

Which affective temperaments are most expressed in patients with chronic subjective tinnitus?

Trifunovic M¹, Zivic Lj², Ignjatovic-Ristic D³, Sretenovic J⁴, Rancic N⁵, Ristic I⁶

¹Department of Otorhinolaryngology and Maxillofacial Surgery, General Hospital "Studnica", Kraljevo

²Clinic of Otorhinolaryngology

³Clinic of Psychiatry

Clinical Center Kragujevac

⁴Department of Physiology, Faculty of Medical Science, University of Kragujevac
Kragujevac

⁵Centre for Clinical Pharmacology, Military Medical Academy, Faculty of Medicine of the Military Medical Academy,
University of Defense, Belgrade

⁶Faculty of Medicine, University of Belgrade, Belgrade
Serbia

Abstract

Background: Although chronic subjective tinnitus is one of the most common symptoms, the background of its pathophysiological mechanism and etiology is not fully understood. No studies are exploring various affective temperaments in persons with chronic tinnitus.

Methods: We included in this study 57 patients with tinnitus who filled out the Serbian 41-item version of the Temperament Evaluation of Memphis, Pisa, Paris, and San Diego Auto questionnaire (TEMPS-A) and a short sociodemographic questionnaire. Patients were assessed using audiometry (measuring the hearing threshold for frequencies of 250, 500, 1,000, 2,000, 4,000, and 8,000 Hz) and tympanometry.

Results: Our research showed that patients with chronic tinnitus predominantly had anxious affective temperament [anxious-cognitive (AnxC): 26.23 %, anxious-somatic (AnxS): 25.6 %]. AnxS was dominant in people without hearing loss (46 %) and males (37.39 %). AnxC was dominant in people with a significant hearing loss and females (30.3 %). Both AnxS and AnxC temperaments correlated with hearing loss in the right ear more than in the left one.

Conclusion: Our study revealed that anxious temperaments (AnxC and AnxS) were predominant in patients with chronic subjective tinnitus. Affective temperaments could play a significant role in explaining this disorder's currently unclear pathophysiology of, but further research is needed. HIPPOKRATIA 2020, 24(2): 77-83.

Keywords: Affective temperaments, chronic subjective tinnitus, Memphis, Pisa, Paris, and San Diego auto questionnaire (TEMPS-A)

Corresponding author: Mirosljub Trifunovic, MD, General Hospital "Studnica" Kraljevo, Department of Otorhinolaryngology and Maxillofacial Surgery, Jug Bogdanova St. bb, 36000 Kraljevo, Serbia, tel: +381641267176, +38136373878, e-mail: trifunovickv@gmail.com

Introduction

Tinnitus is one of the most common chronic symptoms worldwide, which may result from several underlying clinical conditions. Its estimated prevalence among adults in the USA is 10-15 %¹. Tinnitus is defined as a phantom sound perception, or a perception of sound without an appropriate acoustic, mechanical stimulation of the cochlea^{2,3}. The background of the pathophysiological mechanism and etiology of chronic subjective tinnitus (CST) is not fully understood, and there are several theories and pathophysiological models which have attempted to explain its mechanism^{4,7}. Millions of Americans with CST have significant hearing difficulties⁸. Most patients with CST compared to the general population have a steeply sloping audiogram,

which is more pronounced in noise-induced tinnitus^{9,10}. This steeply sloping audiogram and reduced brain plasticity could play an essential role in explaining the etiology (tonotopic reorganization theory) and the pathophysiology of tinnitus of the peripheral acoustic system¹¹.

Recent studies have reported that tinnitus patients are likely to have psychological disorders, mostly insomnia, depression, and anxiety^{12,13}. There are few studies in the literature on the personality characteristics of patients with tinnitus and psychiatric comorbidities^{14,15}. A pathoanatomical marker for tinnitus has not been found yet. Temperament, character, and personality are terms used to distinguish enduring personal characteristics. Temperament represents the biological core of person-

ality with a genetic and constitutional endowment, and it remains relatively stable over time. Dysregulations of temperament may predispose to the development of affective disorders, like bipolar disease or depression^{16,17}. Therefore, affective temperament can be a predisposing factor to psychiatric diseases, such as anxiety or depression. Several studies have found a correlation between various affective temperaments and physical disorders, such as autoimmune disorders¹⁸, disorders with prominent pain, and spondylitis¹⁹. Patients with a predominantly cyclothymic affective temperament more commonly have diabetes²⁰, and those with high scores on the hyperthymic temperament have an increased prevalence of hypertension²¹. We assume that people with tinnitus have a biological predisposition for developing this disorder, which is reflected in the existence of a specific affective way of reacting, i.e., affective temperament. However, no studies have evaluated the correlation between affective temperaments and CST using the Temperament Evaluation of Memphis, Pisa, Paris, and San Diego Auto questionnaire (TEMPS-A) scale.

Affective temperaments were evaluated utilizing the Serbian version of TEMPS-A²². The original TEMPS-A represents the operational measures for five affective temperament traits. The final selection is achieved at a later stage through an inertial process that contains both clinicians' and researchers' feedback.

Therefore, our study's primary aim was to investigate the predominant affective temperament in these patients as a possible predisposing factor. The second aim was to conclude whether the predominant temperament (if it existed) in people with CST changes depends on the hearing loss, gender, and age.

Methods

Participants

This prospective cohort study was conducted on the patients who attended with tinnitus the department of Otorhinolaryngology and Maxillofacial surgery, in the General Hospital "Studenica", in Kraljevo, Serbia, from June 2018 to May 2019. The Ethics Committee of the General Hospital "Studenica" in Kraljevo approved the study (decision No 20-2/5a, date: 28/9/2015). All the patients included in the study signed the informed consent form and were divided into three groups, according to gender, degree of hearing loss, and age (internal comparison group).

The inclusion criteria included all patients above 18 years of age, who attended the hospital department complaining of tinnitus in the ears, diagnosed with chronic tinnitus lasting over six months, and had the ability to understand the study's information and provide informed consent. As exclusion criteria were defined all known causes which may influence the development of tinnitus: patients with objective or pulsatile tinnitus, patients with identified causes of tinnitus (auditory pathway diseases) including otitis externa/media, Meniere's disease, otosclerosis, tumors of the central nervous system (vestibular schwannoma), and other causative diagnoses of

secondary tinnitus or tinnitus related to complex auditory hallucinations or hallucinations related to psychosis or epilepsy, depression, bipolar disorder, anxiety disorder or a neurological disorder affecting memory (e.g., dementia), as well as any patient receiving medication for a possible psychiatric problem. The total number of patients examined in the department was 178, and 57 patients fulfilled the criteria and were included in the study.

Procedures

All enrolled patients underwent thorough clinical examination by the same otolaryngology specialist, including a targeted history and physical examination at the initial evaluation, a full inquiry regarding the symptom and the use of medication, and a review of their electronic medical records. Subsequently, an audiologist conducted an audiological examination, measured the level of hearing for the frequencies of 250, 500, 1,000, 2,000, 4,000, and 8,000 Hz using pure tone audiometry (Amplaid A321 Twin channel, Amplifon, Milan, Italy), and determined the level of hearing loss in each ear individually, as well as in both ears using Fowler-Sabine tables (FS)²³. The summation of hearing impairment percentages at four frequencies from the table for one ear shows the monaural hearing loss in percentages. In order to obtain binaural hearing impairment, the percentage related to the better ear was multiplied by seven and then added by the percentage related to the worse ear multiplied by one. That sum was then divided by eight, and the calculated result represented the percentage of the total hearing loss. Each patient was also tested with tympanometry. After signing the informed consent, patients completed (most in a single visit) a basic sociodemographic questionnaire and the Serbian 41-item version of the TEMPS-A questionnaire²⁴. The TEMPS-A consists of 110 items (yes/no questions) and defines five affective temperaments: depressive (Depr), cyclothymic (Cyclo), hyperthymic (Hyper), irritable (Irit), and anxious (Anx)²⁵. The short 41-item version of the TEMPS-A exhibited construct validity and good overall internal consistency, indicating stable reliability over time²⁶. Instead of the five-factor model, a six-factor one was extracted, separating anxious temperament into somatic items (AnxS) and cognitive items (AnxC). Predominant affective temperaments were calculated by summing the scores of individual items.

Statistics

The data were analyzed using IBM SPSS Statistics for Windows, Version 19.0 (IBM Corp., Armonk, NY, USA). All tests were two-sided, and α was set at 0.05. The normal distribution of continuous variables was tested using the Kolmogorov-Smirnov test. Continuous variables are expressed as mean \pm standard deviation for normal distribution and median (minimum-maximum) for non-normal distribution. The internal consistency of the TEMPS-A scale was measured with Cronbach's alpha. It calculated the total score, mean, and components of the score. The Mann-Whitney U test was utilized for the comparison of

variables (dominant affective temperament score) between two independent groups (males vs females). The Kruskal-Wallis H test (for non-parametric data) and ANOVA (for parametric data) were used to establish the differences among the age groups (<45 years vs 46-60 years vs 61-70 years vs >70 years) as well as among the hearing loss groups (0 % vs <10 % vs 11-30 % vs >30 %) for the dominant affective temperament score. The Spearman's rank correlation coefficient assessed the correlation between variables (temperaments scores and hearing loss, or age).

Results

In total fifty-seven CST patients, 31 of whom were female (54.38 %), were evaluated. The mean age of patients was 58 ± 11.17 (range: 18-85) years. The average tinnitus duration in the left ear was 4.3 ± 5.07 and in the right ear 3.91 ± 4.72 years. The TEMPS-A scale's internal consistency for the whole sample was $\alpha = 0.527$ (the Alpha Cronbach's value).

Predominant affective temperaments were calculated by summing the scores of individual items. The primary results of six affective temperaments of TEMPS-A are shown in Table 1. The highest scores were recorded on AnxC (26.23 %) and AnxS (25.6 %) temperaments. Table 2 presents the temperament scores by gender; men scored

highest on the AnxS temperament (37.79 %), while women scored highest on the AnxC temperament (30.3 %). The scores on AnxC and AnxS temperaments were significantly different depending on gender.

Dominant temperaments within the groups with different levels of hearing loss are shown in Table 3. The AnxS temperament scores became lower as the hearing loss increased, whereas the opposite was found for the AnxC temperament (40.89 % of the patients with a hearing loss greater than 30 % had a predominant AnxC temperament, compared to only 5.53 % with a predominant AnxS temperament). The AnxS group did not show any difference between genders. The AnxC score for the female gender was higher in relation to the male gender in all groups, except in the group without hearing loss. ANOVA and Kruskal Wallis tests' values show statistical significance only in the female gender within the AnxC group; in all other groups where the calculation was done for each gender, no significance was found.

Dominant temperaments within the groups of different ages are shown in Table 4. The values of temperament change concerning age were studied. It can be seen that AnxS and AnxC were dominant temperaments in all groups, and there was no difference between genders

Table 1: Basic results of the TEMPS-A questionnaire, of the dominant affective temperaments regarding the 57 patients with tinnitus who were included in the study.

TEMPS-A items	Cylo	AnxC	Hyper	AnxS	Irrit	Depr
Number of patients	57	57	57	57	57	57
Mean	1.45	2.05	0.61	1.99	1.16	0.54
Median	1.13	2.09	0.514	2.21	1.01	0.00
Std. Deviation	1.47	1.47	0.72	1.23	1.09	0.84
Minimum	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	4.30	3.87	2.77	4.21	3.62	3.94
Sum	82.68	116.87	35.21	113.64	66.39	30.74
% of total score	18.5	26.2	7.9	25.6	14.9	6.9

TEMPS-A: Temperament Evaluation of Memphis, Pisa, Paris, and San Diego Auto questionnaire, Affective temperaments: Cylo: cyclothymic, AnxC: cognitive items, Hyper: hyperthymic, AnxS: somatic items, Irrit: irritable, Depr: depressive, % of total score: this value represents the percentage of each part of the total score of dominant affective temperaments.

Table 2: Dominant affective temperament score among different groups of gender.

TEMPS-A items	Cylo	AnxC	Hyper	AnxS	Irrit	Depr
Male						
Number of patients	26	26	26	26	26	26
Mean	1.21	1.47	0.89	2.55	0.78	0.24
Median	0.57	1.09	0.65	2.39	0.51	0.00
Std. Deviation	1.49	1.40	0.83	1.13	0.91	0.43
Minimum	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	4.31	3.87	2.78	4.22	3.11	1.33
Sum	31.56	38.10	23.23	66.29	20.16	6.18
% out of total score	17.01	20.54	12.52	35.73	10.87	3.33
Female						
Number of patients	31	31	31	31	31	31
Mean	1.65	2.54	0.39	1.53	1.50	0.80
Median	1.28	3.1	0.00	1.32	1.70	0.53
Std. Deviation	1.46	1.36	0.55	1.13	1.50	1.01
Minimum	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	4.30	3.87	1.79	4.22	3.63	3.94
Sum	51.12	78.78	11.99	47.35	46.23	24.57
% out of total score	19.66	30.30	4.62	18.22	17.75	9.45
p value ¹	0.171	0.007	0.013	0.002	0.020	0.018

TEMPS-A: Temperament Evaluation of Memphis, Pisa, Paris, and San Diego Auto questionnaire, Affective temperaments: Cylo: cyclothymic, AnxC: cognitive items, Hyper: hyperthymic, AnxS: somatic items, Irrit: irritable, Depr: depressive, ¹: Mann-Whitney test (male vs female); % of total score: this value represents the percentage of each part of the total score of dominant affective temperaments.

Table 3: Dominant affective temperament score among different groups of hearing loss.

Temperament score	Hearing loss group (using FS method)				p value
	0 %	<10 %	11-30 %	>30 %	
Cyclo	4.82	38.06	31.98	7.81	0.83 ²
	14.01 %	17.45 %	20.5 %	17.99 %	
Male	1.22	18.95	12.28	0.00	0.37 ²
Female	3.60	20.00	19.7	7.87	0.62 ²
p value	1.00 ¹	0.90 ¹	0.02 ¹		
AnxC	3.64	63.38	31.67	18.19	0.01 ³
	10.59 %	29.05 %	20.3 %	41.89 %	
Male	3.64	22.38	12.07	0.00	0.17 ²
Female	0.0	41.00	19.60	18.19	0.02 ²
p value	0.13 ¹	0.04 ¹	0.02 ¹		
Hyper	2.43	17.30	14.13	1.92	0.70 ²
	7.07 %	7.92 %	9.06 %	4.42 %	
Male	2.43	10.2	10.6	0.00	0.82 ²
Female	0.00	7.1	3.53	1.92	0.15 ²
p value	0.13 ¹	0.19 ¹	0.38 ¹		
AnxS	15.89	53.18	44.05	2.46	0.02 ³
	46.19 %	24.38 %	28.23 %	5.67 %	
Male	7.97	26.81	31.58	0.00	0.13 ³
Female	7.92	26.37	12.47	2.46	0.12 ³
p value	0.13 ¹	0.18 ¹	0.16 ¹		
Irrit	6.08	34.97	22.58	5.67	0.91 ²
	17.68 %	16.03 %	14.47 %	13.05 %	
Male	3.61	7.53	9.02	0.00	0.19 ²
Female	2.47	27.44	13.56	5.67	0.27
p value	0.27 ¹	0.004 ¹	0.13 ¹		
Depr	1.54	11.27	11.61	7.37	0.37 ²
	4.46 %	5.17 %	7.44 %	16.98 %	
Male	0.00	3.14	3.43	0.00	0.67 ²
Female	1.53	8.13	8.18	7.37	0.20 ²
p value	0.53 ¹	0.67 ¹	0.01 ¹		
No of patients	6	26	20	5	
Sum	34.40	218.16	156.02	43.42	
	100 %	100 %	100 %	100 %	

Affective temperaments: Cyclo: cyclothymic, AnxC: cognitive items, Hyper: hyperthymic, AnxS: somatic items, Irrit: irritable, Depr: depressive, FS: the Fowler Sabine method, ¹: Mann-Whitney test (males vs females), ²: Kruskal-Wallis test (0 % vs <10 % vs 11-30 % vs >30 %), ³: ANOVA test (0 % vs <10 % vs 11-30 % vs >30 %).

(Mann-Whitney test), except AnxC in the group aged >70 years. The values of ANOVA and Kruskal Wallis tests did not show any statistical differences between the groups.

The relationship between temperament scores and hearing loss is shown in Table 5. The degree of correlation between the average hearing loss in the left ear and the values of temperament was lower in relation to the right ear for both AnxC and AnxS (for the left ear, the correlation was weak, and for the right ear, medium). The correlation coefficient's value was obtained by comparing the total hearing loss for both ears, and for the temperaments AnxS and AnxC was medium and approximately corresponded to the right ear. The correlation between AnxS scores and hearing loss was negative.

Discussion

The results of neurophysiological and brain imaging studies to date suggest cortical plasticity and hearing loss as likely mechanisms to be involved in the chronic progression of tinnitus. Neural impairment in tinnitus patients is unknown. Patients with decompensated tinnitus suffer from

complex somatic and psychological disorder²⁷. In addition to all the proposed models, a significant role in the development of tinnitus may be played by the predisposition reflected in the existence of a dominant affective temperament in these patients. It is corroborated by a standpoint that cyclothymic, depressive, and anxious temperaments are strongly associated with depressive heredity. Also, people with mood disorders in their family history are twice as likely to have a dominant affective temperament²⁸. Affective temperament types are premises of mood disorders and are accepted as subthreshold clinical indications of mood disorders²⁹.

Only one study has previously examined the correlation between temperament and tinnitus, using the Temperament and Character Inventory (TCI)³⁰, and showed that patients with tinnitus had higher scores for "harm avoidance". In contrast, the scores for "novelty seeking", "reward dependence", and "persistence" were significantly lower in comparison to the control group. In terms of character, people suffering from tinnitus had lower "cooperation" and "self-transcendence". The assessment of "searching for novelty" was inversely related to the severity of tinnitus. It is impos-

Table 4: Dominant affective temperament score in different age groups.

Temperament score	Age groups				p value
	<45 years	46<60 years	61<70 years	>70 years	
Cyclo	12.3 14.41 %	26.63 18.74 %	24.14 18.42 %	17.65 21.21 %	0.87 ²
male	6.81	16.65	6.13	0.00	
female	5.42	9.98	18.01	17.65	0.29 ²
p value	0.70 ¹	0.89 ¹	0.44 ¹	0.03 ¹	0.24 ²
AnxC	17.83 20.89 %	35.71 25.13 %	37.69 28.78 %	21.86 26.27 %	0.41 ²
male	9.28	14.87	9.07	11.18	
female	8.55	20.84	28.62	10.68	0.76 ²
p value	0.70 ¹	0.13 ¹	0.32 ¹	0.02 ¹	0.46 ²
Hyper	7.74 9.07 %	11.43 8.04 %	9.70 7.41 %	6.73 8.08 %	0.98 ²
male	6.56	9.13	4.88	2.48	
female	1.18	2.30	4.82	4.25	0.76 ²
p value	0.65 ¹	0.13 ¹	0.09 ¹	1.00 ¹	0.46 ²
AnxS	32.26 37.80 %	36.92 25.99 %	26.14 19.96 %	17.78 21.37 %	0.13 ³
male	18.84	25.41	10.65	8.94	
female	13.42	11.51	15.49	8.84	0.42 ³
p value	0.18 ¹	0.06 ¹	0.32 ¹	0.07 ¹	0.41 ³
Irrit	12.16 14.25 %	24.24 17.05 %	18.67 14.26 %	12.7 15.27 %	0.97 ²
male	6.58	6.92	3.11	2.02	
female	5.58	17.32	15.56	10.68	0.49 ²
p value	0.70 ¹	0.01 ¹	0.18 ¹	0.52 ¹	0.35
Depr	3.06 3.58 %	7.17 5.05 %	14.63 11.17 %	6.48 7.80 %	0.17 ²
male	1.02	3.04	1.64	0.00	
female	2.04	4.13	12.99	6.48	0.62 ²
p value	0.70 ¹	0.81 ¹	0.27 ¹	0.17 ¹	0.24 ²
Sum	85.35	142.1	130.98	83.2	
No of patients	12	18	16	10	

Affective temperaments: Cyclo: cyclothymic, AnxC: cognitive items, Hyper: hyperthymic, AnxS: somatic items, Irrit: irritable, Depr: depressive, ¹: Mann-Whitney test (males vs females), ²: Kruskal-Wallis test (<45 years vs 46<60 years vs 61<70 years vs >70 years), ³: ANOVA test (<45 years vs 46<60 years vs 61<70 years vs >70 years).

Table 5: Correlation coefficient values between average hearing loss and temperament scores.

Temperament score	FS (Sum) ¹	Left	Right
Cyclo	0.052	-0.022	0.054
AnxC	0.262	0.100	0.254
Hyper	-0.057	-0.011	-0.124
AnxS	-0.300	-0.167	-0.326
Irrit	-0.074	-0.123	-0.096
Depr	0.318	0.176	0.302

¹: average hearing loss on both ears [using the Fowler Sabine (FS) method], Affective temperaments: Cyclo: cyclothymic, AnxC: cognitive items, Hyper: hyperthymic, AnxS: somatic items, Irrit: irritable, Depr: depressive.

sible to compare TCI and TEMPS-A results directly, but this paper's results match ours to a certain extent. Namely, higher scores on harm avoidance show that individuals with chronic tinnitus avoid unpleasant stimuli rather than facing them (reduced values of dependence on reward dependence and novelty-seeking). This can be explained by the increase in anxiety in both somatic and cognitive aspects obtained in the research as the basic, most dominant forms of affective temperaments. In further studies, it is necessary to determine whether disposition, i.e., the domination of anxious, affective temperament in patients with chronic tinnitus, will be confirmed. This would make understanding such patients' functioning easier. We believe that the scale presented in this paper has a better clinical application than the previous one.

Anxious affective temperament may be a mediator

between the underlying anxiety disorders in patients with CST³¹. Further research is necessary for a better understanding of this issue.

As mentioned earlier, the highest scores in both anxious temperaments, AnxC (26.23 %) and AnxS (25.6 %), revealed the dominant temperaments in our group of patients, resulting in over 50 % patients with a predominantly anxious temperament. Although no other studies investigated the relationship between affective temperaments and tinnitus, it was found that in patients with other somatic diseases, the anxious temperament was dominant in those with inflammatory bowel disease³² and overactive bladder³³. Anxious temperament was dominant in the group with tinnitus regardless of gender. The cognitive subtype was more pronounced in females and the somatic subtype in males. Unlike the five-factor TEMPS-A scale, the ab-

breviated version of the Serbian TEMPS-A scale has a six-factor structure. The anxious affective temperament subscale was split into the scale of physical symptoms and the scale of “worrying” items, which was statistically better logically and content-wise. This provided support for the division of anxious temperament, more precisely its partial overlap with depression subscale³⁴. In population studies, including non-clinical populations, there was a difference in temperament scores between genders. In general, men scored higher on hyperthymic temperament, while women were of depressed, cyclothymic, and anxious temperaments^{35,36}. In patients with allergic rhinitis, anxious and depressive temperaments showed the highest score, but there was no difference regarding gender and age³⁷.

Anxious temperament was the dominant affective temperament regardless of the age of respondents. Thanks to the six-factor scale, it is possible to identify a difference in subtypes in relation to age. In younger people, the somatic type is more dominant, while in the elderly, it is the cognitive type, which is in line with the generally accepted view that older people often suffer a decline in cognitive functioning as part of normal aging.

Most patients with CST have a significant hearing loss, and tinnitus can also occur in individuals with normal hearing in about 5 to 10 % of cases^{38,39}. Hearing loss plays an important role in the development of tinnitus. A specific hearing impairment leads to a sudden drop in hearing between two frequencies, which is significant for the onset of tinnitus¹¹. According to the literature, it should be considered a relevant symptom because it may be a sign of future hearing loss or an existing abnormality not detected by conventional methods⁴⁰. This does not have to be the only explanation, i.e., that subjects with normal peripheral hearing may show hearing abnormalities, often above the 8,000 Hz frequency, or central abnormalities. The hypothesis in this paper is that in addition to hearing impairment, affective temperament is a contributing factor to tinnitus development, explaining why people who do not suffer hearing loss have tinnitus. The analysis of the results from groups with and without hearing loss showed that anxious affective temperament is predominant in all the groups. The group of patients without hearing loss had higher scores on the AnxS temperament, while the group with a significant hearing loss had higher scores on the AnxC temperament. There is a possibility that anxious temperaments, regardless of the subtype, together with other predisposing factors, may influence tinnitus's pathogenesis. In line with this, it was found that tinnitus retraining therapy in both groups (with and without hearing loss) has approximately the same effects on reducing tinnitus⁴¹. Considering how tinnitus retraining therapy also involves psychotherapy (mostly habituation), there are certain clinical implications of further exploring the psychological factors that may influence tinnitus.

Comorbid anxiety disorders are higher in tinnitus suffering patients. Screening for and treatment of anxiety disorders are recommended in moderate to severe tinnitus⁴². In recent years, several studies have shown a good

therapeutic response to the treatment of tinnitus with antidepressants, benzodiazepines, gabapentin, glutamate antagonists^{43,44}. Clinical guidelines including the “Clinical Practice Guideline: Tinnitus” published by the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) do not recommend that physicians routinely prescribe antidepressants, anticonvulsants, anxiolytics, or intratympanic drugs to treat persistent tinnitus⁴⁵.

A limitation of the current study is the large number of patients who were excluded due to a known cause of tinnitus or due to psychiatric comorbidity. The patients diagnosed with anxiety disorders were also excluded from the study. An inherent limitation is that it cannot be said quite clearly whether anxious temperament is dominant in these cases. The range of patients with CST observed over a certain period of time and in a specific area may not accurately represent a wider CST patients population. As this is the first study on temperament in tinnitus patients that used the TEMPS-A scale, it was impossible to calculate the appropriate sample size.

The advantage of the current study is that the results obtained are closer to routine clinical practice and may be relevant. They may suggest a hypothesis about the influence of affective temperament on tinnitus occurrence and may be useful in further studies.

Generally, it can be concluded that both anxious temperaments were predominant in patients with CST. AnxS temperament was dominant in younger people with lower hearing loss and males, while AnxC was dominant in older people with higher hearing loss and females. This is the first study that explored the relationship between affective temperaments and CST. Further investigations are needed so that the possible involvement of affective temperaments in the pathophysiology of CST could be clarified.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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