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Is tinnitus acceptance the same as tinnitus habituation?

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Abstract

Introduction: Tinnitus habituation and tinnitus acceptance both describe an apparent lack of responding to tinnitus noise. However, no prior studies have evaluated the possible overlap between tinnitus habituation and acceptance processes in chronic tinnitus sufferers. **Objectives:** We examined responses to the seven acceptance items from the Tinnitus Response Scales (TRS) along with 19 items that tapped the perceptual/behavioural aspects of tinnitus habituation. **Materials and Methods:** A large sample of chronic tinnitus sufferers (n = 273) were recruited via advertisements placed at tinnitus clinics and websites and in the media. They were asked to complete an online survey asking about their tinnitus history and recent experiences of tinnitus habituation, sensitization to tinnitus noise, and tinnitus acceptance, and distress. **Results:** Exploratory factor analysis showed that a single factor solution explained 40% of the variance in the scale items. Acceptance and tinnitus habituation (*vs.* sensitization) subscale scores were highly negatively correlated with each other. **Conclusion:** Tinnitus acceptance and tinnitus habituation may describe related cognitive and perceptual/behavioral aspects of tinnitus adaptation. That is in this study, tinnitus-habituation items tapped perceptual awareness and behavioral responses to tinnitus, whereas tinnitus acceptance items tapped cognitive responses to the noise (i.e. lack of need to respond to the noise).

Keywords: behavior, cognitive therapy, tinnitus.

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INTRODUCTION

Tinnitus is the perception of noise in the ears or head in the absence of an external acoustic source[1-3]. Most people with chronic tinnitus are not too bothered by the noise and eventually learn to adapt to it[4]. In contrast, people with problem tinnitus may be severely affected by the noise in potentially engrossing (e.g. work, hobbies) and less stimulating contexts (e.g. sleep); whereas non tinnitus-complainers tend to be aware of the noise only in low-distraction situations[5]. Thus, some people appear to become sensitized to and do not adapt to the noise, increasing their chances of experiencing tinnitus distress[3,6] and related problems such as concentration difficulties, frustration, annoyance, irritability, fear, worry, sleep problems and mood disturbance[4,6,7].

Historically, classical conditioning has primarily informed our understanding of the manner in which people adaptively respond to tinnitus. In particular, habituation (*vs.* sensitization) is conceptualized as being integral to the process: when a person first becomes aware of the tinnitus they tend to orient to the noise due to its novelty. However, after ongoing exposure to the noise a gradual lessening of awareness is experienced that can bring about a lessened contingency between tinnitus noise and its' habitual meaning or consequences (e.g. tinnitus annoyance). However, if the person happens to experience fear, annoyance or distress in response to the noise they may become sensitized to it and fail to habituate to the noise[8].

Consistent with this viewpoint, tinnitus tolerance has previously been shown to be correlated with longer tinnitus duration, whereas problem tinnitus was correlated with younger age and recent tinnitus onset[9]. Taken together, the results suggest that tinnitus is less likely to distress an individual over time. In addition, several recent EEG studies have reported that tinnitus complainers and treatment-seekers experience deficits in tinnitus habituation such as larger middle-latency potentials and less distinct habituation of the vertex potential to auditory stimuli[5,10]. Thus, different tinnitus subgroups seem to exist in terms of the cortical processing of tinnitus-like, externally-presented stimuli: (a) people who readily habituate to external noise, and (b) those who find it difficult to habituate to it. However, it is less clear whether the same processes underpin the habituation to internally-induced, tinnitus noise. Nonetheless, stimulus inattention (e.g. the failure to think about tinnitus or distracting oneself from thoughts about the noise) has been shown to be related to the reduced auditory cortical processing of tinnitus noise[11].

Two main models of tinnitus habituation have been presented in the literature. Hallam's Habituation Model of Tinnitus Suffering[12] posits that tinnitus distress may be symptomatic of a sufferer's failure to habituate to the noise. However, tinnitus habituation was narrowly defined in the model as referring to short-interval aversive stimuli, whereas tinnitus is typically chronic in nature. Additionally, ambient quiet, noise exposure and emotional stress can reactivate a person's noise intolerance and/or promote dishabituation to the noise. Thus, in reality, a person must repeatedly habituate to the tinnitus each time the noise enters their awareness, and this awareness can be amplified by external noise, quiet, or even stress[13].

In contrast, Jastreboff's Habituation Model of Tinnitus[14] posits that there are three key brain systems involved in the tinnitus experience: auditory (i.e. conditioned stimulus), limbic/emotional, and autonomic nervous systems (i.e. conditioned response); and it is the nature of these connections that will determine whether a person simply experiences tinnitus or suffers from it. Thus, habituation is posited to occur as a result of altered connections and/or the changed central processing of tinnitus-related neuronal activity, at the level of perception and reaction. That is, tinnitus adaptation is posited to occur at both the perceptual and psychological response levels. However, no prior studies have explicitly evaluated the premise that tinnitus habituation may have a perceptual/behavioral and a psychological component.

Nonetheless, mindfulness-based approaches (e.g. tinnitus acceptance) have recently been explored in the tinnitus literature[15,16]. As detailed below, tinnitus habituation and tinnitus acceptance are conceptually similar constructs that share several features in common. First, habituation is described as an automatic, effortless, subconscious, and unintentional shift of attention away from tinnitus noise with each new episode of tinnitus awareness[14,17]. That is, if the noise is regarded by a person as being meaningless and harmless then an orienting response to the noise may not occur, although habituation may occur. However, if the noise has particular meaning for the person (e.g. tinnitus is a threat), contingencies between the noise and its response may not be extinguished and habituation may not tend to occur[18,19].

Similarly, acceptance is described as a process of allowing or letting be rather than rushing in to try to fix or change one's experiences. Thus, acceptance permits a person to view a situation non-judgmentally and in the present moment as suggested by Kabat-Zinn as cited in the study of Segal et al.[20]. In particular, tinnitus acceptance is posited to involve shifting attention away from the noise (which cannot be controlled) toward that which can be controlled (e.g. valued activity) thus limiting any emotional response to the tinnitus; and this change in focus is thought to underpin the reductions in tinnitus distress reported in mindfulness-based interventions[21,22]. That is, similar to tinnitus habituation, tinnitus acceptance

has the potential to lessen the contingency between tinnitus noise and habitual distress by providing sufferers with the opportunity to view their situation dispassionately and reflect on the validity of these judgements, thoughts, feelings, and behaviour, thereby, dampening the effects of any negative thoughts on psychological wellbeing[15].

In summary, tinnitus habituation and tinnitus acceptance both describe an apparent lack of responding to tinnitus noise that is assumed to weaken the contingency between tinnitus noise and habitual distress. However, tinnitus habituation involves an automatic, subconscious, and unintentional shift of attention away from the noise (i.e. perceptual/behavioural component)[8], whereas tinnitus acceptance involves simply observing the noise as it enters awareness and then shifting attention toward a more valued activity (i.e. psychological component)[15]. Consistent with this overlap, we evaluated the premise that the two tinnitus processes are overlapping and related aspects of tinnitus adaptation. Such an interpretation is consistent with Jastreboff's Habituation Model of Tinnitus[14] which posits that tinnitus perception (e.g. tinnitus habituation *vs.* sensitization) and the psychological response to tinnitus (e.g. tinnitus acceptance *vs.* non-acceptance) will occur at different levels of consciousness.

To evaluate this premise, we examined the factor structure of the seven acceptance items from the 24-item Tinnitus Response Scales[15] and 19 additional items that tapped the perceptual and behavioural aspects of tinnitus habituation. In accordance with the limited available literature, we expected that tinnitus habituation and acceptance item responses will load onto a single tinnitus adaptation factor that describes the perceptual/behavioural and cognitive (i.e. tinnitus acceptance) aspects of the tinnitus adaptation process.

METHODS

Ethics Approval

Ethics approval was granted by the University of New England Human Research Ethics committee after all components of the project had been examined against local and national standards; approval number HEO4/124.

Participants

The study was conducted using online proprietary survey software (Speedsurvey.com). Respondents were required to be 18 years or older and to have experienced tinnitus for one-month or more. They were recruited via newspaper advertisements, radio and television interviews, and notices placed in tinnitus newsletters, websites, and noticeboards (British Tinnitus Association), and tinnitus and Ménière's disease internet chat-rooms. They were asked to click on the imbedded study URL in the advertisement which took them to the online survey.

Seven-hundred-one people visited the study URL between February and July 2006, 273 of whom participated (39% response rate). Most participants resided in the United Kingdom (51%) or Australia (42%). The sample was comprised 150 males and 123 females, ranging in age from 18 years to 99 years (M = 51 years; SD = 14). Their tinnitus duration ranged from one-month to 55-years (M = 11.4 years; SD = 11.3). Participants had had their tinnitus for different lengths of time with 59% having had tinnitus for more than 5-years (n = 160), 27% had tinnitus for 2 to 5 years (n = 73), and 14% had tinnitus for less than 2-years (n = 39); one participants did not indicate the duration of their tinnitus. About 29% (n = 80) had not received a formal tinnitus diagnosis or could not recall having received the diagnosis. A similar proportion were diagnosed by a general practitioner (n = 80) or ear-nose-throat specialist (n = 76) and the rest (n = 26) received the diagnosis from an audiologist. Tinnitus and hearing characteristics of the sample have been described elsewhere[15]. In brief, most (85%, n = 232) of the participants reported that their tinnitus loudness was variable over time, and about two-thirds described their tinnitus awareness as constant (65%, n = 177).

Procedure

A panel of international tinnitus researchers was asked to judge a large pool of items in an early version of the Tinnitus Response Scales (TRS). If consensus was reached, TRS items were retained in the scale, resulting in an initial 87-item scale. This scale and the scales described below were then administered to study participants. For a detailed description see[15].

Measures

The 87 tinnitus items that were the basis for the 24-item TRS[15] were used in this study. The scale items asked the participants to rate the extent to which a series of statements applied to them or their tinnitus, using scales ranging from 0 (not at all true) to 10 (perfectly true). The published version of the scale is reported to have three distinct subscales: tinnitus acceptance, control and defeat. The TRS has high reported internal consistencies with all the subscale Cronbach's alphas reported to be above .80[15]. In this study, only the seven acceptance items from the TRS were evaluated along with 19 additional items that tapped the perceptual and behavioural aspects of tinnitus habituation.

The Tinnitus Reaction Questionnaire (TRQ)[23] is a 26-item self-report measure of tinnitus responding that quantifies psychological distress, using 5-point Likert type scales, ranging from 0 to 4, with high scores indicating worse tinnitus distress. The scale has four subscales: general distress, interference, severity and

avoidance, but only total scores are usually computed, as was the case in this study. The scale is reported to have good convergent and divergent validity, and is highly correlated with measures of anxiety, depression and tinnitus. The scale has high reported test-retest reliability (r = .88) and internal consistency with a Cronbach's alpha of .96[23].

RESULTS

The mean tinnitus distress level (M = 1.07, SD = .90) of this sample of clinical and non-clinical participants was relatively low and lower than that described in prior studies (Henry & Wilson, 2002). In an Exploratory Factor Analysis (EFA) we examined the factor structure of the seven TRS-acceptance items[15] and 19 habituation items (26 items in total) obtained from an early version of the TRS (87-items). A correlational matrix indicated that most of the correlations exceeded .3, thus, the items appeared to be suitable for factoring. Kaiser-Meyer Olkin Measure of Sampling Adequacy (.94) and Bartlett's Test of Sphericity, c^2 (3,741, N = 273) = 15,617.27, $p < .001$ also indicated the suitability of the items for factoring.

A Principal Component Analysis (run in SPSS version 22) was employed to examine the factor structure of the 26 habituation and acceptance items. The Scree plot indicated that factor solutions for 1 to 4 factors might be tenable. However, only the one-factor model (i.e. tinnitus adaptation) could parsimoniously explain the item data. Most of the TRS-acceptance items (except the item "I leave situations because I cannot tolerate my tinnitus noise") and all of the habituation items loaded onto a single factor, tinnitus adaptation, which explained 40.2% of the item variance, see Table 1 for factor loadings of the different items. That is, all but one of the items loaded strongly onto factor 1, with many cross-loadings around .3 or below on factors 2-4. The correlation between the TRS-acceptance items and a subscale comprised of the 19 habituation items was shown to be high (r = .81).

Table 1. Factor Loading for Items on a Tinnitus Habituation Scale.

Item	Factor loading
I do hear the tinnitus noise and it does not bother me	.786
When I become aware of the tinnitus noise my awareness of it soon passes	.728
I am so used to my tinnitus noise I hardly notice it	.717
It is difficult to accept my tinnitus noise	-.712
I can usually hear the tinnitus noise, and it does not bother me.	.707
I simply let my tinnitus noise be there in the background	.690
I can enjoy peace and quiet and hear the tinnitus noise.	.662
It is difficult to accept that I will always have tinnitus	-.648
I willingly accept the presence of my tinnitus noise	.646
I do not need to suppress or block out the tinnitus noise	.634
I am used to the tinnitus noise and it no longer bothers me	.618
Often I do not notice my tinnitus noise even though it is there to be heard	.612
When I became aware of the tinnitus noise, I simply notice it	.607
As to my tinnitus, what will be will be	.597
Despite the tinnitus noise, I concentrate on tasks I'm doing without needing effort or will	.589
I can readily sleep in a quiet room	.569
When I work in a quiet place it takes effort to maintain concentration, because of the tinnitus noise	-.568
I am always monitoring my tinnitus noise	-.516
Tinnitus noise does not intrude when I am working	.504

DISCUSSION

Habituation is central to our current understanding of tinnitus adaptation[14,24] and it is the basis of most of the evidence-based treatments for chronic tinnitus[25,26]. Nonetheless, mindfulness-or acceptance-based tinnitus treatments have recently been shown to be effective[21,22], and possibly more effective than habituation-based treatments (e.g. tinnitus retraining therapy)[27]. However, as detailed below, tinnitus habituation and acceptance are likely to be related and overlapping processes. Thus, there may be some synergy or complementarity between the two treatments, although such a premise has yet to be evaluated.

In this study, we evaluated the premise that tinnitus habituation and tinnitus acceptance are overlapping processes that represent different aspects of the larger tinnitus adaptation process. First, both processes describe a state of non-reactivity to tinnitus noise that may lead to a lessening of the contingency between tinnitus noise and habitual distress[15,19,20]. However, tinnitus habituation involves an automatic, subconscious, and unintentional shift of attention away from the noise (i.e. perceptual/behavioural component)[8], whereas tinnitus acceptance involves a willingness to experience tinnitus noise and at the same time direct attention towards a valued activity, despite an awareness of the noise (i.e. psychological component)[15], although no prior studies have explicitly evaluated this premise.

To evaluate this premise, we conducted an EFA on the seven acceptance items from the 24-item TRS[15] and 19 habituation items from an early 87-item version of the TRS. This analysis showed that all but one of the scale

items loaded strongly onto a single factor (i.e. tinnitus adaptation), explaining 40% of the variance in the scale items. Other factor solutions were not tenable. That is, tinnitus habituation and acceptance items both loaded onto a single factor that described the processes of tinnitus habituation/sensitization and tinnitus acceptance. Further, the seven-item TRS-24 acceptance subscale and the 19 habituation items were very highly correlated with each other.

Taken together, the results suggest that tinnitus habituation and acceptance items tapped different but related aspects of the tinnitus adaptation process. Specifically, tinnitus habituation/sensitization items tapped perceptual awareness and behavioral responding to the noise, whereas tinnitus acceptance items tapped the cognitive response to tinnitus which involved a lack of need to respond behaviorally or emotionally to the noise[15]. Such an interpretation is consistent with Jastreboff & Hazell's[14] assertion that tinnitus adaptation occurs at both the perceptual (e.g. habituation *vs.* sensitization) and psychological response levels (i.e. limbic-emotional and autonomic nervous system, e.g. tinnitus acceptance).

This interpretation is also consistent with the current understanding of tinnitus habituation as an automatic, effortless, subconscious, and unintentional shift of attention away from tinnitus noise with each new episode of tinnitus awareness[14,17], whereas tinnitus acceptance involves the recognition of the noise, non-reactivity to it, and the effortless ability to shift attention towards a valued activity or focal point[15]. With regards to timing, tinnitus acceptance cognitions might be expected to enable a person with chronic tinnitus to adopt a non-judgmental and neutral regard for the noise, which can then facilitate their habituation to the noise. That is, tinnitus acceptance may represent the cognitive response that precedes, underpins or facilitates the automatic perceptual/behavioural processing of tinnitus noise (i.e. tinnitus habituation), although such a premise has yet to be tested empirically in a longitudinal study.

Finally, with regards to clinical implications, the study results may indicate that there is some merit in examining for potential synergy between the tinnitus habituation and tinnitus acceptance treatments. That is, tinnitus habituation and acceptance appear to be similar and potentially complementary processes of tinnitus adaptation. Thus, any overlap between the two processes might be exploited to enhance the efficacy of the two tinnitus treatments. However, mindfulness-based tinnitus treatments may already include an implicit focus on tinnitus habituation processes, albeit involving the cognitive aspects of this adaptation process.

Given several limitations, the study results should be interpreted with some caution. First, audiological characteristics of the sample were not obtained just self-reports of their clinical condition. Second, as previously described[15], clinical, demographic and psychological data from this sample indicates that the participants were less distressed than tinnitus sufferers in other studies[23,28,29], although they did have similar tinnitus characteristics[7,30,31]. Third, survey-based approaches have not previously been used to evaluate tinnitus habituation. Thus, it is possible that this approach failed to capture the automatic behavioural experiences of tinnitus habituation that were beyond conscious recall or the understanding of the tinnitus sufferer. Finally, the results were only cross-sectional in nature therefore precluding any causal inferences being drawn.

CONCLUSION

An exploratory factor analysis indicated that seven tinnitus acceptance items from the Tinnitus Response Scales[15] and 19 additional tinnitus habituation items all loaded onto a single tinnitus adaptation factor. The tinnitus habituation items captured participant's perceptual/behavioural response to the tinnitus (i.e. habituation *vs.* sensitization), whereas tinnitus acceptance tapped cognitive responses to the noise. The two sets of items were highly negatively correlated with each other. Taken together, the results suggest that tinnitus adaptation is comprised of a cognitive component (i.e. tinnitus acceptance *vs.* non-acceptance) and a perceptual/behavioural component (i.e. tinnitus habituation *vs.* sensitization). Given the conceptual overlap between the two processes, these results may indicate that there is some merit in testing for possible synergy between habitation- and acceptance-based therapies for the treatment of problem tinnitus.

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