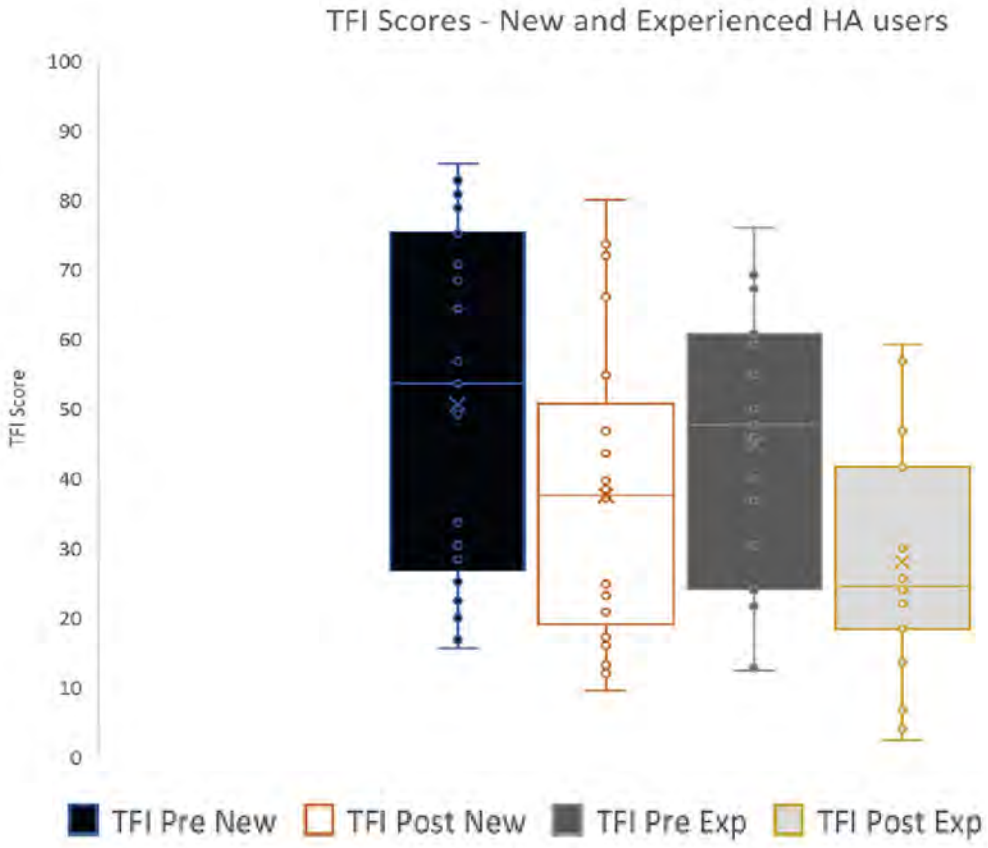
- **Hypothesis:**
  - Hearing aids with a tinnitus sound support feature would reduce the impact of tinnitus for new and previous hearing aid users over a 12-week period
- **Participants:**
  - 19 experienced hearing aid users and 21 new hearing aid users
- **Methods**
  - Hearing aids from one of the big 6 manufacturers were fit using comprehensive real ear measures and NAL-NL2 targets
  - 4 hearing aid programs were included: Amplification alone, noise reduction, amplification + tinnitus sound generator, and noise reduction + tinnitus sound generator.
  - 3 visits were completed: Initial visit, 3 week follow up, 12 week follow up
  - TFI and tinnitus related Client Oriented Scale of Improvement (COSI) goals were measured
  - A Likert Scale (0-5) measuring the problem of their tinnitus was measured
  - Severity of tinnitus perception across 5 dimensions: strength, intrusiveness, discomfort, unpleasantness, and ease to ignore were measured on a 0-10 scale.

Hearing aids with tinnitus sound support reduce tinnitus severity for new and experienced hearing aid users

Philip J. Sanders[1,2], Reena M. Nielsen[3], Josefine J. Jensen[3] and Grant D. Searchfield[1,2*]

- The Findings:

Measure	All	New Users	Experienced
Number of participants	40	21	19
Age	59.5 (12.4)	60.5 (8.4)	58.5 (16)
Sex	19 F 21 M	8 F 13 M	11 F 8 M
TFI (screen)	47.8 (22.6)	51.0 (24.7)	44.2 (20.1)
THI (screen)	41.7 (24.2)	43.2 (26.8)	39.9 (21.6)
Pitch (Hz)	4,686 (1,812)	5,059 (1,859)	4,274 (1,712)
Perceived level (dB SL)	23 (12)	23 (12)	23 (12)
TT duration	17 y 5 m	16 y 4 m	19 y 6 m



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Subscales	Measurement	Median (IQR)	Change score	Effect size	*p*-values
Total TFI score	Baseline	49 (40)	−24	0.60 (large)	$p = 0.0001$
	Follow-up	26 (26)			
Intrusive	Baseline	48 (28)	−1.6	0.33 (medium)	$p = 0.04$
	Follow-up	47 (31)			
Sense of control	Baseline	60 (43)	−13	0.49 (medium)	$p = 0.002$
	Follow-up	47 (28)			
Cognitive	Baseline	40 (38)	−18	0.52 (large)	$p = 0.001$
	Follow-up	22 (18)			
Sleep	Baseline	32 (51)	−13	0.54 (large)	$p = 0.0009$
	Follow-up	18 (33)			
Auditory	Baseline	67 (35)	−32	0.55 (large)	$p = 0.0004$
	Follow-up	35 (38)			
Relaxation	Baseline	60 (44)	−32	0.45 (medium)	$p = 0.004$
	Follow-up	28 (31)			
Quality Of Life	Baseline	34 (51)	−14	0.54 (large)	$p = 0.0006$
	Follow-up	20 (26)			
Emotional	Baseline	43 (46)	−27	0.62 (large)	$p = 0.00005$
	Follow-up	17 (28)			

Implantable Devices: Cochlear Implants

Early effects of very early cochlear implant activation on tinnitus

Ivy Yenwen Chau[a,b], Sophia Yung-Hsia Li[c], An-Suey Shiao[a,b], Albina S. Islam[d], Daniel H. Coelho[d,*]

- Purpose:
  - To compare preoperative and postoperative tinnitus handicap in individuals receiving early cochlear implant activation
- Participants:
  - 27 adults with chronic tinnitus, severe-to-profound hearing loss who were implanted with a cochlear implant receiving activation faster than the traditional 3–4-week activation wait time.
- Methods
  - All participants were implanted with the same electrode array and activated within 24 hours of surgery
  - The Tinnitus Handicap Inventory (THI) was used to measure pre- and post-implantation / activation tinnitus change
  - The THI was measured pre-implantation, immediately after activation, at 1 week, 2 weeks, and 1-month post-implantation.

Early effects of very early cochlear implant activation on tinnitus

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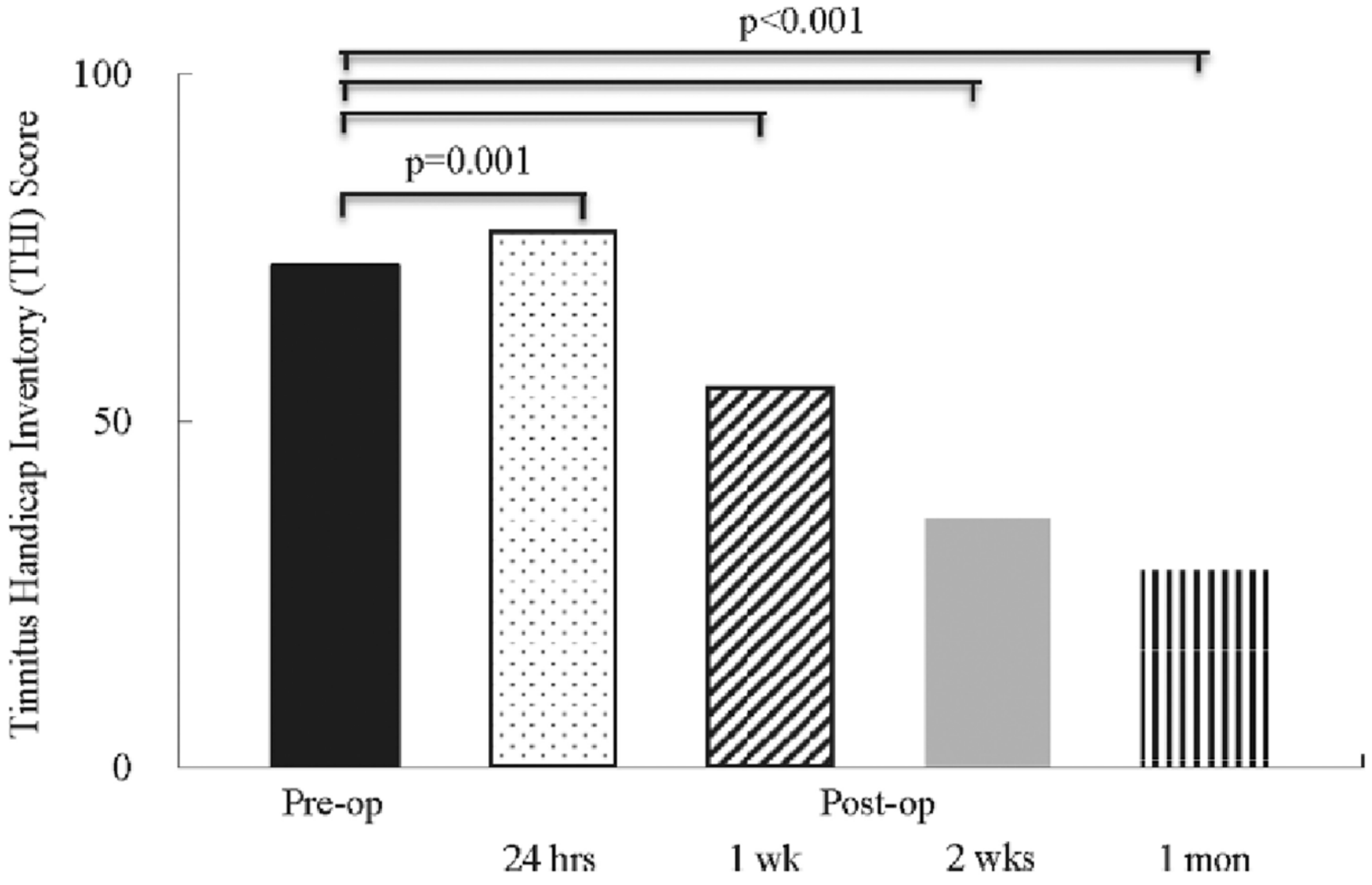

Early effects of very early cochlear implant activation on tinnitus

Ivy Yenwen Chau[a,b], Sophia Yung-Hsia Li[c], An-Suey Shiao[a,b], Albina S. Islam[d], Daniel H. Coelho[d,*]

- Findings:
  - Tinnitus perception increased within the 24-hour period following implantation/activation
    - The authors attribute this change to intracochlear changes and modulation of the entire auditory pathway
  - Tinnitus perception continually reduced after this temporary worsening of symptoms
- Future directions (Dave's Idea):
  - Investigate the role of counseling in early activation to determine if awareness of temporary increase in tinnitus perception influences THI scores immediately following activation / implantation

Changes in Tinnitus Characteristics and Residual Inhibition following Cochlear Implantation: A Prospective Analysis

Ann Nancy Deklerck [1], Freya Swinnen [2,3], Hannah Keppler [2,3] and Ingeborg Johanna Maria Dhooge [1,3,*]

- Purpose:
  - To explore the effect of cochlear implantation on tinnitus perception
- Participants:
  - 72 hearing impaired adults receiving a cochlear implant from one of the big 3 CI manufacturers
  - 42 participants reported tinnitus (Average age: 58 years)
  - 30 participants reported no tinnitus (Average age: 51 years)
  - Hearing status of the non-implanted ear was reported, however use of a hearing aid on the non-implanted ear as not reported
- Methods
  - The Tinnitus Sample Case History Questionnaire, the TFI and the THI were measured before and after implantation (3 months)
  - Etiology of hearing loss was recorded

	Tinnitus (n = 42)
Tinnitus severity	TFI score 38.1 (±27.6, range 0–93) THI score 22 (range 0–96)
Tinnitus main phenotype	Noise-like sound (54.8%, n = 23), ipsilateral to implanted ear (28.6%, n = 12) or bilateral (54.8%, n = 23), mid-frequency pitch (38.5%, n = 15)
Tinnitus duration	10.9 y (±10.2, range 1–35 y)

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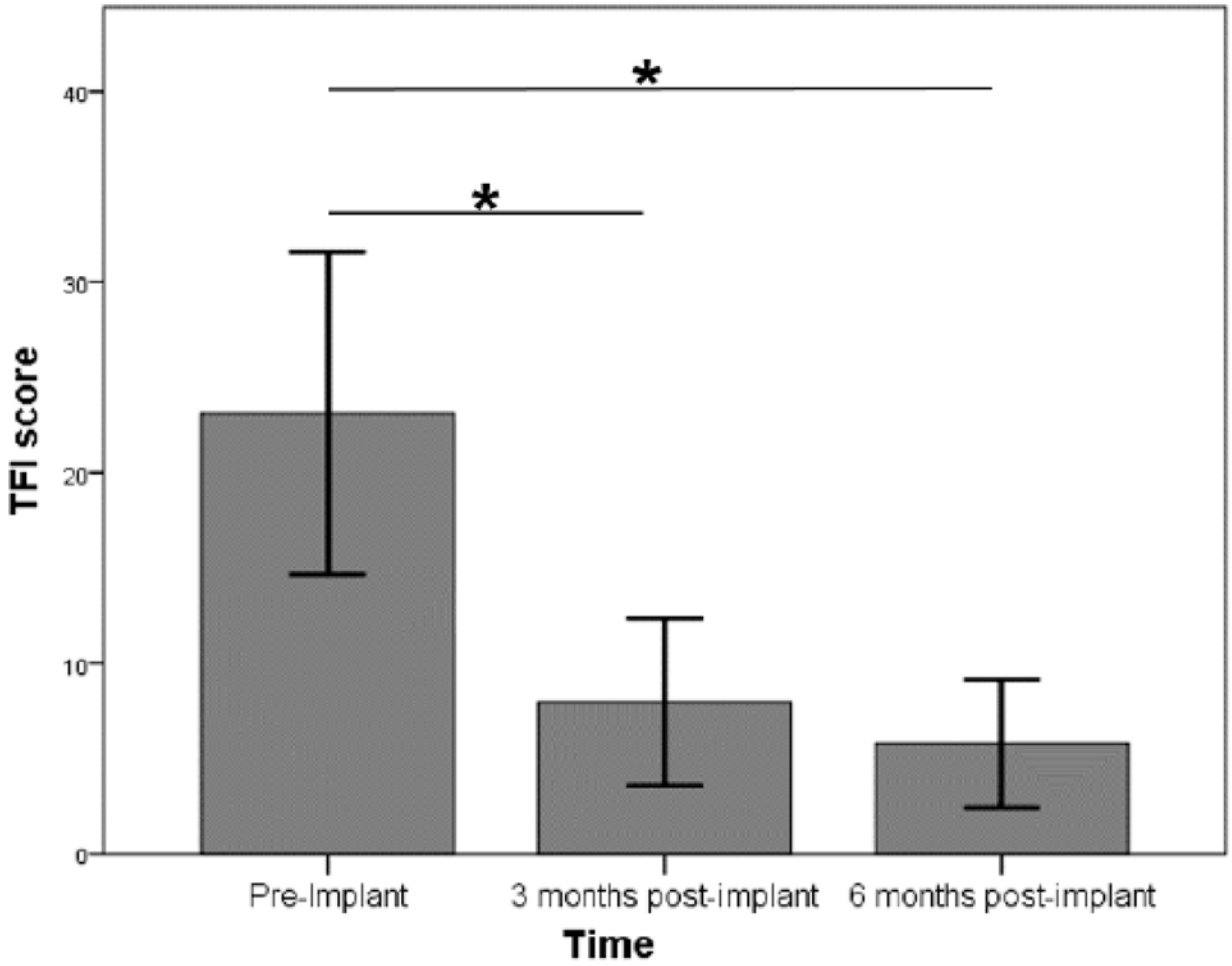

THI scores also significantly improved from pre-implant to 3 months post-implant and remained stable through 6-months, but no figure was provided

Changes in Tinnitus Characteristics and Residual Inhibition following Cochlear Implantation: A Prospective Analysis

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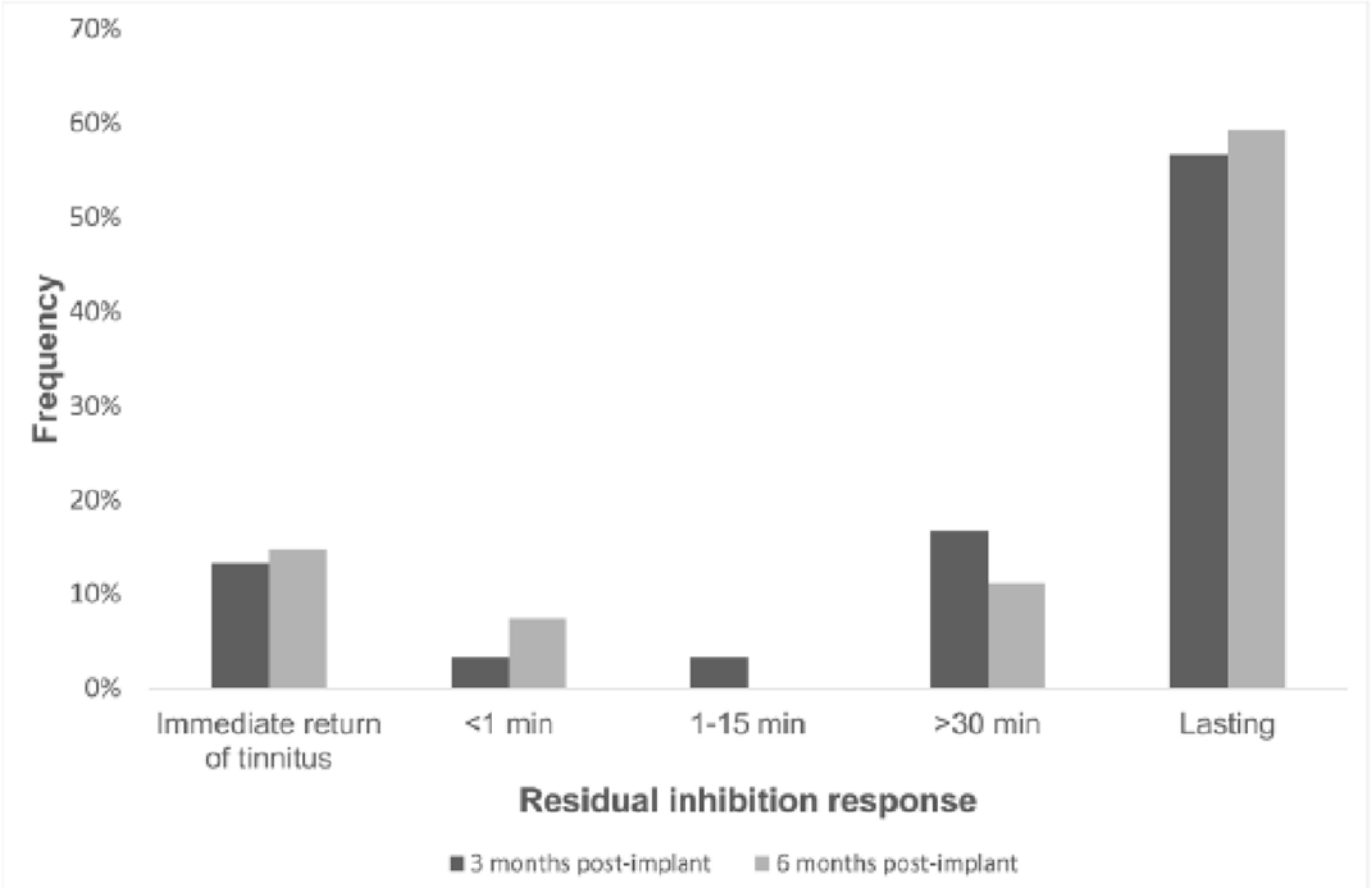

Sound Therapy

Pink noise: a potential sound therapy for tinnitus

Hongbo Lai[1], Gaoxing Wang[1], Zelian Zheng[1], Meijuan Gao[1], Shuaifeng Li[2], Shuai Wu[3]

- Purpose:
  - To explore the effect of pink noise as a tinnitus sound therapy treatment as pink noise has a more balanced frequency distribution than white noise
- Participants:
  - 43 adults with hearing loss and tinnitus
  - Hearing loss could not exceed 70 dB HL at any frequency
  - Participants were identified from 2 different Chinese hospitals providing tinnitus treatment
- Methods
  - Subjects must have reported an initial THI score of 18 or greater for inclusion
  - Fractal pink noise was delivered through ear level devices (hearing aids)
  - THI scores were measured at 1, 3, and 6 months post-treatment

Pink noise: a potential sound therapy for tinnitus

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Figure 3. Tinnitus Handicap Inventory scores of individual patients at different stages.

Table 1. Results of paired t-test: 1 month after treatment (Th1), 3 months after treatment (Th2), 6 months after treatment (Th3)

	M	± SD	T value	*P* value
THI1	33.3	17.3	5.853	<0.001
THI2	22.0	11.0	8.742	<0.001
THI3	42.0	15.5	6.888	<0.001

The effect of music therapy on tinnitus

A systematic review

Yunlian Niu, MD[a], Yijie You, MD[b,*]

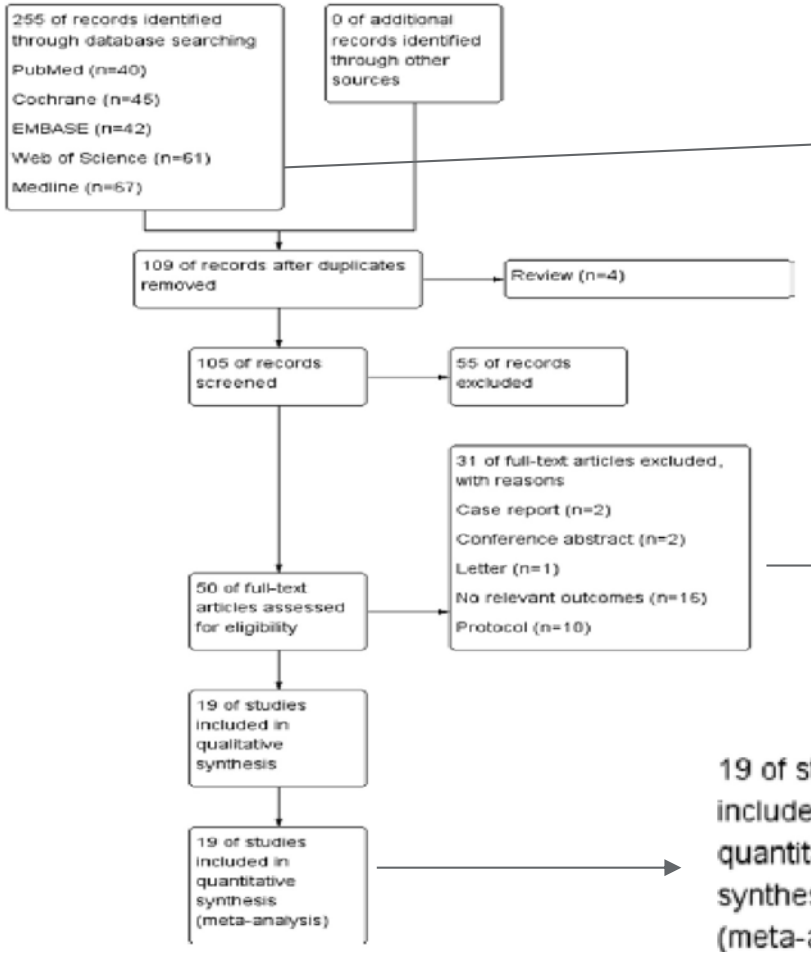
- Purpose:
  - To analyze music therapy effects on tinnitus patients evaluating the Heidelberg model of music therapy (HMOMT), standard music therapy (SMT), and tailor-made notched music therapy (TMNMT).

- Methods
  - A literature review across 5 research databases was completed from inception through May 2023
  - All languages were included
  - 2 researchers screened the studies and extracted data
  - Randomized and non-randomized studies were included
  - 19 studies were selected for inclusion
  - Preferred Reporting Items for Systematic Reviews (PRISMA) reporting guidelines were followed, however the study was not registered in the International Prospective Register of Systematic Reviews Database

The effect of music therapy on tinnitus

A systematic review

Yunlian Niu, MD[a], Yijie You, MD[b,*]



255 of records identified through database searching

PubMed (n=40)

Cochrane (n=45)

EMBASE (n=42)

Web of Science (n=61)

Medline (n=67)

31 of full-text articles excluded, with reasons

Case report (n=2)

Conference abstract (n=2)

Letter (n=1)

No relevant outcomes (n=16)

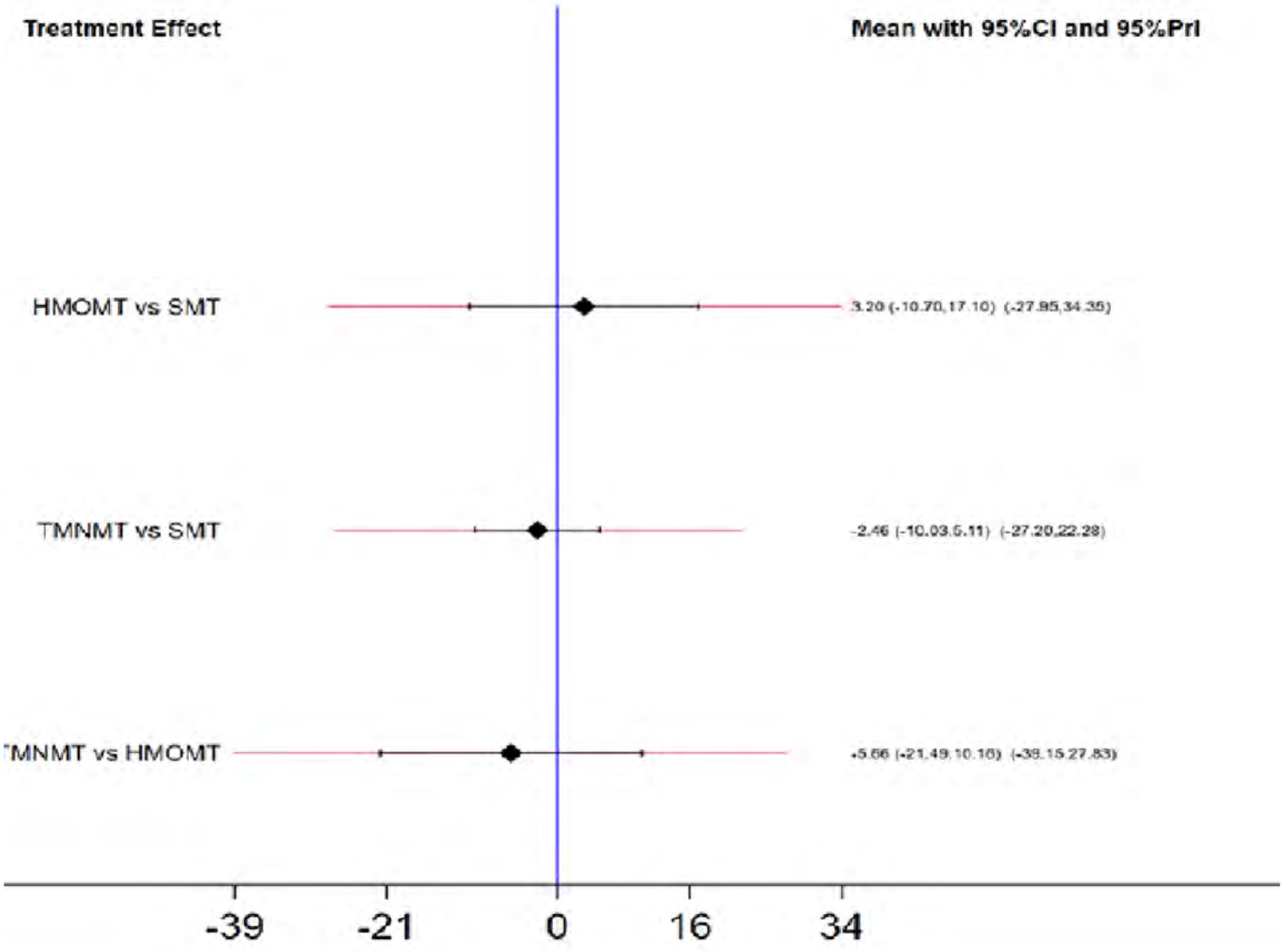
Protocol (n=10)

19 of studies included in quantitative synthesis (meta-analysis)

The effect of music therapy on tinnitus

A systematic review

Yunlian Niu, MD[a], Yijie You, MD[b,*]



The effect of music therapy on tinnitus

A systematic review

Yunlian Niu, MD[a], Yijie You, MD[b,*]

- Findings:
  - All 3 music therapy methods are effective for treating tinnitus
  - Standard music therapy should be recommended first based on efficacy, cost, and convenience
  - The Heidelberg model and tailor-made notched music trainings can be used if standard music therapy is not effective or if the evidence supports this treatment model for more specific cases
  - The tailor-made notched therapy was the most researched (9 articles) while the Heidelberg model was the lease researched (4 articles)
- Future recommendations:
  - Future tinnitus research should include clear and uniform reporting guidelines to allow for equal comparison across studies
  - Future meta-analysis (rapid reviews) should focus on high-level, randomized control studies
  - Long term outcomes should be studied and published as the majority of literature only explores short-term outcomes.

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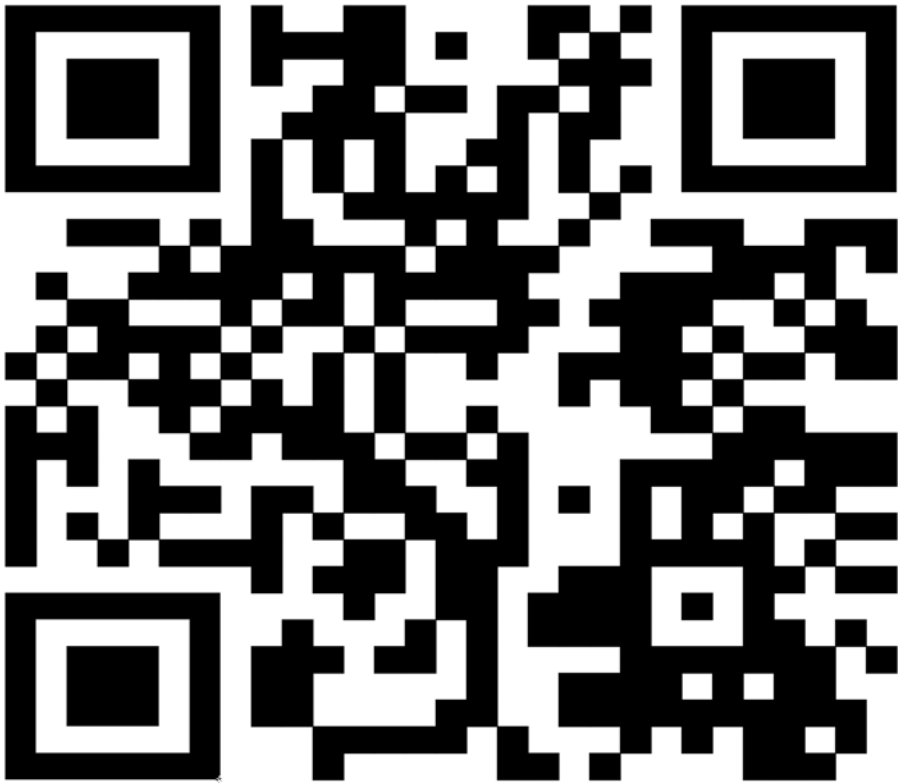

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