Testing the Feasibility of Creating a Tinnitus Biobank

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Background

A feasibility study asks can something can be done? Should it be done?, and if so, How? Feasibility studies consider issues such as timing, participant burden, response rates, and testing logistics.

We are investigating the feasibility of creating a tinnitus biobank to better understand what underlies tinnitus distress. The study addressed the following questions:

- Are people with tinnitus willing to provide data to a tinnitus biobank?
- What data should be collected and how?
- Do participants find the selected tests acceptable?
- How much time is needed to collected the desired data?
- Will participants attend an appointment in a laboratory and/or in a mobile testing unit located in a public space?

Methods

The research took place (a) in a laboratory at Manchester Centre for Audiology and Deafness (ManCAD) and (b) in a mobile testing unit (van) at location around Greater Manchester.

Laboratory-based testing

Participants (n=50)

- Tinnitus as reported on the tinnitus screener[1]
- Mean age: 60. 1yr. (SD = 10.5), range: 41-79
- Normal hearing to profound hearing loss
- Recruited via ManCAD's research participant database, and social media

Test battery

Pre appointment

- **Online questionnaires:** Demographics, Tinnitus-specific case history[14], tinnitus severity[2,3,4]

In lab (testing was conducted for a max of 3 hr.)

- Case history: Tinnitus and medical, measured height, weight, questionnaire based on the Noise Exposure Structured Interview[13]
- Hearing assessment: Otoscopy, tympanometry, PTA with extended high frequency testing (EHF), DPOAEs, Uncomfortable loudness levels, digits in noise test
- Tinnitus severity questionnaires[3-6]
- Tinnitus percept: loudness and pitch matching, minimum masking level (MML), residual inhibition (RI)
- Sound sensitivity questionnaires[6,7]
- Mental health and wellbeing questionnaires[10-12]
- Ratings of annoyance, boredom, fatigue, difficulty, and confidence during tests

Results

1. Willingness to take part

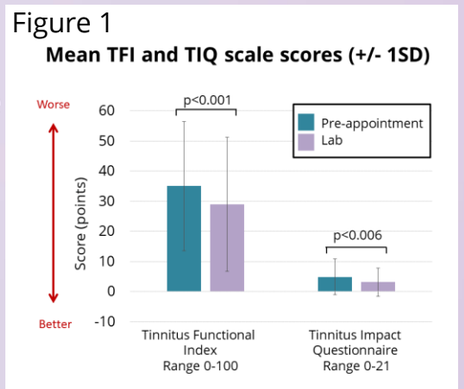
>90% of participants attended their scheduled appointment, and >90% completed their pre-appointment questionnaires.

2. What data should be collected and how?

Comparison of pre-appointment and lab-based questionnaire scores

Figure 1 shows mean pre-appointment and lab-based questionnaire scores. Reported tinnitus was statistically more severe pre-appointment, but the differences are not clinically meaningful

Figure 1



We conclude questionnaires can be completed in advance of an in-person appointment .

Independence of questionnaire scores

Strongly correlated measures are assessing the same underlying construct. Intercorrelations between questionnaires score here were:

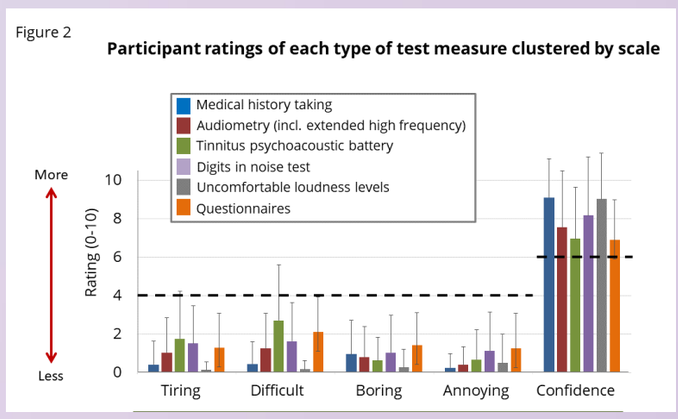
- Tinnitus questionnaires: Range r=0.763 to r=0.914
- Sound sensitivity questionnaires: r=0.567 to r=0.574
- Mental health and wellbeing questionnaires: r=0.272 to r=0.919

We conclude some questionnaires can be omitted because they assess the same construct.

3. Test acceptability

Figure 2 shows participants' acceptability ratings by measure type with ±*1 SD* error bars.

Figure 2



No tests had mean burden scores of >4; all had a mean confidence scores of >6.

We conclude all measures were acceptable to participants.

4. Time needed for data collection

Table 1 shows information about the time taken to complete each test measure.

Test measure		Timing min:sec			
		Mean	SD	75th %ile	90th %ile
Tinnitus	History	09:47	04:26	11:30	16:06
	TFI	03:35	01:55	04:12	05:41
	TIQ	00:54	00:53	01:03	02:00
	VAS	00:49	00:30	00:56	01:27
Sound sensitivity	HIQ	02:28	01:29	03:28	04:52
	SSIQ	00:40	00:18	00:49	01:06
	HQ	01:36	00:32	01:49	02:36
Mental health and wellbeing	Sleep	03:59	01:33	05:14	06:32
	Anxiety	00:30	00:12	00:38	00:47
	Depression	00:53	00:23	01:08	01:29
	COPE	02:18	01:14	02:53	03:27
	IPQ	03:26	01:56	04:31	04:49
Hearing	Otoscopy	01:20	00:50	02:00	02:53
	Tympanometry	02:20	01:23	03:00	04:00
	PTA (incl. EHF)	17:39	17:40	16:30	27:17
	ULL	02:12	01:36	02:00	03:00
Tinnitus percept	Pitch matching	09:47	04:07	12:00	14:00
	Loudness matching	02:36	00:57	03:07	04:00
	Residual inhibition	04:11	01:55	05:00	06:06
	Min. masking level	04:28	01:30	05:00	07:00

If questionnaires are completed pre-appointment, then >75% of participants could complete the test battery within 70 minutes, and 95% complete the test battery within 100 minutes.

Mobile unit (van) testing

Method (ongoing)

- Tinnitus UK pre-arranges a location for testing, typically a supermarket car park.
- Participants register for the study, select a test location and appointment time. They then receive a link to complete the pre-appointment questionnaires.
- During the van appointment participants complete a medical history, hearing assessment and tinnitus percept measures.

Preliminary results

10 of 12 weeks of van testing have been completed

Appointments are taking about 1 hour to complete

Tinnitus UK has managed to arrange a testing location everyday

133 appointments have been scheduled, representing 64% of the 207 possible time slots (past and future).

73 appointments have been attended, there have been 12 no shows, 28 appointments were cancelled in advance by a participant and 8 appointments were cancelled by the research team. 16 of these cancelled appointments have been rebooked.

Summary

The data collected in the lab determined the battery used for mobile unit testing.

- Attendance at scheduled appointments has been acceptable indicating willingness to give data to a tinnitus biobank.
- The good agreement between pre-appointment and at-appointment questionnaire scores means questionnaires can be completed in advance, saving time during the appointment.
- No tests have been rated as burdensome

Tinnitus UK will use this data to decide on the next steps towards setting up a Tinnitus Biobank.

References

[1]Henry et al., Am J Audiol. 2016;25(2):153-60. [2]Meikle et al., Ear Hear. 2012, 33(2):153-76. [3]Aazh et al., Int J Audiol. 2022;62(9):835-844. [4]Raj-Koziak et al., Audiol Neurootol. 2018;23(4):229-237. [5]Hallam. Polpresa Press, 2008. [6]Aazh et al., J Am Acad Audiol. 2022; 33(5):248-258. [8]Fackrell et al. Biomed Res Int. 2015; 2015:290425. [7]Buysse et al., Psychiatry Res. 1989;28(2):193-213. [9]Kroenke et al., J Gen Intern Med. 2001; 16(9):606-13. [10]Löwe et al., Med Care 2008; 46:266–274. [11]Carver. Int J Behav Med. 1997;4(1):92-100; [12]Broadbent et al., J Psychosom Res. 2006; 60(6):631-7, [13]Guest et al., Trends Hear. 2018 Jan-Dec;22: 2331216518803213 [14]Genitsaridi et al., Hear Res. 2019;377:353-359

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