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The study on psychological resilience of tinnitus and associated influencing factors

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ABSTRACT

The association between tinnitus and psychological resilience is an underdeveloped area of research. This cross-sectional study investigated such associations and factors potentially affecting resilience in 61 patients. Demographic and psychometric data were collected by questionnaires. The Connor–Davidson Resilience Scale (CD-RISC), Medical Coping Modes Questionnaire (MCMQ), Satisfaction with Life Scale (SWLS), General Self-Efficacy Scale (GSES), Big Five Inventory (BFI) and Perceived Social Support Scale (PSSS) were completed by participants. Data were analyzed using independent *t*-test and Pearson's correlation analysis and multiple linear regression modeling. The CD-RISC score was relatively low (66.97 ± 15.71), negatively correlated with tinnitus ($r = -0.276$, $p < 0.001$) and associated with age ($r = 0.270$, $P < 0.001$). As protective factors, SWLS ($r = 0.486$, $p < 0.001$), GSES ($r = 0.555$, $p < 0.001$), PSSS ($r = 0.538$, $p < 0.001$) and extraversion were positively correlated with CD-RISC and BFI scores ($r = 0.287$, $p < 0.001$). We also detected a negative correlation with neuroticism ($r = -0.395$, $p < 0.001$), which is a known risk factor for worse CD-RISC scores. Identifying protective and risk factors for psychological resilience can be used to predict treatment outcomes in tinnitus patients, which will help devise personalized solutions and improve patients' quality of life.

1. Introduction

Tinnitus is the perception of sound without an external source that must exceed a 5 min duration. It can be divided into primary and secondary tinnitus (Yu et al., 2015). Primary tinnitus does not have a definite etiology and is often accompanied by symptoms including insomnia, irritability, anxiety, depression and suicidal thoughts or behaviors. Some patients with primary tinnitus may have sensorineural deafness. It can have an adverse effect on patient's mood, daily life and performance at work, as in contrast with secondary tinnitus. The prevalence of tinnitus is 5.1–42.7% and increases with age and noise exposure (Tang et al., 2019). There lacks a cure for primary tinnitus, but a personalized management strategy can be developed based on the psychological characteristics of an individual patient, often aimed at relieving anxiety and sleep disorders, as well as improving quality of life (Yu, 2013).

Studies on psychological characteristics of tinnitus patients have mainly focused on anxiety, depression and suicide ideation, often involving use of the Tinnitus Handicap Inventory (Martz et al., 2018; Trevis et al., 2016). However, each element in the THI reflects only a single psychological aspect, while measurement of psychological resilience requires a comprehensive evaluation of a patient's psychological state. Resilience is a process used by an individual to adapt to trauma or a serious health condition. Three factors influence psychological resilience, i.e. personal characteristics, family support and external support systems.

Psychological resilience, which is a dynamic process, can be improved by training. Psychological resilience is not only a protective factor against anxiety and depression (Shin et al., 2019) but also improves sleep quality by alleviating direct and indirect effects of stressful events on sleep (Li et al., 2019). Research on resilience and recovery style confirms that they promote disease recovery in a complementary manner, indicating the need to establish a

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personalized treatment using individual characteristics (Zizolfi et al., 2019). Understanding the level of psychological resilience and related factors in tinnitus will help develop personalized treatment strategies for tinnitus patients, promote disease recovery and improve quality of life.

2. Methods and materials

2.1. Study population

Seventy patients with primary tinnitus, admitted to the Department of Otolaryngology, Second Hospital of Shanxi Medical University, between July 2019 and December 2019, were enrolled in the study. The study protocol was approved by the hospital ethnicity committee and all participants signed an informed consent. The inclusion criteria were: ability to complete the questionnaires, and absence of psychotic or chronic systemic diseases. The questionnaires were mailed to the participants and collected on site. We communicated with the patients before they completed the questionnaires to ensure that they understood the intention of the survey, and to increase compliance and questionnaire recovery. We also explained the purpose and significance of the investigation for cooperation on the part of the patients and to address their concerns. The patients were provided with on-the-spot explanations in the case of any questions. If more than two-thirds of the items in one scale were not answered, the scale was excluded. A singular missing entry was replaced by the mean of the item from the remaining samples.

2.2. Psychometric scores

The questionnaires include demographic information and psychological measures. The demographic information included gender, age, educational level and place of birth. The Connor–Davidson Resilience Scale (CD-RISC) was used to assess levels of resilience, which contains items measuring tolerance to negative emotions, acceptance of change, control and support of emotions. This questionnaire has been widely used and verified in clinical practice, and reflects improvement in the patients' overall adaptability under clinical treatment conditions. The Tinnitus Handicap Inventory (THI) was used to assess tinnitus severity, which covers functional, severe and emotional areas.

The Medical Coping Modes Questionnaire (MCMQ), Satisfaction with Life Scale (SWLS), General Self-Efficacy Scale (GSES) and Big Five Inventory (BFI) were used to assess personal characteristics. The Perceived Social Support Scale (PSSS) was used to assess external support. The MCMQ contains three elements: confidence, avoidance and resignation. The SWLS (five items) and GSES (10 items) are designed to utilize 7-point and 4-point Likert scales, respectively. The five elements in the BFI cover extraversion, agreeableness, conscientiousness, neuroticism and openness.

2.3. Statistical analyses

The independent *t*-test was used in analyzing differences between genders (male vs female), educational backgrounds (high school or above vs under high school), age groups (45 years or younger vs older than 45 years) and birth places (rural vs urban). Pearson's correlation coefficient was used to evaluate relationships between the CD-RISC (competence, tolerance of negative effect, acceptance of change, control and spiritual influence) and tinnitus (functionality, emotion and severity), and among the MCMQ (confidence, avoidance and resignation), SWLS, GSES, BFI (extraversion, agreeableness facets, conscientiousness, neuroticism and openness) and PSSS. Multiple linear regression was used to explain involvement of independent variables (SWLS, GSES, PSSS, and confidence, avoidance and resignation) and dependent variables in the CD-RISC. Analyses were performed using the SPSS version 18.0 software (SPSS Inc., Chicago, IL, USA). A p-value < 0.05 was considered significant.

3. Results

3.1. General information

A total of 61 valid questionnaires were collected, including 23 by male patients (37.70%) and 38 by female patients (62.30%). The average age of the patients was 44.38 ± 11.87 years (19–72 years). Among the patients, 2 (3.28%) completed primary school, 16 (26.23%) junior high school, 14 (22.95%) high school and 29 (47.54%) completed college. Twenty eight (45.90%) participants were born in rural areas and 33 (54.10%) in urban areas. The mean CD-RISC score in this group of tinnitus patients was 66.97 ± 15.71, lower than that reported for patients from primary health service settings (71.8 ± 18.4) (Connor and Davidson, 2003) or for healthy adults (70.50 ± 13.48) (Chen, 2007). The mean MCMQ, SWLS, GSES, BFI and PSSS scores were 16.00 ± 2.83, 25.69 ± 6.12, 28.16 ± 6.35, 146.64 ± 16.97 and 63.96 ± 12.98, respectively.

3.2. Demographic variables

No statistically significant differences were observed for gender ($p = 0.766$), educational background ($p = 0.364$) or birth place ($p = 0.519$) (Table 1).

3.3. CD-RISC and influencing factors

Age was positively correlated with CD-RISC scores ($r = 0.270$, $p < 0.05$). Of the five elements in CD-RISC, tolerance to negative affect ($r = 0.253$, $p < 0.05$) and competence ($r = 0.300$, $p < 0.05$) improved with age. Tinnitus and its functionality element were negatively correlated with CD-RISC scores ($r = -0.276$ and -0.271, $p < 0.05$), competence ($r = -0.267$ and -0.274, $p < 0.05$), tolerance to negative affect ($r = -0.256$ and -0.282, $p < 0.05$) and acceptance of change ($r = -0.311$ and -0.300, $p < 0.05$). Emotional measures were not correlated with the other four CD-RISC elements, although negatively correlated with the CD-RISC score ($r = -0.267$, $p < 0.05$) and acceptance of change ($r = -0.311$, $p < 0.05$). No correlation was detected between severity and the total CD-RISC score or its five elements.

The CD-RISC score was positively correlated with the SWLS ($r = 0.486$, $p < 0.001$), GSES ($r = 0.555$, $p < 0.001$) and PSSS ($r = 0.538$, $p < 0.001$) scores, except that moral support was not correlated with the SWLS score. The BFI and agreeableness facets, conscientiousness and extroversion were correlated with the CD-RISC score ($r = 0.287$, 0.266, 0.316 and 0.402, respectively, $p < 0.05$), as well as competence ($r = 0.310$, 0.329, 0.344 and 0.461, respectively, $p < 0.05$), tolerance of negative affect ($r = 0.291$, 0.192, 0.275 and 0.423, respectively, $p < 0.05$) and acceptance of change ($r = 0.260$, 0.274, 0.297 and 0.347, respectively, $p < 0.05$). However, agreeableness and facets were not correlated with tolerance of negative affect. Openness was found to be correlated with endurance of negative emotions only ($r = 0.278$, $p < 0.05$). Notably, neuroticism was negatively correlated with the CD-RISC score ($r = -0.395$, $p < 0.001$), competence ($r = -0.391$, $p < 0.001$), tolerance of negative affect ($r = -0.359$, $p < 0.001$) and acceptance of change ($r = -0.353$, $p < 0.001$). The MCMQ score and its elements were not correlated with the CD-RISC score or its five elements, except that resignation was negatively correlated with control ($r = -0.304$, $p < 0.05$). See Table 2 for specific results.

Table 1
Demographic characteristics of the participants with tinnitus (n = 61).

Variable		N	Mean value	Standard deviation	F	P	T	P
Gender	Male	23	67.54	16.090	0.036	0.850	0.299	0.766
	Female	38	66.30	14.319				
Age	≤45 years	27	62.85	14.573	0.487	0.488	−1.860	0.068
	>45 years	34	70.24	16.017				
Education background	High school and below	32	64.77	18.582	5.971	0.018	−0.916	0.364
	Graduate and above	29	68.45	11.612				
Birth place	Rural areas	33	67.71	15.426	0.025	0.875	0.648	0.519
	Urban areas	28	65.04	15.855				

P < 0.05.

3.4. Multiple linear regression analysis

Durbin–Watson test (2.354) showed that the observed multiple linear regression values in this study were independent of each other. The scatter plot of the unnormalized predictive value (PRE_1) and Studentized residual value (SRE_1) showed a horizontal band, indicating a linear relationship between the dependent variable (the CD-RISC) and all independent variables in the multiple linear regression model. The uniform distribution of all points in the scatter plot indicated that the data conformed to an equal variance. The regression tolerance was >0.1, and no multicollinearity was detected. No observed outlier values were detected with a student-deleted residual more than three times the standard deviation. Finally, the histogram revealed a normal distribution curve with a normalized residual.

In all models, the adjusted R^2 value showed that 22.3% of a change in CD-RISC was explained by the SWLS, 38.4% by the GSES, 41.2% by the PSSS and 39.1% by the MCMQ. The regression model was significant with an F = 37.651 ($p < 0.001$; adjusted $R^2 = 0.39$). The six independent variables included in the model had significant effects on the CD-RISC value ($p < 0.05$). Specific results are shown in Table 3.

Table 3
Correlation coefficients of psychological resilience and the SWLS, GSES, PSSS, and MCMQ.

Model	R	R2	adjusted R2	F	Sig.
1. SWLS	0.486	0.236	0.223	18.208	0.000
2. GSES	0.636	0.405	0.384	19.701	0.000
3. PSSS	0.665	0.442	0.412	15.036	0.000
4. MCMQ	0.672	0.452	0.391	7.426	0.000

SWLS:Satisfaction With Life Scale; GSES:general self-efficacy Scale; PSSS:Perceived Social Support Scale; MCMQ:Medical CopingModes Questionnaire.P < 0.001.

4. Discussion

Psychological resilience has recently become a hot research topic. Primary tinnitus is commonly complicated with insomnia, irritability, anxiety, depression and suicidal thoughts or behaviors. Psychological resilience not only protects against anxiety and depression (Shin et al., 2019) but also helps with insomnia (Li et al., 2019). Personalized treatment depends on confirming factors influencing psychological resilience that promote rehabilitation and improve quality of life.

In our study, psychological resilience was not associated with gender, educational background or birth place. This finding was congruent with a study on operating room nurses, which showed no correlation between psychological resilience and age or educational background (Gillespie et al., 2009). In contrast, in an analysis of hypertensive patients, psychological resilience level was lower in women than in men, and higher education levels were linked with higher psychological resilience levels (Ye et al., 2019). Functional nuclear magnetic resonance imaging of the brain at resting state showed that psychological resilience in girls are different from boys, depending on brain development and hormonal changes during adolescence. (Wang et al., 2019). Future studies with an adequate sample size are needed to investigate associations between psychological resilience and patient gender, educational background and birth place.

Table 2
Pearson's correlation values for the main study variables.

		Total CD-RISC scores	Competence	Tolerance of negative affect	Acceptance of change	Control	Spiritual influence
Age		.270*	.300*	.253*	.228	.055	.056
Tinnus	Total tinnitus Scores	-.276*	-.267*	-.256*	-.311*	-.239	-.190
	Functionality	-.271*	-.274*	-.282*	-.300*	-.208	-.189
	Emotion	-.267*	-.248	-.220	-.311*	-.234	-.203
	Seriousness	-.183	-.171	-.158	-.200	-.186	-.131
SWLS		.486**	.479**	.338**	.507**	.331**	.215
MCMQ	Total MCMQ Scores	-.007	-.086	.043	-.014	-.007	.025
	Conference	-.026	-.149	-.025	-.055	.059	.005
	Avoidance	.122	.144	.109	-.001	.091	.122
	Resignation	-.144	-.163	.033	-.099	-.304*	-.070
GSES		.555**	.540**	.474**	.506**	.359**	.313**
PSSS		.538**	.511**	.373**	.498**	.373**	.385**
BFI	Total BFI scores	.287*	.310*	.291*	.260*	.171	.029
	Extraversion	.402**	.461**	.423**	.347**	.013	.212
	Agreeableness facets	.266*	.329**	.192	.274*	.109	.082
	Conscientiousness	.316*	.344**	.275*	.297*	.187	.107
	Neuroticism	-.395**	-.391**	-.359**	-.353**	-.183	-.202
	Openness	.203	.151	.278*	.112	.139	-.067

Note : CDRS-10:Connor-Davidson Resilience Scale; SWLS:Satisfaction With Life Scale; MCMQ:Medical CopingModes Questionnaire; GSES:general self-efficacy Scale; PSSS:Perceived Social Support Scale; BFI: Big Five Inventory.*P < 0.05 , **P < 0.001.

A cross-sectional study on psychological resilience after surgery for breast cancer confirmed that appropriate physical training, self-efficacy and support from family and society all clearly affect psychological resilience by promoting recovery from disease and improving quality of life (Huang et al., 2019). This is consistent with our findings, which suggest that greater psychological resilience is linked with greater life satisfaction, self-efficacy, and support from family and society. The neural basis is that there is a positive correlation between psychological resilience and the strength of left orbitofrontal gyrus (OFC) and inferior frontal gyrus (IFG) connectivity. This positive correlation is associated to the flexible use of emotional resources and flexible control in processing affective information, as well as cognitive control process (Shi et al., 2019).

We detected a significant correlation between psychological resilience and life satisfaction, which is supported by the neural basis of psychological resilience. Psychological resilience is positively correlated with fractional amplitude of low-frequency fluctuations (fALFF) in the left OFC and with orbitofrontal gyrus (OFG) − amygdala connectivity. Higher psychological resilience has been found to be related to lower fALFF in the left orbitofrontal cortex (OFC), which is involved in reward-related processing and emotion regulation. In the meantime, psychological resilience can mediate the association between the fALFF in left OFC and subjective well-being (Kong et al., 2018; Fischer et al., 2018). Compared with patients with low resilience, those with high resilience showed greater connectivity strength between the left inferior OFG and the right superior OFG, between the right inferior OFG and the left PHG, and between the right middle OFG and the left PHG (Son et al., 2019).

Support from family and society appeared to play a protective role in psychological resilience. This finding is congruent with another study that identified the risk and protection factors for depressive symptoms in cancer survivors in northern India and indicated that strengthening social support is equivalent to prevention and the intervention efforts in cancer patients and survivors. (Roh et al., 2019).

Psychological resilience has a genetic basis in addition to the biological basis. It is 30−50% heritable as shown in twin studies (Amstadter et al., 2014; Waaktaar and Torgersen, 2012). The positive correlation between subjective well-being and positive affect is also partially heritable. Earlier studies reported that *APOE epsilon 4 and 5HTTLPR* are candidate psychological resilience genes (Stein et al., 2009; Bruenig et al., 2017). An analysis of US Army soldiers showed that psychological resilience has significant common-variant heritability and revealed three genes, i.e. *doublecortin-like kinase 2* (DCLK2), *kelch-like family member 36* (KLHL36), and *solute carrier family 15 member 5* (SLC15A5). DCLK2 is a member of the doublecortin gene family of kinases that promote survival and regeneration of injured neurons, located on the intergenic region of Chr 4. KLHL36 acts as part of the degradation pathway and is expressed in virtually all tissues. Rs12716755 is a single nucleotide polymorphism in *KLHL36* that has been reported to be a risk variant for late onset Alzheimer's disease. *SLC15A5* maps on Chr 12 and is significantly associated with psychological resilience in people exposed to the highest level of deployment stress (Stein et al., 2019).

Early studies on breast cancer patients reported that positive psychotherapies, including improving cognitive processes, changing coping strategies and improving psychological resilience, improve treatment outcomes, thus suggesting a theoretical model to improve intervention (Ranieri et al., 2018). Distress can be reduced and quality of life improved in tinnitus patients through personalized treatment, including improving cognitive processes, changing coping strategies and increasing psychological resilience.

Declaration of competing interest

Feng Xin, Fangling Guan and Qingfeng Li drafted the manuscript; Feng Xin retrieved literatures; Fangling Guan and Qingfeng Li selected the scales; Jie Yang and Dan Li collected data; Minli Suo analyzed the data; Changqing Zhao conceived the study, participated in study design and coordination and helped draft the manuscript. All authors have read and approved the final manuscript.

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References

Amstadter, A.B., Myers, J.M., Kendler, K.S., 2014. Psychiatric resilience: longitudinal twin study. Br. J. Psychiatry. https://doi.org/10.1192/bjp.bp.113.130906.

Bruenig, D., Morris, C.P., Mehta, D., Harvey, W., Lawford, B., Young, R.M., et al., 2017. Nitric oxide pathway genes (NOS1AP and NOS1) are involved in PTSD severity, depression, anxiety, stress and resilience. Gene. http://doi.org/10.1016/j.gene.2017.04.048.

Chen, Y., 2007. Study on Parents' Resilience and Related Factors of Children with Autism [D]. Nan Jing. Nanjing Normal University. https://doi.org/10.7666/d.y1118295.

Connor, K.M., Davidson, J.R., 2003. Development of a new resilience scale: the connor-davidson resilience scale (CD-RISC). Depression and Anxiety. https://doi.org/10.1002/da.10113.

Fischer, A.S., Camacho, M.C., Ho, T.C., Whitfeld-Gabrieli, S., Gotlib, I.H., 2018. Neural markers of resilience in adolescent females at familial risk for major depressive disorder. JAMA Psychiatry. https://doi.org/10.1001/jamapsychiatry.2017.4516.

Gillespie, B.M., Chaboyer, W., Wallis, M., 2009. The influence of personal characteristics on the resilience of operating room nurses: a predictor study. Int. J. Nurs. Stud. https://doi.org/10.1016/j.ijnurstu.2007.08.006.

Huang, Y., Huang, Y., Bao, M., Zheng, S., Du, T., Wu, K., 2019. Psychological resilience of women after breast cancer surgery: a cross-sectional study of associated influencing factors. Psychol. Health Med. https://doi.org/10.1080/13548506.2019.1574353.

Kong, F., Ma, X., You, X., Xiang, Y., 2018. The resilient brain: psychological resilience mediates the effect of amplitude of low-frequency fluctuations in orbitofrontal cortex on subjective well-being in young healthy adults. Soc. Cognit. Affect Neurosci. https://doi.org/10.1093/scan/nsy045.

Li, Y., Gu, S., Wang, Z., Li, H., Xu, X., Zhu, H., et al., 2019. Relationship between stressful life events and sleep quality: rumination as a mediator and resilience as a moderator. Front. Psychiatr. https://doi.org/10.3389/fpsyt.2019.00348.

Martz, E., Jelleberg, C., Dougherty, D.D., Wolters, C., Schneiderman, A., 2018. Tinnitus, Depression, Anxiety, and Suicide in Recent Veterans: A Retrospective Analysis. Ear Hear. https://doi.org/10.1097/AUD.0000000000000573.

Roh, S., Burnette, C.E., Lee, Y.S., Giger, J.T., Goins, R.T., Petereit, D.G., et al., 2019. Identifying Risk and Protective Factors Related to Depressive Symptoms Among Northern Plains American Indian Women Cancer Survivors. https://doi.org/10.1080/03630242.2018.1544965. Women Health.

Shi, L., Sun, J., Wei, D., Qiu, J., 2019. Recover from the adversity: functional connectivity basis of psychological resilience. Neuropsychologia. https://doi.org/10.1016/j.neuropsychologia.2018.12.002.

Shin, Y.C., Kim, S.M., Kim, H., Min, K.J., Yoo, S.K., Kim, E.J., et al., 2019. Resilience as a protective factor for depressive mood and anxiety among Korean employees. J. Kor. Med. Sci. https://doi.org/10.3346/jkms.2019.34.e188.

Son, S.J., Park, B., Choi, J.W., Roh, H.W., Kim, N.R., Sin, J.E., et al., 2019. Psychological resilience enhances the orbitofrontal network in the elderly with mild cognitive impairment. Front. Psychiatr. https://doi.org/10.3389/fpsyt.2019.00615.

Stein, M.B., Campbell-Sills, L., Gelernter, J., 2009. Genetic variation in 5HTTLPR is associated with emotional resilience. Am J Med Genet B Neuropsychiatr Genet. https://doi.org/10.1002/ajmg.b.30916.

Stein, M.B., Choi, K.W., Jain, S., Campbell-Sills, L., Chen, C.Y., Gelernter, J., et al., 2019. Genome-wide analyses of psychological resilience in U.S. Army soldiers. Am J Med Genet B Neuropsychiatr Genet. https://doi.org/10.1002/ajmg.b.32730.

Tang, D., Li, H., Chen, L., 2019. Advances in understanding, diagnosis, and treatment of tinnitus. Adv. Exp. Med. Biol. https://doi.org/10.1007/978-981-13-6123-4_7.

Trevis, K.J., McLachlan, N.M., Wilson, S.J., 2016. Psychological mediators of chronic tinnitus: the critical role of depression. J. Affect. Disord. https://doi.org/10.1016/j.jad.2016.06.055. Epub 2016 Jun 21.

Waaktaar, T., Torgersen, S., 2012. Genetic and environmental causes of variation in trait resilience in young people. Behav. Genet. https://doi.org/10.1007/s10519-011-9519-5.

Wang, S., Yang, C., Zhao, Y., Lai, H., Zhang, L., Gong, Q., 2019. Sex-linked neurofunctional basis of psychological resilience in late adolescence: a resting-state functional magnetic resonance imaging study. Eur. Child Adolesc. Psychiatr. https://doi.org/10.1007/s00787-019-01421-6.

Ye, S., Huang, P., Wang, K., 2019. Analysis on the level of mental resilience and its influencing factors in patients with hypertension. Journal of chronic disease. https://doi.org/10.16440/j.cnki.1674-8166.2019.04.018.

Yu, L., 2013. AWMF catalogue guides: tinnitus. J. Audiol. Speech Pathol. https://doi.org/10.3969/j.issn.1006-7299.2013.06.004.

Yu, L., Ma, X., Jing, Y., 2015. The treatment and rehabilitation of tinnitus. Journal of Clinical Otorhinolaryngology Head and Neck Surger. https://doi.org/10.13201/j.issn.1001-1781.2015.08.002.

Zizolfi, D., Poloni, N., Caselli, I., Ielmini, M., Lucca, G., Diurni, M., et al., 2019. Resilience and recovery style: a retrospective study on associations among personal resources, symptoms, neurocognition, quality of life and psychosocial functioning in psychotic patients. Psychol. Res. Behav. Manag. https://doi.org/10.2147/PRBM.S205424.