


# What Has EMDR Taught Us About the Psychological Characteristics of Tinnitus Patients?

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Tinnitus is a common and distressing symptom affecting at least 10% of the population. It is poorly understood. There are many proposed therapies but a significant lack of well-controlled trials. This study is a secondary analysis from our recent study to determine the effectiveness of eye movement desensitization and reprocessing (EMDR) therapy as a treatment for tinnitus. It was designed as a single-site prospective interventional clinical trial and took place at a teaching hospital in the United Kingdom. Participants received a maximum of 10 sessions of EMDR. The EMDR used was a bespoke protocol: EMDR-for-tinnitus protocol (tEMDR). Outcome measures included evidence-based tinnitus and mood questionnaires recorded at baseline, discharge, and at 6 months post-discharge. The main outcome measure was the Tinnitus Handicap Inventory, and scores demonstrated a statistically significant improvement. Secondary analyses conducted indicate statistically significant improvement for tinnitus patients with and without probable posttraumatic stress disorder (PTSD) diagnoses. There was no significant decrease in depression and anxiety measures, however these were at the minimal range at the start. The purpose of this article is to describe the rationale behind the use of EMDR in tinnitus, the process of administering a bespoke EMDR protocol, and the differences between tinnitus sufferers with differing experiences of trauma. To date our study is one of only two published studies investigating the use of EMDR for tinnitus; we therefore introduce an evolving and exciting application for EMDR therapy.

**Keywords:** EMDR; tinnitus; trauma; psychological mechanisms

**E**ye movement desensitization and reprocessing (EMDR) therapy is widely recognized as a treatment for posttraumatic stress disorder (PTSD; e.g., International Society for Traumatic Stress Studies [ISTSS], 2019). It is also used for many other disorders, including the treatment of pain (Tesarz et al. (2019)), and there are several studies showing that it is helpful for health-related anxieties. Two studies (Phillips et al., 2019; Rikkert et al., 2018) provide preliminary evidence that it may be helpful in the treatment of tinnitus. The current article examines the role of traumatic memories in treating tinnitus with EMDR therapy, by conducting a secondary analysis of data collected in an original study (Phillips et al., 2019).

## Tinnitus

Tinnitus is the perception of sound in the absence of an external source. According to the British Tinnitus Association (2020), one in eight of the U.K. population experience this phantom sensation. Despite its prevalence, tinnitus remains poorly understood and challenging to treat. The distress associated with experiencing tinnitus appears to be less related to its particular sound, loudness, pitch, or frequency, and more so to the psychological and behavioral appraisals and responses to it (Andersson & Westin, 2008; Cima et al., 2011; McKenna et al., 2014). Psychological effects vary considerably among tinnitus sufferers, with some

experiencing mild distress and others experiencing incapacitating effects. Similarly, psychological symptoms vary greatly between individuals, with sufferers experiencing a reduced quality of life as a consequence of a combination of depression, anxiety, insomnia, and/or irritable mood. Severe tinnitus may lead to suicidal ideation in some individuals.

## Causes

In the United Kingdom, in some cases a sufferer may report the symptom to their family physician and a clinical exam of the ears and neurological system will be undertaken. In other cases, a sufferer may be referred to an ear, nose, and throat specialist; in this case a more detailed examination would be carried out, including hearing testing. Further investigations such as magnetic resonance imaging (MRI) may occasionally be indicated. There is a strong association between hearing loss and tinnitus. As such the investigation and treatment of any associated hearing loss is considered to be essential. In addition to causes such as age-related hearing loss and noise-induced hearing loss, Meniere's disease, head injury, ear infections, and the effects of ototoxic medication can also contribute to the perception of tinnitus.

## Treatment

Treatment involves addressing any underlying cause, and involves the fitting of a hearing aid when an associated hearing loss is identified. If simple treatments cannot reduce or eliminate the tinnitus, then the focus shifts to therapeutic techniques to decrease the intrusiveness of the sound and to reduce the patient's emotional distress. Further treatment options include the provision of sound-masking systems and/or the provision of information, signposting to support groups, and cognitive behavioral therapy (CBT) to lessen the distress caused by the tinnitus (Tunkel et al., 2014). CBT typically guides the patient to identify and challenge tinnitus-related thoughts, behaviors, and perceptions that are deemed problematic and unhelpful (McKenna et al., 2014). The evidence supports CBT as a moderately effective treatment for the distress associated with tinnitus (Cima et al., 2014). However, there has been insufficient reporting on dropout rates by most trials of CBT with tinnitus (Cima et al., 2014), and high dropout rates reported: for example, as high as 51% for Internet-delivered CBT for tinnitus (Andersson et al., 2002). Often patients need to undergo a stepped-care approach to become eligible for CBT,

which involves completing less intense forms of interventions for tinnitus before they are eligible for the CBT. These problems highlight a need for alternative psychological treatments (Cima et al., 2014). Some patients might try antidepressants due to the impact of tinnitus on their mood and lives, although there is currently no effective drug treatment available to solely treat tinnitus.

## EMDR Therapy

EMDR therapy (Shapiro, 2018) is an empirically supported therapy for a growing group of conditions. EMDR is one of the two psychological treatments for PTSD endorsed by the World Health Organization (WHO, 2013), as well as being awarded a strong recommendation for the treatment of PTSD in adults and children in the ISTSS 2019 PTSD guidelines.

EMDR is a "three-pronged intervention" that targets past trauma experiences, present triggers, and future possible challenges (Shapiro, 2001). With EMDR, the treatment aims to reduce any disturbance associated with painful past memories, alleviate present symptoms, improve self views, and address present and future anticipated triggers. The theoretical model that underpins EMDR, adaptive information processing (AIP), emphasizes the central role of the physiological information processing system in the origin and treatment of persistent symptoms. Symptoms and pathology are theorized to stem from the emotions and physical sensations driven by unprocessed trauma memories (Shapiro, 2001).

## EMDR and Tinnitus

In making forward steps toward an effective alternative to the existing tinnitus treatments, EMDR was identified as a putative candidate for tinnitus amelioration for several reasons. Tinnitus has long been conceptualized as a form of phantom auditory perception, similarities have been observed between patients with chronic tinnitus and those with chronic pain (Eggermont, Roberts, 2014; Sedley et al., 2016), and EMDR has proved useful in treating pain conditions (reviewed in Tesarz et al., 2019). A separate line of evidence suggests that trauma experiences can play an important role in chronic tinnitus (Fagelson, 2007; Fagelson & Smith, 2016).

Hypothesized explanations unique to unprocessed traumas and to Medically Unexplained Symptoms (MUS) conditions (Van Rood & De Roos, 2009) could be extended to understand the theoretical relevance of EMDR to tinnitus. Naturally, if tinnitus originated

in a trauma event that has not been adequately processed in memory, then experiences that are reminiscent of that event are likely to elicit reminders of the original trauma and the sensations of tinnitus experienced at the time. This link has been termed a physical reexperience (Van der Kolk & Fisler, 1995). An additional explanation concerns what EMDR terms “negative cognitions,” defined as negative, presently held beliefs that originated from the trauma memory. These cognitions typically fall under the four categories or thematic domains of choice and control, self-defectiveness, responsibility, and safety. One’s negative belief about the meaning of having tinnitus (e.g., “I’m not in control”) might have a thematic link with a past, potentially unrelated traumatic experience (e.g., being the victim of violence). In this second explanation, we might consider the trauma event in which the tinnitus started, or an unrelated trauma that shares the same belief about the self. In this cognitive and emotional reexperience (Van Rood & Visser, 2008), tinnitus may be maintained by the posttraumatic stress triggered by the trauma memory, as well as by unintentionally unhelpful coping strategies (e.g., experiential avoidance) that are employed in attempts to cope with the tinnitus. If so, successful resolution of the unprocessed trauma memory could lead to a reduction in the intensity of the tinnitus in the case of a physical reexperience, or to a reduction of stress coupled with initiating new and more effective coping, in the case of cognitive and emotional reexperiencing.

**Possible Treatment Targets.** What about tinnitus clients for whom tinnitus is unrelated to trauma, or those who had never experienced a traumatic event? Exposure to trauma is common; WHO recently released an extensive survey reporting that seven out of 10 people will have experienced at least one trauma during their life (Kessler et al., 2017) and higher figures of nearly nine of 10 had been reported in the United States (Kilpatrick et al., 2013). While to the best of our knowledge there has not been an evaluation of trauma exposure in tinnitus patients in particular, a reasonable expectation would be that, as in the earlier figures, some would have experienced no trauma whatsoever. The question bears then, whether and how might EMDR be applied with this non-trauma subgroup of tinnitus clients?

In line with the proposed theoretical underpinning and putative links connecting tinnitus with trauma, and drawing on the work by De Roos and Veenstra (2009) on EMDR with chronic pain, three types of

targets could be of relevance in EMDR for tinnitus. The first is a traumatic memory that is connected in one of the two proposed connecting routes to the tinnitus (i.e., physical or cognitive and emotional reexperience). The second is a bodily symptom-related memory: a present emotionally distressing memory connected with traumatic experiences or consequences related to tinnitus (e.g., waking up to the loudness of tinnitus in the morning, feeling incompetent at a dinner party as tinnitus makes it challenging to join in with conversations). The last target is a current bodily symptom, such as the in-session experience of the tinnitus. The second and third target types would be suitable for tinnitus patients with no trauma experience.

**Research on EMDR Treatment of Tinnitus.** A recent pilot study from the Netherlands showed favorable outcomes for the application of the standard EMDR protocol to tinnitus patients’ traumas (Rikkert et al., 2018). In this trial, 35 patients with chronic tinnitus initially waited for 3 months (the “waitlist” period) and then underwent six EMDR sessions of 90 minutes duration. The EMDR treatment followed the standard EMDR protocol and focused on “disturbing tinnitus-related aversive memories and, when present, intrusive images related to other traumatic experiences that directly evoked feelings of powerlessness” (Rikkert et al., 2018). The final therapy session was used to process current tinnitus sensations. Results comparing patients at the end of treatment and at 3 months follow-up with their own pretreatment scores showed significant reductions in tinnitus distress as measured with the Tinnitus Functional Index and the Mini-Tinnitus Questionnaire. There was also improvement in general psychological distress as measured with the Symptom Checklist-90.

Seeing these favorable conditions, a feasibility study on the treatment of tinnitus with a bespoke EMDR-for-tinnitus protocol (tEMDR) was carried out by the authors of this article (Phillips et al., 2019). Findings showed significant improvement on the Tinnitus Handicap Inventory (THI) and Beck Depression Inventory (BDI) at discharge and at 6 months post-discharge for 14 participants with tinnitus. A detailed description of this study follows in the Method section. The data from this original study were used in the current study, which is a secondary analysis to focus on the delivery of EMDR with tinnitus patients and answer the question, “What has EMDR taught us about tinnitus?”

## The Original Study

The original study (Phillips et al., 2019) was a feasibility study with the main purpose to explore the acceptability of EMDR for tinnitus and to ensure the protocol was effective. The bespoke study protocol was developed specifically for patients experiencing tinnitus (tEMDR) for the purposes of this study. It was designed to be purposefully inclusive of a diverse range of tinnitus patients. Given the similarities between tinnitus and pain conditions, our *a priori* expectation had been that EMDR for clients with tinnitus could target tinnitus-related trauma memories (the physical reexperience or cognitive and emotional reexperience described earlier) and/or the current tinnitus symptoms and symptom-related memories (as in De Roos and Veenstra, 2009). Hence, the tEMDR protocol amalgamated the standard EMDR (Shapiro, 2001) and the EMDR for pain (Grant, 2000) protocols. The pain protocol is essentially similar in structure and components to the standard protocol, but offers cognitive interventions for the EMDR therapist, called Cognitive Interweaves, uniquely suited to a pain target.

### Participants

Study participation was offered to patients treated at Norfolk and Norwich University Hospital NHS Foundation Trust. Inclusion criteria were: (a) adults aged 18 years and over with capacity to consent; (b) "subjective idiopathic tinnitus," specifically "chronic decompensated tinnitus" and a THI score of 38 to 100; (c) tinnitus for longer than 6 months duration; and (d) prepared to commit to a full course of EMDR therapy. Exclusion criteria were: (a) ongoing and severe mental health problems (current treatment from secondary care mental health services); and (b) difficulty communicating in English.

### Outcome Measurements

The primary study outcome measure was the THI (Newman et al., 1996) score. This 25-item inventory uses a 3-point Likert scale (0 = no, 2 = sometimes, 4 = yes) to measure cognitive, emotional, and social impairments arising from tinnitus. An example of an item is, "Does your tinnitus make it difficult for you to enjoy life?" Scores range from 0 to 100 and indicate the level of handicap: 0–16 no/slight; 18–36 mild; 38–56 moderate; 58–76 severe; 78–100 catastrophic. Other measures included the BDI-II (Beck et al., 1996), the Beck Anxiety Inventory (BAI; Beck et al., 1988), and the Posttraumatic Diagnostic Scale (PDS; Foa et al., 1997). The BDI-II is a 21-item self-report measure of

depression severity that assesses the severity of depressive symptoms over the previous week. Each item is scored on a 4-point Likert scale. Scores range from 0 to 63: 0–13 minimal depression; 14–19 mild depression; 20–28 moderate depression; 29–63 severe depression. The BAI is a 21-item self-report measure of anxiety severity that assesses the severity of anxiety symptoms over the previous week. Items are scored on a 4-point Likert scale (0 = not at all to 3 = severely). Scores range from 0 to 63: 0–7 minimal anxiety; 8–15 mild anxiety; 16–25 moderate anxiety; 26–63 severe anxiety. The PDS is a 17-item self-report measure that includes a trauma checklist and a self-report assessment of all PTSD criteria outlined in the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (*DSM-IV*). PDS scores can be used to obtain a preliminary determination of *DSM-IV* PTSD diagnosis. Items denote symptoms of PTSD and are scored on a 4-point Likert scale (0 = not at all to 3 = very much) over a period of the previous month. A symptom is considered present if it is scored as 1 or higher. These symptom scores are added to provide a severity score. An indicated exposure to a trauma event on the trauma checklist, plus an overall score of 15 or over that includes at least one reexperiencing symptom, three avoidance symptoms, and two arousal symptoms, as well as clinically significant distress, is altogether considered as a positive screen for PTSD. The PDS was found to be comparable to clinician-rated measures of PTSD and showed high internal consistency (Cronbach's  $\alpha = .92$ ) and test-retest reliability ( $\kappa = .74$  for PTSD diagnosis;  $\kappa = .83$  for total PDS score).

Outcome measures were administered by a dedicated research nurse. The PDS was administered only at pre-intervention assessment (T0). The THI questionnaire was completed at consent (T0), before the first EMDR session (on the day of the EMDR session), and then before every subsequent EMDR session began (on the day of the EMDR session) for up to a maximum of 10 EMDR sessions, at discharge (T1), and then at 6 months post-discharge (T2). This provided a maximum of 13 data points for the THI. The BDI and BAI were administered at T0, at discharge (T1), and at 6 months post-discharge (T2).

### Procedure

According to the study protocol, each potential study participant was initially provided with a verbal and written explanation of the rationale behind the use of EMDR therapy for tinnitus. Those who then chose to

participate were invited to complete the pre-trial measures with a research nurse. Next, tEMDR began with an initial assessment session, consisting of history-taking to identify relevant past trauma memories and current conditions associated with tinnitus distress, case formulation, and treatment planning. The assessment session concluded with psycho-education about EMDR therapy and the AIP theoretical model of EMDR. Finally, a self-soothing resource was created and practiced. Following this initial meeting, each participant was offered up to 10 further sessions of tEMDR therapy, lasting 60 minutes each. tEMDR therapy sessions occurred regularly with a frequency of once every 1 to 2 weeks. The tEMDR was administered by a clinical psychologist, accredited as an EMDR practitioner, and was regularly discussed in clinical supervision with an EMDR consultant-supervisor who was independent of the study.

For participants who identified past trauma(s) related to tinnitus, the initial session(s) out of the allotted 10 focused on processing the trauma memory using the standard EMDR protocol. Past traumas which were unrelated to tinnitus were not addressed. In the occasion that an unexpected link between the tinnitus and a past trauma emerged, here too the standard protocol was used to process the trauma and clear the past disturbance prior to proceeding to the present tinnitus difficulties. Once the past tinnitus-related trauma(s) had been processed, and for those participants who did not have past trauma that related to their tinnitus, the remaining treatment sessions used the tEMDR protocol.

**The tEMDR Protocol.** The tEMDR protocol for target processing started with asking the study participant to create a description of their tinnitus that includes (a) an image or a felt sense that represents the study participant's tinnitus experiences, "How does the tinnitus feel in the your body?" or, asking the patient to "Draw a picture in your mind of what the tinnitus feels like," (b) obtaining a negative, self-referencing belief in relation to the tinnitus experiences, "When you think about your tinnitus, what negative thoughts go with that?" (c) a preferred, positive self-belief, (d) the (usually negative/undesirable) emotions associated with the tinnitus, and (e) the bodily sensations associated with the tinnitus experiences. Subjective ratings of disturbance (SUDS) termed as "how bad" the tinnitus is currently felt (ranging from 0 = neutral/no distress to 10 = bad/most distressing) as well as rating "how true it (i.e., the positive belief) currently feels" on a 1–7 Likert scale (ranging

from 1 = perceiving the belief as completely false to 7 = seeing the belief as completely true) were recorded to monitor progress during each session. Following this set of stages, the desensitization phase began with one of two forms of bilateral stimulation (BLS)—bilateral eye movements or handheld pulsators for bilateral tactile stimulation—subject to the study participant's preference. The participant was initially invited to focus on the chosen image or felt sense and related feelings, negative belief, and body sensations while simultaneously focusing on the chosen mode of BLS given by the therapist. After each such set of BLS, a brief pause allowed the participant the space to share any insights or new awareness that emerged. Generally, these insights—whether cognitive, emotional, or physical—became the initial focus of the next set of bilateral attention. This sequence continued until the distress associated with the initial target (i.e., the SUDS rating) reduced to 3 or less. Additional, shorter sets of BLS were then repeatedly employed while the participant considered the positive identified self-belief together with the current tinnitus experience, to the point that the positive version felt "true." In participants who spontaneously identified a new experience that has come to replace the tinnitus-related distress, the novel experience too was paired with short sets of BLS, to strengthen this adaptive inner shift. If there was no change after three attempts of BLS, and a change of direction/speed/length of BLS was insufficient to get "unstuck," a further adaptation had been to then offer either of two cognitive interweaves: "If the tinnitus could speak, what would it be saying?" and "What's stopping the tinnitus from changing?" During the installation phase, an adaptation of the pain protocol was to ask questions to build resources out of change. The questions asked were, "What's come in place of the tinnitus?" and/ or "What's there now where the tinnitus was before?" Responses were then installed with a cue word and BLS.

If the processing of the target trauma or tinnitus sensation was not completed within the session, that is, in cases in which the SUD score remained elevated, the final 5–10 minutes of the session were used for the participant to reflect on the session, identify any insights, and make use of the individualized self-soothing resource to promote calmness and containment. The next session, whether it followed a session in which the target was completely processed or not, began with a check of the participant's current perception of their tinnitus. Identified positives would be made into a psychological resource, with a cue word

and a slow set of BLS used to strengthen this. If the previous session was incomplete, there would then be a focus on the previous session material and a further processing of the same target.

### Results of the Original Study

The median number of EMDR sessions undertaken by the participants was nine sessions (IQ range of 7–10 sessions). THI scores were significantly improved at discharge with a median improvement of 20 points (IQ: 16–35;  $p = .0005$ ). BDI scores improved as well with a median improvement of 7 points at discharge (IQ: 0–11;  $p = .0098$ ). For both THI and BDI the improvements were maintained at the 6-month follow-up (T2). BAI scores were not significantly improved at discharge and at the 6-month follow-up. No adverse events were reported.

### The Current Investigation

The current investigation is a secondary analysis of existing data from our original study (Phillips et al., 2019). Data from the 14 patients who completed the original study were analyzed to examine if there were differences in treatment response according to whether participants had a probable PTSD diagnosis.

For the purpose of the current analyses, we derived PTSD scores from the PDS administered at baseline. Two groups were identified: Pathway 1—Tinnitus and probable PTSD; Pathway 2—Tinnitus with past trauma(s) but no PTSD, and tinnitus with no trauma. The tinnitus with past trauma were those who, on the PDS, indicated at least one past trauma in Part 1 of the PDS (questions 1–12), but whose endorsed symptoms on the PDS were not suggestive of a PTSD diagnosis. The tinnitus with no trauma were those who did not indicate any trauma at all in Part 1 of the PDS.

### Statistical Analyses

Descriptive statistics were reported for all variables at baseline. For the primary and secondary outcome variables, descriptive statistics were reported for the change from baseline for their respective recorded time points. A Wilcoxon matched-pairs signed rank test was also performed to test for differences in the changes from baseline. All analyses were carried out using SAS statistical software version 9.4 (SAS Institute, Cary, NC).

## Results

### PDS Scores and Two Pathways

The examination of PDS scores at T0 found that seven of the participants (Pathway 1) endorsed a criterion. A traumatic event and had a symptom profile suggestive of PTSD diagnosis. Another four participants identified a traumatic experience but their symptom profile was not indicative of PTSD, and another three participants did not endorse any traumatic experience. These seven participants constitute Pathway 2.

### Changes to THI Scores

With regard to the discharge (T1) THI scores, Pathway 1 ( $N = 7$ ) had a median improvement of 20 points (IQ: 16–35); this was a statistically significant improvement ( $p = .0313$ ). Pathway 2 ( $N = 7$ ) also had a median improvement in THI at discharge of 20 points (IQ: 11–38); this was a statistically significant improvement ( $p = .0156$ ). For the 6-month follow-up, there was further improvement for Pathway 1 of 26 points from pre-treatment (IQ: 20–35); this was statistically significant  $p = .0313$ . For Pathway 2, THI scores were slightly reduced, 15 (IQ: 6–28), but this was not statistically significant (Table 1).

### Descriptive Statistics

**TABLE 1. Pathway 1 and 2 Results**

Outcome	Pathway	
	1 <i>N</i> = Median (IQ)	2 (2 and 3) <i>N</i> = Median (IQ)
THI		
T0	<i>N</i> = 7 60 (55–69)	<i>N</i> = 7 65 (43–84)
T1	<i>N</i> = 7 37 (32–54)	<i>N</i> = 7 38 (3449)
T6	<i>N</i> = 7 35 (30–46)	<i>N</i> = 7 46 (33–58)
BDI		
T0	<i>N</i> = 7 14 (4–17)	<i>N</i> = 7 12 (8–19)
T1	<i>N</i> = 7 8 (0–9)	<i>N</i> = 7 5 (1–13)
T6	<i>N</i> = 7 4 (0–8)	<i>N</i> = 7 9 (2–14)
BAI		
T0	<i>N</i> = 4 7 (1.5–18)	<i>N</i> = 3 6 (4–10)
T1	<i>N</i> = 3 7 (3–11)	<i>N</i> = 3 2 (1–8)
T6	<i>N</i> = 4 5.5 (2–7.5)	<i>N</i> = 2 6.5 (3–10)

*Note.* BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; THI = Tinnitus Handicap Inventory.

**TABLE 2. Entire Sample**

	Mean (SD)			
Age	57 (12.4)			
Gender				
Female	7 (50%)			
Male	7 (50%)			
Outcome	Median (IQ)	Decrease from T0	P-value <sup>a</sup>	Percentage greater than 20-point decrease
THI				
T0	62.5 (54 to 72)			
T1	37.5 (34 to 49)	20 (16 to 35)	0.0005	8 (57.1%) 17% to 71%
T6	38.5 (32 to 46)	24 (11 to 30)	0.0009	9 (64.3%) 11% to 61%
BDI				
T0	13.5 (7.5 to 18.5)			
T1	6.5 (1.0 to 11.0)	7.0 (0 to 11)	0.0098	
T6	6.0 (1.0 to 13.0)	6.5 (0 to 10)	0.0054	
BAI				
T0	6 (2 to 12)			
T1	5 (2 to 8)	3.5 (2 to 5)	0.0625	
T6	5.5 (3.0 to 8.0)	1.5 (0 to 4)	0.3125	

**Note.** BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; THI = Tinnitus Handicap Inventory.

<sup>a</sup>Wilcoxon signed rank test.

## Depression and Anxiety Scores

The participants in this study did not endorse high levels of depression or anxiety. At baseline, the median score on the BDI-II for the entire sample was 13.5 (IQR = 7.5–18.5), which is in the minimal range. At discharge, Pathway 1 ( $N = 7$ ) and Pathway 2 ( $N = 7$ ) had similar improvements of 7 points (IQ: –4 to 11) and 5 points (0–18) respectively. Both these improvements were not statistically significant ( $p = .125$  and  $p = .0625$  respectively). For the 6-month follow-up, similar results were observed: Pathway 1 and Pathway 2 had similar improvements of 7 points (IQ: 0–15) and 6 points (0–10), but again both results were not statistically significant (Table 2).

With the BAI scores, Pathway 1 ( $N = 3$ ) had a median score of 5 points (IQ: –1 to 13) at discharge and 3 (IQ: –0.5 to 10.5) at the 6-months follow, and Pathway 2 ( $N = 3$ ) had a median score of 3 points (IQ: 2–4) at discharge and 0.5 (IQ: 0–1) at the 6-months follow. These scores are all within the minimal anxiety range, however the groups were too small to conduct a meaningful analysis.

## Negative Cognitions

A count of the negative cognitions reported by the sample indicated cognitions pertaining to two of the four possible domains: choice and control, and self-defectiveness. Most participants endorsed negative cognitions in both domains.

## Discussion

Our original study (Phillips et al., 2019) was the first study to offer a bespoke EMDR protocol to patients with tinnitus. To our knowledge there is only one other completed study regarding EMDR and tinnitus (Rikkert et al., 2018). The findings of our original study (Phillips et al., 2019) were consistent with Rikkert et al.'s work in which EMDR reduced tinnitus-related distress in patients with chronic tinnitus (Rikkert et al., 2018).

## Tinnitus and PTSD Symptoms

Our results show a meaningful improvement in tinnitus for participants with and without, clinically

significant PTSD symptoms. These gains were maintained at 6-months follow-up in the subgroup of participants with clinically significant PTSD symptoms. What psychological processes may have led to the observed improvements? One explanation could be that the experience of the tinnitus had taken participants to the unresolved trauma, either via a physical reexperience or a cognitive and emotional reexperience (Van Rood & De Roos, 2009). The resolution of the past trauma appeared to have enabled a change in the experience of the tinnitus in the present. Interestingly, all of the study participants had the initial assumption that tinnitus was the problem. The introduction of EMDR and the AIP model offered an opportunity to reformulate the problem: seeing the connection between the tinnitus and the earlier trauma, and thus, the rationale and need to treat the trauma memory first. With the trauma resolved, participants were then available to focus on the current tinnitus symptoms or symptom-related memories and to process any unhelpful coping strategies using EMDR.

Our findings, as well as Rikkert et al.'s (2018), suggest possible preliminary evidence for the traumatological aspect for some presentations of tinnitus. Likewise, in a comprehensive review of studies on the treatment of a similar group of patients, those with MUS, EMDR was identified as potentially useful "on the condition that the MUS is trauma related" (Van Rood & De Roos, 2009). It is thought that treatments aimed at processing unresolved trauma and bodily symptom-related memories may lead to improvements of the physical symptom by lessening the affective dimension of these memories, or by promoting an integration of the somatic memory components (Tesarz et al., 2014; Van Rood & De Roos, 2009). We suggest that this explanation could also account for the reduction in tinnitus distress after EMDR.

Our study found significant improvements with regard to tinnitus distress in participants who experienced trauma(s) but did not develop PTSD, and in participants with no trauma exposure. It seems that the focus in tEMDR on the present experiences of one's tinnitus is an important component of the therapy when applied to tinnitus. This is an exciting finding as it suggests that EMDR may offer symptom relief for tinnitus sufferers across the board.

### Possible Mechanisms of Action

The observed improvements could be related to the hypothesis that EMDR works by taxing working

memory (WM). When we engage in two simultaneous tasks that tax our WM, the tasks in effect compete for limited capacity available in WM (Baddeley, 1998). Mentally focusing on an emotional memory or on the current sensations of one's tinnitus while making eye movements (or, we might claim, while attending to tactile bilateral stimuli) both make demands on WM. Thus, adhering to a bilateral stimulus and focusing on one's trauma memory or the tinnitus is hypothesized to leave less capacity for the latter two. The memory of the tinnitus-related past trauma, much like in the case of ordinary trauma memories, is stored back in memory less vividly (Andrade et al. 1997). The focus on the bilateral stimulus may also reduce tinnitus in the moment by loading on WM. EMDR also contains additional pain-relief therapeutic elements that are not specific to EMDR, such as relaxation, hypnotic techniques, improved coping abilities, and, of course, exposure (Bergmann, 2010; Grant & Threlfo, 2002). The in-session exposure to tinnitus while feeling safe was reported by some participants to enable them to "develop a different relationship with the tinnitus," which resulted in observable reduction of distress and improved confidence about living with tinnitus.

It is of interest to note the rate of probable PTSD diagnosis in our sample of 50%, among those who completed the trial. This rate stands in somewhat of a contrast to the 9% reported in a trial of EMDR for tinnitus in the Netherlands (Rikkert et al., 2018), as well as with the PTSD rate of 24% in patients with MUS (Van Rood & De Roos, 2009). It is possible that the similarities between some tinnitus symptoms and PTSD, such as exaggerated startle response (Fagelson, 2007), confounded the PDS scores. The dissimilar rates may also reflect a different reality for tinnitus patients in the United Kingdom or, in part, the mere use of different PTSD assessment methods across these trials. Unlike comparatively more-stringent exclusion criteria, the inclusive nature of this study and the higher rates of PTSD captured suggest potentially higher PTSD rates in tinnitus patients than those previously reported. In line with the observed improvements with EMDR in those with both tinnitus and PTSD, this highlights a need for a multidisciplinary team approach in the treatment of tinnitus moving forward.

### Negative Cognitions

The negative cognitions reported by the participants, and the thematic domains into which they are distributed, are unusual when compared with standard EMDR. Namely, participants with tinnitus described negative cognitions pertaining to perceived



self-defectiveness and/or perceived lack of choice and control. Most participants shifted between the two domains. Thus, during the trauma-related and/or current tinnitus distress reprocessing, we had seen shifts in the intensity of the negative cognitions as well shifts into different thematic domains. One way of interpreting these findings would be that with EMDR, the story of the self changes. For instance, as earlier networks regarding the perception of the self as defective or faulty are processed, there is a reexamination of the impact of living with tinnitus and realizing one's lack of choice and control.

The impression from clinical observation of participants in this trial is that choice and control played the most significant role in maintaining negative beliefs about the self in tinnitus. To date, there has been little research specifically on beliefs relating to tinnitus (McKenna et al., 2014). Personal control was reported to be a significant predictor of tinnitus discomfort (Scott et al., 1990). Having positive beliefs about perceived control over one's own health was associated, in people with tinnitus, with less depression and a greater sense of well-being. Beliefs about control were predictive of adjustment irrespective of tinnitus severity, suggesting that beliefs about personal control are not exclusive to people with milder tinnitus (Sirois et al., 2006). A significant association was also observed between locus of control, tinnitus severity, and emotional distress (Budd & Pugh, 1995); help-seeking in tinnitus was linked with a greater external locus of control, compared with those less prone to seek help for tinnitus (Attias et al., 1995). Clearly, our results highlight that in taking a trauma approach to tinnitus, choice and control, as well as a perceived self-defect, play a crucial role in the maintenance of the distress associated with tinnitus.

### Relationship Between SUD and THI Scores

Perhaps a surprising finding of the study was that THI and SUDS were not associated. In other words, asking either "how distressing/disturbing" the memory feels during tinnitus-related trauma processing or "how bad is the tinnitus" during present focus tinnitus processing did not shift in line with self-reported changes in tinnitus distress. We could tentatively deduce that changes in SUDS do not necessarily reflect changes in tinnitus severity. A matching clinical observation during the trial had been that many participants reported the tinnitus as particularly "bad," for instance, especially noisy, but with minimal distress because EMDR had enabled a shift in tinnitus. Therefore, it might be

that the mere wording of "how bad is the tinnitus" in tEMDR, which follows from the EMDR pain protocol (Grant, 2000), merits adaptation. Asking participants how much their tinnitus "gets in the way," "annoys," "bothers," or yet a different adjective that predominates for the individual, might capture change better and more meaningfully. This could be a direction for future research.

### BDI and BAI Scores

The original study (Phillips et al., 2019) reported significant improvement in BDI scores for the full sample at discharge, with results maintained at follow-up. When the sample was broken into the two subgroups, the significant effect disappeared and BDI and BAI scores did not significantly improve for the two pathways. This is an interesting finding that appears to contradict what would be expected of the positive improvements seen in tinnitus distress. Importantly, our sample was characterized with what is considered minimal range scores for both depression and anxiety and this may have indicated a lesser problem with depression or anxiety to begin with.

### Treatment Observations

Observations made in the course of applying tEMDR in this exploratory study shed light on several lessons to be learned. First, despite the use of the PDS and the initial assessment session devoted to history-taking and case formulation, unidentified trauma memories still emerged unexpectedly for some patients during EMDR and required processing due to their surprising link with the tinnitus. While there clearly exists tinnitus without trauma, and wishing not to "force" the trauma during this trial, perhaps for some participants this had meant that some trauma "seeds" to their tinnitus had not been spotted. Therefore, one lesson may be about a more explicit exploration of physical, cognitive, and emotional (Van Rood & De Roos, 2009) trauma connections to tinnitus; for instance, via the EMDR techniques of the touchstone (Shapiro, 2001) and affect bridge (Watkins, 1971).

Given the inclusive nature of the trial, it may be that participants with particularly long-standing tinnitus, and those with additional physical difficulties or issues of secondary gains, should have either been excluded from the trial or offered a longer course of EMDR and additional adaptations to account for comorbid complications.

## Protocol Adaptations

Observations of tEMDR in practice also bear several recommendations for protocol adaptations in future work. In the assessment session the default self-soothing resource was the “safe place,” and failing that, either creating an imaginary “trauma container” or teaching a relaxed breathing technique. With the hypothesis regarding the utility of BLS in taxing WM and reducing present tinnitus distress, the “butterfly hug” (Artigas et al., 2000; Boel, 1999; Jarero et al., 2008) could be added in the initial treatment stage as a somatic resource.

Just two of the study participants chose eye movements as their preferred form of bilateral stimulation, compared with 12 that preferred the tactile alternative. This suggests there may be a need to allow for additional forms of bilateral stimulation that do not rely on eye-tracking, to increase participant satisfaction and personal choice when working with patients with tinnitus.

Given the similarities described between tinnitus and pain conditions, like the EMDR pain protocol (Grant, 2000), tEMDR too did not include a body scan. Yet the occasions in which participants spontaneously reported changes observed in bodily sensations after EMDR might merit the inclusion of a body scan, as with the standard protocol. Similarly, as the emphasis with the EMDR had been either on the past (trauma) and present (tinnitus), or the latter only, the future “prong” of EMDR was not a formal part of the protocol. Given the manner in which maladaptive coping strategies in tinnitus can prolong or worsen distress, adding the option, where relevant, for future work may enable a direct focus on future tinnitus-related fears.

## Limitations

As this was an exploratory study, the sample size was relatively small and became even smaller when participants had been grouped according to PTSD and trauma status. The small group size perhaps reduced the likelihood of capturing meaningful change in the groups. As a small uncontrolled study, these results do not consider the significant effects of placebo and therapist interaction. Larger high-quality studies are essential for the verification of these preliminary results.

## Future Research

Our study found that EMDR improved tinnitus regardless of PTSD status, and this merits further

exploration. The suggested adaptations to the protocol may yield improved outcomes, particularly following resolution of participants’ tinnitus-related traumas and for those participants with no PTSD or no trauma history. Seeing that tinnitus patients with PTSD fared better at the 6-months follow-up, it is possible that participants with tinnitus that is at least partly related to past trauma respond better to EMDR. Studies of EMDR with pain conditions also reported that “the use of the current pain sensations as primary target in EMDR is not as effective as the use of a traumatic memory as primary target” (Mazolla et al., 2009; Ray & Page, 2002). Future controlled trials could directly compare the subpopulation of tinnitus participants with no PTSD/trauma and those with PTSD/trauma, to clarify whether there are differences in response and whether EMDR may hold promise for those individuals as well.

## References

- Andersson, G., & Westin, V. (2008). Understanding tinnitus distress: Introducing the concepts of moderators and mediators. *International Journal of Audiology, 47*(Suppl. 2), S106–111. <https://doi.org/10.1080/14992020802301670>.
- Andersson, G., Strömngren, T., Ström, L., & Lyttkens, L. (2002). Randomized controlled trial of internet-based cognitive behavior therapy for distress associated with tinnitus. *Psychosomatic Medicine, 64*(5), 810–816. <https://doi.org/10.1097/00006842-200209000-00014>
- Andrade, J., Kavanagh, D., & Baddeley, A. (1997). Eye-movements and visual imagery: A working memory approach to the treatment of post-traumatic stress disorder. *British Journal of Clinical Psychology, 36*, 209–223. <https://doi.org/10.1111/j.2044-8260.1997.tb01408.x>
- Artigas, L., Jarero, I., Mauer, M., López Cano, T., & Alcalá, N. (2000, September). *EMDR and traumatic stress after natural disasters: Integrative treatment protocol and the butterfly hug*. Poster presented at the EMDRIA Conference, Toronto, Ontario, Canada.
- Attias, J., Shemesh, Z., Bleich, A., Solomon, Z., Baror, G., Alster, J., . . . Sohmer, H. (1995). Psychological profile of help-seeking and non-help-seeking tinnitus patients. *Scandinavian Audiology, 24*(1), 13–18. <https://doi.org/10.3109/01050399509042204>
- Baddeley, A. D. (1998). *Human memory: Theory and practice*. Allyn & Bacon.
- Beck, A. T., Epstein, N., Brown, G., & Steer, R.A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting Clinical Psychology, 56*(6), 893–897. <https://doi.org/10.1037/0022-006X.56.6.893>
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *The beck depression inventory* (2nd ed.). Psychological Corporation.

- Bergmann, U. (2010). EMDR's neurobiological mechanisms of action: A survey of 20 years of searching. *Journal of EMDR Practice and Research*, 4(1), 22–42. <https://doi.org/10.1891/1933-3196.4.1.22>
- Boel, J. (1999). The butterfly hug. *EMDRIA Newsletter*, 4(4), 11–13.
- British Tinnitus Association. (2020). *What is Tinnitus?* <https://www.tinnitus.org.uk/Pages/FAQs/Category/what-is-tinnitus>
- Budd, R. J., & Pugh, R. (1995). The relationship between locus of control, tinnitus severity, and emotional distress in a group of tinnitus sufferers. *Journal of Psychosomatic Research*, 39, 1015–1018. [https://doi.org/10.1016/0022-3999\(95\)00512-9](https://doi.org/10.1016/0022-3999(95)00512-9)
- Cima, R. F., Andersson, G., Schmidt, C. J., & Henry, J. A. (2014). Cognitive-behavioral treatments for tinnitus: A review of the literature. *Journal of the American Academy of Audiology*, 25(1), 29–61. <https://doi.org/10.3766/jaaa.25.1.4>
- Cima, R. F., Crombez, G., & Vlaeyen, J. W. (2011). Catastrophizing and fear of tinnitus predict quality of life in patients with chronic tinnitus. *Ear and Hearing*, 32(5), 634–641. <https://doi.org/10.1097/AUD.0b013e31821106dd>
- De Roos, C., & Veenstra, S. (2009). EMDR pain protocol for current pain. In M. Luber (Ed.), *EMDR scripted protocols, special populations* (pp. 537–557). Springer Publishing.
- Eggermont, J. J., & Roberts, L. E. (2014). Tinnitus: Animal models and findings in humans. *Cell Tissue Research*, 361, 311–336. <https://doi.org/10.1007/s00441-014-1992-8>
- Fagelson, M. A. (2007). The association between tinnitus and posttraumatic stress disorder. *American Journal of Audiology*, 16, 107–117. [https://doi.org/10.1044/1059-0889\(2007/015\)](https://doi.org/10.1044/1059-0889(2007/015))
- Fagelson, M. A., & Smith, S. L. (2016). Tinnitus self-efficacy and other tinnitus self-report variables in patients with and without post-traumatic stress disorder. *Ear Hear*, 37, 541–546. <https://doi.org/10.1097/AUD.0000000000000290>
- Foa, E., Cashman, L., Jaycox, L., & Perry, K. (1997). The validation of a self-report measure of PTSD: The post-traumatic diagnostic scale. *Psychological Assessment*, 9, 445–451. <https://doi.org/10.1037/1040-3590.9.4.445>
- Grant, M. (2000). EMDR: A new treatment for trauma and chronic pain. *Complementary Therapies in Nursing and Midwifery*, 6, 91–94.
- Grant, M., & Threlfo, C. (2002). EMDR in the treatment of chronic pain. *Journal of Clinical Psychology*, 58, 1505–1520. <https://doi.org/10.1002/jclp.10101>
- International Society for Traumatic Stress Studies. (2019). *Posttraumatic stress disorder prevention and treatment guidelines*. <http://www.istss.org/treating-trauma/new-istss-prevention-and-treatment-guidelines.aspx>
- Jarero, I., Artigas, L., & Montero, M. (2008). The EMDR integrative group treatment protocol: Application with child victims of mass disaster. *Journal of EMDR Practice and Research*, 2, 97–105. <https://doi.org/10.1891/1933-3196.2.2.97>
- Kessler, R. C., Aguilar-Gaxiola, S., Alonso, J., Benjet, C., Bromet, E. J., Cardoso, G., . . . Koenen, K. C. (2017). Trauma and PTSD in the WHO World Mental Health Surveys. *European Journal of Psychotraumatology*, 8(5), 1353383. <https://doi.org/10.1080/20008198.2017.1353383>
- Kilpatrick, D. G., Resnick, H. S., Milanak, M. E., Miller, M. W., Keyes, K. M., & Friedman, M. J. (2013). National estimates of exposure to traumatic events and PTSD prevalence using DSM-IV and DSM-5 criteria. *Journal of Traumatic Stress*, 26(5), 537–547. <https://doi.org/10.1002/jts.21848>
- Mazolla, A., Calcagno, M. L., Goicochea, M. T., Puey-redòn, H., Leston, J., & Salvat, F. (2009). EMDR in the treatment of chronic pain. *Journal of EMDR Practice and Research*, 3, 66–79. <https://doi.org/10.1891/1933-3196.3.2.66>
- McKenna, L., Handscomb, L., Hoare, D. J., & Hall, D. A. (2014). A scientific cognitive-behavioral model of tinnitus: Novel conceptualizations of tinnitus distress. *Frontiers in Neurology*, 5, 196. <https://doi.org/10.3389/fneur.2014.00196>
- Newman, C. W., Jacobson, G. P., & Spitzer, J. B. (1996). Development of the tinnitus handicap inventory. *Archives of Otolaryngology–Head & Neck Surgery*, 122(2), 143–148.
- Phillips, J., Erskine, S., Moore, T., Nunney, I., & Wright, C. (2019). Eye movement desensitization and reprocessing as a treatment for tinnitus. *The Laryngoscope*, 29, 1–7. <https://doi.org/10.1002/lary.27841>
- Ray, P., & Page, A. C. (2002). A single session of hypnosis and eye movement desensitisation and reprocessing (EMDR) in the treatment of chronic pain. *Australian Journal of Clinical and Experimental Hypnosis*, 30, 170–178.
- Rikkert, M., Van Rood, Y., De Roos, C., Ratter, J., & Van den Hout, M. (2018). A trauma-focused approach for patients with tinnitus: The effectiveness of eye movement desensitization and reprocessing - A multicentre pilot trial. *European Journal of Psychotraumatology*, 9(1), 1512248.
- Scott, B., Lindberg, P., Melin, L., & Lyttkens, L. (1990). Predictors of tinnitus discomfort adaptation and subjective loudness. *British Journal of Audiology*, 24, 51–62. <https://doi.org/10.3109/03005369009077842>
- Sedley, W., Friston, K. J., Gander, P. E., Kumar, S., & Griffiths, T. D. (2016). An integrative tinnitus model based on sensory precision. *Trends in Neuroscience*, 39(12), 799–812. <https://doi.org/10.1016/j.tins.2016.10.004>
- Shapiro, F. (2001). *Eye movement desensitization and reprocessing (EMDR): Basic principles, protocols, and procedures* (2nd ed.). Guilford Press.
- Shapiro, F. (2018). *Eye movement desensitization and reprocessing (EMDR) therapy* (3rd ed.). Guilford Press.

- Sirois, F. M., Davis, C. G., & Morgan, M. S. (2006). Learning to live with what you can't rise above: control beliefs, symptom control, and adjustment to tinnitus. *Health Psychology, 25*, 119–123. <https://doi.org/10.1037/0278-6133.25.1.119>
- Tesarz, J., Leisner, S., Gerhardt, A., Janke, S., Seidler, G. H., Eich, W., et al. (2014). Effects of eye movement desensitization and reprocessing (EMDR) treatment in chronic pain patients: A systematic review. *Pain Med, 15*, 247–263. <https://doi.org/10.1111/pme.12303>
- Tunkel, D. E., Bauer, C. A., Sun, G. H., Rosenfeld, R. M., Chandrasekhar, S. S., Cunningham, E. R., Jr., . . . Whamond, E. J. (2014). Clinical practice guideline: Tinnitus. Otolaryngology–Head and Neck Surgery. *Official Journal of American Academy of Otolaryngology-Head and Neck Surgery, 151*(2), S1–s40. <https://doi.org/10.1177/0194599814547475>
- Van der Kolk, B. A., & Fisler, R. (1995). Dissociation and the fragmentary nature of traumatic memories: Overview and exploratory study. *Journal of Traumatic Stress, 8*, 505–525. <https://doi.org/10.1002/jts.2490080402>
- Van Rood, Y. R., & De Roos, C. (2009). EMDR in the treatment of medically unexplained symptoms: A systematic review. *Journal of EMDR Practice and Research, 3*, 248–263. <https://doi.org/10.1891/1933-3196.3.4.248>
- Van Rood, Y. R., & Visser, S. (2008). Principles of cognitive behavior therapy in the treatment of patients with a somatoform disorder. In C. M. Van Der Feltz-Cornelis & H. Van Der Horst (Eds.), *Handbook somatization: Medically unexplained symptoms in primary and secondary care* (2nd ed., pp. 269–291). Tijdstroom.
- Watkins, J. G. (1971). The affect bridge: A hypnoanalytic technique. *International Journal of Clinical and Experimental Hypnosis, 19*(1), 21–27. <https://doi.org/10.1080/00207147108407148>
- World Health Organization. (2013). *Guidelines for the Management of Conditions Specifically Related to Stress*. Geneva: World Health Organization.

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