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ORIGINAL ARTICLE

ANXIETY IN PATIENTS WITH HYPERACUSIS AND TINNITUS: DIFFERENCES BETWEEN WOMEN AND MEN

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B Data collection/entry
C Data analysis/statistics
D Data interpretation
E Preparation of manuscript
F Literature analysis/search
G Funds collection

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Abstract

Introduction: Hyperacusis is a specific auditory disorder characterized by an increased sensitivity to sounds, which is often accompanied by a significant psychological component. Some studies suggest that individuals with hyperacusis exhibit greater anxiety compared to the general population. However, it remains unclear whether gender affects the relationship between hyperacusis and anxiety. The aim of this study was therefore to investigate the role of gender in the interplay between hyperacusis, tinnitus, and anxiety.

Material and methods: The study group consisted of 106 patients with hyperacusis and tinnitus. There were 55 women and 51 men. The women were aged between 20 and 72 years ($M = 44.9$; $SD = 12.8$); the men were aged between 19 and 72 years ($M = 45.4$; $SD = 12.0$). A clinical interview, an audiological examination, and three questionnaires – State-Trait Anxiety Inventory (STAI), Hyperacusis Assessment Questionnaire (HAQ), and Tinnitus Handicap Inventory (THI) – were applied.

Results: The levels of anxiety in women and men were similar, but exceeded normative values established for the general population. In women, hyperacusis was not a significant predictor of anxiety ($\beta = 0.13$, $p = 0.34$), whereas tinnitus severity was ($\beta = 0.47$, $p = 0.002$). In men, both hyperacusis ($\beta = 0.36$, $p = 0.004$) and tinnitus severity ($\beta = 0.48$, $p < 0.001$) significantly predicted anxiety.

Conclusions: This study highlights the complex interplay between gender, hyperacusis, tinnitus, and anxiety. The findings suggest that interventions for subjects with hyperacusis and tinnitus should be gender-specific.

Keywords: anxiety • hyperacusis • tinnitus • gender

LĘK U PACJENTÓW Z NADWRAŻLIWOŚCIĄ SŁUCHOWĄ I SZUMAMI USZNYMI: RÓŻNICE MIĘDZY KOBIETAMI A MĘŻCZYZNAMI

Streszczenie

Wprowadzenie: Nadwrażliwość słuchowa jest specyficznym zaburzeniem słuchu, charakteryzującym się zwiększoną wrażliwością na dźwięki, któremu często towarzyszą problemy psychologiczne. Niektóre badania sugerują, że osoby z nadwrażliwością słuchową wykazują wyższy poziom lęku w porównaniu z populacją ogólną. Jednak nadal nie jest jasne, czy płeć ma wpływ na związek między nadwrażliwością słuchową a lękiem. Celem badania było zbadanie roli płci w interakcji między nadwrażliwością słuchową, szumami usznymi i lękiem.

Materiał i metody: Grupa badana składała się ze 106 pacjentów z nadwrażliwością słuchową i szumami usznymi. Było wśród nich 55 kobiet i 51 mężczyzn. Kobiety były w wieku od 20 do 72 lat ($M = 44,9$; $SD = 12,8$), mężczyźni – w wieku od 19 do 72 lat ($M = 45,4$; $SD = 12,0$). Przeprowadzono wywiad kliniczny, badanie audiologiczne oraz zastosowano trzy kwestionariusze: *State-Trait Anxiety Inventory* (STAI), *Kwestionariusz nadwrażliwości słuchowej* (KNS), oraz *Tinnitus Handicap Inventory* (THI).

Wyniki: Poziom lęku u kobiet i mężczyzn był podobny, ale przekraczał wartości normatywne ustalone dla populacji ogólnej. U kobiet nadwrażliwość słuchowa nie była istotnym czynnikiem prognostycznym lęku ($\beta = 0,13$, $p = 0,340$), natomiast istotnym czynnikiem prognostycznym było nasilenie szumów usznych ($\beta = 0,47$, $p = 0,002$). U mężczyzn zarówno nadwrażliwość słuchowa ($\beta = 0,36$, $p = 0,004$), jak i nasilenie szumów usznych ($\beta = 0,48$, $p < 0,001$) były istotnymi czynnikami prognostycznymi lęku.

Wnioski: Wyniki badania wskazują na złożoną wzajemną zależność między płcią, nadwrażliwością słuchową, szumami usznymi i lękiem. Interwencje wobec osób cierpiących na nadwrażliwość słuchową i szumy uszne powinny uwzględniać płeć pacjenta.

Słowa kluczowe: lęk • nadwrażliwość słuchowa • szumy uszne • płeć

Key to abbreviations	
AC	air conduction
BC	bone conduction
HAQ	Hyperacusis Assessment Questionnaire
STAI	State-Trait Anxiety Inventory
THI	Tinnitus Handicap Inventory
ULL	uncomfortable loudness level

Introduction

Some studies suggest that people with hyperacusis are more likely to suffer from psychiatric disorders, particularly those related to anxiety [1,2]. According to the American Psychological Association, anxiety is an emotion marked by feeling of tension, worried thoughts, and physical changes (e.g. in blood pressure). It is an inappropriate, future-oriented, prolonged response broadly focused on a diffuse and not clearly identifiable threat [3]. There also other characteristic features of anxiety discussed in the scientific literature, including uncomfortable feelings, a state of apprehension and uncertainty, and persistent feelings of worry that can impair daily functioning [4]. The uncertainty about the future triggers worry, which manifests as obsessive thoughts about possible negative events that are hard to dismiss and persist in the person's mind [5].

Another feature of anxiety is non-adaptive physical and mental reactions, e.g. sleep disturbance, loss of appetite, and avoidance behaviors which disturb people's normal lives [6]. The most common anxiety disorders are: i) generalized anxiety disorder (free-floating anxiety without a specific cause); ii) panic disorder with recurrent attacks of severe anxiety; iii) obsessive-compulsive disorder with obsessional thoughts or compulsive acts; iv) phobic anxiety disorders (e.g. social phobia, agoraphobia) with anxiety evoked in well-defined situation. The global prevalence of anxiety disorders is estimated at 7.3% and women are twice as likely as men to have an anxiety disorder [7].

Aaazh and Allot [8] in their review showed results of eight studies on the relationship between anxiety and hyperacusis. Nearly all of them indicated that subjects with hyperacusis exhibited significantly more anxiety symptoms. This raises the question of whether these two phenomena are simply co-occurring or share common underlying mechanisms, e.g. overactivation of some brain regions responsible for attention and heightened sensitivity to potential threats, which can lead to an excessive focus on minor stimuli or perceived dangers [9,10].

Hyperacusis is a specific auditory disorder which is highly subjective and has a significant psychological component. Unlike many other medical conditions, it is not subject to objective measurement, and its diagnosis relies almost entirely on the patient's self-reported experience. This can readily be seen when it comes to defining these phenomena. In the Delphi study conducted by Adams and colleagues among hearing healthcare professionals, they developed the following definition of hyperacusis: "A reduced tolerance to sound(s) that are perceived as normal to the majority of the population or were perceived as normal to the person before their onset of hyperacusis" [11]. Of course, this definition carries a great deal of subjectivity (which must be the case, since the phenomenon itself is eminently subjective). The prevalence of hyperacusis is estimated to be from 8.5% [12] to 15–17% [13,14], but it is much higher in some special populations, e.g. musicians, individuals with William syndrome, autism, and hearing disorders [15].

Hyperacusis is often comorbid with tinnitus. Jastreboff and Jastreboff [16] reported that approximately 60% of tinnitus patients have decreased sound tolerance, with about 30% requiring treatment for hyperacusis. Anari reported that 86% of adults with hyperacusis suffer from tinnitus as well [17]. Tinnitus is accompanied by a broad range of negative emotional symptoms, cognitive dysfunction, and significantly impacts on quality of life [18,19]. It has been shown that subjects with tinnitus are more likely to suffer from depression and anxiety [20].

Juris et al. [1] studied the relationship between psychiatric disorders and hyperacusis in a group of Swedish patients. There were 62 subjects with hyperacusis and 79% of them had comorbid tinnitus. It was found that 47% of subjects fulfilled the criteria for an anxiety disorder. The most common was social phobia (23%), generalized anxiety disorder (16%), agoraphobia (15%), and obsessive-compulsive disorder (10%). The researchers also showed that anxiety as a personality trait was significantly higher in patients with hyperacusis than in the general Swedish population.

Similar conclusions are drawn from the study of Sachetto and al. [2]. It was found that subjects with hyperacusis exhibited a higher anxiety level than controls (without hyperacusis); they were also more depressed, had high levels of somatic attention, and were more hypervigilant to bodily sensation. Blaesing and Kroener-Herwig [21] showed that tinnitus severity was similar in subjects who had hyperacusis and tinnitus as in subjects with tinnitus alone. But anxiety was significantly higher in subjects who had both tinnitus and hyperacusis than in those with tinnitus alone. This suggests that hyperacusis may be a factor exacerbating anxiety.

Studies to date do not indicate whether gender plays any role in the relationship between hyperacusis and anxiety. A systematic review published in 2023 suggests there are no gender-specific differences in hyperacusis (i.e. men and women exhibit a similar level of hyperacusis) [22]. On the other hand, it is known that women report greater anxiety than men and the prevalence of anxiety disorders is significantly higher in women than in men [23,24].

Given these gender differences in anxiety, it becomes important to explore whether this factor causes men and women to experience hyperacusis differently. The aim of our study was to assess the role of gender in the relationship between hyperacusis, tinnitus, and anxiety.

Material and methods

Setting

This study involved patients who were referred to the tertiary ENT center in Poland. Prior to the study, all subjects were informed about its nature, and informed consent was obtained from them. The study was conducted in compliance with the principles outlined in the Declaration of Helsinki. The research protocol was approved by the local Ethics Committee (KB.IFPS: 9/2020). Patient data were anonymised to ensure participant confidentiality. Personal information was removed and the dataset was stored in the database using only medical record numbers.

Participants

There were 106 adult patients who were admitted to our tertiary referral center due to hyperacusis and/or tinnitus. All of them reported having both hyperacusis and tinnitus. There were 55 women and 51 men. The women were aged between 20 and 72 years and their mean age was 44.9 years ($SD = 12.8$). Men were aged between 19 and 72 years; their mean age was 45.4 years ($SD = 12.0$). The age difference between women and men was not statistically significant ($t = 0.22$; $p = 0.829$).

Interview

An interview was carried out by an ENT doctor and focused on different aspects of hyperacusis and tinnitus. Patients were asked about the onset and duration of their symptoms. They were also questioned about which sounds triggered their hyperacusis, whether they experienced fear of certain sounds, or avoided specific noisy environments. Additionally, patients were asked if noise worsened their tinnitus and which issue they found most troublesome – tinnitus, hyperacusis, or hearing loss.

Audiological examination

Audiological assessment comprised pure-tone audiometry, impedance audiometry, and measurement of uncomfortable loudness level (ULL). Hearing thresholds for each patient were evaluated in both ears. Air conduction (AC) thresholds were measured at frequencies of 0.125, 0.25, 0.5, 1, 2, 4, and 8 kHz, while bone conduction (BC) thresholds were assessed at 0.25, 0.5, 1, 2, and 4 kHz. Impedance audiometry included measurement of the tympanometric curve and stapedial reflex testing. Middle ear function was confirmed as normal using 226 Hz tympanometry, with tympanometric peak pressures ranging from –100 to +100 daPa and peak compensated static acoustic admittance between 0.2 and 1.0 mmhos. Ipsilateral and contralateral acoustic reflex thresholds were also recorded for tones at 0.5–4 kHz. The ULL test aimed to determine the minimum sound level that the patient perceived as uncomfortably loud. This test was conducted at frequencies of 1, 2, and 4 kHz using pure-tone stimuli. During the test, the intensity of the sound was gradually increased, and patients were instructed to signal as soon as they found the sound to be uncomfortably loud.

Questionnaires

Three questionnaires – State-Trait Anxiety Inventory, Hyperacusis Assessment Questionnaire, and Tinnitus Handicap Inventory – were self-administered by the patients. They were provided with a quiet clinical setting to ensure minimal distraction, and the assessments took approximately 20 minutes to complete.

State-Trait Anxiety Inventory

The STAI is a psychological questionnaire designed to measure anxiety captured as state (temporary condition) and trait (stable predisposition) [25]. In this study only trait anxiety was assessed, because it reflects a stable predisposition to perceive situations as threatening and experience anxiety over time, making it a good indicator of an individual's general anxiety level. The trait anxiety scale consists of 20 self-report items, rated on a 4-point Likert scale ranging from "almost never" (1 point) to "almost always" (4 points). The total score is calculated by summing up the responses, with higher scores indicating greater levels of trait anxiety. In the study, the Polish version of the STAI was utilized, adapted and validated by Wrzesniewski et al. [26].

Hyperacusis Assessment Questionnaire

The HAQ is a questionnaire developed by Raj-Koziak et al. [27]. It assesses the severity of hyperacusis in terms of loudness, fear, and pain. It consists of 14 items scored on 5-point Likert scale from "definitely not" (0 points) to "definitely yes" (4 points). It has three subscales: the Loudness Hyperacusis subscale (comprising 7 items), the Fear Hyperacusis subscale (4 items), and the Pain Hyperacusis subscale (3 items). The scores are obtained by summing up the answers from appropriate items. The tool has been validated in a clinical group of patients with hyperacusis and tinnitus [27].

Tinnitus Handicap Inventory

The THI comprises 25 items. For each item the patient can respond with a "yes" (scored 4 points), "sometimes" (2 points), or "no" (0 points). The total score is obtained by summing the points from all responses, with higher scores indicating greater tinnitus severity [28]. In this study, the Polish version of THI adapted and validated by Skarzynski and colleagues was utilised [29].

Statistical analysis

The assumption of normality was checked with a Kolmogorov–Smirnov test, which confirmed that anxiety, overall hyperacusis, and tinnitus severity followed a normal distribution. A Student *t*-test for independent samples was conducted to compare the level of measured variables between women and men. Cohen's *d* was also calculated to check how meaningful the differences were in practical

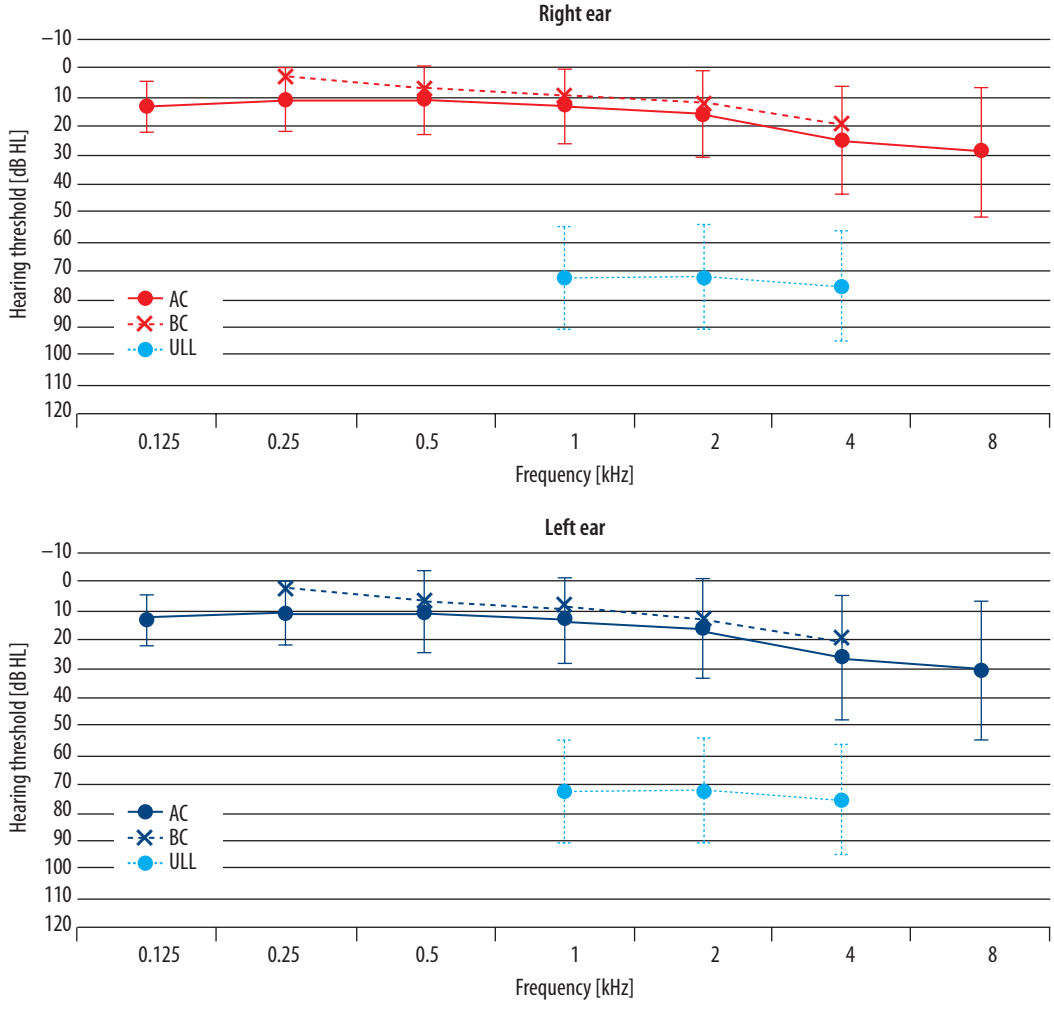

Figure 1. Hearing thresholds and uncomfortable loudness levels for the right and left ears. Note: AC, air conduction; BC, bone conduction; ULL, uncomfortable loudness level

terms. Pearson's correlation coefficient was applied to examine the relationship between the variables. Linear multiple regression models were built to evaluate the impact of hyperacusis and tinnitus severity (as potential predictors) on anxiety (the dependent variable). Statistical significance was set at $p < 0.05$. All analyses were performed using SPSS software (v.24).

Results

Audiological characteristics of patients

Mean AC threshold averaged for all frequencies from 0.125 to 8 kHz was 16.9 dB HL ($SD = 11.8$) for the right ear and 17.7 dB HL ($SD = 14.1$) for the left. Mean BC threshold averaged for all frequencies from 0.25 to 4 kHz was 9.8 dB HL ($SD = 9.3$) for the right ear and 10.5 dB HL ($SD = 10.8$) for the left. The difference between women and men was not statistically significant for either the right ear ($t = 0.15$; $p = 0.885$) or the left ear ($t = 0.30$; $p = 0.766$). Similarly, there was no significant difference in hyperacusis duration ($t = 0.47$; $p = 0.640$). There were 62 patients (58.5%) with normal hearing (i.e. an average hearing threshold better than 20 dB in both ears) and 44 patients (41.5%) with hearing loss (i.e. with an average hearing threshold worse than 20 dB HL in at least one ear). Mean ULL averaged for 1, 2, and 4 kHz was 73.4 dB HL ($SD = 17.8$) for the right ear and 73.5 dB HL ($SD = 18.1$) for the left. **Figure 1** shows hearing thresholds for air conduction and bone conduction in the right and left ears, as well as ULLs in both ears.

Levels of anxiety in women and men

The level of anxiety measured with STAI in all patients was between 28 and 72 points, with a mean score of 47.5 ($SD = 9.3$). In women the mean level of anxiety was 48.6 ($SD = 9.0$); in men it was 46.4 ($SD = 9.6$), and the difference was not statistically significant ($t = 1.18$; $p = 0.241$).

Normative values for anxiety measured with STAI were established for Polish population by Wrześniewski et al. [26]. They were drawn up separately for women and men and the mean normative anxiety score for women is 46.8, while for men it is 42.2. In our study, the mean anxiety scores were slightly higher, exceeding the normative values by 1.8 points for women ($M = 46.8$) and 4.2 points for men ($M = 42.2$). Normative values were also provided for women and men of different ages: 21–40 years, 41–54 years,

Table 1. The level of anxiety: comparison of normative values vs. own study results

Anxiety (STAI)	Polish normative study		This study	
	M	*SD*	*M*	*SD*
Women				
21–40 years	43.27	8.06	47.45	10.27
41–54 years	47.80	9.78	50.09	8.19
55–69 years	48.12	8.40	48.91	9.02
Men				
21–40 years	39.46	7.06	47.37	10.22
41–54 years	42.20	7.62	46.43	9.18
55–69 years	44.42	9.12	44.10	10.07

Note: Data for 70–79 years are not given, since there were only 2 women and 1 man above 70 in this study

Table 2. Comparison of hyperacusis and tinnitus severity in women and men

	Women ($n = 55$)		Men ($n = 51$)		*t*; *p*
	M	*SD*	*M*	*SD*	
Anxiety	48.6	9.0	46.4	9.6	1.18; 0.241
Loudness hyperacusis	21.9	5.1	20.5	5.5	1.62; 0.109
Fear hyperacusis	7.8	5.0	7.9	4.8	0.01; 0.991
Pain hyperacusis	7.6	3.6	7.8	3.6	0.37; 0.715
Overall hyperacusis	37.3	11.1	36.3	11.7	0.66; 0.511
Tinnitus severity	56.9	24.7	55.3	28.2	0.08; 0.904

Note: Minimum and maximum possible scores: anxiety (measured by STAI), 20–80 points; hyperacusis (overall, measured by HAQ), 0–56 points; tinnitus severity (measured by THI), 0–100 points

Table 3. Correlations (*r*-Pearson coefficients) between anxiety, hyperacusis, and tinnitus severity

	All ($n = 106$)		Women ($n = 55$)		Men ($n = 51$)	
	Anxiety	Tinnitus severity	Anxiety	Tinnitus severity	Anxiety	Tinnitus severity
Loudness hyperacusis	0.33**	0.28**	0.27*	0.45**	0.38**	0.15
Fear hyperacusis	0.46**	0.36**	0.43**	0.33*	0.51**	0.39**
Pain hyperacusis	0.11	0.08	0.01	0.03	0.23	0.13
Overall hyperacusis	0.39**	0.31**	0.32*	0.36*	0.46**	0.27
Tinnitus severity	0.55**	–	0.52**	–	0.58**	–

Note: ** $p < 0.01$; * $p < 0.05$

55–69 years, and 70–79 years. Our participants were similarly categorized into these age groups to facilitate comparisons with the normative data. The comparison is shown in **Table 1**.

The comparison of anxiety levels (STAI scores) between the Polish normative study and the findings from the present research revealed a consistent pattern of elevated anxiety among younger individuals with hyperacusis and tinnitus. It was found both in women and men; however among men this tendency was stronger.

Levels of hyperacusis and tinnitus severity

Table 2 shows the differences between women and men for both hyperacusis and tinnitus severity. As can be seen,

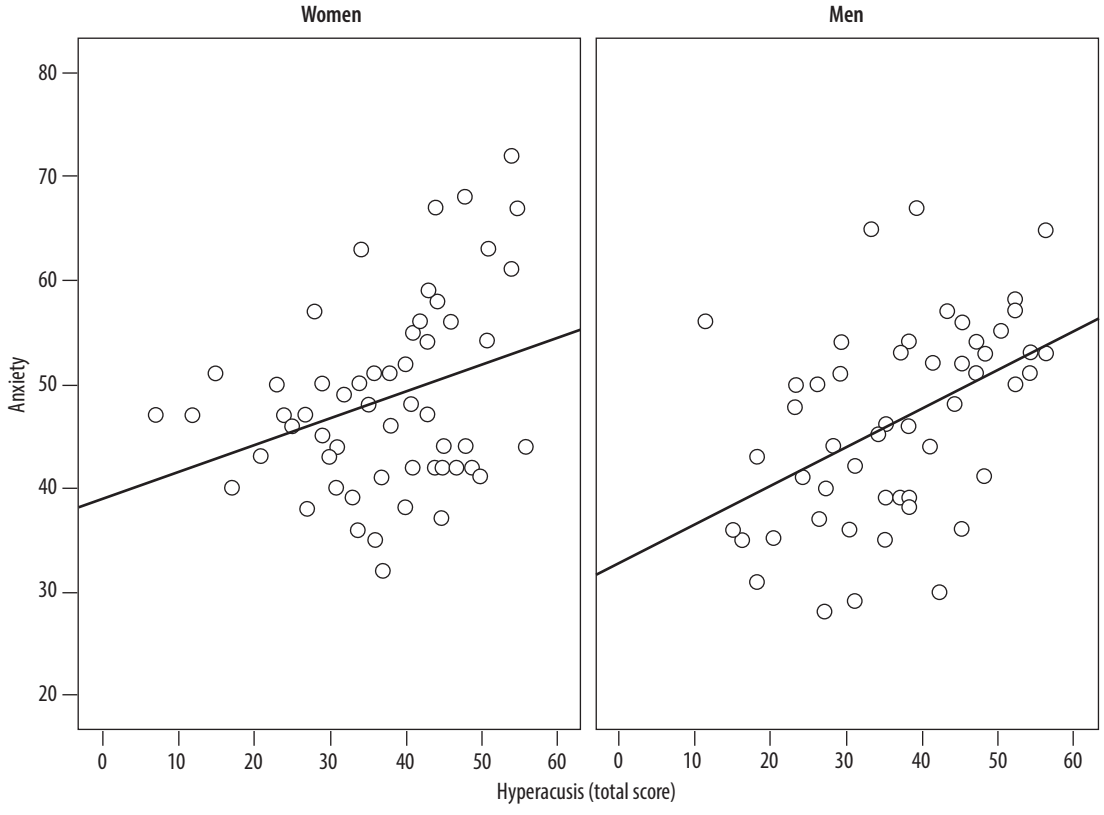

Figure 2. Relationships between anxiety and hyperacusis in men and women

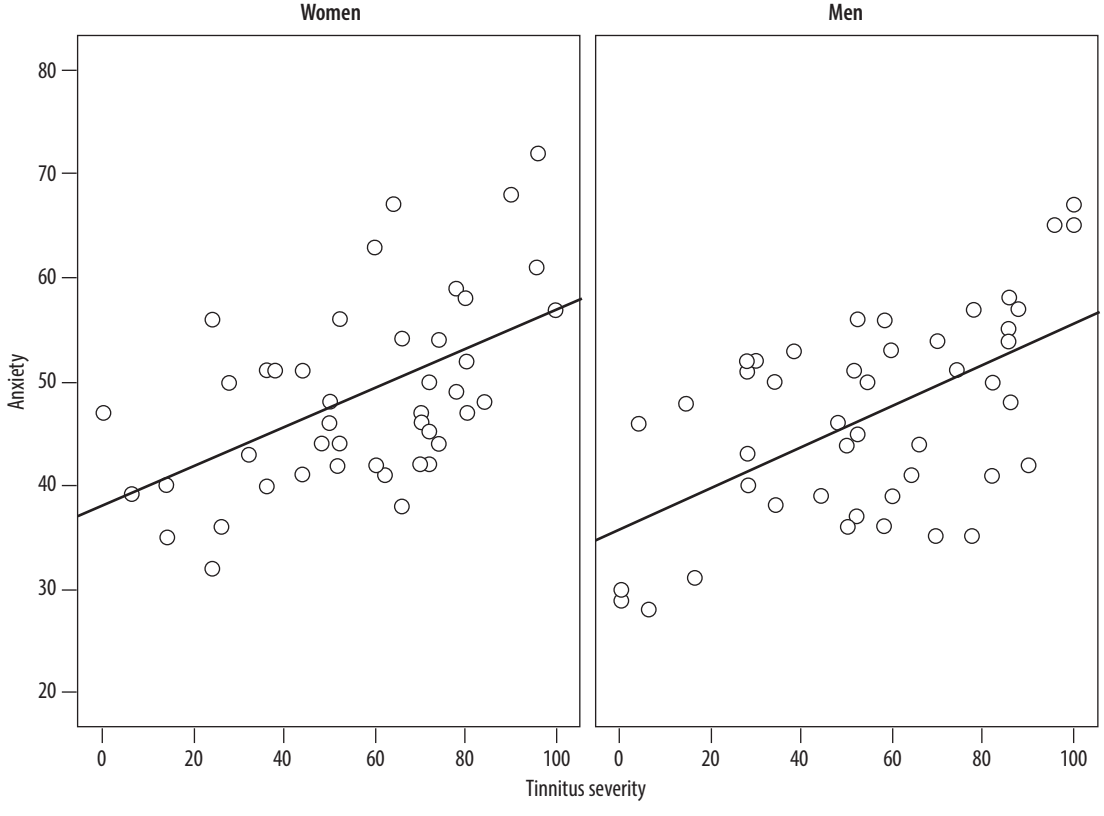

Figure 3. Relationships between anxiety and tinnitus severity in men and women

Table 4. Results of regression analysis predicting anxiety based on hyperacusis and tinnitus severity

	All ($n = 106$)		Women ($n = 55$)		Men ($n = 51$)	
	$R^2 = 0.35$; $F = 25.10$; $p < 0.001$		$R^2 = 0.25$; $F = 8.41$; $p = 0.001$		$R^2 = 0.42$; $F = 17.49$; $p < 0.001$	
	β	*p*	β	*p*	β	*p*
Overall hyperacusis	0.26	0.005	0.13	0.340	0.36	0.004
Tinnitus severity	0.47	< 0.001	0.47	0.002	0.48	< 0.001

the level of hyperacusis was similar in both women and men. Additionally, there was no significant difference in the severity of tinnitus between the two groups.

Relationships between anxiety, hyperacusis, and tinnitus severity

Table 3 presents correlation coefficients between anxiety, hyperacusis, and tinnitus severity for the entire sample, and for women and men separately.

Correlations between anxiety and hyperacusis (loudness, fear, and overall score) were statistically significant and positive for both women and men. However, these correlations were generally moderate in men but mostly weak in women. Higher levels of hyperacusis were associated with higher anxiety, with this relationship being more pronounced in men than in women. The strongest correlations, as expected, were found between anxiety and fear hyperacusis. Correlations between anxiety and tinnitus severity were also statistically significant, positive, and moderate for both women and men. The higher the tinnitus severity, the higher the anxiety in both groups. **Figure 2** and **Figure 3** show the relationships between anxiety, hyperacusis, and tinnitus severity in both men and women.

Table 4 shows the results of regression analysis predicting anxiety based on hyperacusis and tinnitus severity. The assumptions for homoscedasticity and the absence of multicollinearity were met (the plot of standardized residuals versus predicted values was inspected visually; variance inflation factors (VIF) were 1.10 and 1.11). In women only did tinnitus severity significantly predict anxiety ($\beta = 0.47$, $p = 0.002$), whereas hyperacusis as a predictor was not statistically significant ($\beta = 0.13$, $p = 0.340$). For men, both tinnitus severity ($\beta = 0.48$, $p < 0.001$) and hyperacusis ($\beta = 0.36$, $p = 0.004$) significantly predicted anxiety, with tinnitus severity having a slightly stronger effect.

Discussion

The aim of this study was to examine the role of gender in the relationship between hyperacusis, tinnitus, and anxiety. Specifically, we sought to determine whether gender influences the severity of anxiety associated with these auditory conditions.

The results of this study revealed no statistically significant differences between women and men in their levels of hyperacusis, which is consistent with findings of Musumano et al. [22]. In their systematic review, which included 282 subjects with hyperacusis (125 women and 157 men) it was concluded that women and men exhibited a similar level of hyperacusis. In our study we found that the level of loudness hyperacusis and overall hyperacusis were slightly higher in women than in men, but the differences were not statistically significant. Also tinnitus severity was similar in both genders.

The levels of anxiety observed in men and women with hyperacusis were found to be similar. This lack of difference is rather intriguing, as in the general population women exhibit higher levels of anxiety than men. It is also worth mentioning the study by Blomberg et al. [30] on individuals with Williams syndrome, which revealed gender differences in fear and hyperacusis, with female participants reporting higher levels of both compared to male participants. The absence of this expected gender difference in individuals with hyperacusis raises a question regarding the interplay between hyperacusis and anxiety, suggesting that hyperacusis may be a factor that overrides or mitigates the typical gender-related pattern of anxiety observed in the general population. One systematic review [23] indicates that greater anxiety in women compared to men may be explained by a combination of biological, genetic, and psychosocial factors.

Anxiety levels in both women and men with hyperacusis exceeded Polish normative values, indicating heightened psychological burden among affected individuals. In the 21–40 age group, anxiety levels were higher in the present study compared to normative data, with a similar trend in the 41–54 age group. These results suggest heightened anxiety in younger women and men relative to standardized benchmarks.

The elevated anxiety levels in our participants compared to normative values echo findings by Jüris et al. [1] and Sacchetto et al. [2]. The former reported a high prevalence of anxiety disorders, such as social phobia and generalized anxiety disorder in patients with hyperacusis; similarly, the latter noted heightened anxiety levels in hyperacusis patients compared to controls, emphasizing the psychological burden of this condition. Our results contribute further evidence by confirming that this heightened anxiety persists regardless of gender, but manifests differently in its predictors, particularly when hyperacusis and tinnitus coexist.

Our findings also corroborate the conclusions of Blaesing and Kroener-Herwig [21] who demonstrated that individuals with both tinnitus and hyperacusis experience higher anxiety levels compared to those with tinnitus alone. This suggests that hyperacusis may act as a significant aggravator

of psychological distress. Interestingly, while [21] did not examine gender-specific effects, our study identifies a stronger influence of hyperacusis on anxiety among men. This distinction underscores the necessity of considering gender as a moderating factor in clinical assessments and interventions.

The significant positive correlations between hyperacusis (loudness, fear, and overall score) and anxiety, as well as between tinnitus severity and anxiety, reinforce the notion that these auditory conditions substantially affect emotional well-being. These relationships were slightly stronger among men, indicating potential gender differences in vulnerability to anxiety related to hyperacusis and tinnitus.

The key finding of our study is that while hyperacusis severity itself does not differ by gender, its role in predicting anxiety varies between men and women, which is a novel contribution to the field. The gender differences in predictors of anxiety observed in our study raise important questions about underlying mechanisms. Women have consistently been reported to exhibit higher baseline levels of anxiety [23], which might explain why tinnitus severity alone significantly predicts anxiety in this group. Conversely, men, who typically report lower baseline anxiety levels, may require the additive stressor of hyperacusis for significant psychological impact. This distinction is supported by our findings of generally stronger correlations between anxiety and auditory conditions in men compared to women. Regression results also suggest that hyperacusis may play a greater role in male anxiety responses.

Aazh and Allott [8] emphasized the necessity of integrating psychological care into the management of hyperacusis, particularly due to its strong link with anxiety. Our findings extend this recommendation by highlighting the importance of tailoring psychological interventions to gender-specific needs. For instance, interventions focusing on hyperacusis management may yield greater benefits for men, while tinnitus-specific therapies could be prioritized for women.

Our study has some limitations. First, the study group consisted of individuals with both hyperacusis and tinnitus. A more comprehensive design would involve separate groups: individuals with hyperacusis alone, those with both hyperacusis and tinnitus, those with tinnitus alone, and a control group without either condition. This approach would allow for a clearer understanding of the relationship between hyperacusis, tinnitus, and anxiety. Second, the sample consisted of patients from a tertiary referral center, which may limit the generalizability of findings to broader populations with hyperacusis and tinnitus. Lastly, the study's cross-sectional design does not allow for causal inferences about the relationship between anxiety and auditory disorders (hyperacusis and tinnitus may contribute to increased anxiety, but also anxious individuals may be more sensitive to sound). Longitudinal studies would be better suited to determine the directionality of these relationships.

Conclusions

This study highlights the complex interplay between gender, hyperacusis, tinnitus, and anxiety. The finding that both tinnitus severity and hyperacusis are stronger predictors of anxiety in men has important clinical implications, suggesting the need for gender-tailored interventions. For women, management of tinnitus severity may yield significant psychological benefits, while for men, addressing both tinnitus and hyperacusis should be prioritized.

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