

Situationally influenced tinnitus coping strategies: A mixed methods approach

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Abstract

Purpose The primary aim of this study was to identify coping strategies used to manage problematic tinnitus situations. A secondary aim was to determine whether different approaches were related to the level of tinnitus distress, anxiety, depression and insomnia experienced.

Materials and Methods A cross-sectional survey design was implemented. The study sample was adults interested in undertaking an Internet-based intervention for tinnitus. Self-reported measures assessed the level of tinnitus distress, depression, anxiety, and insomnia. An open-ended question was used to obtain information about how problematic tinnitus situations were dealt with. Responses were investigated using qualitative content analysis to identify problematic situations. Further data analysis comprised of both qualitative and quantitative methods.

Results There were 240 participants (137 males, 103 females), with an average age of 48.16 years (SD: 22.70). Qualitative content analysis identified eight problematic tinnitus situations. Participants had either habituated to their tinnitus (7.9%), used active (63.3%) or passive (28.8%) coping styles to manage these situations. Those who had habituated to tinnitus or used active coping strategies had lower levels of tinnitus distress, anxiety, and depression.

Conclusions The main problematic tinnitus situations for this cohort were identified. Both active and passive coping styles were applied to approach these situations. The coping strategies used most frequently and utilised in the widest range of problematic situations were using sound enrichment and diverting attention.

Key Words

tinnitus, coping strategies, self-help, behaviour modification, problematic situations

Introduction

The diagnosis of a chronic condition is often a significant life event. It is frequently associated with a sense of loss and increased levels of stress [1]. Tinnitus is one such chronic condition. It is characterised by hearing unwanted sounds in the absence of an external sound source [2]. The prevalence of tinnitus is surprisingly high. It affects an estimated 10-17% of the adult population across the globe [3,4]. The range of individual reactions following the onset of tinnitus remains puzzling [5]. The majority of people with tinnitus do not find it problematic. However, others convey that tinnitus has a severe effect on their ability to lead a normal life [6]. There exists a continuum spanning from those finding tinnitus very disabling to those indicating tinnitus only has a minimal impact on their lives. These variations are not directly related to the character of the tinnitus (loudness or pitch), but instead to the psychological interpretation on the tinnitus [7]. Of great importance is enabling those with distressing tinnitus to habituate to the perception and reactions towards tinnitus. The importance of the process of habituation to adjust to tinnitus has been suggested since 1984 in the Habituation model proposed by Hallam and colleagues [8]. This process is challenging as eliminating tinnitus is rarely possible. The use of coping mechanisms has been suggested to be a key element in the habituation process [9]. Coping has been defined as “the process of managing demands (external or internal) that are appraised as taxing or exceeding the resources of the person” [9, p.283]. Developing coping mechanisms can be a complex process. It depends on many factors, including the stressors faced, changes in the condition (tinnitus) over time and the resources available [10].

If appropriate coping strategies are not in place, associated problems are likely to continue [11]. Assisting those with troublesome tinnitus to develop appropriate coping processes, may be required to help them habituate to tinnitus.

Identifying which strategies would be of value in the context of tinnitus needs consideration. Various attempts have been made to categorise the range of reported coping strategies. Lazarus and Folkman [12], classified coping into either problem-focused coping (reducing the cause of stress in a practical way) or emotion-focused coping (regulating the resulting emotional reactions). In addition to these categories, Folkman and Moskowitz [13] included social support, meaning-focused and religious coping. Krohne [14] organised coping into a hierarchical framework comprising of lower-level situation-specific variable coping and higher-level macro-analytic coping. When considering coping in the context of an unalterable stressor such as tinnitus, a range of coping strategies is required [15]. Emotion-focused coping may be used to reduce stress levels whilst problem-solving coping may reduce the stressor itself [15]. Coping strategies may also depend on the situation. If struggling to sleep due to tinnitus, relaxation may be used whereas distraction techniques may be applied in quiet situations. The strategies used may change over time to meet the changing demands and types of stressors that also vary over time [11]. Coping strategies, therefore, need to be considered in the context of matching the coping strategy used to the type of situation or stressor faced. The use of situational coping requires a good fit between the strategy utilised and the specific situation or stressor as suggested by Folkman [16]. Ineffective coping may occur when the coping strategy is not well matched with the type of stressor. As yet, this ‘goodness-of-fit’ has been unexplored in relation to tinnitus.

Coping with tinnitus has generally been studied using standardised questionnaires such as the Ways of Coping Checklist [15], Tinnitus Coping Style Questionnaire [17] and

The Tinnitus Coping Strategy Questionnaire [18] provide insights into coping styles. These questionnaires assess the frequency that those with tinnitus apply specific coping styles, using questions such as “thinking that you cannot do anything to cope with your tinnitus” (related to maladaptive coping) or “thinking of things to do to distract yourself from your tinnitus” (related to effective coping) from the Tinnitus Coping Styles Questionnaire [18]. These questionnaires have been utilised to explore coping with tinnitus from various perspectives [19]. Budd and Pugh [17] using their Tinnitus Coping Style Questionnaire investigated coping in relation to tinnitus distress. They found that a greater perceived control was associated with lower reported severity and better adjustment to tinnitus. In a further study [20], they used their questionnaire to identify two coping styles in tinnitus patient’s namely effective and maladaptive coping. Maladaptive coping was associated with avoidance behavior and catastrophic thinking. It related to greater tinnitus severity and emotional distress.

Other studies have related coping to psychological functioning. Kirsch and colleagues [21] used a coping scale and found that those not coping well with their tinnitus (low copers) were more psychologically distressed in comparison with those coping well (high copers). Bartels and colleagues [22] reported similar findings that maladaptive (non-effective) tinnitus coping strategies were associated with the presence of anxiety and depression whereas effective strategies were not associated with these conditions. Furthermore, Sullivan and colleagues [23] explored the types of coping used in those with tinnitus. They found that those with tinnitus used significantly more avoidance coping strategies. Hallberg and colleagues [24] reported that males with tinnitus used more escape-related coping strategies when compared to males with hearing loss, who used active coping strategies more frequently.

The utility of tinnitus coping strategies has, however, been debated. Both Henry and Wilson [18] and Andersson et al. [25] found a trend indicating that individuals who frequently used coping strategies, as measured by the Tinnitus Coping Strategy Questionnaire [18], had a higher level of tinnitus distress. Dinneen and colleagues [26] also reported that coping strategies were not always effective in reducing tinnitus. These findings may be related to additional factors, such as individuals using strategies not defined by the questionnaire used. It may also be that the coping strategy used was not a good fit for the problematic situation. Measuring the 'goodness-of-fit', however, brings its own challenges and an optimal approach is still to be found. The standardised questionnaires that are generally used have pre-defined coping mechanisms. They, therefore, do not identify whether the strategy utilised is effective for the specific problematic situation faced. Furthermore, they do not determine whether coping strategies, other than those proposed by the questionnaire, are in use.

In this context using an open-questioning approach may be better suited, but has not been applied before in the context of tinnitus. To fill this research gap, this study aimed to investigate the use of situationally influenced tinnitus coping strategies by means of an open-questioning style approach.

The research objectives were to (1) identify whether there are specific problematic situations that those with tinnitus face (2) ascertain what strategies were frequently used in coping with tinnitus (3) identify which strategies were used in which problematic situations faced (4) establish whether the coping style used was associated with differences in levels of tinnitus distress, anxiety, depression, and insomnia.

Materials and Methods

Study Design

A cross-sectional survey design was used to capture those with varying levels of tinnitus. Data for this study were obtained from phase I and II (feasibility and efficacy) of a clinical trial investigating the effectiveness of an Internet-based intervention for tinnitus in the United Kingdom [27,28]. Ethical approval was granted by Anglia Ruskin University in Cambridge (FST/FREP/14/478) and the study was registered with Clinical Trials.gov: NCT02370810, date 05/03/2015.

Recruitment

Participants across the United Kingdom were invited to undertake the clinical trial investigating an Internet-based intervention for tinnitus. The information for this study was embedded in this trial. Recruitment included various formats such as social media, newspapers, magazines and support groups. Information was available on the recruitment website outlining the nature of the intervention participants would be undertaking, the data to be collected (such as information about their tinnitus), data collection time points and the eligibility criteria which was as follows:

Inclusion Criteria:

- i) Aged 18 years and over living in the United Kingdom
- ii) Computer and Internet access and the ability to use these
- iii) The ability to read and type in English
- iv) Experiencing tinnitus for a minimum duration of three months
- v) A score of 25 or above on the Tinnitus Functional Index [29] suggesting the need for tinnitus care

Exclusion Criteria:

- i) Reporting any major medical, psychiatric or mental disorder which may hamper commitment to the program
- ii) Reporting pulsatile, objective or unilateral tinnitus, which have not been investigated medically
- iii) Tinnitus as a consequence of a medical disorder, still under investigation
- iv) Undergoing any tinnitus therapy concurrently with partaking in this study

Data collection

Data collection was online and included a demographic questionnaire, self-assessment questionnaires and an open question. Participants were asked to consider how they felt over the past week with regards to the questions. The following information was obtained:

- Demographical information regarding gender, age, tinnitus duration, hearing aid use, medical examinations related to tinnitus, health and/or mental health conditions as well as past or current tinnitus treatments.
- The Tinnitus Functional Index [29] was used to determine the level of tinnitus distress based on an individual's subjective rating. It has excellent psychometric properties with an internal consistency of 0.97 and test-retest reliability of 0.78. It is a 25-item questionnaire, scored on a scale of 0-100. Scores less than 25 indicate mild tinnitus, with no need for intervention, whereas scores ranging from 25-50 signify significant tinnitus, and possible need for intervention. A score of 50 or greater demonstrates more severe tinnitus and indicates the need for more intensive intervention.
- The Generalised Anxiety Disorder [30] was selected to quantify the level of anxiety. This seven-item questionnaire is scored between 0-21 and has an internal validity of 0.89. Scores less than 5 indicate minimal anxiety, of 5-9 indicate mild anxiety; scores of 10-14 imply moderate anxiety and scores of 15-21 suggest severe anxiety.

- The Patient Health Questionnaire was chosen to assess symptoms of depression [31]. Scoring is between 0-28 on this nine-item questionnaire with an internal validity of 0.83. Scores less than 5 suggest minimal depression, of 5-9 indicate mild depression; scores of 10-14 indicate moderate depression; those in the range of 15-19 imply moderately severe depression and scores of 20-28 suggest severe depression.
- The Insomnia Severity Index [32] scored out of 28. Scores less than 8 indicate no clinically significant insomnia, between 8-14 indicate sub-threshold insomnia; 15-21 suggest moderate clinical insomnia; and 22-28 show severe clinical insomnia.

To obtain information about problematic tinnitus situations and how these are dealt with an open-ended question was asked. This would enable free responses from participants without imposing any pre-defined concepts. The question was carefully worded without including leading words that may direct responses. Participants were asked to consider a difficult situation and how they dealt with this in a question worded: *“Describe a specific situation in the last week when you experienced tinnitus as a problem. Describe how you responded and what you did in the situation.”* To encourage participants to consider this question, a response was required and could not be left blank. If participants did not experience tinnitus as a problem they could indicate this in their response by writing “none”.

Data analysis

Data analysis was done by using a mixed methods approach consisting of qualitative and quantitative analysis [33]. This facilitated quantifying the relationship between the strategies used and clinical and demographic factors.

Qualitative data coding was performed using QSR International’s NVivo 10 Software

[34]. Conventional qualitative content analysis formed the theoretical framework, as described by Graneheim and Lundman [35]. Content analysis enables systematic interpretation of participant statements to identify central aspects (a set of condensed categories) that emerge from careful examination [36]. The categories were derived directly and inductively from the raw data using a bottom-up approach. This methodology was selected to gain information regarding problematic tinnitus situations without imposing pre-conceived categories or theoretical perspectives. The responses were read repeatedly and coded for 'meaning units,' which are statements that relate to the same central category. These meaning units formed the units of analysis for coding [35,37]. Codes were then gradually merged into broader categories and subcategories by grouping thematically similar codes together. Categories were then condensed by combining categories with similarities, ensuring that the categories were mutually exclusive until around 8-12 categories were identified. Category labels were assigned by selecting the terms that best matched the audiology literature (listening to sounds was for instance labelled sound enrichment, using hearing aids was labelled amplification, etc). Definitions were provided for consistency between coders. After selecting the codes and categories the original responses were checked to ensure they were in line with the assigned categories and to identify if any additional categories emerged. The data set was rechecked for consistency.

To reduce possible researcher bias and improve reliability, two researchers coded the full data set independently (i.e., authors EB & PT). The coding was compared and where there were inconsistencies a third researcher was asked to code the response (i.e. VM). The final codes and categories were selected where there was agreement between two out of the three researchers. The reliability of the categories was validated by use of agreement/ disagreement ratings amongst the three researchers.

Quantitative analysis was performed using the Statistical Package for Social Sciences software version 23.0 [38]. The cohort of participants was divided into groups based on coping styles. Chi-square analysis was used to identify any baseline categorical demographical differences between these identified coping style groups in terms of gender, difficulty hearing and support group attendance. One-way analysis of variance was performed to ascertain any differences between continuous variables such as age, tinnitus duration, tinnitus distress, level of anxiety, depression and insomnia. Due to the variance in these coping styles group sizes, the Hochberg's GT2 post hoc test was carried out to compare participants groups. The Chi-Square Goodness-of-Fit Test for unequal distribution was used to determine the distribution of strategies used in different problematic situations. The situations were weighted for each category. Cohen's *d* was used to determine the effect size of these differences. Effect sizes below $d=0.5$ represented small effect sizes; those of $d=0.5-0.79$ medium effect sizes and those equal or greater than $d=0.8$, large effect sizes [39]. For all analyses, a two-tailed significance level of <0.05 was considered statistically significant.

Results

Participant

In total, 240 participants (137 males, 103 females) completed assessment measures and were included in this study. The mean age was 48.16 years (SD: 22.70) with mean tinnitus duration of 11.52 years (SD: 11.88). The mean level of tinnitus distress on the Tinnitus Functional Index was 55.16 (SD: 21.86) indicating severe clinically significant tinnitus. The mean level of anxiety (6.93; SD: 5.66) and depression (7.44; SD: 6:10) indicated mild anxiety and depression respectively. The mean level of insomnia (12.01; SD 6.81) suggested sub-threshold insomnia. No participants were undertaking any form of tinnitus intervention or psychotherapeutic treatment whilst undertaking the trial. Of these 240 participants

completing the assessment measures, 57 did not undertake the intervention by choice or because they did not meet the eligibility criteria. In most cases, this was due to their Tinnitus Functional Index scores being below that requiring clinical intervention (< 25). There were 183 participants that started the intervention. Of these, 152 completed the post-intervention questionnaire.

Problematic situations

A sub-section of participants (n=19; 7.9%) indicated that they no longer faced problematic tinnitus situations as they had habituated to having tinnitus. Problematic situations as a result of tinnitus were described by 221 participants. There were 229 individual problematic situations described, as a few participants mentioned more than one situation. These fell into eight distinct categories as seen in table 1. Inter-rater reliability yielded an agreement rating of 95.4% for the problematic situations, demonstrating good reliability. The problematic situation reported most frequently was that tinnitus affected sleep (22.6%) and “*sleep*” was the word used most frequently when running a word frequency search (table 2). The situation reported second most commonly was the interference of tinnitus when trying to listen (19.8%) and this correlated with the word “*hear*” being the second most frequently used word. The third most difficult situation reported was during times when tinnitus sounded loud and intrusive (17.7%). Many participants reported difficulties in noisy situations, as indicated by the word “*noise*” being frequently used. Further difficulties included quiet situations, when stressed and concentrating. Some participants reported that it was always difficult living with tinnitus and was not related to specific situations.

Table 1: Problematic tinnitus situations

Category	Sub-category	Number of meaning units (n=248)	Example of a meaning unit	Frequency reported in each category
Sleeping	Trying to go to sleep	43	"When trying to sleep every night."	56 reports; 22.6%
	Waking during the night	10	"Difficulty going back to sleep especially when waking to use the bathroom in the middle of the night."	
	When tired	3	"Was especially loud when I was tired."	
Listening	When listening	19	"My tinnitus makes it hard hearing the TV."	49 reports; 19.8%
	When conversing	25	"It stops me from hearing what is being said."	
	In meetings	5	"It became more noticeable in a meeting."	
Loud tinnitus	When tinnitus is very loud	44	"Several occasions when my tinnitus was unbearably loud."	44 reports; 17.7%
Noisy	Noisy environments	12	"Being in a noisy pub with a band playing."	26 reports; 10.4%
	Impact noise	5	"When I dropped the saucepan lid."	
	Social gatherings	9	"Social event, had to remove hearings aid and isolate myself."	

Constantly	Always problematic	22	“It is impossible to escape the noise.”	22 reports; 8.9%
Quiet	Quiet environments	9	“At quite times of the day or night”.	
	In a quiet environment after being in noisy situation	3	“Getting to a quiet home after being at work all day.”	12 reports, 4.8%
Stressed	When stressed	11	“When under stress my tinnitus is worse.”	11 reports; 4.4%
Concentrating	Concentrating on work	4	“My ability to concentrate- tinnitus is very distracting.”	9 reports; 3.6%
	When reading	5	“My tinnitus always flares when I try to read.”	
Subtotal				229
Never	No difficulties	19	“I don't let it be a problem.”	19 reports; 7.7%

Table 2: Most frequently used words used when describing problematic tinnitus situations

Word	Count	Weighted Percentage (%)
sleep	149	1.97
hear	93	1.23
noise	91	1.20
problem	70	0.93
music	67	0.89
loud	60	0.79
hearing	59	0.78
trying	59	0.78
work	57	0.75
ear	53	0.70
sound	51	0.67
tried	50	0.66
night	44	0.58
people	43	0.57

Strategies used

There were 237 individual descriptions of how participants dealt with problematic situations, as sometimes more than one strategy was incorporated. There were also 42 responders who failed to mention which strategy they used in the selected problematic situation. The strategies were divided into two coping styles, namely an active or a passive approach. Active coping styles included trying to do something to cope better with the tinnitus whereas a passive approach was using strategies that were not aimed at improving the intrusiveness of the tinnitus. Of the strategies used, 175 were identified as active problem-solving strategies. There were 10 different types of active strategies. These included the use of sound enrichment, diverting attention, communication tactics, relaxation, ear protection, amplification, self-reassurance, medication, physical manipulation and seeking support. The most frequently used active strategy was sound enrichment, utilising both meaningful and non-meaning background sounds, as seen in table 3. Diverting attention by doing other activities, keeping busy, being physically active and delaying bedtime was the second most frequently used strategy. Further strategies occurred infrequently (< 10% each).

In addition to the active strategies, 72 passive strategies were identified. There were three categories identified, namely, becoming emotional, doing nothing or avoiding the situation. The most recurrent passive strategy was worrying or becoming frustrated. When considering all strategies used, becoming emotional occurred third most frequently at 16.6%. Further passive strategies were reporting that nothing can be done about the tinnitus (6.5%) and avoiding the problematic situation (6.1%). Inter-rater reliability yielded an agreement rating of 94.9% for the coping strategies used, again demonstrating good reliability.

Table 3: Coping strategies classification

Category	Sub-category	Number of meaning units (247)	Example of a meaning unit	Frequency reported in each category
Active strategies				
Sound enrichment	Meaningful background sounds	37	"I switched on the radio to help me."	50 reports; 20.2%
	Non-meaningful background sound	13	"Got a fan for my desk to distract me."	
Diverting attention	Focusing on other activities	28	"Played chess on iPad and read until tired enough to sleep."	43 reports; 17.4%
	Keeping busy	6	"I have been trying to keep busy at work"	
	Physically active	5	"I've been going for long walks at the weekend."	
	Delaying going to bed	4	"I have to wait till I am very tired before trying to sleep."	
Communication tactics	Ask for clarity	16	"I have to ask the person to repeat what they have said."	22 reports; 8.9%
	Move position	6	"I kept having to move closer to people or different position."	

Relaxation	Trying to relax	7	"Tried several approaches through the night including relaxing."	13 reports; 5.3%
	Deep breathing	4	"I tried deep breathing to remain calm."	
	Sleeping	2	"I just went to bed in the end."	
Ear protection	Use ear plugs	7	"I put an earplug in."	11 reports; 4.5%
	Remove hearing aids	2	"Had to remove hearing aids and isolate myself."	
	Reduced the sound	2	"I got up and put music at a low level."	
Amplification	Volume control	6	"Turning up the volume did help to a certain extent."	10 reports; 4.1%
	Hearing aids	4	"I try adjusting my hearing aids"	
Self-reassurance	Staying calm	9	"Talked to myself and tried not to panic."	9 reports; 3.6%
Medication	Medication for sleep	4	"Took a sleep medicine to help me sleep."	7 reports; 2.8%
	Ear drops	3	"I was prescribed eardrop"	
	Press on ear	4	"Trying to remove the noise by poking/prodding at ear."	

Physical manipulation	Move head	2	"I tilted my head and propped myself up differently to stop the sounds."	6 reports; 2.4%
Support seeking	Professional advice	2	"I told her I would go see the doctor."	4 reports;
	Social support	2	"My tinnitus was so loud and I was so scared, I phoned a friend..."	1.6%
Subtotal for active strategies				175
Passive strategies				
Emotional	Worry	26	"I was really worried the party would make it worse."	
	Frustration	15	"I shouted out loud at the tinnitus."	41 reports; 16.6%
Doing nothing	Put up with it	9	"Just have to put up with it."	
	Nothing can be done	5	"There is nothing I can do about it."	16 reports; 6.5%
	Stop and wait	2	"Wait a couple of minutes until it stops"	

Avoidance	Avoiding activities	15	"Avoided golf, which I normally enjoy."	15 reports; 6.1%
Subtotal for passive strategies				72
Nothing mentioned	No strategy noted	42		

Situationally influenced coping

The strategies associated with various specific problematic tinnitus situations are shown in table 4. Sound enrichment was a strategy used for five different problematic situations. These were when tinnitus was loud, trying to sleep, when concentrating, in quiet situations and when tinnitus is always problematic. The second most frequently used strategy was diverting attention. This was applied in the same situations as mentioned above, except for when trying to concentrate. Relaxation was used for loud tinnitus, when trying to concentrate and when feeling stressed. Self-reassurance was also applied in three situations, namely when tinnitus was loud, in noisy situations and when tinnitus was always problematic. The use of physical manipulation, seeking support and medication were used in two situations each. Communication tactics, ear protection, and amplification were used in one situation each. The widest range of strategies was applied to loud tinnitus situations. The Chi-Square goodness-of-fit test indicated that the observed frequency of strategies did not measure the expected range, as more strategies were applied to sleep problems than to other situations [$X^2(7)=46.54, p=0.001^*$].

When evaluating the passive strategies used, becoming emotional was reported in seven situations. Doing nothing in six situations, while avoidance behaviour was used in two situations. For noisy situations, the number of passive strategies was greater than the number of active strategies employed. In accordance with the active coping styles, the Chi-Square goodness-of-fit test indicated that the observed frequencies of strategies did not measure the expected range as more strategies were applied to noisy situations and when listening than to other situations [$X^2(7)=478.042, p=0.001^*$]. Overall, only a narrow range of strategies was used for each problematic situation.

Table 4: Situationally influenced coping strategies

	Loud tinnitus	Sleep	Concentrating	Noisy	Listening	Quiet	Constantly	Stressed
Active coping strategies	Sound enrichment (15)	Sound enrichment (23)	Sound enrichment (3)	Ear protection (11)	Communication tactics (22)	Sound enrichment (5)	Sound enrichment (4)	Relaxation (4)
	Diverting attention (15)	Diverting attention (22)	Relaxation (2)	Diverting attention (2)	Amplification (10)	Diverting attention (4)	Self-reassurance (5)	Medication (4)
	Relaxation (7)	Medication (3)	Physical manipulation (2)	Self-reassurance (2)	Seeking support (3)			
	Physical manipulation (4)							
	Self-reassurance (2)							
	Seeking support (1)							
Passive coping	Emotional (12)	Emotional (8)		Avoidance (9)	Emotional (11)	Emotional (2)	Emotional (3)	Emotional (5)
	Do nothing (3)	Do nothing (3)		Emotional (8)	Avoidance (6)	Do nothing (1)	Do nothing (3)	
				Do nothing (3)	Do nothing (3)			

Key: numbers denotes the number of instances these strategies where used for each situation

Participants' categories based on coping style

Participants were categorised according to how they dealt with problematic situations. One group consisted of those that had habituated to tinnitus (n=19; 7.9%) and were no longer facing problematic situations. A second group faced problematic situations and used an active coping style (n=152; 63.3%) by trying to address the problematic tinnitus situation by utility of problem-solving approaches to diverting attention from tinnitus. A third group was identified who approached problematic situations using a passive coping style (n= 69; 28.8%) by not doing anything, becoming upset or avoiding the situation. Those that did not mention the strategy applied to the problematic situation, were also placed in the passive copying styles group, as it appeared that they did nothing to help in these situations.

The three identified coping styles were compared as shown in table 5. No significant gender differences were seen across the three groups, as they all had similar ratios of male and female participants. There was also no significant difference in the age distribution or support group attendance. There was a trend for a lower level of insomnia and longer tinnitus duration for the habituated group, but these trends were not statistically significant. There was a statistically significant difference between the level of hearing difficulty reported, as those using an active coping style reported more difficulty in comparison to those that had habituated or used a passive coping style as seen in table 5 [$\chi(6)=13.58, p=0.035^*$].

Table 5: Demographical information of the participants

Category	Habituated to tinnitus (n=19, 7.9%)	Active copying style (n=152, 63.3%)	Passive coping style (n=69, 28.8%)	Group comparison: Chi Squared/ ANOVA	Effect size	Post-hoc comparison: Habituated to active group	Post-hoc comparison: Habituated to passive group	Post-hoc comparison: Active to passive group
Gender:				$\chi(2)=0.20,$ $p=0.903$				
Male	10 (52.6%)	88 (57.9%)	39 (56.5%)					
Female	9 (47.4%)	64 (42.1%)	30 (43.5%)					
Mean Age	55.84 (SD: 21.88)	46.84 (SD: 22.83)	48.96 (SD: 22.49)	F(2, 238)= 1.39, $p=0.251$	0.10			
Tinnitus duration	14.89 (SD:16.47)	11.42 (SD: 11.07)	10.80 (SD: 12.16)	F(2, 238)=0.90, $p=0.409$	0.08			

Difficulty hearing						
None	▪ 2 (10.5%)	▪ 29 (19.1%)	▪ 16 (23.3%)	$\chi(6)=13.58,$ $p=0.035^*$	Phi and Cramer's V: $\chi(6)=0.24,$ $p=0.035^*$	
Slight	▪ 12 (63.2%)	▪ 89 (58.6%)	▪ 30 (43.5%)			
Moderate	▪ 3 (15.8%)	▪ 32 (21.1%)	▪ 16 (23.2%)			
Great	▪ 2 (10.5%)	▪ 2 (1.2%)	▪ 7 (10.1%)			

Support group				$\chi(4)=2.59,$ $p=0.628$				
No	▪ 16 (84.2%)	▪ 128 (84.2%)	▪ 55 (79.7%)					
On occasion	▪ 1 (5.2%)	▪ 17 (11.2%)	▪ 8 (11.6%)					
Regularly	▪ 2 (10.5%)	▪ 7 (4.6%)	▪ 6 (8.7%)					
Tinnitus distress^a	36.00 (SD: 22.98)	52.77 (SD: 20.23)	63.96 (SD: 21.06)	F(2, 238)=15.11, $p= 0.001^*$	0.34	$p= 0.006^*$ [CI: 3.82 to 29.92]	$p= 0.001^*$ [CI:14.93 to 42.62]	$p= 0.001^*$ [CI: 4.60 to 19.11]

Anxiety level^b	4.64 (SD: 5.87)	6.37 (SD: 5.43)	8.65 (SD: 5.80)	F(2, 238)=5.19, <i>p</i> =0.006*	0.21	<i>p</i> =0.608 [CI: -2.02 to 5.47]	<i>p</i> =0.044* [CI: 0.76 to 7.93]	<i>p</i> =0.016*[CI: 0.32 to 4.24]
Depression level^c	5.07 (SD: 7.24)	6.79 (SD: 5.31)	9.35 (SD: 7.03)	F(2, 238)=5.45, <i>p</i> =0.005*	0.21	<i>p</i> = 0.662 [CI: -2.30 to 5.74]	<i>p</i> =0.046* [CI: -0.06 to 8.50]	<i>p</i> =0.011* [CI: 0.46 to 4.66]
Insomnia severity^d	8.50 (SD: 8.10)	11.95 (SD: 6.26)	13.15 (7.50)	F(2,238)=2.84, <i>p</i> =0.060	0.16			

Key: CI= confidence interval, SD= standard deviation

a=Tinnitus Functional Index: Scores on a scale of 0-100. Scores suggest: < 25 mild tinnitus, 25-50 significant tinnitus, >50 severe tinnitus

b= Generalised Anxiety Disorder: Scored out of 21. Scores suggest: <5 no anxiety, 5-9: mild anxiety, 10-14: moderate anxiety, 15-21: severe anxiety

c=Patient Health Questionnaire-: Scored out of 28. Scores suggest: <5 no depression, 5-9 mild depression, 10-14, moderate depression, 15-19: moderately severe depression, 20-28: severe depression.

d=Insomnia Severity Index: Scored out of 28. Scores suggest: <8 no insomnia, 8-14: subthreshold insomnia, 15-21: moderate insomnia, 22-28: severe insomnia

There were significant differences in levels of tinnitus distress, anxiety, and depression between the groups, as seen in figure 1. Post hoc testing indicated that those using a passive coping style had significantly greater tinnitus distress, anxiety, and depression in comparison to both those who had habituated and those using active coping styles (see table 5). Those that had habituated also had significantly lower tinnitus distress than the active group, although this group difference was not seen for anxiety and depression.

<figure 1 near here>

Discussion

This study aimed to identify situationally influenced tinnitus coping strategies using both mixed qualitative and quantitative research methods. The findings from the main study aims namely investigated problematic tinnitus situations, how these were approached, and if different coping styles were related to differences in the severity of tinnitus, anxiety, depression and insomnia as discussed.

Problematic tinnitus situations

The eight most problematic situations identified were: (1) sleeping (2) listening; (3) loud tinnitus; (4) noisy situations; (5) quiet situations; (6) constantly; (7) when concentrating; and (8) when stressed. These problems, such as sleeping difficulties can lead to a higher risk of developing tinnitus-related distress and emphasis the need for early interventions for those with tinnitus [40]. Targeting these common problematic tinnitus situations is important for future tinnitus interventions and research. Current standardised coping and tinnitus questionnaires may not fully investigate the specific issues related to dealing with problematic tinnitus situations and therefore assessment measures to address specific problematic areas require careful consideration [41].

Situationally influenced coping

Three coping styles of approaching problematic tinnitus situations were identified. These were having habituated to tinnitus (7.9%), using active problem-solving strategies to address problematic situations (63.3%) or using a passive coping style (28.8%) in that they did not attempt to address problematic situations. The active coping styles used most frequently were using sound enrichment, diverting attention and the use of communication tactics. The use of sound enrichment and diverting attention was also applied in the widest range of problematic situations. Overall, the range of coping strategies appeared limited, considering the range of ways of coping available, as reviewed by Skinner and colleagues [11]. This may partially be due to the study design targeting more acute problematic situations. The coping mechanisms selected may therefore not be broad enough to consider other longer-term problematic situations. Of interest was the lack of seeking support, which was only found for two problematic tinnitus situations, namely loud tinnitus and when listening. Support can be obtained from various means including professionals, help-lines, forums and tinnitus support groups. Peer interaction in a group context can facilitate information exchange and validate experiences that promote coping with tinnitus [42]. Encouraging the use of available professional and peer support for those with distressing tinnitus may promote habituating to tinnitus.

The use of relaxation is frequently recommended in the management of tinnitus [43]. In the current study, relaxation was only used in 13 instances (5.3%) for three types of problematic situations namely when concentrating, when stressed and for loud tinnitus. Respondents undertaking an Internet-based intervention for tinnitus rated the relaxation components on the programme to be the most useful [27,28]. Those not undertaking tinnitus interventions may, therefore, not be aware of the helpful coping strategies available to assist.

Effective coping can aid a stronger sense of control over the tinnitus, which is associated with greater adjustment towards the tinnitus [17,44] and should therefore be promoted.

Cognitive behavioural therapy is a comprehensive programme encompassing applied relaxation, cognitive restructuring, addressing emotional reactions and problems related to having tinnitus [45]. Although cognitive behavioural therapy has the most evidence of effectiveness for those with tinnitus [46] the use of these strategies was uncommon in this study. Self-reassurance, a positive cognitive restructuring technique was only found in nine instances (i.e. 3.6%) for loud tinnitus, noisy situations and for constant tinnitus. Ways of ensuring those with tinnitus have access to these helpful cognitive behavioural therapy based strategies should be sought to encourage the use of helpful strategies in more difficult situations.

The passive coping styles used for problematic tinnitus situations were becoming emotional, doing nothing or avoidance behaviour. Although these were used less than active coping styles, they were found in all problematic situations, except for when concentrating.

Avoidance behaviour is found when there is a fear of situations that may exacerbate the tinnitus (e.g. exposure to loud sounds). In certain contexts, avoidance behaviour is required for health and safety reasons. In the context of problematic tinnitus situations, the behavioural avoidance was found for situations that were judged to be noisy or when trying to listen.

Avoiding these situations therefore restricts activities (e.g. I declined a dinner invitation from the neighbours in fear of the effect on my tinnitus). Although there are some short-term gains, avoidance behaviour in the context of problematic tinnitus situations is often associated with poorer long-term outcomes [47,48]. Fear avoidance behaviour has been associated with greater anxiety sensitivity and tinnitus distress [20,41,49,50]. There are also indications that

strategies to suppress a negative sound (such as tinnitus) may reduce attentional capabilities [48].

The strong emotional representations (e.g. worrying, becoming frustrated) identified are often linked with the perception that tinnitus is due to a serious medical condition [51].

Catastrophising about tinnitus may hinder adjustment as worrying about tinnitus has been shown to be related to reduced quality of life and increased attention of the tinnitus [52].

Catastrophising has also been associated with greater tinnitus distress, higher depressive pathology and lower use of active coping attempts [53]. Catastrophising may also intensify the cognitive and emotional distress associated with tinnitus and lead to reduced acceptance and habituation to tinnitus sounds [54].

In contrast with the present findings, Dinneen and colleagues [26] reported that coping strategies were not always effective at reducing tinnitus distress. Henry and Wilson [18] and Andersson et al. [55] found a trend towards those more distressed by tinnitus using more coping strategies. Ways of measuring tinnitus distress and coping with tinnitus differed between these studies and the present study, making direct comparisons difficult. The Tinnitus Coping Strategy Questionnaire [18] with pre-defined coping styles was used in these initial studies, whereas the current study used an open-ended question without defining possible coping strategies. Furthermore, the current study associated the coping strategy used with the problematic tinnitus situation, which is not possible using a structured questionnaire. Both the previous studies and the present study measured tinnitus distress using standardised questionnaires, which assess tinnitus distress in general over the past week. Tinnitus distress could therefore be related to factors other than the specific problematic situation encountered

or the coping strategies used. Further work is required to measure tinnitus distress related directly to specific coping strategies and problematic situations.

Coping styles

When compared to those that had habituated to their tinnitus or used an active coping style, the use of a passive coping style was associated with greater tinnitus distress, anxiety, and depression. Passive coping styles such as avoidance behaviours, negative emotional reactions and not applying problem-solving skills may therefore contribute to increased tinnitus distress. Maladaptive (non-effective) tinnitus coping strategies have previously also been associated with increased anxiety and depression [22,23]. Moreover, Sullivan and colleagues [23] also reported that those with depression associated with tinnitus used less problem-solving active coping strategies than those who were not depressed. On the other hand, habituation and tinnitus acceptance has been found to relate to lower tinnitus distress, reduced anxiety and depression and better long-term outcomes [56,57].

It may have been expected that a longer duration of having tinnitus would be correlated with a greater chance of having habituated to tinnitus. The finding of a non-significant temporal effect linking coping to the time that passed since the onset of tinnitus may reflect the variable nature of tinnitus and that the related distress could improve or worsen over time. These findings are linked with those of Rubinstein and colleagues [58] who reported that tinnitus distress decreased over time in about 50% of individuals, increased in 25% and remains unchanged in 25%. They found that tinnitus distress might continue despite having tinnitus for 4.9 years, but that tolerance to tinnitus decreased. Much of the literature regarding treatment response to tinnitus indicates a lack of long-term outcomes except for those people that received cognitive behavioural therapy for tinnitus [59]. Therefore, despite treatment,

tinnitus distress may return, depending on the treatment undertaken. Effective treatment to aid habituation for those with tinnitus should be aimed for.

Study strengths and limitations

Data collection aimed to elicit free responses from participants without imposing any pre-defined concepts on them by using an open-ended question. The question elicited information about how problematic tinnitus situations were dealt with. A drawback of this approach is that data were not collected on how beneficial individual strategies were for the specific problematic situations. Studies matching the benefit of situational coping strategies are required. Online data collection was used for this study as this had the advantage of being able to collect a lot of relevant information efficiently and cost effectively. It will have reduced bias as a result of clinician's interference and reduced patient's providing responses to please clinicians. This format also provided participants with time to process and formulate answers to questions. The disadvantages of online data collection for this study include that clarification was not possible. It may also have reduced the diversity of the participants, as not all individuals have access to technology or feel confident using the Internet. Moreover, the cross-sectional design only measured coping at one time point. Prospective experimental longitudinal studies are required to further investigate the precise nature and direction of the relationships explored in this study. As the sample consisted of self-selected volunteers, recruited via advertisements for a tinnitus treatment study, they may not represent the wider clinical population. The fact that they sought treatment for their tinnitus may result in sample bias. The approach used represented acute problematic situations and not necessarily the most frequent chronic problematic situations and is therefore a limitation. Coping strategies were assessed for specific situations encountered over the last week, whereas tinnitus distress was assessed more broadly.

Furthermore, it was not possible to collect audiometric data regarding the extent of participant's hearing loss. Not all respondents mentioned which strategies they used and could not be prompted to provide this information. It is difficult to determine whether this is because they do not utilise strategies or omitted the second part of the question. An additional limitation is that coping strategies were assessed retrospectively so participants had to think back on a specific situation. This can produce a memory bias, which may enhance or impair the recall of such situations.

Conclusion

This study has been of value in identifying the main problematic situations that those with tinnitus face. Both active and passive coping styles were used to approach these situations. The use of passive strategies was correlated with higher levels of tinnitus distress, depression, and anxiety. Future research should assess coping and its effect on tinnitus distress prospectively so that participants can indicate the coping behaviours used in specific problematic situations as problems occur, instead of having to recall these strategies. It should also match the benefit of the strategy selected to the problematic situation.

Declaration of Interest

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Table Headings

Table 1: Problematic tinnitus situations

Table 2: Most frequently used words used when describing problematic tinnitus situations

Table 3: Coping strategies classification

Table 4: Situationally influenced coping strategies

Table 5: Demographical information of the participants

Figure Heading

Figure 1: Comparison of coping styles

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