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Moderating Role of Stress, Anxiety, and Depression in the Relationship Between Tinnitus and Hearing Loss Among Patients

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Adaptation level theory of tinnitus and neuropsychological theory of tinnitus are extensively used frameworks for understanding emotional and psychological distress among tinnitus sufferers. Objective of the present study was to investigate potential associations between hearing loss, tinnitus, anxiety, depression, and stress. The Tinnitus Handicap Inventory (Newman, Jacobson, & Spitzer, 1996) and the Depression, Anxiety, Stress Scale (Lovibond & Lovibond, 1995)scales were administered to a sample of 110 tinnitus outpatients recruited from Audiology departments of Lahore and Rawalpindi hospitals. Results revealed tinnitus was positively linked with psychological problems. Additionally, it was established that tinnitus is a positive significant predictor for anxiety, stress and depression. The moderation models related to the interactions between psychological problems and hearing loss were negative significant predictors for tinnitus symptoms. Moreover, the comparative analysis between gender differences revealed a significant diversity in the levels of stress, anxiety, and depression. Results also elucidated that patients at initial stages of hearing loss were more prone towards reporting tinnitus symptoms along with emerging psychological problems.

Keywords. Hearing loss, anxiety, stress, depression, tinnitus patients

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The word ‘tinnitus’ is adopted from Latin word ‘tinnire’, which in English language means ‘to ring’(Shore, Roberts, & Langguth, 2016). “Tinnitus is defined as the perception of sound, which does not come from an external acoustical source, or due to bodily muscle contractions and turbulent blood flow, or due to auditory hallucinations arising from mental illness” (Chen et al., 2017). Tinnitus, is, generally a disturbing condition that is usually expressed as a conscious awareness of sound without the existence of any environmental sound source, experienced by millions of patients around the world (Shore et al., 2016).

There is a consensus across researchers that constant presence of tinnitus is amongst the most important symptoms of a biological problem which instigates and triggers a range of psychological issues(Skarzynski et al., 2017; Swiahb et al., 2016; Watts et al., 2017; Ziai, Moshtaghi, Mahboubi, & Djalilian, 2017). A number of studies have been carried out to determine the underlying links of tinnitus with a variety of biological and psychological factors (Penha Nascimento, Almeida, Junior, & Rosa, 2018; Sedley, Friston, Gander, Kumar, & Griffiths, 2016; Silverman, Silman, & Emmer, 2017).

Studies investigating the biological origins of tinnitus have highlighted that either damage to the tympanic membrane or disturbances in the cochlea can trigger tinnitus sounds (Brozoski, Brozoski, Wisner, & Bauer, 2017; Guinchard et al., 2016). Studies have also documented that tinnitus can also be triggered due to hearing loss, otosclerosis (growth of bone close to the middle ear), ear infections of the middle ear, and a range of neurological problems of the cochlea like presbycusis due to old age, sudden hearing loss due to prolonged exposure to loud environmental noises, and Meniérè’s disease (Minami, Oishi, Watabe, Uno, & Ogawa, 2017; Moring, Peterson, & Kanzler, 2018; Vanneste, Martin, Rennaker, & Kilgard, 2017).

Adaptation level theory of tinnitus is an approach used to gauge the phenomenon involved in the process of varying adjustment levels by a patient towards annoying or loud tinnitus (Durai, O'Keeffe, & Searchfield, 2017). The overall enormity of tinnitus and its judgment by a patient is derived from versatile interactions between different components of tinnitus like contextual component (background noises), focal component (the tinnitus), and the residual component also known as the behavioral and cognitive component (Durai, O’Keeffe, & Searchfield, 2017; Silverman et al., 2017; Strumila, Lengvenytė, Vainutienė, & Lesinskas, 2017). Further, this theory states that the emotional state of an individual suffering from tinnitus

serves as one of the residual factors in determining adaptation level for tinnitus, therefore suggesting two key concepts: Arousal (The psychological arousal level that varies between agitated or excited state and tranquil state) and valence (variations between negative and positive feelings that relate with level of pleasantness) (Durai, Kobayashi, & Searchfield, 2018; Shekhawat, Stinear, & Searchfield, 2015). These two dimensions are not specifically orthogonal or statistically independent (Searchfield, Kobayashi, Proudfoot, Tevoitdale, & Irving, 2015); in fact, the whole emotional process encompasses the limbic system of the brain primarily involving the insula, hippocampus, and amygdala (Dauman, Erlandsson, Albarracin, & Dauman, 2017; Haider et al., 2018).

The neuropsychological theory of tinnitus proposes that coactivation of negative emotions related with the tinnitus at the time of onset can form a negative reinforcement feedback loop, therefore, increasing tinnitus distress and its increased detection frequency (Dauman et al., 2017); resulting in classical conditioning over a period of time (Bornkessel-Schlesewsky, Schlesewsky, Small, & Rauschecker, 2015). Further, the causal role of emotion in tinnitus is explained as elucidating factor that stimulates limbic system of the brain, which acts as a noise canceller at the thalamus level this therefore, stops the tinnitus signal towards the auditory cortex and therefore inhibits them in reaching the conscious perception (Leaver & Rauschecker, 2016; Leaver et al., 2016). However, if the limbic system is compromised, the tinnitus sound reaches higher centers and therefore initiates changes in the cortical region thus, becomes a cause of chronic tinnitus (Rauschecker, May, Maudoux, & Ploner, 2015).

Prior studies related to the psychological implications of tinnitus predicate that negative automatic thoughts and wellbeing behaviors sustain tinnitus related distress (Hullfish et al., 2018; Moschen et al., 2017; Probst et al., 2017), hence, activates non auditory brain networks and regions, used for arousal, attention, distress, and consciousness (Probst, Pryss, Langguth, & Schlee, 2016). The association of non auditory brain networks is frequently associated with anxiety, and depression in tinnitus patients (Hébert, Mazurek, & Szczepek, 2017; Martz, Jelleberg, Dougherty, Wolters, & Schneiderman, 2016).

Studies related to the neuroanatomy of male and female gender have reported dimorphic outcomes (Shlamkovich, Gavriel, Eviatar, Lorberboym, & Aviram, 2016; Skarzynski et al., 2017). It has been reported that behavior towards tinnitus differs in both genders and female patients may report more distress related symptoms (Riga et al., 2018). Prior studies on the management of psychological distress

at the subconscious level also serve to explain the differences in the incidence of tinnitus irrespective of hearing loss between the two genders (Alhazmi, Kay, Mackenzie, Kemp, & Sluming, 2016; Ottaviani et al., 2016). Previous studies have reported that management of psychological distress occurs at the non-conscious level and possibly also involves differential handling of cortisol-like hormones that varies in both genders (Deng, Chang, Yang, Huo, & Zhou, 2016; Nelson, Strickland, Krueger, Arbisi, & Patrick, 2016). Theoretical framework of present study is also consistent with the theoretical framework of Riga et al.(2018) suggesting that behavior towards tinnitus differs in both genders and the intensity of reporting tinnitus related distress differs. Therefore, it is hypothesized that female tinnitus patients will report more anxiety, stress, and depression in contrast to male tinnitus patients.

Hearing loss is one of the most frequently reported sensory deficit around the world (Goman & Lin, 2016). The core biological cause is damage to the inner ear hair cells of the cochlea, which transfer sound waves into electrical impulses that are further transmitted through the synapses of the sensory fibers present in the cochlear nerve (Goman & Lin, 2016; Liberman & Kujawa, 2017).

Prior empirical studies have highlighted that hearing loss can be due to both genetic and environmental interactions (Bowl et al., 2017; Fortunato et al., 2016; Lavinsky et al., 2016; Miguel et al., 2018; Naz et al., 2017; Riordan & Nadeau, 2017). Prolonged exposure to deafening sounds and hearing loss due to the aging process are the most reported persistent occurrences of ‘environmental-genetic’ hearing loss; only a small number of studies have managed to link these complex genetic traits with the environmental causes (Lavinsky et al., 2016; Yang, Schrepfer, & Schacht, 2015). Several prior studies have reported that patients diagnosed with hearing deficits have a propensity to skip social interactions with others, which generates difficulty in maintaining relationships with family and friends, in the same way the endurance of expressive intricacies during work have been linked with elevated levels of stress, anxiety, and depression (Jayakody et al., 2018; Lin et al., 2016; Muñoz et al., 2017; Pattyn et al., 2016).

Several studies have shown the presence of tinnitus symptoms among individuals with hearing loss, however there are variations in reporting the annoyance levels and severity, as every patient perceives tinnitus symptoms differently, these symptoms are solely reliant on the emotional state of the patient (Han et al., 2018; Kehrle, Sampaio, Granjeiro, de Oliveira, & Oliveira, 2016; Moon, Park, Jung, Lee, & Lee, 2018). Several studies have described neuropsychological aspects

such as anxiety and depression among tinnitus patients as a subjective occurrence related to the emotional and cognitive tribulations rather than solely objective auditory problems. Additionally, the pervasiveness of psychological problems, such as stress, anxiety and depression, in patients with tinnitus is well documented (Han et al., 2018; Hullfish et al., 2018). Our theoretical framework is also consistent with the theoretical framework of Hullfish et al. (2018) suggesting that the reaction on tinnitus and its influence on emotional and psychological health are there in patients with hearing loss. From this theoretical model, it is hypothesized that negative psychological symptoms such as stress, depression and anxiety serve as a moderator in the relationship between hearing loss and tinnitus.

Method

Sample

Purposive sample of 110 patients having pathology of hearing loss along with tinnitus symptoms were selected from audiology departments of Alam Audiology Clinic, Lahore and Hearts International Hospital, Rawalpindi. Gender distribution was 40 female patients and 70 male patients. The inclusion criteria of the selected sample were: Patients over 18 years of age; having hearing loss as well as constant tinnitus from last 2 to 3 months; having hearing levels ranging from moderate to severe; also it was confirmed that included patients were not under the influence of any medication side effects.

Instruments

Tinnitus Handicap Inventory (THI). The Tinnitus Handicap Inventory (Newman, 1996) is a 25 items self-reporting scale of tinnitus severity. In the present research Urdu version was used (Aqeel & Ahmed, 2018).Questionnaire allows screening of tinnitus symptoms; it consists of three subscales: Emotional, Catastrophic and Functional. The Functional subscale consists of 11 items measuring the mental and physical functioning of tinnitus patient (Newman, Jacobson, Gary, Spitzer, & Jaclyn, 1996). The Emotional subscale is made up of 9 items measuring emotional responses towards tinnitus sounds, including elements of depression, anger, irritability, and frustration. The Catastrophic subscale comprises of 5 items and measures the reactions towards tinnitus such as nervousness, distraction, failure of anticipation, incapacity to cope, and apprehensions of a serious disease. There are three possible responses for all the items on a 3 point summated type scale, where "*no*" is

having zero points, "*Yes*" is having four points and "*sometimes*" having two points. Scores are calculated ranging from 0 to 100 for the THI overall scale and similarly scores for Emotional, Catastrophic, and Functional range from 0-36, 0-20, and 0-44, respectively (Aqeel & Ahmed, 2018; Job et al., 2018; Newman, Sandridge, & Jacobson, 1998). In present study Cronbach alpha was .93 for the overall scale

Depression Anxiety Stress Scale (DASS). The Depression Anxiety and Stress Scale (Lovibond, 1995), consists of 42 items in total and further distributed into three subscales having fourteen items each: Depression, Anxiety and Stress. In the present research Urdu version was used (Zafar & Khalily, 2014). It is a four-point self reporting scale to ascertain differing psychological conditions over the duration of past week. The scores from each subscale are calculated separately and then total score of each subscale is used to interpret and measure symptoms of each emotional state, the scoring is based on a 0 to 3 scale where "*did not apply to me at all*" is 0 and "*applied to me very much, or most of the time*" is3. The internal consistency of Urdu version over a number of samples has been found to be in the range of .83 to .88for the overall DASS scale and for subscales it has been reported as Anxiety.60, for Stress .60 and for Depression .63 (Lovibond & Lovibond, 1995; Zafar & Khalily, 2015).

Physiological Instrument

Ear examination for ear related disease was performed using a Delphino Video Otoscope to exclude other diseases. Audiometric assessments were carried out by Interacoustic AC-40 clinical audiometer. Tympanometry was performed to exclude middle ear fluid by employing the Inventis middle ear analyzer. Hearing and tinnitus related information were collected in a soundproof room and outcomes were reported according to the different levels of hearing loss in decibels (dB), and classified into mild, moderate, severe, and profound; along with tinnitus across the four sound frequencies that is 250Hz to 4000 Hz in accordance to the world health organization and British society of audiology (Aazh, Moore, Lammaing, & Cropley, 2016; British Society of Audiology, 2011; Olusanya, Neumann, & Saunders, 2014; World Health Organization, 1991).

Procedure

Current study was conducted according to the guidelines mentioned in the international world medical association declaration (Taichman et al., 2017; World Medical Association, 2001). Official

permission was granted by the ethics committee of Foundation University, Islamabad. Only standardized scales were selected and employed, which were having sound ethical and cultural acceptability. Participants were included in the present study after obtaining written consent for and knew in advance the repercussions of exposure to situations unsafe to hearing. After the completion of physiological tests and possible responses on the psychological instruments were obtained, participants were given a debriefing session highlighting the purpose of research and ambiguities regarding anonymity were resolved.

Results

Relationship Between Hearing Loss, Tinnitus with Stress Anxiety and Depression

This study explores the relationship between hearing loss, tinnitus and the complaints of stress, anxiety and depression faced by the patients. Pearson Product Moment Correlation method was used (Puth, Neuhäuser, & Ruxton, 2014). Next the moderated regression was performed to evaluate the moderating role of anxiety, depression, and stress for the problems being faced by patients in predicting tinnitus complaints.

Table 1

Alpha Coefficients and Correlation between THI, Hearing Loss Along with Depression, Anxiety, and Stress of Tinnitus patients (N = 110)

	Variables	*M*	*SD*	*α*	1	2	3	4	5
1	THI	68.59	21.09	.93	-	.55**	.63**	.54**	.81**
2	Depression	15.24	9.08	.91		-	.90**	.90**	.49**
3	Anxiety	16.23	8.83	.90			-	.86**	.53**
4	Stress	17.42	8.44	.91				-	.49**
5	Hearing Loss	2.59	1.229	-					-

Note.THI: Tinnitus Handicap Inventory.

***$p < .000$. **$p < .01$. *$p < .05$.

The overall, Cronbach alphas in Table 1 reported are in the acceptable range. The results in Table 1 reveal that problems faced by tinnitus patients significantly correlate with the psychological symptoms which include stress, depression, and anxiety. Similarly, the consequences of hearing loss limit significantly the daily activities along with various social interactions and the general psychological and emotional state of individuals (Cardin, 2016). This demonstrates that as tinnitus and hearing problems increase the negative

psychological symptoms such as stress, depression, and anxiety thatalso increase in severity. Moreover, with increase in these problems, personal quality of life also declines (Carlsson et al., 2015).

Table 2

Mean Difference between men and women tinnitus patients on THI, Hearing Loss, Depression, Anxiety, and Stress (N=110)

	Men (*n*=70)		Women (*n*=40)				*95% CI*		Cohen's
Variables	*M*	*SD*	*M*	*SD*	*t(108)*	*p*	*LL*	*UL*	d
Tinnitus	60.86	21.87	82.13	10.10	6.93	.01	-27.34	-15.19	1.25
Hearing Loss	3.10	1.09	4.00	.84	4.81	.01	-1.27	-.53	0.92
Depression	12.29	8.79	20.43	7.09	4.99	.01	-11.37	-4.91	1.02
Stress	15.01	8.25	21.65	7.06	4.26	.01	-9.72	-3.55	0.86
Anxiety	13.39	8.82	21.23	6.37	4.93	.01	-10.99	-4.69	1.02

Note. Significant results are reported in this Table, CI=Confidence Interval;LL=Lower Limit; UL=Upper Limit.

In order to ascertain that how the perceived negative emotional symptoms such as stress, depression and anxiety moderate the relationship between hearing loss and tinnitus independent sample t-test was carried out. Dependent variable was tinnitus. The analysis revealed a significant effect of the degree of hearing loss on the dependent variable (p> 0.10). However, there was a statistically significant effect of hearing loss on the dependent variable tinnitus.

An independent sample *t*-test was performed to determine the gender differences for tinnitus symptoms and psychological problems. Interestingly, it is observed in Table 2, that female patients report increased symptoms of anxiety, depression and stress as compared to male patients.

Role of Depression, Stress, and Anxiety in Relationship Between Tinnitus and Hear Hearing Loss

The moderation analysis was performed to study the moderating role of stress, anxiety, and depression for problems faced by patients in predicting tinnitus complaints (see Table 3, 4, and 5). Only significant moderations are reported.

Table 3

Moderating Role of Depression on Relationship Between Tinnitus and Hearing Loss (N =110)

Variables	S.E.	β	ΔR^2	ΔF
Hearing Loss	1.60	20.72**	.07	33.38***
Depression	.41	2.71***		
Hearing Loss*Depression	.11	-.62***		
Constant	5.12			

*** $p < .000$; ** $p < .01$.

Table 3 displays that depression is a significant moderator for hearing loss and its social consequences in predicting tinnitus complaints. Further Table 3 reports that hearing loss is significantly, positively associated with tinnitus, also tinnitus is significant positively predicting depression, however the interaction between depression and hearing loss serves as a negatively significant predictor for tinnitus (see Figure 1)

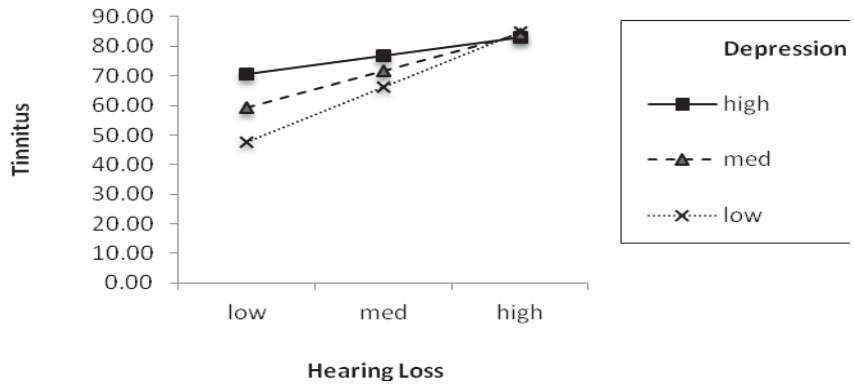

Figure 1. Moderating role of depression in relationship between tinnitus and hearing loss.

A significant slope in Figure 1 displays that patients having tinnitus due to hearing loss were prone to have symptoms of depression at the earlier stages. Further, it shows that, tinnitus patients at lower to medium stages of hearing loss had more symptoms of depression. Similarly, as the hearing loss moves towards higher levels so does the severity of tinnitus, but the impact of depression diminishes, therefore, suggesting that at profound levels medical treatment is more beneficial than that of psychological rehabilitation.

Table 4

Moderating Role of Anxiety on Relationship Between Tinnitus and Hearing Loss (N =110)

Variables	S.E.	β	ΔR^2	ΔF
Hearing Loss	1.68	19.88**	.06	28.84***
Anxiety	.38	2.62***		
Hearing Loss*Anxiety	.11	-.57***		
Constant	5.06			

***$p < .000$; **$p < .01$.

Table 4 indicates that anxiety is a significant moderator for hearing loss and its social consequences in predicting tinnitus complaints. Further Table 4 highlights that hearing loss is a positive significant predictor for tinnitus, and tinnitus is positively significant predictor for anxiety, however the interaction between anxiety and hearing loss serves as a negatively significant predictor for tinnitus. It was hypothesized that anxiety acts as a moderator of the relationship between hearing loss and tinnitus. A significant moderation effect of anxiety is assumed as the hierarchical linear regression reveals a significant contribution of an interaction between hearing loss and anxiety to the prediction of tinnitus (Table 4).

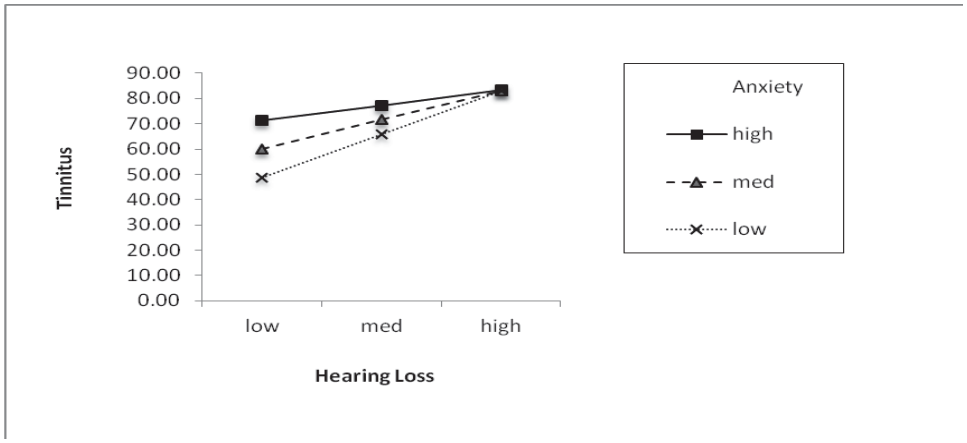

Figure 2. Moderating role of anxiety on relationship between tinnitus and hearing loss.

A significant slope in Figure 2 shows that at all levels of anxiety patients are more predisposed to have complaints of tinnitus due to hearing loss at the earlier stages. Further it was established that, tinnitus patients at lower to medium stages of hearing loss had more symptoms of anxiety. Similarly as the hearing loss moves towards higher levels so does the severity of tinnitus, but the impact of anxiety diminishes, therefore suggesting that at profound levels medical treatment is more beneficial than that of psychological rehabilitation.

Table 5

Moderating Role of Stress on Relationship Between Tinnitus and Hearing Loss (N=110)

Variables	S.E.	β	ΔR^2	ΔF
Hearing Loss	1.95	20.74**	.047	18.77***
Stress	.45	2.33***		
Hearing Loss*Stress	.12	-.51***		
Constant	6.40			

***$p < .000$; **$p < .01$.

Table 5 indicates that stress is a significant moderator between hearing loss and tinnitus. Further Table 5 demonstrates that hearing loss is a positive significant predictor for tinnitus and tinnitus is a positively significant predictor for stress, however the interaction between stress and hearing loss is significant negatively predicting tinnitus (see Table 5).

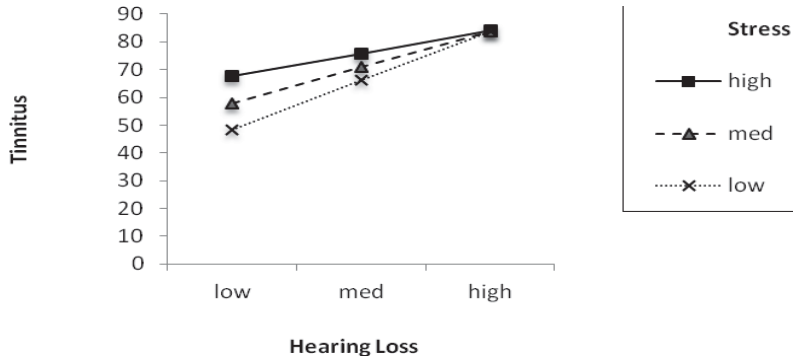

Figure 3. Moderating role of stress in relationship between tinnitus and hearing loss.

A significant slope in Figure 3 displays that at all levels of stress patients are more liable to have complaints of tinnitus due to hearing loss at the earlier stages. Further, the findings indicated that, tinnitus patients at lower to medium stages of hearing loss had more symptoms of stress. Similarly, as hearing loss moves towards elevated levels so does the severity of tinnitus, but the impact of stress diminishes, therefore suggesting that at higher level of hearing loss medical treatment is more beneficial than that of psychological rehabilitation.

Discussion

This current study had two aims: To analyze the relationship between stress, anxiety, depression and tinnitus due to hearing loss; and to validate to what extent stress, anxiety, and depression moderates the relationship between hearing loss and tinnitus.

In view of the first aim, it was predicted that hearing loss is having positive inclinations towards the development of stress, depression and anxiety along with tinnitus symptoms, which turned out to be true in the present study. These results are in consistence with those of Goman and Lin (2016) suggesting that hearing loss in most cases instigates tinnitus symptoms and therefore, according to neuropsychological and adaptational theory of tinnitus, the symptoms of tinnitus combine the affect on patients on an emotional and social level by further aggravating the wellbeing of patients (Durai, Kobayashi, & Searchfield, 2015; Durai, O'Keeffe, Mary, & Searchfield, 2017; Goman & Lin, 2016).

Further the gender differences among tinnitus patients were confirmed, and it was found that female tinnitus patients had a tendency to report more emotional implications than that of male tinnitus patients, therefore, these results favor the theoretical framework of Riga et al.(2018) suggesting that behavior towards tinnitus differs in both genders and therefore the intensity of reporting tinnitus related distress differs (Riga et al., 2018; Skarzynski et al., 2017). Previous studies have reported almost similar findings for the variables tinnitus, depression, anxiety and stress (Han et al., 2018; Hullfish et al., 2018; Langguth et al., 2017; Sultana, Mumtaz, & Dawood, 2018; Tong & Yeung, 2017). Present study's findings are in accordance with the recent empirical studies on hearing loss indicating that the reaction on tinnitus and its influence on factors of emotional and psychological health are there in patients with hearing loss (Hullfish et al., 2018; Langguth et al., 2017).

Additionally, the aim of current study was to differentiate among the unusual levels of hearing loss with differing emotional levels along with tinnitus, since there is limited knowledge regarding the implications of variables hearing loss, tinnitus and hearingloss (Goman & Lin, 2016; Peelle & Wingfield, 2016).Therefore, to further find out implications of hearing loss the three moderation models revealed that at lower to medium stages of hearing loss patients did experience tinnitus sounds along with elevated symptoms of stress, anxiety and depressionbut as hearing loss moves towards higher levels so does the tinnitus symptoms, but the signs of anxiety, stress and

depression related symptoms start to deminish, therefore clearly highlighting that patient's rehabilitation is achievable with the psychological therapies at mild to moderate stages of hearing loss.

Furthermore,it was found in literature that although the social support variable is a widely considered variable among the health and chronic diseases (Chiauzzi, Rodarte, & DasMahapatra, 2015; Dwarswaard, Bakker, van Staa, & Boeije, 2016), therefore the present study tries to find out the existance of psychological problems and its role in the context of chronic disease like hearing loss with tinnitus. Only a few prior studies in Pakistan have narrated these two variables along with the implications of stress, anxiety, and depression (Ahmed, Ahmed, Aqeel, Akhtar, & Salim, 2017; Aqeel et al., 2017). Further, it was found that prior studies have only addressed social support assistance for the families of the elderly experiencing tinnitus symptoms and hearing loss in different contexts (Deal et al., 2015; Kamil et al., 2016).

Conclusion

This study further helps in creating awareness among researchers and psychologists that hearing loss and tinnitus throughout life is an influential predictor which instigates stress, anxiety, and depression along with other disease circumstances that are not possible to avoid in any case. Tinnitus, anxiety, depression and stress are not essentially amalgamated in patients having higher levels of hearing loss. It is essential to development public health policies and chronic disease impact to encourage awareness in order to take affective actions for both male and female tinnitus patients, for its effectiveness on prevention at earlier stages, hence signifying the importance of medical intervention along with psychological rehabilitation.

Limitations of the Study

The general overview of results is only for patients with hearing loss and tinnitus. Thus, future studies should consider with vestibulocochlear disorder patients with and without tinnitus and hearing loss, to observe whether our results could be replicated further in other cochlear disorders. Since, sample comprised of voluntary participants, it is prone to signify acute cases within the chosen population.

Implications of Present Study

This study will support health practitioners to become acquainted with the repercussions of tinnitus regarding its strange characteristic and psychological outcomes. Further this research would enable rehabilitation psychologists under clinical settings to cater patients for their emotional and psychological needs by developing specific therapies. Lastly, evidences from the present study will guide psychologists in helping patients wear hearing aids and assisting patients to cope with medical procedures (such as cochlear implant operations).

References

Aazh, H., Moore, B. C., Lammaing, K., & Cropley, M. (2016). Tinnitus and hyperacusis therapy in a UK National Health Service audiology department: Patients' evaluations of the effectiveness of treatments. *International Journal of Audiology, 55*(9), 514-522.

Ahmed, B., Ahmed, A., Aqeel, M., Akhtar, T., & Salim, S. (2017). Impact of tinnitus perception on psychological distress in male and female tinnitus patients. *Foundation University Journal of Psychology, 1*(1), 56-77.

Alhazmi, F., Kay, T., Mackenzie, I., Kemp, G., & Sluming, V. (2016). An investigation of the impact of tinnitus perception on the quality of life. *Journal of Phonetics and Audiology, 2*(1000113), 2.

Aqeel, & Ahmed, A. (2018). translation, adaptation and cross language validation of tinnitus handicap inventory in Urdu. *Journal of Audiology and Otology, 22*(1), 13.

Aqeel, Ahmed, A., Akhtar, D., Rohail, I., Ahsan, S., Zonash, R., & Salim, S. (2017). Moderating role of coping styles among perception of tinnitus and psychological adjustment in pakistani tinnitus patients. *Ponte Journal, 73*(4), 15-27.

Bornkessel-Schlesewsky, I., Schlesewsky, M., Small, S. L., & Rauschecker, J. P. (2015). Neurobiological roots of language in primate audition: Common computational properties. *Trends in Cognitive Sciences, 19*(3), 142-150.

Bowl, M. R., Simon, M. M., Ingham, N. J., Greenaway, S., Santos, L., Cater, H., . . . Pearson, S. (2017). A large scale hearing loss screen reveals an extensive unexplored genetic landscape for auditory dysfunction. *Nature Communications, 8*(1), 886-897.

British Society of Audiology. (2011). Recommended procedure: Pure-tone air-conduction and bone-conduction threshold audiometry with and without masking *British Society of Audiology* (pp. 32). Berkshire, RG6 1PS, UK: British Society of Audiology.

Brozoski, T., Brozoski, D., Wisner, K., & Bauer, C. (2017). Chronic tinnitus and unipolar brush cell alterations in the cerebellum and dorsal cochlear nucleus. *Hearing Research, 350*, 139-151.

Cardin, V. (2016). Effects of aging and adult-onset hearing loss on cortical auditory regions. *Frontiers in Neuroscience, 10*, 1-12.

Carlsson, P. I., Hjaldahl, J., Magnuson, A., Ternevall, E., Edén, M., Skagerstrand, Å., & Jönsson, R. (2015). Severe to profound hearing impairment: Quality of life, psychosocial consequences and audiological rehabilitation. *Disability and Rehabilitation, 37*(20), 1849-1856.

Chen, Y. C., Chen, G. D., Auerbach, B. D., Manohar, S., Radziwon, K., & Salvi, R. (2017).Tinnitus and hyperacusis: Contributions of paraflocculus, reticular formation and stress. *Hearing Research, 349*, 208-222.

Chiauzzi, E., Rodarte, C., & DasMahapatra, P. (2015). Patient-centered activity monitoring in the self-management of chronic health conditions. *Biomed Central Medicine, 13*(1), 1-6.

Dauman, N., Erlandsson, S. I., Albarracin, D., & Dauman, R. (2017). Exploring tinnitus-induced disablement by persistent frustration in aging individuals: A grounded theory study. *Frontiers in Aging Neuroscience, 9*, 1-18.

Deal, J. A., Sharrett, A. R., Albert, M. S., Coresh, J., Mosley, T. H., Knopman, D., . . . Lin, F. R. (2015). Hearing impairment and cognitive decline: A pilot study conducted within the atherosclerosis risk in communities neurocognitive study. *American Journal of Epidemiology, 181*(9), 680-690.

Deng, Y., Chang, L., Yang, M., Huo, M., & Zhou, R. (2016). Gender differences in emotional response: Inconsistency between experience and expressivity. *Public Library of Science, 11*(6), 1-9.

Durai, M., Kobayashi, K., & Searchfield, G. (2015). A preliminary examination of the roles of contextual stimuli and personality traits under the adaptation level theory model of tinnitus. *Acta Acustica United with Acustica, 101*(3), 543-551.

Durai, M., Kobayashi, K., & Searchfield, G. D. (2018). A feasibility study of predictable and unpredictable surf-like sounds for tinnitus therapy using personal music players. *International Journal of Audiology, 57*(9), 707-713.

Durai, M., O'Keeffe, M. G., & Searchfield, G. D. (2017). Examining the short-term effects of emotion under an adaptation level theory model of tinnitus perception. *Hearing Research, 345*, 23-29.

Durai, M., O'Keeffe,M. G., Mary.C., & Searchfield, G. D.(2017). The personality profile of tinnitus sufferers and a nontinnitus control group. *Journal of the American Academy of Audiology, 28*(4), 271-282.

Durai, M., O'Keeffe, M. G., & Searchfield, G. D. (2017). The personality profile of tinnitus sufferers and a nontinnitus control group. *Journal of the American Academy of Audiology, 28*(4), 271-282.

Dwarswaard, J., Bakker, E. J., van Staa, A., & Boeije, H. R. (2016). Self-management support from the perspective of patients with a chronic condition: A thematic synthesis of qualitative studies. *Health Expectations, 19*(2), 194-208.

Fortunato, S., Forli, F., Guglielmi, V., De Corso, E., Paludetti, G., Berrettini, S., & Fetoni, A. (2016). A review of new insights on the association between hearing loss and cognitive decline in ageing. *Acta Otorhinolaryngologica Italica, 36*(3), 155.

Goman, A. M., & Lin, F. R. (2016). Prevalence of hearing loss by severity in the United States. *American Journal of Public Health, 106*(10), 1820-1822.

Guinchard, A. C., Ghazaleh, N., Saenz, M., Fornari, E., Prior, J., Maeder, P., . . . Maire, R. (2016). Study of tonotopic brain changes with functional MRI and FDG-PET in a patient with unilateral objective cochlear tinnitus. *Hearing Research, 341*, 232-239.

Haider, H. F., Bojić, T., Ribeiro, S. F., Paço, J., Hall, D. A., & Szczepek, A. J. (2018). Pathophysiology of subjective tinnitus: Triggers and maintenance. *Frontiers in Neuroscience, 12*, 1-16.

Han, K. M., Ko, Y. H., Shin, C., Lee, J. H., Choi, J., Kwon, D. Y., . . . Kim, Y. K. (2018). Tinnitus, depression, and suicidal ideation in adults: A nationally representative general population sample. *Journal of Psychiatric Research, 98*, 124-132.

Hébert, S., Mazurek, B., &Szczepek, A. J. (2017). Stress-related psychological disorders and tinnitus.*Tinnitus and Stress* (pp. 37-51). Cham, Switzerland: Springer.

Hullfish, J., Abenes, I., Kovacs, S., Sunaert, S., De Ridder, D., & Vanneste, S. (2018). Functional connectivity analysis of fMRI data collected from human subjects with chronic tinnitus and varying levels of tinnitus-related distress. *Data in Brief, 21*, 779-789.

Jayakody, D. M., Almeida, O. P., Speelman, C. P., Bennett, R. J., Moyle, T. C., Yiannos, J. M., & Friedland, P. L. (2018). Association between speech and high-frequency hearing loss and depression, anxiety and stress in older adults. *Maturitas, 110*, 86-91.

Job, A., Cardinal, F., Michel, H., Klein, C., Ressiot, E., & Gauthier, J. (2018). Tinnitus and associated handicaps in the French mountain artillery: Assessment by the Tinnitus Handicap Inventory. *Military Medicine, 183*(9-10), 302-306. doi:10.1093/milmed.usy042.

Kamil, R. J., Betz, J., Powers, B. B., Pratt, S., Kritchevsky, S., Ayonayon, H. N., . . . Martin, K. (2016). Association of hearing impairment with incident frailty and falls in older adults. *Journal of Aging and Health, 28*(4), 644-660.

Kehrle, H. M., Sampaio, A. L. L., Granjeiro, R. C., de Oliveira, T. S., & Oliveira, C. A. C. P. (2016). Tinnitus annoyance in normal-hearing

individuals: CSorrelation with depression and anxiety. *Annals of Otology, Rhinology and Laryngology, 125*(3), 185-194.

Langguth, B., Landgrebe, M., Schlee, W., Schecklmann, M., Vielsmeier, V., Steffens, T., . . . Frick, U. (2017). Different patterns of hearing loss among tinnitus patients: a latent class analysis of a large sample. *Frontiers in Neurology, 8*, 1-8.

Lavinsky, J., Ge, M., Crow, A. L., Pan, C., Wang, J., Dermanaki, P. S., . . . Lusis, A. J. (2016). The genetic architecture of noise-induced hearing loss: evidence for a gene-by-environment interaction. *G3: Genes, Genomes, Genetics, 6*(10), 3219-3228.

Leaver, A. M., & Rauschecker, J. P. (2016). Functional topography of human auditory cortex. *Journal of Neuroscience, 36*(4), 1416-1428.

Leaver, A. M., Turesky, T. K., Seydell-Greenwald, A., Morgan, S., Kim, H. J., & Rauschecker, J. P. (2016). Intrinsic network activity in tinnitus investigated using functional MRI. *Human Brain Mapping, 37*(8), 2717-2735.

Liberman, M. C., & Kujawa, S. G. (2017). Cochlear synaptopathy in acquired sensorineural hearing loss: Manifestations and mechanisms. *Hearing Research, 349*, 138-147.

Lin, C., Lin, Y., Liu, C., Weng, S., Lin, C., & Lin, B. (2016). Increased risk of sudden sensorineural hearing loss in patients with depressive disorders: population-based cohort study. *The Journal of Laryngology and Otology, 130*(1), 42-49.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335-343.

Martz, E., Jelleberg, C., Dougherty, D. D., Wolters, C., & Schneiderman, A. (2016). Tinnitus, depression, anxiety, and suicide: A retrospective analysis. *Archives of Physical Medicine and Rehabilitation, 97*(12).

Miguel, V., Cui, J. Y., Daimiel, L., Espinosa-Diez, C., Fernández-Hernando, C., Kavanagh, T. J., & Lamas, S. (2018). The role of microRNAs in environmental risk factors, noise-induced hearing loss, and mental stress. *Antioxidants and Redox Signaling, 28*(9), 773-796.

Minami, S., Oishi, N., Watabe, T., Uno, K., & Ogawa, K. (2017). Auditory and non-auditory resting-state functional connectivity in normal-hearing individuals with and without tinnitus: RsFMRI study. *Journal of Hearing Science, 7*(2), 114-114.

Moon, K. R., Park, S., Jung, Y., Lee, A., & Lee, J. H. (2018). Effects of anxiety sensitivity and hearing loss on Tinnitus symptom severity. *Psychiatry Investigation, 15*(1), 34-40.

Moring, J. C., Peterson, A. L., & Kanzler, K. E. (2018). Tinnitus, traumatic brain injury, and posttraumatic stress disorder in the military. *International Journal of Behavioral Medicine, 25*(3), 312-321.

Moschen, R., Fioretti, A., Eibenstein, A., Natalini, E., Cuda, D., Chiarella, G., . . . Riedl, D. (2017). Validation of the Italian version of the TQ12-I for assessment of Tinnitus-related distress. *Journal of Hearing Science, 7*(2), 153-153.

Muñoz, K., McLeod, H., Pitt, C., Preston, E., Shelton, T., & Twohig, M. P. (2017). Recognizing emotional challenges of hearing loss. *The Hearing Journal, 70*(1), 34-35.

Naz, S., Imtiaz, A., Mujtaba, G., Maqsood, A., Bashir, R., Bukhari, I., . . . Rehman, A. U. (2017). Genetic causes of moderate to severe hearing loss point to modifiers. *Clinical Genetics, 91*(4), 589-598.

Nelson, L. D., Strickland, C., Krueger, R. F., Arbisi, P. A., & Patrick, C. J. (2016). Neurobehavioral traits as transdiagnostic predictors of clinical problems. *Assessment, 23*(1), 75-85.

Newman, C. W., Jacobson, G. P., & Spitzer, J. B. (1996). Development of the Tinnitus Handicap Inventory. *Archives of Otolaryngology–Head and Neck Surgery, 122*(2), 143-148.

Newman, C. W., Sandridge, S. A., & Jacobson, G. P. (1998). Psychometric adequacy of the Tinnitus Handicap Inventory (THI) for evaluating treatment outcome. *Journal-American Academy of Audiology, 9*, 153-160.

Olusanya, B. O., Neumann, K. J., & Saunders, J. E. (2014). The global burden of disabling hearing impairment: A call to action. *Bulletin of the World Health Organization, 92*, 367-373.

Ottaviani, C., Thayer, J. F., Verkuil, B., Lonigro, A., Medea, B., Couyoumdjian, A., & Brosschot, J. F. (2016). Physiological concomitants of perseverative cognition: A systematic review and meta-analysis. *Psychological bulletin, 142*(3), 231.

Peelle, J. E., & Wingfield, A. (2016). The neural consequences of age-related hearing loss. *Trends in Neurosciences, 39*(7), 486-497.

Penha N, I., Almeida, A. A., Junior, J. D., & Rosa, M. R. D. (2018). Tinnitus evaluation: Relation among pitch matching and loudness, visual analog scale and Tinnitus Handicap Inventory. *Brazilian Journal of Otorhinolaryngology, 84*(4), 1-6.

Probst, T., Dinkel, A., Schmid-Mühlbauer, G., Radziej, K., Limburg, K., Pieh, C., & Lahmann, C. (2017). Psychological distress longitudinally mediates the effect of vertigo symptoms on vertigo-related handicap. *Journal of Psychosomatic Research, 93*, 62-68.

Probst, T., Pryss, R., Langguth, B., & Schlee, W. (2016). Emotional states as mediators between tinnitus loudness and tinnitus distress in daily life: Results from the "TrackYourTinnitus" application. *Scientific Reports, 6*, 1-8.

Puth, M. T., Neuhäuser, M., & Ruxton, G. D. (2014). Effective use of Pearson's product–moment correlation coefficient. *Animal Behaviour, 93*, 183-189.

Rauschecker, J. P., May, E. S., Maudoux, A., & Ploner, M. (2015). Frontostriatal gating of tinnitus and chronic pain. *Trends in Cognitive Sciences, 19*(10), 567-578.

Riga, M., Komis, A., Maragoudakis, P., Korres, G., Ferekidis, E., & Danielides, V. (2018). Objective assessment of subjective tinnitus through contralateral suppression of otoacoustic emissions by white noise: Effects of frequency, gender, tinnitus bilaterality and age. *Acta Otorhinolaryngologica Italica, 38*, 131-137.

Riordan, J. D., & Nadeau, J. H. (2017). From peas to disease: Modifier genes, network resilience, and the genetics of health. *The American Journal of Human Genetics, 101*(2), 177-191.

Salviati, M., Bersani, F. S., Terlizzi, S., Melcore, C., Panico, R., Romano, G. F., . . . Mazzei, F. (2014). Tinnitus: Clinical experience of the psychosomatic connection. *Neuropsychiatric Disease and Treatment, 10*, 267-275.

Searchfield, G., Kobayashi, K., Proudfoot, K., Tevoitdale, H., & Irving, S. (2015). The development and test–retest reliability of a method for matching perceived location of tinnitus. *Journal of Neuroscience Methods, 256*, 1-8.

Sedley, W., Friston, K. J., Gander, P. E., Kumar, S., & Griffiths, T. D. (2016). An integrative tinnitus model based on sensory precision. *Trends in Neurosciences, 39*(12), 799-812.

Shekhawat, G. S., Stinear, C. M., & Searchfield, G. D. (2015). Modulation of perception or emotion? A scoping review of tinnitus neuromodulation using transcranial direct current stimulation. *Neurorehabilitation and Neural Repair, 29*(9), 837-846.

Shore, S. E., Roberts, L. E., & Langguth, B. (2016). Maladaptive plasticity in tinnitus-triggers, mechanisms and treatment. *Nature Reviews Neurology, 12*(3), 150.

Silverman, C. A., Silman, S., & Emmer, M. B. (2017). Auditory adaptation testing as a tool for investigating tinnitus origin: Two patients with vestibular schwannoma. *International Journal of Audiology, 56*(6), 431-435.

Skarzynski, P., Rajchel, J., Raj-Koziak, D., Bienkowska, K., Gos, E., & Skarzynska, M. (2017). Depressive symptoms, quality of life and tinnitus handicap in a clinical group of tinnitus patients. *Journal of Hearing Science, 7*(2), 129-129.

Strumila, R., Lengvenytė, A., Vainutienė, V., & Lesinskas, E. (2017). The role of questioning environment, personality traits, depressive and anxiety symptoms in tinnitus severity perception. *Psychiatric Quarterly, 88*(4), 865-877.

Sultana, H., Mumtaz, N., & Dawood, T. (2018). Type and degree of hearing loss in patients with tinnitus. *International Journal of Rehabilitation Sciences (IJRS), 7*(01), 24-27.

Swiahb, K., Nasser, J., Hwang, E. S., Kong, J. S., Kim, W. J., Yeo, S. W., & Park, S. N. (2016). Clinical and audiologic characteristics of patients with sensorineural tinnitus and its association with psychological aspects: an analytic retrospective study. *European Archives of Oto-Rhino-Laryngology, 273*(12), 4161-4165.

Taichman, D. B., Sahni, P., Pinborg, A., Peiperl, L., Laine, C., James, A., . . . Godlee, F. (2017). Data sharing statements for clinical trials: A requirement of the international committee of medical journal editors. *Medical Journal of Chile, 145*, 691-693.

Tong, M., & Yeung, K. (2017). Prevalence of tinnitus in occupational noise induced hearing loss population in Hong Kong. *Journal of Hearing Science, 7*(2), 135-136.

Vanneste, S., Martin, J., Rennaker, R. L., & Kilgard, M. P. (2017). Pairing sound with vagus nerve stimulation modulates cortical synchrony and phase coherence in tinnitus: An exploratory retrospective study. *Scientific Reports, 7*(1), 17345.

Watts, E., Fackrell, K., Smith, S., Sheldrake, J., Haider, H., & Hoare, D. (2017). Why is Tinnitus a Problem? A qualitative analysis of problems reported by Tinnitus patients. *Journal of Hearing Science, 7*(2), 1-10.

World Health Organization. (1991). Grades of hearing impairment. *Hearing Network News, 1*(1), 199-206.

World Medical Association. (2001). World medical association declaration of Helsinki: Ethical principles for medical research involving human subjects. *Bulletin of the World Health Organization, 79*(4), 373-395.

Yang, C. H., Schrepfer, T., & Schacht, J. (2015). Age-related hearing impairment and the triad of acquired hearing loss. *Frontiers in Cellular Neuroscience, 9*, 1-12.

Zafar, H., & Khalily, M. T. (2015). Didactic therapy for management of stress and co-morbid symptoms of depression and anxiety in Pakistani adolescents. *Pakistan Journal of Psychological Research, 30*(1), 131-149.

Ziai, K., Moshtaghi, O., Mahboubi, H., & Djalilian, H. R. (2017). Tinnitus patients suffering from anxiety and depression: A review. *The International Tinnitus Journal, 21*(1), 68-73.

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