



The moderating effect of personality traits on acute tinnitus sensation in idiopathic sudden sensorineural hearing loss

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Abstract

Background: People may experience tinnitus after sudden hearing impairment. The details of the relationship between tinnitus improvement and hearing recovery are still unclear. Personality traits may play a role in the modulation of tinnitus sensation. We investigated the moderating effect of personality traits on pretreatment and posttreatment tinnitus sensation in patients with idiopathic sudden sensorineural hearing loss (ISSHL).

Methods: This prospective longitudinal study enrolled 33 patients diagnosed with unilateral ISSHL and acute tinnitus in 2018-2019 at one institute. Clinical data were collected before and after treatment, including results of pure-tone audiometry (PTA), the Clinical Tinnitus Questionnaire (CTQ), the Tinnitus Handicap Inventory (THI), tinnitus loudness and annoyance (Visual Analog Scale; VAS), the Hospital Anxiety and Depression Scale (HADS), and the Big Five Inventory (BFI)-44.

Results: Eighteen men and 15 women with an average age of 48.3 ± 15.8 years were enrolled. The pretreatment hearing threshold and THI score were 58.0 ± 27.4 dB HL and 42.9 ± 26.2 (range: 0-88), respectively; the posttreatment values were 39.8 ± 22.4 dB HL and 20.7 ± 22.5 (range: 0-64), respectively. There were significant differences between pretreatment and posttreatment hearing thresholds as well as THI, VAS, and HADS scores ($p < 0.001$) but not BFI-44 results. Neuroticism and openness had significant positive and negative correlations, respectively, with acute tinnitus stress before treatment ($r = 0.561$, $p = 0.001$; $r = -0.359$, $p = 0.040$). After 3 months of follow-up, all patients were analyzed separately by dividing them into recovery ($n = 16$) and nonrecovery groups ($n = 14$) according to their hearing improvement status by Siegel's criteria. Neuroticism showed a significant moderating effect on acute tinnitus sensation in the ISSHL recovery group ($p < 0.001$) but not in the nonrecovery group ($p = 0.106$).

Conclusion: Neuroticism and openness may affect acute tinnitus stress in ISSHL patients. Practitioners should consider personality traits when managing ISSHL patients with bothersome tinnitus.

Keywords: Idiopathic sudden hearing loss; Personality traits; Tinnitus

1. INTRODUCTION

Idiopathic sudden sensorineural hearing loss (ISSHL) is an otologic emergency and a frustrating disease that may cause disability.^{1,2} ISSHL is defined as hearing loss of at least 30 dB at three sequential frequencies within 3 days.³ The clinical symptoms also include tinnitus and vertigo.^{4,5} Old age, severe hearing loss at onset, and accompanying vertigo have been reported

as negative prognostic factors for hearing recovery in adult patients with ISSHL.^{1,6} According to previous studies, regardless of treatment modality, approximately one-third of patients could still suffer from hearing impairment with severe tinnitus or hyperacusis.⁵⁻⁷ However, the effect of tinnitus as an associated symptom of ISSHL is still controversial in the literature. The reported prevalence of tinnitus in ISSHL patients ranges from 79% to 97%.^{8,9}

Tinnitus consists of subjective sound perception in the absence of an external source of sound.¹⁰ Perceived loudness and severity are two important aspects of tinnitus. Depression, anxiety, insomnia, and personality traits (especially neuroticism and agreeableness) are related to the perceived severity of tinnitus.^{10,11} Mucci et al.¹² reported that tinnitus perception was related to certain personality traits, such as neuroticism, psychasthenia, and schizoid aspects. In a web-based personality survey, Durai et al.¹³ showed that tinnitus sufferers exhibited higher levels of stress reactions, lower social closeness, lower self-control, and higher alienation than control subjects without tinnitus. In a cross-sectional and longitudinal study by Simoes et al., patients were clustered into three groups based on their level of tinnitus improvement. The

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researchers reported that patients in the “clinically improved” and “clinically stable” groups scored lower in neuroticism and higher in extraversion than those in the “clinically worsened” group. It has been suggested that personality traits are associated with the improvement of tinnitus over time.¹⁴

Up to 77% of people suffering from tinnitus may have psychiatric comorbidities,^{15,16} and patients with severe tinnitus may be vulnerable to neurotic disorders and lack coping capabilities.¹⁷ People may experience tinnitus when they experience hearing impairment,¹⁸ especially in the event of sudden hearing impairment. Some studies have focused on the relationship between psychiatric comorbidities and tinnitus, while other studies have focused on the relationship between psychiatric comorbidities and sudden deafness.^{19,20} Personality traits may be related to psychiatric comorbidities. Mühlmeier et al.²¹ showed that complete hearing recovery and full tinnitus remission were both approximately three times more frequent in patients with mild to moderate hearing loss than in those with severe to profound ISSHL. Lin and Liu discussed the relationship between tinnitus recovery and hearing improvement in ISSHL and concluded that the improvement rate of hearing is a favorable prognostic factor for recovery from tinnitus-related disability but not for the loudness sensation of tinnitus. However, the details of the relationship between tinnitus improvement and hearing recovery are still unclear.²² Furthermore, the relationship between personality traits and acute tinnitus sensation in tinnitus sufferers, especially those who have experienced sudden deafness, needs further study.

In this study, we investigated the personality, level of tinnitus impact and hearing outcomes of patients with ISSHL. We also analyzed the interaction with personality, tinnitus handicap and the dynamic change in hearing status before and after treatment.

2. METHODS

2.1. Subjects

We enrolled patients who were diagnosed with unilateral ISSHL and experienced acute tinnitus between 2018 and 2019 in our hospital. This prospective longitudinal study was approved by the institutional review board (TPEVGH IRB No.: 2017-11-006BC). All patients were between 20 and 65 years old at the time of diagnosis. Patients who had preexisting otological symptoms (infection, hearing loss, or tinnitus), previous neurological/cognitive diseases or a history of using psychiatric medication were excluded from this study. The duration of follow-up after treatment was at least 3 months.

2.2. General treatment and study protocol

Our standard treatment for ISSHL is high-dose intravenous steroids (1 mg/kg/day) for 1 week. The initial examinations included pure-tone audiometry (PTA), the Clinical Tinnitus Questionnaire (CTQ), Tinnitus Handicap Inventory (THI), tinnitus loudness and annoyance on a Visual Analog Scale (VAS), the Hospital Anxiety and Depression Scale (HADS), and the Big Five Inventory (BFI)-44. The pure-tone thresholds were averaged across 4 frequencies (0.5, 1, 2, and 4 kHz). All of the evaluation measures were repeated at the posttreatment follow-up visit 3 months later. All patients' hearing outcomes were assessed according to Siegel's criteria²³: final hearing better than 25 dB HL was classified as type I (complete recovery); final hearing of 25-45 dB HL with >15 dB improvement was classified as type II (partial recovery); final hearing poorer than 45 dB HL but with >15 dB improvement was classified as type III (slight improvement); <15 dB improvement was classified as type IV (no improvement). On this basis, the patients were divided into recovery and nonrecovery groups (Fig. 1).

2.3. Questionnaires

The CTQ is mainly for acquiring a general understanding of a patient's basic information, medical history, and state of hearing loss and tinnitus.

The THI, developed by Newman et al.,²⁴ is a highly reliable and valid self-report measure to quantify the impact of tinnitus on daily living. This 25-item questionnaire is grouped into functional (11 questions), emotional (9 questions), and catastrophic subscales (5 questions). Each question is measured on a three-level scale (0 = no, 2 = sometimes, and 4 = yes). Accordingly, total scores on the entire scale range from 0 to 100, with higher scores representing more severe tinnitus. Patients with THI scores higher than 36 were diagnosed with moderate to severe tinnitus handicap.

The BFI-44 is a personality assessment designed for the adult population and based on the model of the Big Five trait domains: extraversion, agreeableness, conscientiousness, neuroticism, and openness. The 44 items are brief and use simple adjectival items without complex sentence structures or ambiguous meanings. Participants rate each BFI item on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). A higher score on each subscale indicates a stronger tendency toward the corresponding personality trait.

A visual analog scale (VAS) from 0 to 10 points was applied in this study for subjective measurement of the loudness (VAS-L) and annoyance (VAS-A) of tinnitus.

The HADS is a 14-item self-assessment questionnaire that is reliable for detecting states of depression (seven items) and anxiety (seven items). Each item is scored from 0 to 3, and a score of 11 or higher on either scale was deemed to indicate the probable presence of the corresponding mood disorder (depression or anxiety).

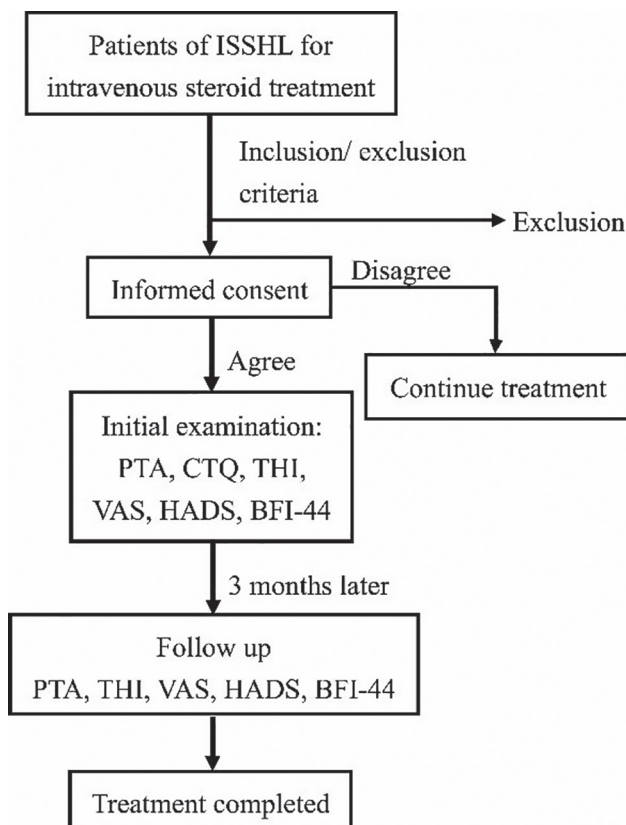


Fig. 1 Algorithm of our study. PTA = pure-tone audiometry; CTQ = Clinical Tinnitus Questionnaire; THI = Tinnitus Handicap Inventory; VAS = Visual Analog Scale; HADS = Hospital Anxiety and Depression Scale; BFI-44 = Big Five Inventory-44.

2.4. Statistical analysis

All data were analyzed with IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY). The Wilcoxon signed-rank test was used to compare the pretreatment and posttreatment values of each variable. The Mann-Whitney U test was used to assess the differences between the hearing recovery and nonrecovery groups. Spearman's rank-order correlation analysis was used to measure the associations between tinnitus (THI score) and the independent variables of personality (BFI-44), anxiety/depression (HADS), and loudness/annoyance of tinnitus (VAS-L, VAS-A). To evaluate whether personality traits could cause any significant difference in tinnitus in patients with different hearing recovery statuses, hierarchical regression analysis was applied.

3. RESULTS

3.1. Hearing status and tinnitus sensation before and after treatment

In total, 33 patients (18 male and 15 female) were recruited; their age at diagnosis (mean \pm SD) was 48.3 ± 15.8 years (range: 20-65). In 23 (69.7%) patients, the affected ear was on the left side. The most common audiogram shape was the low-frequency type ($n = 13$, 39.4%), followed by the sloping ($n = 10$, 30%) and flat types ($n = 5$, 15.2%).

The average pretreatment hearing thresholds in the affected ear and the healthy ear were 58.0 ± 27.4 dB HL and 18.53 ± 9.58 dB HL, respectively. All patients were followed up for at least 3 months. The average posttreatment hearing threshold was 39.8 ± 22.4 dB HL (Table 1).

The mean THI score obtained before treatment was 42.9 ± 26.2 (range: 0-88), which improved to 20.7 ± 22.5 (range: 0-64) after 3 months of follow-up. There were significant differences between pretreatment and posttreatment hearing thresholds, as well as THI, VAS, and HADS scores ($p < 0.001$), but the same was not true of BFI-44 scores (Table 1) (Supplementary Table 1, <http://links.lww.com/JCMA/A136>).

Table 1
Comparison of pretreatment and posttreatment values

	Pretreatment	Posttreatment	<i>p</i>
PTA	58.00 ± 27.40	39.80 ± 22.4	<0.001
Tinnitus			
THI-T	42.85 ± 26.18	20.73 ± 22.53	<0.001
THI-C	10.18 ± 5.95	6.13 ± 5.89	<0.001
THI-F	18.48 ± 14.03	8.80 ± 10.13	<0.001
THI-E	14.18 ± 9.64	5.80 ± 7.36	<0.001
Disruptiveness			
VAS-L	6.39 ± 2.02	3.80 ± 2.43	<0.001
VAS-A	6.03 ± 2.69	3.20 ± 2.70	<0.001
Mood			
HADS-A	7.27 ± 4.52	4.03 ± 4.01	<0.001
HADS-D	5.12 ± 3.22	3.07 ± 3.08	<0.001
Personality (BFI-44)			
Extraversion	28.45 ± 4.96	27.43 ± 4.46	0.253
Agreeableness	33.42 ± 5.25	34.07 ± 5.39	0.506
Conscientiousness	33.24 ± 5.48	32.97 ± 4.99	0.444
Neuroticism	20.45 ± 5.60	19.90 ± 5.87	0.370
Openness	34.33 ± 7.52	35.17 ± 7.01	0.054

BFI-44 = Big Five Inventory-44; C = catastrophic; E = emotional; F = functional; HADS = Hospital Anxiety and Depression Scale; HADS-A = HADS-anxiety; HADS-D = HADS-depression; THI = Tinnitus Handicap Inventory; T = total; VAS = Visual Analog Scale; VAS-L = VAS-loudness; VAS-A = VAS-annoyance.

According to Newman et al.,²⁵ the THI results are classified into four categories. Scores of 0-16 points indicated "no handicap" (Category 1); 18-36 points indicated "mild handicap" (Category 2); 38-56 points indicated "moderate handicap" (Category 3); and 58-100 points indicated "severe handicap" (Category 4). Subjects whose THI score was higher than 18 points were considered to have a persistent and significant tinnitus handicap. In our study, 8 of 14 patients in the nonrecovery group were considered to have significant and persistent tinnitus after treatment (1 in Category 2, 6 in Category 3, and 1 in Category 4). The remaining six patients of the nonrecovery group were in Category 1. Meanwhile, in the recovery group, there were four patients (2 in Category 2 and 2 in Category 4) who were considered to have a persistent and significant tinnitus handicap after treatment. The remaining 12 patients in the recovery group were in Category 1.

3.2. Correlation between pretreatment tinnitus and personality traits

When we analyzed the correlation between tinnitus handicap severity and personality traits before the start of treatment, we found that pretreatment tinnitus handicap scores had a significant, moderately strong and positive correlation with neuroticism ($r = 0.561$, $**p = 0.001$) and a mild but significant negative correlation with openness ($r = -0.359$, $*p = 0.040$). The remaining Big Five traits, namely, extraversion, agreeableness, and conscientiousness, were not significantly correlated with tinnitus handicap scores (Table 2).

In addition, anxiety ($r = 0.733$, $***p < 0.001$), depression ($r = 0.703$, $***p < 0.001$), loudness ($r = 0.567$, $**p = 0.001$), and annoyance ($r = 0.706$, $***p < 0.001$) showed positive correlations with tinnitus handicap scores (Table 3).

3.3. The differential effects of personality traits on tinnitus sensation between the hearing recovery group and the nonrecovery group

After 3 months of follow-up, all patients were divided into a recovery group (types I and II; $n = 16$) and a nonrecovery group (types III and IV; $n = 14$) according to their hearing improvement status by Siegel's criteria. The average posttreatment hearing thresholds were 24.5 ± 11.2 dB HL (recovery group) and 57.5 ± 18.8 dB HL (nonrecovery group).

On analysis, neuroticism ($U = 26$, $z = -3.598$, $p < 0.001$) and VAS-annoyance ($U = 62$, $z = -2.102$, $p = 0.036$) differed significantly between the recovery and nonrecovery groups. However, no significant differences in tinnitus handicap, loudness, mood, or personality traits other than neuroticism were found between these two groups (Table 4).

Table 2
Pearson correlation coefficients between tinnitus handicap scores and personality traits before treatment ($n = 33$)

	Tinnitus (THI)			
	Total	Catastrophic	Functional	Emotional
Personality (BFI-44)				
Extraversion	-0.03	-0.18	-0.07	-0.14
Agreeableness	-0.08	-0.14	-0.15	0.10
Conscientiousness	0.24	0.06	0.22	0.30
Neuroticism	0.56**	0.52**	0.50**	0.48**
Openness	-0.36*	-0.44**	-0.26	-0.33

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

BFI-44 = Big Five Inventory-44; THI = Tinnitus Handicap Inventory.

Table 3
Pearson correlation coefficients of tinnitus handicap with mood and the disruptiveness of symptoms before treatment (n = 33)

	Tinnitus (THI)			
	Total	Catastrophic	Functional	Emotional
Mood and disruptiveness				
VAS-L	0.57**	0.50**	0.49**	0.53**
VAS-A	0.71***	0.67***	0.62***	0.61***
HADS-A	0.73***	0.62***	0.63***	0.70***
HADS-D	0.70***	0.71***	0.50***	0.75***

**p* < 0.05,
***p* < 0.01,
****p* < 0.001.

HADS = Hospital Anxiety and Depression Scale; HADS-A = HADS-anxiety; HADS-D = HADS-depression; THI = Tinnitus Handicap Inventory; VAS = Visual Analog Scale; VAS-L = VAS-loudness; VAS-A = VAS-annoyance.

Upon analyzing the relationship between tinnitus and personality, we found that neuroticism was the only personality trait associated with tinnitus handicap scores ($r = 0.8, p < 0.01$) in the recovery group. There was no personality trait associated with tinnitus in the nonrecovery group (Table 5).

3.4. The moderating effect of personality traits on hearing recovery status

The moderating effects of personality traits and hearing recovery status on tinnitus handicap were further analyzed with hierarchical regression analysis, as shown in Table 6. Neuroticism and hearing recovery status had a combined 25.1% moderating effect on tinnitus handicap scores ($F(2, 27) = 4.532, p = 0.020$). After the main effects were controlled for, the interaction effect of neuroticism and hearing recovery status accounted for an

Table 4
Comparison of the recovery group and the nonrecovery group

	Recovery Group	Nonrecovery Group	U	z	p
Age	45.88 ± 17.85	53.07 ± 13.09	84.5	-1.144	0.252
PTA	25.27 ± 10.95	57.50 ± 18.80	8	-4.140	0.000***
Tinnitus					
THI-T	13.37 ± 21.18	29.14 ± 21.74	68	-1.855	0.064
THI-C	3.50 ± 4.82	9.14 ± 5.70	57	-2.348	0.019*
THI-F	6.75 ± 10.61	11.14 ± 9.37	78	-1.443	0.149
THI-E	3.12 ± 6.53	8.86 ± 7.26	55.5	-2.514	0.012*
Disruptiveness					
VAS-L	3.38 ± 2.75	4.29 ± 1.98	83.5	-1.200	0.230
VAS-A	2.31 ± 2.58	4.32 ± 2.55	62	-2.102	0.036*
Mood					
HADS-A	3.94 ± 4.43	4.14 ± 3.63	99.5	-0.526	0.599
HADS-D	2.75 ± 3.55	3.43 ± 2.53	85.5	-1.127	0.260
Personality (BFI-44)					
Extraversion	28.62 ± 4.30	26.07 ± 4.39	79.5	-1.360	0.174
Agreeableness	34.44 ± 5.85	33.64 ± 4.99	104.5	-0.312	0.755
Conscientiousness	32.31 ± 3.46	33.71 ± 6.38	93	-0.793	0.428
Neuroticism	16.13 ± 5.08	24.21 ± 3.09	26	-3.598	0.000**
Openness	35.94 ± 5.63	34.29 ± 8.45	100.5	-0.479	0.632

**p* < 0.05,
***p* < 0.01,
****p* < 0.001.

BFI-44 = Big Five Inventory-44; C = catastrophic; E = emotional; F = functional; HADS = Hospital Anxiety and Depression Scale; HADS-A = HADS-anxiety; HADS-D = HADS-depression; PTA = pure-tone audiometry average threshold; THI = Tinnitus Handicap Inventory; T = total; VAS = visual analog scale; VAS-L = VAS-loudness; VAS-A = VAS-annoyance.

Table 5
Pearson correlation coefficients between tinnitus handicap scores and personality traits after treatment

	Tinnitus (THI)			
	Total	Catastrophic	Functional	Emotional
Recovery group (n = 16)				
Personality (BFI-44)				
Extraversion	-0.30	-0.46	-0.21	0.28
Agreeableness	-0.15	-0.25	-0.12	0.10
Conscientiousness	0.32	0.41	0.21	0.41
Neuroticism	0.80**	0.86***	0.68*	0.87***
Openness	-0.49	-0.50*	-0.49	-0.43
Nonrecovery group (n = 14)				
Personality (BFI-44)				
Extraversion	-0.53	-0.58*	-0.52	-0.47
Agreeableness	-0.51	-0.48	-0.48	-0.53
Conscientiousness	0.51	-0.40	-0.53	-0.54*
Neuroticism	-0.37	-0.30	-0.40	-0.35
Openness	-0.38	-0.28	-0.41	-0.39

THI = Tinnitus Handicap Inventory; BFI-44 = Big Five Inventory-44.

**p* < 0.05,
***p* < 0.01,
****p* < 0.001.

11% increase in tinnitus handicap scores ($F(1, 26) = 4.550, p = 0.043$). Therefore, neuroticism could have a moderating effect on tinnitus handicap ($\beta = 1.852, p = 0.036$), with greater neuroticism being related to a more severe tinnitus handicap. Hearing recovery status had no moderating effect on tinnitus handicap ($\beta = 16.581, p = 0.190$). Furthermore, the interaction effect of neuroticism and hearing recovery status had a significant moderating effect (+11%) on tinnitus handicap ($\beta = -2.559, p = 0.043$). A significant positive interaction effect on tinnitus handicap between neuroticism and hearing recovery status was observed in the recovery group ($p < 0.001$). In the nonrecovery group, a nonsignificant negative interaction effect was identified ($p = 0.106$). The results are also presented with a simple slope test (Fig. 2).

4. DISCUSSION

Our study is the first to analyze the effect of personality traits and impaired hearing on acute tinnitus distress in ISSHL patients. We found that neuroticism and openness were significantly correlated with acute tinnitus sensation before treatment. However,

Table 6
The interaction effect of a personality trait (neuroticism) and hearing recovery status

	Tinnitus Handicap	
	Δr^2	β
Step 1	0.251*	
Neuroticism		1.898*
Hearing recovery status		0.417
Step 2	0.112*	
Neuroticism		1.852*
Hearing recovery status		16.581
Interaction effect of neuroticism and hearing recovery status		-2.559*
Total r^2	0.363*	
n	30	

**p* < 0.05.

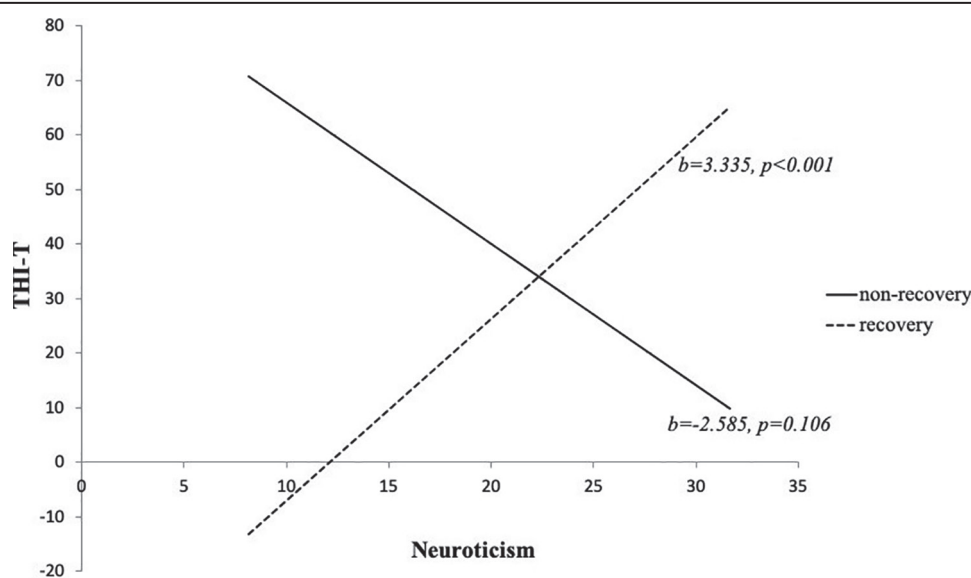


Fig. 2 The association between neuroticism and tinnitus in the recovery and nonrecovery groups. THI-T = Tinnitus Handicap Inventory total score.

after 3 months of follow-up, only neuroticism correlated with tinnitus, and only in the hearing recovery group.

According to some previous studies, personality traits are correlated with chronic tinnitus.^{11,26} Indeed, our results showed that neuroticism and openness were significantly correlated with acute tinnitus sensation in our patients before treatment. This may be explained by the possible involvement of personality traits in “interpreting” the impact of tinnitus, whether chronic or acute.

Age, education, socioeconomic status, and gender were considered to be correlated with the Big Five model of personality domains in previous studies.²⁷ However, the time duration for the detection of personality changes needs more prospective study for confirmation.²⁸ Due to our prospective study design, we could not obtain personality trait data before the sudden hearing loss event. Additionally, as shown in Table 1, there was also no significant difference in the BFI-44 scores during the treatment period (i.e., pretreatment and posttreatment).

Tinnitus involves both auditory and nonauditory systems, according to the neurophysiological model of tinnitus, which was first published by Jastreboff in 1990.²⁹ Hypothetical mechanisms include the processing of signals in the auditory pathway and the interactions of the auditory system with the limbic system and the autonomic nervous system.^{29–31} Møller et al.³² reported that hearing deprivation could cause tinnitus by decreasing auditory input and remodeling connections through neural plasticity. In animal and human models, Price et al.^{33,34} reported that mood states such as anxiety and fear may increase the hemodynamic activity of the amygdala and other limbic structures, enhancing the connection between mood and tinnitus.

The recent hypothesis of a “gatekeeper system” assigns subjective value or affective meaning to sensory signals (in this case, auditory signals) and implies that tinnitus symptoms would occur if this system were compromised.²⁰ In our study, neuroticism was related to tinnitus sensation in the ISSHL recovery group, but no personality trait was involved in the nonrecovery group. In other words, hearing status could moderate the effect of neuroticism on the impact of tinnitus sensation and handicap. However, most patients in the nonrecovery group had worse tinnitus severity and handicap than those in the recovery

group, which may countervail the moderating effect of personality on tinnitus. Our findings partially support the theory that personal traits may influence patients’ sensation of acute tinnitus through the “gatekeeper” in the amygdala or thalamus within the limbic system, causing the connection between emotion and tinnitus. Hullfish et al. found significant increased connectivity in the nucleus accumbens in the brains of tinnitus patients on resting state fMRI.³⁵ They also hypothesized that the nucleus accumbens may play a role on the transition from acute to chronic tinnitus perception, similar to the perception of back pain which was implied in an analogous study by Baliki et al.³⁶ However, the detailed mechanism by which personality relates to tinnitus sensation needs to be explored in further studies in the future.

Our study has several limitations. First, not all personality traits had significant moderating effects on the sensation of acute tinnitus, perhaps as a result of the small sample size; further study with a larger sample might be needed to reject the null hypothesis through hierarchical regression. Second, it is still unclear whether previous personality—existing before the sudden onset of hearing impairment—had an influence on tinnitus handicap severity. In addition, more research is needed to confirm whether changes in personality traits during acute illness may have some impact on tinnitus handicap and hearing recovery.

In conclusion, neuroticism and openness may be important factors affecting acute tinnitus stress in ISSHL patients. Practitioners should take personality factors into account when managing bothersome tinnitus in patients with ISSHL.

APPENDIX A. SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <http://links.lww.com/JCMA/A136>.

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