HALLUCINATIONS: NEW INTERVENTIONS SUPPORTING PEOPLE WITH DISTRESSING VOICES AND/OR VISIONS

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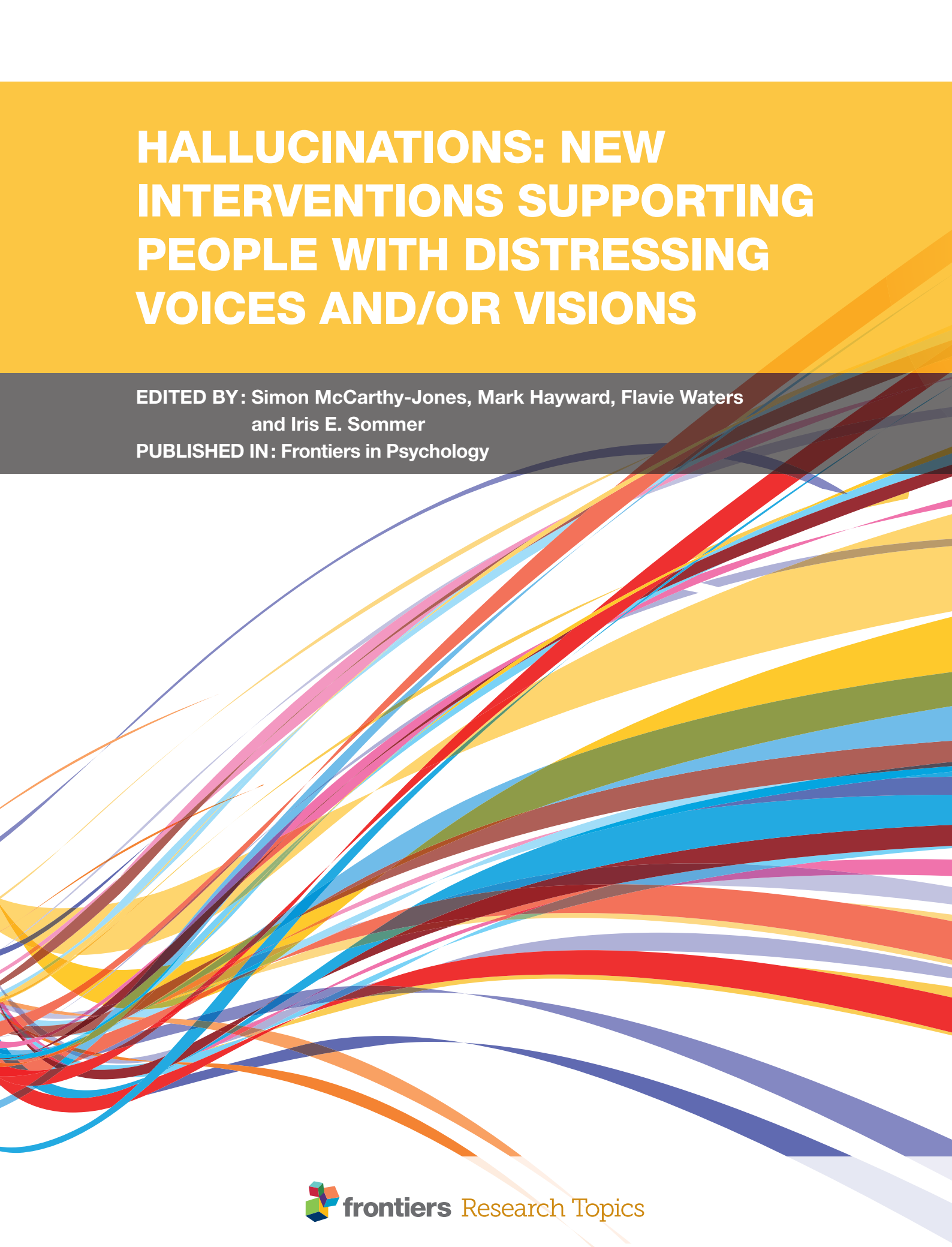

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HALLUCINATIONS: NEW INTERVENTIONS SUPPORTING PEOPLE WITH DISTRESSING VOICES AND/OR VISIONS

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Hallucinations can occur across the five sensory modalities (auditory, visual, olfactory, tactile, and gustatory). Whilst they have the potential to be benign or even highly valued, they can often be devastating experiences associated with distress, impaired social and occupational functioning, self-harm and suicide. Those who experience hallucinations in this latter manner may do so within the context of a wide range of psychiatric diagnoses, including schizophrenia, bipolar disorder, borderline personality disorder, and post-traumatic stress disorder. The only routinely available interventions for people distressed by hallucinations are antipsychotic drugs, which date from the introduction of chlorpromazine in the 1950s, and manualized cognitive behavioral therapy, which originated in the 1990s. These interventions do not help all people distressed by hallucinations, and in the case of antipsychotic medication, come with notable side-effects. There has hence been great interest in new interventions to support people distressed by hallucinations.

The goal of this Frontiers Research Topic is to present a collection of papers on new developments in clinical interventions for those distressed by hallucinations. In the psychiatric condition that remains most strongly associated with hallucinations, schizophrenia, the majority (~70%) of people will have experienced hallucinations in the auditory modality, approximately a third will have experienced visual hallucinations, and a smaller minority will have experienced hallucinations in other modalities. Consistent with this prevalence, this collection focusses on auditory and visual hallucinations. This is not to minimise the potential distress that can occur from hallucinations in other modalities. For example, tactile hallucinations, particularly when stemming from earlier experiences of sexual abuse, can be highly distressing, and improved ways to help sufferers of such experiences are also needed. In summary, this collection aims to result in an interdisciplinary collection of papers which will appeal to a wide readership, spanning all with an interest in this area.

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EDITORIAL
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Editorial: Hallucinations: New Interventions Supporting People with Distressing Voices and/or Visions

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The Editorial on the Research Topic

Hallucinations: New Interventions Supporting People with Distressing Voices and/or Visions

Hallucinations can occur across the five sensory modalities (auditory, visual, olfactory, tactile, and gustatory). Whilst they have the potential to be benign or even highly valued (Romme et al., 2009; Sommer et al., 2010), they can often be devastating experiences associated with distress, impaired social, and occupational functioning, self-harm and suicide (McCarthy-Jones et al., 2013; Kjelby et al., 2015). Those who experience hallucinations in this latter manner may do so within the context of a wide range of psychiatric diagnoses, including schizophrenia, bipolar disorder, borderline personality disorder, and post-traumatic stress disorder (Blom and Sommer, 2011; Larøi et al., 2012; McCarthy-Jones, 2012). The only routinely available interventions for people distressed by hallucinations are antipsychotic drugs, which date from the introduction of chlorpromazine in the 1950s, and manualized cognitive behavioral therapy, which originated in the 1990s. These interventions do not help all people distressed by hallucinations (Lecrubier et al., 2007; Sommer et al., 2012; Jauhar et al., 2014; van der Gaag et al., 2014), and in the case of antipsychotic medication, come with notable side-effects. There has hence been great interest in new interventions to support people distressed by hallucinations.

The goal of this Frontiers Research Topic is to present a collection of papers on new developments in clinical interventions for those distressed by hallucinations. In the psychiatric condition that remains most strongly associated with hallucinations, schizophrenia, the majority (∼70%) of people will have experienced hallucinations in the auditory modality (Thomas et al., 2007; McCarthy-Jones et al., Submitted), approximately a third will have experienced visual hallucinations (Waters et al., 2014; McCarthy-Jones et al., Submitted), and a smaller minority will have experienced hallucinations in other modalities (Thomas et al., 2007; McCarthy-Jones et al., Submitted). Consistent with this prevalence, this collection focusses on auditory and visual hallucinations. This is not to minimize the potential distress that can occur from hallucinations in other modalities. For example, tactile hallucinations, particularly when stemming from earlier experiences of sexual abuse (Read et al., 2003), can be highly distressing, and improved ways to help sufferers of such experiences are also needed.

This collection starts with a paper by Coebergh et al. offering insights into how musical hallucinations may be treated. An interesting theoretical counterpoint to this paper is offered by Deamer and Wilkinson, who stress how auditory verbal hallucinations (AVH; "hearing voices")

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may be understood primarily as hallucinated acts of communication, rather than hallucinated sounds, and then consider how this conception of AVH may help us better understand some recent therapeutic successes.

Two papers in this collection focus on the therapeutic implications of the now burgeoning research literature showing traumatic life events are associated with hallucinations (e.g., Read and Argyle, 1999; Read et al., 2003; Janssen et al., 2004; Bentall et al., 2012). Whilst not all individuals who experience hallucinations will have experienced traumatic life events, this is increasingly emerging as a notable causal factor (Janssen et al., 2004; Bentall et al., 2012; Kelleher et al., 2013; although, see Sideli et al., 2012). McCarthy-Jones and Longden argue that the iron curtain between AVH in post-traumatic stress disorder (often termed "dissociative AVH") and AVH in schizophrenia (so-called "psychotic AVH") needs to be torn down, and that AVH should be included as a characteristic symptom of PTSD in diagnostic manuals. This is based on the argument that AVH in these two diagnoses often have a common phenomenology and a common root in traumatic life-events, which in turn leads to the argument that more trauma-based interventions should be made available to people diagnosed with schizophrenia distressed by hallucinations. Similarly, based on a review of the relationship between stressful life-events and the content of voices and visions, Steel argues that a subgroup of voices and visions, linked to stressful life-events, are likely to be responsive to trauma-informed interventions.

Cognitive behavioral therapy (CBT) remains the dominant psychological therapy for hallucinations. A number of papers in this Research Topic consider how CBT, which appears to only have a modest ability to help people with distressing hallucinations (Jauhar et al., 2014; van der Gaag et al., 2014), may be improved. Thomas, in a paper that has already stimulated significant interest, offers a thoughtful consideration of the problems of CBT for psychosis, examining when the CBT for psychosis protocol has uses and when it is limited. Fielding-Smith et al. explore how a better understanding of the role of the "self" (e.g., self-reflection, self-schema, self-concept) in causing and maintaining distress and disability in people with AVH may be able to improve the effectiveness of CBT. Smailes et al. examine how CBT for AVH may be tailored, based on the potential subtype of AVH that a person presents with, to improve its effectiveness.

As CBT interventions are increasingly being used in conjunction with mindfulness techniques (e.g., Shawyer et al., 2012), Strauss et al. examine the current evidence-base for mindfulness-based interventions for people distressed by hearing voices. The recent development of Relating Therapy for people with AVH (Hayward et al., 2009) is built upon by Hayward et al. who report on gender differences in how men and women relate to their voices (e.g., engagement vs. distancing) and consider the results of their findings for how psychological therapies could be tailored by gender. This work reflects an increasing interest in the relation between gender and hallucinations, psychosis more generally, and psychiatric diagnosis (Fisher et al., 2009; Marecek and Gavey, 2013; McCarthy-Jones et al.).

Finally, extending the collection beyond psychological therapies for hallucinations, a number of other therapeutic directions are considered. Koops et al. review the evidence base for transcranial direct current stimulation (tDCS) as a possible new treatment option to help reduce treatment-resistant auditory hallucinations. Taking a different approach, Waters et al. explore the potential for sleep interventions to improve the mental health of people with psychosis. There is evidence that almost all individuals with psychotic disorders meet the criteria for Insomnia Disorder and comorbid sleep complaints, and that sleep therapy can be effective in improving sleep, negative mood, and psychotic symptoms. Their paper explores the attitudes and preferences of people with psychosis toward three different types of treatment for sleep problems: (i) standard pharmacological interventions (antipsychotics, hypnotics, and sedatives), (ii) melatonin, and (iii) cognitive and behavior therapy (CBT). Waters et al. find that participants view both psychological and behavioral-type interventions and melatonin as valid adjuncts to pharmacotherapy and document a strong desire for participants to make their own choices regarding the type, and timing, of their therapies. Of course, in order for people to be able to choose between different therapies, these need to be made available. A right to choose in the absence of choices is worth little. This study also reinforces the point, made throughout this Research Topic, that people with hallucinations can be perceptive and insightful and must be consulted about their treatment and care.

In summary, the papers in this Research Topic offer a sample of the ways that the next generation of psychological therapies for hallucinations are developing. Specifically, they highlight how advances may stem from improved understandings of; (1) hallucinations themselves (as acts of communication, as having specific subtypes); (2) the person experiencing the hallucinations (their gender, multiple facets of their "self"); (3) inter-relations between the hallucinations and the experiencer (how the voices are related to, mindful responding), and; (4) the etiology of the hallucination (trauma-specialized interventions). Other promising forms of intervention include neurostimulation techniques, such as tDCS, and sleep-based interventions. When combined with other neurological and psychological developments in this field, which we would also refer the interested reader to, such as neurofeedback for hallucinations (McCarthy-Jones, 2012; Dyck et al.; Fovet et al.) and the Maastricht Interview (Romme and Escher, 2000), the future looks promising.

AUTHOR CONTRIBUTIONS

All authors listed, have made substantial, direct and intellectual contribution to the work, and approved it for publication.

REFERENCES

Bentall, R. P., Wickham, S., Shevlin, M., and Varese, F. (2012). Do specific early-life adversities lead to specific symptoms of psychosis? A study from the 2007 the adult psychiatric morbidity survey. *Schizophr. Bull.* 38, 734–740. doi: 10.1093/schbul/sbs049

Blom, J. D., and Sommer, I. E. C. (eds.). (2011). *Hallucinations: Research and Practice*. New York, NY: Springer.

Fisher, H., Morgan, C., Dazzan, P., Craig, T. K., Morgan, K., Hutchinson, G., et al. (2009). Gender differences in the association between childhood abuse and psychosis. *Br. J. Psychiatry* 194, 319–325. doi: 10.1192/bjp.bp.107.047985

Hayward, M., Overton, J., Dorey, T., and Denney, J. (2009). Relating therapy for people who hear voices: a case series. *Clin. Psychol. Psychot.* 16, 216–227. doi: 10.1002/cpp.615

Janssen, I., Krabbendam, L., Bak, M., Hanssen, M., Vollebergh, W., Graaf, R. D., et al. (2004). Childhood abuse as a risk factor for psychotic experiences. *Acta Psychiatr. Scand.* 109, 38–45. doi: 10.1046/j.0001-690X.2003.00217.x

Jauhar, S., McKenna, P. J., Radua, J., Fung, E., Salvador, R., and Laws, K. R. (2014). Cognitive-behavioural therapy for the symptoms of schizophrenia: systematic review and meta-analysis with examination of potential bias. *Br. J. Psychiatry* 204, 20–29. doi: 10.1192/bjp.bp.112.116285

Kelleher, I., Keeley, H., Corcoran, P., Ramsay, H., Wasserman, C., Carli, V., et al. (2013). Childhood trauma and psychosis in a prospective cohort study: cause, effect, and directionality. *Childhood* 170, 734–741. doi: 10.1176/appi.ajp.2012.12091169

Kjelby, E., Sinkeviciute, I., Gjestad, R., Kroken, R. A., Løberg, E. M., Jørgensen, H. A., et al. (2015). Suicidality in schizophrenia spectrum disorders: the relationship to hallucinations and persecutory delusions. *Eur. Psychiatry* 30, 830–836. doi: 10.1016/j.eurpsy.2015.07.003

Larøi, F., Sommer, I. E., Blom, J. D., Fernyhough, C., Hugdahl, K., Johns, L. C., et al. (2012). The characteristic features of auditory verbal hallucinations in clinical and nonclinical groups: state-of-the-art overview and future directions. *Schizophr. Bull.* 38, 724–733. doi: 10.1093/schbul/sbs061

Lecrubier, Y., Perry, R., Milligan, G., Leeuwenkamp, O., and Morlock, R. (2007). Physician observations and perceptions of positive and negative symptoms of schizophrenia: a multinational, cross-sectional survey. *Eur. Psychiatry* 22, 371–379. doi: 10.1016/j.eurpsy.2007.03.003

Marecek, J., and Gavey, N. (eds.). (2013). DSM-5 and beyond: a critical feminist engagement with psychodiagnosis. *Feminism Psychol.* 23, 3–9. doi: 10.1177/0959353512467962

McCarthy-Jones, S. (2012). *Hearing Voices: The Histories, Causes and Meanings of Auditory Verbal Hallucinations*. Cambridge: Cambridge University Press.

McCarthy-Jones, S., Marriott, M., Knowles, R., Rowse, G., and Thompson, A. R. (2013). What is psychosis? A meta-synthesis of inductive qualitative studies exploring the experience of psychosis. *Psychosis* 5, 1–16. doi: 10.1080/17522439.2011.647051

Read, J., Agar, K., Argyle, N., and Aderhold, V. (2003). Sexual and physical abuse during childhood and adulthood as predictors of hallucinations, delusions and thought disorder. *Psychol. Psychother.* 76, 1–22. doi: 10.1348/14760830260569210

Read, J., and Argyle, N. (1999). Hallucinations, delusions, and thought disorder among adult psychiatric inpatients with a history of child abuse. *Psychiatr. Serv.* 50, 1467–1472. doi: 10.1176/ps.50.11.1467

Romme, M., Escher, S., and Dillon J. (2009). *Living with Voices: 50 Stories of Recovery*. Ross, CA: PCCS Books.

Romme, M. A. J., and Escher, A. D. M. A.C. (2000). *Making Sense of Voices: A Guide for Professionals Working with Voice Hearers*. London: MIND.

Shawyer, F., Farhall, J., Mackinnon, A., Trauer, T., Sims, E., Ratcliff, K., et al. (2012). A randomised controlled trial of acceptance-based cognitive behavioural therapy for command hallucinations in psychotic disorders. *Behav. Res. Ther.* 50, 110–121. doi: 10.1016/j.brat.2011.11.007

Sideli, L., Mule, A., La Barbera, D., and Murray, R. M. (2012). Do child abuse and maltreatment increase risk of schizophrenia? *Psychiatry Investig.* 9, 87–99. doi: 10.4306/pi.2012.9.2.87

Sommer, I. E., Daalman, K., Rietkerk, T., Diederen, K. M., Bakker, S., Wijkstra, J., et al. (2010). Healthy individuals with auditory verbal hallucinations; who are they? Psychiatric assessments of a selected sample of 103 subjects. *Schizophr. Bull.* 36, 633–641. doi: 10.1093/schbul/sbn130

Sommer, I. E., Slotema, C. W., Daskalakis, Z. J., Derks, E. M., Blom, J. D., and van der Gaag, M. (2012). The treatment of hallucinations in schizophrenia spectrum disorders. *Schizophr. Bull.* 38, 704–714. doi: 10.1093/schbul/sbs034

Thomas, P., Mathur, P., Gottesman, I. I., Nagpal, R., Nimgaonkar, V. L., and Deshpande, S. N. (2007). Correlates of hallucinations in schizophrenia: a cross−cultural evaluation. *Schizophr. Res.* 92, 41–49. doi: 10.1016/j.schres.2007.01.017

van der Gaag, M., Valmaggia, L. R., and Smit, F. (2014). The effects of individually tailored formulation-based cognitive behavioural therapy in auditory hallucinations and delusions: a meta-analysis. *Schizophr. Res.* 156, 30–37. doi: 10.1016/j.schres.2014.03.016

Waters, F., Collerton, D., Jardri, R., Pins, D., Dudley, R., Blom, J. D., et al. (2014). Visual hallucinations in the psychosis spectrum and comparative information from neurodegenerative disorders and eye disease. *Schizophr. Bull.* 40(Suppl. 4), S233–S245. doi: 10.1093/schbul/sbu036

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REVIEW
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Musical hallucinations: review of treatment effects

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Background: Despite an increased scientific interest in musical hallucinations over the past 25 years, treatment protocols are still lacking. This may well be due to the fact that musical hallucinations have multiple causes, and that published cases are relatively rare.
Objective: To review the effects of published treatment methods for musical hallucinations.

Methods: A literature search yielded 175 articles discussing a total number of 516 cases, of which 147 articles discussed treatment in 276 individuals. We analyzed the treatment results in relation to the etiological factor considered responsible for the mediation of the musical hallucinations, i.e., idiopathic/hypoacusis, psychiatric disorder, brain lesion, and other pathology, epilepsy or intoxication/pharmacology.
Results: Musical hallucinations can disappear without intervention. When hallucinations are bearable, patients can be reassured without any other treatment. However, in other patients musical hallucinations are so disturbing that treatment is indicated. Distinct etiological groups appear to respond differently to treatment. In the hypoacusis group, treating the hearing impairment can yield significant improvement and coping strategies (e.g., more acoustic stimulation) are frequently helpful. Pharmacological treatment methods can also be successful, with antidepressants being possibly more helpful than antiepileptics (which are still better than antipsychotics). The limited use of acetylcholinesterase inhibitors has looked promising. Musical hallucinations occurring as part of a psychiatric disorder tend to respond well to psychopharmacological treatments targeting the underlying disorder. Musical hallucinations experienced in the context of brain injuries and epilepsy tend to respond well to antiepileptics, but their natural course is often benign, irrespective of any pharmacological treatment. When intoxication/pharmacology is the main etiological factor, it is important to stop or switch the causative substance or medication.
Conclusion: Treatments for musical hallucinations tend to yield favorable results when they target the main etiological factor of these phenomena. There is a need to establish the natural course of musical hallucinations, their response to non-pharmacological treatments, and their effects on the patient's quality of life. There is also a need to standardize the assessment of treatment responses, and document long-term follow up.

Keywords: Auditory Charles Bonnet syndrome, auditory hallucination, brain lesion, epilepsy, intoxication/pharmacology, psychiatric disorder

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Introduction

Musical hallucinations (MH) are auditory hallucinations characterized by songs, tunes, melodies, harmonics, rhythms, and/or timbres (Coebergh et al., 2009). The scientific interest in these phenomena has increased significantly over the past 25 years, but so far no evidence-based treatments have been established. The principle reason for this would seem to be that published case series are relatively small, and that the mechanisms responsible for the mediation of MH are probably diverse. Furthermore, case reports tend to over represent positive responses, as negative responses to specific medication are rarely published. We therefore endeavored to identify which treatments have been tried under which circumstances, and what their effect has been upon the MH.

MH are commonly divided into two groups. When they occur without the presence of any associated pathological abnormalities—with the exception of hearing impairment (hypoacusis)—they are called idiopathic MH. When there are associated pathological abnormalities, they are named symptomatic MH (Coebergh et al., 2009). The most relevant etiological factors for MH, as reported in the literature, are brain injuries, epilepsy, psychiatric disorder, and intoxication/pharmacology (Berrios, 1990; Keshavan et al., 1992; Evers and Ellger, 2004; Cope and Baguley, 2009).

Research by Fukunishi et al. (1998a), Schakenraad et al. (2006) and Teunisse and Olde Rikkert (2012) has shown that MH are more common than previously assumed, with prevalence rates of 3.6% among groups of patients referred for audiometric testing. Similar to our own experiences, Ross (1978) and Aziz (2009) found that after the publication of an article on the subject several people wrote to them, and told them that they had adjusted to their MH without seeking any medical attention. However, others show themselves in dire need of medical consultation. MH can indeed be experienced as mild and well-tolerable, but more often they are experienced as severely disabling, leading to impaired quality of life, significant distress, and comorbid anxiety and/or depression. Patients often have difficulty concentrating and falling asleep, and many of them are afraid that they are dementing or otherwise psychiatrically ill (Fukunishi et al., 1998b; Cole et al., 2002; Schakenraad et al., 2006). Occasionally they develop secondary delusions, and accuse others (frequently neighbors) of being responsible for the music. As a result, they may even call the police, move house, or take other drastic measures. Diagnosis and treatment of such cases is paramount, but at this point the lack of treatment protocols and our lack of knowledge about the natural history and prognosis of MH stand in the way of an evidence-based approach.

Various treatment options have been described in case reports and modest case series. Non-pharmacological treatment tends to consist of lifestyle advice, reassurance, and explanation of the nature of MH, optimization of hearing, and behavioral modifications [such as listening to actual music (Coebergh et al., 2009)], but no previous review has recorded the effectiveness of such interventions. Loneliness may be an important factor and increasing social interactions and conversations can be beneficial. All pharmacological treatment of idiopathic MH is off-label. It tends to consist of antiepileptics, antidepressants, antipsychotics or acetylcholinesterase inhibitors, but even when treated for a sufficient amount of time and at adequate plasma levels, MH can be refractory to most of these treatments (Sacks and Blom, 2012). Repetitive transcranial magnetic stimulation (rTMS) may perhaps be a viable option in the near future, but so far it only showed a favorable response in a single medication-resistant patient with post-traumatic damage to the right temporal lobe (Cosentino et al., 2010).

This review attempts to quantify the treatment as responses described in the literature, and to correlate them with the probable etiology of the MH at hand. It should be noted, however, that in the literature we reviewed treatment responses were described and defined in widely varying ways. In some papers there was an extensive description of what exactly changed in e.g., the character, loudness and frequency of the MH, whereas other papers only mentioned that they changed, decreased or stopped or remained unaltered. Duration and onset of treatment response were also reported extremely variably and frequently not mentioned at all.

Methods

For the purpose of this review, we searched the databases of MEDLINE, psycINFO, and Embase Psychiatry for articles matching the terms *Music* hallucin*, Musical hallucination,* and *Treatment*, and added relevant papers from our personal collection with titles such as "Auditory Charles Bonnet syndrome" and "The sound of silence." We examined all articles published between 1890 and January 2015 that were written in English, Dutch, French or German.

The variables we assessed in each published case report were age, sex, treatment, and results of treatment. When available, documentation of hearing impairment, electroencephalography (EEG), brain imaging, and psychiatric assessment were used to establish our interpretation of the main etiological factor (which was occasionally different from that of the original authors). Five different etiological groups were distinguished consisting of hypoacusis, brain lesions and other pathology, epilepsy, psychiatric disorder, and intoxication/pharmacology. This classification is modeled on Evers and Ellger's categorization of MH in 2004 (Evers and Ellger, 2004). When patients had more than one possible etiology, which turned out to be very common, we chose the one most closely linked to the onset of the MH. For example, if a patient with hypoacusis developed a severe depression, and improved after treatment for depression, then psychiatric disorder was selected as the main cause of the MH. However, when the MH were complicated by depression and did not improve with treatment for depression, than hypoacusis was selected. In two cases no apparent cause was identified (Duncan et al., 1989; Satoh et al., 2007).

All cases were subdivided according to kind of treatment, i.e., non-pharmacological [rTMS, electroconvulsive therapy (ECT), ear-nose-throat intervention, cognitive-behavioral therapy (CBT), coping strategies/explanation], and pharmacological

[antidepressants, antipsychotics, antiepileptics, other medication (comprising of benzodiazepines and acetylcholinesterase inhibitors), and withdrawal of medication]. Furthermore, we identified cases where the MH decreased or faded away without any treatment, as well as those where it was documented that the patient desired no treatment whatsoever (which could be for multiple reasons, see the Discussion Section).

When MH appeared soon (i.e., within 1 week) after starting a certain drug or after increasing its dose, and disappeared soon after stopping or reducing the dose, this medication was considered the most likely cause; when patients were occasionally rechallenged and the MH recurred, this was taken as an extra indication that the medication was causative. However, standardized measures of causality such as the WHO-UMC causality assessment system were not applied. At times there were multiple medications, and at other times the exact time course of the relation between the intoxication/pharmacological intervention and MH was unclear.

Epilepsy was deemed the main cause when the MH were phenomenologically linked to a seizure, e.g., as an aura, ictal episode or post-ictal episode, when the patient was treated surgically for an epileptic focus or when epileptiform EEG abnormalities disappeared which had been present prior to treatment.

We scored treatment effects in three groups, i.e., "no effect" (0), "patient experiences a clinically meaningful improvement, but the hallucinations remain" (1), and "complete disappearance of the MH" (2). Improvement was deemed meaningful whenever a report implied that the patient had experienced an improvement in quality of life; irrespective of whether the MH were experienced as quieter, less frequent, or not interfering as much with sleep or daily activities, or whether there was increased acceptance/insight or improved mood/anxiety. Two articles (Bergman et al., 2014; Islam et al., 2014) used the Yale-Brown Obsessive Compulsive Scale (Y-BOCS). At times it was difficult to rate the exact treatment effects; e.g., Warner and Aziz (Warner and Aziz, 2005) briefly described 30 patients, mostly elderly people suffering from hearing loss, and stated that 90% were treated (among which 23 with antipsychotics). The majority lost the MH completely, and the remainder reported a reduction in intensity and frequency of the MH. We chose to conservatively document this as a single patient with hearing loss treated with antipsychotics, with a response of 1. Whenever patients had first tried a certain class of medication without improvement (0), followed by a positive response to another class (1/2), both outcomes were scored.

Author JAFC rated the treatment responses in each report. He is a consultant neurologist who has 9 years of experience with neurological, psychiatric, neurophysiological, and radiological diagnosis, and who personally assessed more than 30 patients experiencing MH. The data were analyzed (and mean treatment response calculated) in Microsoft Excel for Mac 2011.

Results

A total number of 175 articles were identified that discussed 516 new patients with MH or related symptoms. This collection of articles included various modest case series [(Fenton and McRae, 1989; Mahendran, 2007), one which described 44 patients with MH in association with alcohol hallucinosis (Scott, 1975), and one which described 55 patients diagnosed with obsessive-compulsive disorder (OCD) and/or schizophrenia spectrum disorder where the question was asked whether the patient had *ever* heard music that did not have an external origin (other than humming, thinking of music and simple recollection of music) (Hermesh et al., 2004)].

Among those 175 articles we found 161 that discussed the treatment results of MH or related symptoms (including some which only discussed whether treatment was desired). No more than 28 of those were published before 1990. We took this as confirmation of the above-mentioned increase in the scientific interest in MH over the past 25 years rather than as proof of any increase in their prevalence. We then excluded all reports of musical illusions, pseudohallucinations, palinacusis, hypnagogic or hypnopompic hallucinations, and obsessions (i.e., "earworms"); only rarely did our interpretation of obsession vs. hallucination (i.e., "earworm" vs. MH) differ from that of the original authors (e.g., Islam et al., 2014). A total number of 276 cases in 147 articles met these inclusion criteria (Colman, 1894; Penfield and Erickson, 1941; David et al., 1944; Mulder and Daly, 1952; Rozanski and Rosen, 1952; Arieff and Brooks, 1958; Rennie, 1964; Ross et al., 1975; Scott, 1975, 1979; Schiffter and Straschill, 1977; Miller and Crosby, 1979; Raghuram et al., 1980; Wieser, 1980; Gilchrist and Kalucy, 1983; Hammeke et al., 1983; Mackworth-Young, 1983; Aizenberg et al., 1986, 1987, 1991; Jonas, 1986; Cambier et al., 1987; Lanska et al., 1987; Patel et al., 1987; Keshavan et al., 1988, 1992; Duncan et al., 1989; Fenton and McRae, 1989; Wengel et al., 1989; Berrios, 1990; McLoughlin, 1990; Donnet and Régis, 1991; Fisman, 1991; Nevins, 1991; Podoll et al., 1991; Shapiro et al., 1991; Vallada and Gentil, 1991; Wagner and Gertz, 1991; Freeland and O'Reilly, 1992; Klostermann et al., 1992; Paquier et al., 1992; Erkwoh et al., 1993; Feehan and Birchwood, 1993; Fénelon et al., 1993; Gilbert, 1993; Inzelberg et al., 1993; Isaacson et al., 1993; Couper, 1994; Hosty, 1994; Murata et al., 1994; Terao, 1995; Wodarz et al., 1995; Baurier and Tuca, 1996; Gertz et al., 1996; Stephane and Hsu, 1996; Douen and Bourque, 1997; Marneros et al., 1997; Thorpe, 1997; Clark, 1998; Fernandez and Crowther, 1998; Fukunishi et al., 1998b, 1999; Terao and Tani, 1998; Baba and Hamada, 1999; Terao and Matsunaga, 1999; Zungu-Dirwayi et al., 1999; David and Fernandez, 2000; Gomibuchi et al., 2000; Iijima et al., 2000; Keeley et al., 2000; Schielke et al., 2000; Augustin et al., 2001; Cerrato et al., 2001; Roberts et al., 2001; Tanriverdi et al., 2001; Ali, 2002; Curtin and Remund, 2002; Evers et al., 2002; Izumi et al., 2002; Assal, 2003; Baba et al., 2003; Brusa et al., 2003; Ginsberg, 2003; Matsui et al., 2003; Moore, 2003; Shinosaki et al., 2003; Stricker and Winger, 2003; Agrawal and Sherman, 2004; Aziz et al., 2004; Fischer et al., 2004; Hageman et al., 2004; Kobayashi et al., 2004; Wilkinson and Schuller, 2004; Davies and Quinn, 2005; Wang, 2005; Biran and Steiner, 2006; Janakiraman et al., 2006; Gentile et al., 2007; Gilhuis et al., 2007; Mahendran, 2007; Satoh et al., 2007; Tomar and Cheung, 2007; Ukai et al., 2007; Allen, 2008; Holroyd and Sabeen, 2008; Mocellin et al., 2008; Umene et al., 2008; Williams et al., 2008; Auffarth and

Kropp, 2009; Coebergh et al., 2009; Engmann and Reuter, 2009; Ergün et al., 2009; Rentrop et al., 2009; Strauss and Gertz, 2009; Tuerlings et al., 2009; Cosentino et al., 2010; Gondim et al., 2010; Isolan et al., 2010; Kanemura et al., 2010; Mittal and Giron, 2010; Padala et al., 2010; Shoyama et al., 2010; Wong and Bhalerao, 2010; Bleich-Cohen et al., 2011; Huntley et al., 2011; Bhatt and de Carpentier, 2012; Calabrò et al., 2012; Johns and Zuromskis, 2012; Ozsarac et al., 2012; Serrador-García et al., 2012; Simões et al., 2012; Teunisse and Olde Rikkert, 2012; Dinges et al., 2013; Giermanski et al., 2013; Vitorovic and Biller, 2013; Abdel-Aziz and Pomeroy, 2014; Aizawa et al., 2014; Bergman et al., 2014; Colon-Rivera and Oldham, 2014; Futamura et al., 2014; Husain et al., 2014; Islam et al., 2014; Kataoka and Ueno, 2014; Kumar et al., 2014; Mansoor and Ganzini, 2014; Woo et al., 2014; Blom et al., 2015; Joe et al., 2015).

Clinical Features

The clinical features of those 276 cases are shown in **Table 1**, and the main etiology in **Table 2**. Among the cases where sex was stated, women made up 68.2 % of the population. The patients' average age was 63.8 years (range 18–94 years). *One hundred* and sixty-six of the patients (60.4%) had a history of hearing impairment, most of them chronic. The level of hearing impairment—even whether a hearing aid was required and/or used, or which frequencies and/or ear were affected—was often not specified. There was a concomitant psychiatric disorder in 99 (36.2%) of the patients; among them, 69.7% suffered from mood disorder. Criteria for diagnosing psychiatric disorder were frequently not recorded, and standardized diagnostic methods were rarely used.

Treatment Effects

In **Table 3** the mean treatment effects per etiology and pharmacological class are displayed, as well as the number of patients with a complete response. A mean close to zero indicates no or little effect of the treatment, and a mean close to two indicates that the MH disappeared completely or almost completely.

TABLE 1 | Clinical features of 276 patient with musical hallucinations.

Sex (*N* = 261)	Percentage
Female (*N* = 178)	68.2%
Male (*N* = 83)	31.8%
Age (*N* = 238)	
Mean	63.8 year (18–94)
Hearing impairment (*N* = 166)	60.4%
Psychiatric disorder (*N* = 99)	36.2%
Depression (*N* = 52)	
Other mood disorder (*N* = 2)	
Schizophrenia spectrum disorder (*N* = 18)	
OCD (*N* = 4)	
Dementia (*N* = 6)	
Anxiety (with or without comorbid depression) (*N* = 15)	
Other (*N* = 2)	

Hypoacusis

In the hypoacusis group, 80 out of 96 patients either received treatment or improved spontaneously, with a mean effect of 1.19. Twenty-two patients desired no treatment (in two patients after trying a treatment first) since they generally found that they could manage without. Although impaired hearing was considered the main etiological factor, the group had an average of 1.54 etiological factors. Eleven patients showed spontaneous improvement, often after reassurance. Behavioral interventions that were attempted included improving sleep or lying on one ear at night (which, incidentally, was not helpful during the day) (Keshavan et al., 1992). Several patients report that they were bothered less by their MH when they listened to the radio (Mahendran, 2007; Teunisse and Olde Rikkert, 2012), drummed along with their fingers (Raghuram et al., 1980), wore headphones (Keshavan et al., 1988), sang along (Berrios, 1990), listened to music at bedtime (Coebergh et al., 2009), rubbed the hair near their ears (Gilchrist and Kalucy, 1983), or used a tinnitus mask (i.e., a hearing device that delivers music-like tones) (Abdel-Aziz and Pomeroy, 2014).

Six patients had some response, and six a complete response to interventions directed at improving their hearing; e.g., (optimizing) hearing aids (e.g., Feehan and Birchwood, 1993; Tuerlings et al., 2009), removing ear wax (Terao and Matsunaga, 1999; Tuerlings et al., 2009), and otosclerosis surgery [which in one case replaced MH with tinnitus (Mocellin et al., 2008)]. MH occurred only when taking hearing aid out at night in one patient (Serrador-García et al., 2012). It was generally not recorded whether changes in the use of a hearing aid made any difference but several reports mention briefly that no change occurred. Cochlear implantation can be a cause of MH but in two cases adaptation of the implant did not lead to any meaningful improvement (Auffarth and Kropp, 2009; Joe et al., 2015).

Among the 54 patients treated pharmacologically; on average 1.95 types of medication (range 1–11) were tried. The mean treatment effect of acetylcholinesterase inhibitors was 1.71 in seven patients (Shinosaki et al., 2003; Ukai et al., 2007; Strauss and Gertz, 2009; Serrador-García et al., 2012; Colon-Rivera and Oldham, 2014; Blom et al., 2015). Five other patients were treated with benzodiazepines or barbiturates and their mean response was 0.66. The mean treatment effect of antidepressants in 19 patients was 1.0, with six showing a complete response. The mean treatment effect of antipsychotics in 31 patients was 0.52, with

TABLE 2 | Main etiology.

Main etiology	*N*	Percentage (%)
Hypoacusis	96	34.8
Psychiatric disorder	63	22.8
Brain lesion or other pathology	40	14.5
Epilepsy	12	4.4
Intoxication/pharmacology	63	22.8
None of the above	2	0.7
Total	276	100

TABLE 3 | Mean effect of (pharmacological) treatment on musical hallucinations (0 = no effect, 1 = clinically meaningful, 2 = complete disappearance).

Main etiological factor	Treatment	Mean	Complete response *N* (%)	*N*
Hypoacusis	Antipsychotic	0.52	6 (19%)	31
	Antiepileptic	0.89	6 (22%)	27
	Antidepressant	1	6 (32%)	19
	Acetylcholinesterase inhibitor	1.71	5 (71%)	7
	Total response of all patients	**1.19**	**24 (32%)**	**76**
Psychiatric disorder	Antipsychotic	0.75	10 (28%)	36
	Antiepileptic	1.18	4 (36%)	11
	Antidepressant	1,18	10 (45%)	22
	Benzodiazepines	1.00	2 (40%)	5
Psychosis	Antipsychotics	1.00	6 (40%)	15
	Total	1.26	8 (42%)	19
Depression/Anxiety	Antidepressant	1.22	9 (50%)	18
	Antipsychotic	0.67	5 (21%)	24
	Total	1.32	14 (36%)	39
	Total response of all patients	**1.25**	**31 (49%)**	**63**
Brain lesion or other pathology	Total response of all patients	**1.66**	**28 (70%)**	**40**
Intoxication/pharmacology	Antipsychotic	0		2
	Antiepileptic	2.0	1	1
	Antidepressant	0		1
	Total response of all patients	**1.94**	**61 (97%)**	**63**

six of them achieving a complete response. The mean treatment effect of antiepileptics in 27 patients was 0.89, with six achieving a complete response.

Psychiatric Disorder

Among the group diagnosed with a psychiatric disorder (63 patients) many were treated pharmacologically (54 patients). The patients had a mean response to treatment of 1.25, and an average of 1.65 causes.

One patient benefited from adjustment of his hearing aid, even though psychosis was considered the trigger for his MH (Keshavan et al., 1992). One benefited from singing along (Miller and Crosby, 1979), one from listening to the radio (Baurier and Tuca, 1996), and one from CBT (Wilkinson and Schuller, 2004). Four patients improved spontaneously and two did not want any intervention even thought there were significantly bothered by their MH (Podoll et al., 1991; Keshavan et al., 1992). Treating the underlying psychiatric disorder with ECT was helpful for MH in five patients, but not in all (Wengel et al., 1989; Stephane and Hsu, 1996; Janakiraman et al., 2006) and sometimes the effect was temporary (Colon-Rivera and Oldham, 2014).

The pharmacological treatment response was best when an antidepressant was used (1.18) (with 10 of them showing a complete response), or when antiepileptics were used (1.18), with four patients responding completely. Antipsychotics yielded a mean treatment response of 0.75, and complete disappearance of the MH in 10 patients. Results tended to be better in patients diagnosed with schizophrenia spectrum disorder (1.00) than in those with mood disorders (0.67). The use of benzodiazepines led to complete disappearance in two patients, and to a mean treatment response of 1.0 (in five patients).

Brain Lesion and Other Pathology

In the brain lesion and other pathology group (40 patients) the mean number of causes was 1.4 (range 1–3). Sixteen cases of MH had a cerebrovascular cause, and in nine cases the cause was a tumor and others had pathology like multiple sclerosis and Parkinson's disease. When a tumor was present removal led to disappearance of MH (Penfield and Erickson, 1941; David et al., 1944; Scott, 1979). In all stroke cases, the hallucinations disappeared without any adjuvant treatment in days or months and up to a year [and in one case only ever lasted 90 min (Cerrato et al., 2001)]. In 22 patients MH disappeared without intervention.

One patient with a previous head trauma, who had not responded to antiepileptics and antidepressants, was treated with rTMS after 1 year of experiencing MH. The MH disappeared after 2 weeks, only to reappear after 4 months; although by that time they were less intense, and only present in a quiet environment and before falling asleep (Cosentino et al., 2010).

All in all it is difficult to fully ascertain any medication effects in the brain injury group. Thirteen patients were treated pharmacologically, but in one case of delirium (Rentrop et al., 2009) and in two cases of brain tumor patients the natural history probably led to improvement (Evers et al., 2002), rather than the use of medication (i.e., olanzapine and pregabalin, respectively). Four patients showed a complete response, and three no response to antiepileptics; three patients were treated with antidepressants, and four with antipsychotics, which are all very small numbers to establish a mean treatment response. Twenty-two improved spontaneously and six did not want any treatment.

Epilepsy

The rather small epilepsy group, which comprised of 12 patients, had a mean treatment response of 1.66. The mean number of medication used was 1.08 (range 1–4) in eight patients. MH tended to respond well to antiepileptics or surgery for the underlying cause (Rennie, 1964; Wieser, 1980; Roberts et al., 2001). Four cases of MH resolved spontaneously and were ictal or post-ictal in nature, and some of these patients were on antiepileptics already that was not changed or just started after the seizure but the MH were in all likelihood post-ictal.

Intoxication/Pharmacology

The intoxication/pharmacology group comprised of 63 patients. The mean treatment result was a robust 1.94 when patients stopped their medication or switched to another type of medication. When the above-mentioned case series of 44 patients

with alcoholic hallucinosis (Scott, 1975) was excluded, the mean treatment response was 1.79. The mean number of causes in the intoxication/pharmacology group was 1.4.

They include benzodiazepines [lormetazepam (Ginsberg, 2003), temazepam (Fisman, 1991), lorazepam (Curtin and Remund, 2002), and triazolam (Nevins, 1991)], opioids [morphine (Davies and Quinn, 2005), tramadol (Keeley et al., 2000) and oxycodone (Moore, 2003)], tricyclic antidepressants [imipramine (Terao, 1995), clomipramine (Vallada and Gentil, 1991) and mirtazapine (Padala et al., 2010)], anticholinergic medication [biperiden (Gertz et al., 1996)], alcohol (Scott, 1975), an N-methyl-D-aspartate antagonist [amantadine (Gondim et al., 2010)], a dopamine agonist [bromocriptine (Kobayashi et al., 2004)], salicylates (Allen, 2008), dipyridamole(Tomar and Cheung, 2007), propranolol (Fernandez and Crowther, 1998), voriconazole (Agrawal and Sherman, 2004), pentoxifylline (Gilbert, 1993) and steroids (Kanemura et al., 2010).

Only six patients in this group were treated with adjuvant medication. This had no effect, except in one patient who suffered from depression, white matter changes and a hearing impairment. Biperiden induced the MH and they responded to carbamazepine (Gertz et al., 1996). One patient benefited from listening to the radio (Fernandez and Crowther, 1998).

In 42 cases the musical hallucinations decreased or disappeared without any treatment—see **Table 4**. As indicated above, most of them stemmed from the brain lesion and other pathology group.

Discussion

Musical hallucinations, like actual musical sounds, are associated with activity in an extensive network of interconnected brain areas. This network comprises auditory areas, visual areas, basal ganglia, brainstem, pons, tegmentum, cerebellum, hippocampi, amygdala, motor cortex, the peripheral auditory system, and possibly many other areas (Sacks and Blom, 2012). Even though there is not a single unique pathophysiological pathway within the network that can be held responsible for the mediation of MH, there is often an etiological factor that would seem to act as a necessary and sufficient condition for it to become activated. We hypothesized that the key to successful treatment of MH might lie in identifying that etiological factor. Based on our analysis of the treatment results of 276 patients with MH as described in the literature, the following can be said about this.

TABLE 4 | Decrease or disappearance of musical hallucinations without any intervention.

Etiological factor	*N*
Hearing impairment	11
Psychiatric disorder	4
Brain lesion and other pathology	22
Epilepsy	4
None	1
Total	42

In the hypoacusis group—with patients suffering from idiopathic MH—frequently no treatment is required except for explanation, behavioral interventions, and improving auditory function. And yet pharmacological therapy can also be successful, with many different medications. The mean treatment response rate in this group is highest—although admittedly modest—with acetylcholinesterase inhibitors, followed by antiepileptics and antidepressants, and lowest with antipsychotics (which however can still be useful). Symptomatic MH, on the other hand, are more likely to respond to pharmacological treatment. In the group diagnosed with a psychiatric disorder, the type of disorder provides the most important clue to choice of treatment. Thus, treating MH experienced in the context of a depression with the aid of an antidepressant is more effective than with an antipsychotic, whereas MH experienced in the context of a schizophrenia spectrum disorder tend to respond more often to antipsychotics. Patients in the brain-injury and epilepsy groups can best be treated with antiepileptics, although in these groups the natural course of the MH is often benign, especially after a stroke. When intoxication/pharmacology is the main etiological factor, it is important to stop the medication that is held responsible for their mediation, and if necessary to replace it with a substance from a different pharmacological class.

As an aside, it is worth mentioning that in the intoxication/pharmacology group many causative medications play a role that have an opposite effect to medications used for treatment. Dopamine agonists (causative) and antipsychotics (treatment) work on the same dopaminergic receptors. Anticholinergics and tricyclics (causative) and acetylcholinesterase inhibitors (treatment) act on the same cholinergic neurotransmitters. Benzodiazepines, which act on the gamma-amino-butyric-acid (GABA) system, can at once be causative and curative. This suggests that all the neurotransmitter systems and receptors involved can play an a priori unpredictable role in the mediation *and* treatment of MH, and that proper clinical and pharmacological assessment is always necessary to establish the course of action that is most likely to yield favorable results.

Limitations

This review has several limitations. Firstly, there would seem to be a positive publication bias for successful treatments. For example, salicylates (Allen, 2008) and propranolol (Fernandez and Crowther, 1998), which in some studies are associated with the mediation of MH, are used by many of our patients in clinical practice without causing this particular side effect. Moreover, we have attempted to treat some of our patients by withdrawing these medications, and no resolution of the MH was ever noted. None of the pharmacological treatments (or withdrawal) were ever placebo controlled. There may also be a positive publication bias for pharmacological treatments *per se*. Many of our patients, after proper explanation, prefer not to try any medication, whereas others try one type of medication but refrain from trying another type. In our experience some patients are content with explanation and practical advice, which is also described by others (Shapiro et al., 1991; Feehan and Birchwood, 1993; Bhatt and de Carpentier, 2012; Johns and Zuromskis,

2012; Teunisse and Olde Rikkert, 2012). However, the fact that patients show themselves content without any pharmacological intervention does not mean that no treatment should be offered (Podoll et al., 1991; Keshavan et al., 1992).

A second limitation of this review is that its sample size is relatively small ($N = 276$), especially when subdividing the group in etiological subgroups. A previous review included 132 patients (Evers and Ellger, 2004), and yet another one did not state the total number of patients included but instead based its conclusions on 55 relevant papers (Cope and Baguley, 2009). Our sample size is nevertheless the largest analyzed so far. With the small numbers involved it cannot be ruled out that the variations are due to chance since statistical significance of differential treatment responses in every etiological subgroup would often not have been reached.

Thirdly, we may have underestimated the effects of antipsychotics in the hypoacusis group by not including the majority of patients described by Warner and Aziz (2005). As noted above, we decided to count this group as a single patient because individual patient data were lacking in the original report. However, the mean response rate to antipsychotics in this study is much higher than in others. Moreover, by lumping various classes of antidepressants into a single group, we may have missed the opportunity to identify possible group differences, especially since tricyclics are implicated in various studies as possible causes of MH. The same holds true for the various groups of antipsychotics and antiepileptics that work on very different ion channels and neurotransmitters.

If patients have tried multiple drugs in one class but did respond to another one we scored this as a response and therefore overestimated the effect of individual drugs; some patients tried up to 11 medications (Colon-Rivera and Oldham, 2014).

The interpretation of the intoxication/pharmacology literature is influenced by inclusion of 44 patients with alcoholic musical hallucinosis out of a total of 63 patients (Scott, 1975). Removing them from the analysis did not alter the finding that withdrawing the presumed offending medication is highly effective.

Conclusions and Recommendations

Musical hallucinations are best treated by directing our intervention at the etiological mechanism responsible for their mediation. Based on the findings presented above and on our clinical experience with MH, our advice would be to chart the (possibly multiple) underlying causes with the aid of a history; extensively exploring temporal relationships between MH and medication, trauma, drug (ab-)use, seizures, and use of hearing aid devices. Furthermore, neurological assessment, psychiatric assessment an ear, nose, and throat (ENT) assessment are recommended, and imaging with an MRI head. Not all patients need treatment, as MH may be self-limiting, especially when occurring after brain lesions. If associated distress is low, reassurance may be enough. When treatment is indicated, we suggest that non-pharmacological interventions should be attempted first. This may involve interventions ranging from behavioral modifications, increasing social interactions and CBT. ENT interventions and withdrawing possible causative medication should be attempted due to their low risk of side effects. When idiopathic MH significantly affects the patient's quality of life, it is worthwhile to target any particularly troublesome symptom, i.e., anxiety with a selective serotonin reuptake inhibitor (SSRI), a secondary delusion with antipsychotics, and sleep disturbances with hypnotics. In the hypoacusis group, pharmacological treatment can first perhaps best be attempted with acetylcholinesterase inhibitors. Although there currently is only limited evidence for the effectiveness of this medication group, in our clinical experience they can help significantly, while side effects are relatively mild as compared to antipsychotic and antiepileptic medication.

Antidepressants and antiepileptics have a more favorable response rate and less side effects than antipsychotics; considering most patients are elderly. The literature documents several examples of beneficial effects using carbamazepine, often a low doses.

Targeting treatment to the underlying psychiatric disorder can clearly be helpful; MH in those with mood disorders respond less well to antipsychotics than in those with a psychotic disorder. ECT can clearly be helpful in patients with severe depression and MH (Wengel et al., 1989; Stephane and Hsu, 1996; Janakiraman et al., 2006), albeit sometimes relief of MH is only brief (Colon-Rivera and Oldham, 2014).

Further exploration of rTMS could be worthwhile after the successful treatment in a very treatment resistant case (Cosentino et al., 2010).

Finally, we would like to make recommendations for further research. There ought to be a clear documentation of the volume and frequency of the MH, degree of control over the MH, quality of the MH (as well as its relation to tinnitus), and the influence of MH on daily life, before and after the start of treatment. Documenting what is taken as a successful treatment response (i.e., less meaningful, less frequent/intrusive/loud, more control, complete disappearance, improved sleep) is also essential. It should be considered to try placebo-controlled treatment (and withdrawal of presumed offending medication). Larger sized treatment trials should be able to elucidate whether the differential treatment response to different (classes) of medication is real, as suggested by this review. This should allow for a more effective and accurate assessment of the effects of treatment in the future. Perhaps, analogous to recent initiatives to create international databases for rare diseases, a database for cases of MH should be considered, with a focus on diagnostic findings, natural course, and treatment results.

Author Contributions

JC designed the manuscript, acquired data, drafted the manuscript, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. RL contributed substantially to the design of the manuscript, acquired data, revised the manuscript, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work in ensuring that questions

related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. RB acquired data, helped to draft the manuscript, revised the manuscript, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. IS contributed substantially to the design of the manuscript, revised the manuscript, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. JB contributed substantially to the design of the manuscript, revised the manuscript, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

Abdel-Aziz, K., and Pomeroy, I. (2014). Ear worms and auditory Charles Bonnet syndrome. *J. Neurol. Neurosurg. Psychiatr.* 85, e4. doi: 10.1136/jnnp-2014-309236.80

Agrawal, A. K., and Sherman, L. K. (2004). Voriconazole-induced musical hallucinations. *Infection* 32, 293–295. doi: 10.1007/s15010-004-3121-1

Aizawa, S., Terao, T., Hatano, K., and Ishii, N. (2014). Musical hallucinations responding to a further increase of carbamazepine. *BMJ Case Rep.* 2014:bcr2014206418. doi: 10.1136/bcr-2014-206418

Aizenberg, D., Dorfman-Etrog, P., Zemishlany, Z., and Hermesh, H. (1991). Musical hallucinations and hearing deficit in a young non-psychotic female. *Psychopathology* 24, 45–48. doi: 10.1159/000284696

Aizenberg, D., Modai, I., Roitman, M., Mendelson, E., and Wijsenbeek, H. (1987). Musical hallucinations, depression and old age. *Psychopathology* 20, 220–223. doi: 10.1159/000284502

Aizenberg, D., Schwartz, B., and Modai, I. (1986). Musical hallucinations, acquired deafness, and depression. *J. Nerv. Ment. Dis.* 174, 309–311. doi: 10.1097/00005053-198605000-00008

Ali, J. A. (2002). Musical hallucinations and deafness: a case report and review of the literature. *Neuropsychiatry Neuropsychol. Behav. Neurol.* 15, 66–70.

Allen, J. R. (2008). The woman who heard music: high salicylate levels and tinnitus. *Minn. Med.* 91, 44–45.

Arieff, A., and Brooks, J. (1958). Musical hallucinations as a psychical seizure: focal epileptic disorder. *Q. Bull. Northwest. Univ. Med. Sch.* 32, 201–203.

Assal, F. (2003). Musical hallucinations in the elderly. *Rev. Med. Suisse Romande.* 123, 41–44.

Auffarth, I. S., and Kropp, S. (2009). Musical hallucination in a patient after cochlear implantation. *J. Neuropsychiatry Clin. Neurosci.* 21, 230–231. doi: 10.1176/jnp.2009.21.2.230

Augustin, J., Guegan-Massardier, E., Levillain, D., Lemarchand, M., Mihout, B., and Hannequin, D. (2001). Musical hallucinosis following infarction of the right middle cerebral artery. *Rev. Neurol.* 157, 289–292.

Aziz, V. (2009). Musical hallucinations in normal children and adult non-psychiatric population. *BMJ Case Rep.* 2009:bcr06.2008.0023. doi: 10.1136/bcr.06.2008.0023

Aziz, V. M., Nessim, M., and Warner, N. J. (2004). Charles-Bonnet syndrome and musical hallucination. *Int. Psychogeriatr.* 80, 489–491. doi: 10.1017/S1041610204220919

Baba, A., and Hamada, H. (1999). Musical hallucinations in schizophrenia. *Psychopathology* 32, 242–251. doi: 10.1159/000029096

Baba, A., Hamada, H., and Kocha, H. (2003). Musical hallucinations in schizophrenia: 2. Relations with verbal hallucinations. *Psychopathology* 36, 104–110. doi: 10.1159/000070366

Baurier, V. O., and Tuca, J. O. (1996). Auditory hallucinosis in brainstem lesions and musical hallucination in deafness. Analogies and differences. *Eur. J. Neurol.* 3, 203–211. doi: 10.1111/j.1468-1331.1996.tb00424.x

Bergman, J., Pashinian, A., Weizman, A., and Poyurovsky, M. (2014). The beneficial effect of escitalopram on obsessive–compulsive-related musical hallucinations in elderly patients with hearing impairment. *Int. Clin. Psychopharmacol.* 29, 263–265. doi: 10.1097/YIC.0000000000000037

Berrios, G. E. (1990). Musical hallucinations. A historical and clinical study. *Br. J. Psychiatry* 156, 188–194. doi: 10.1192/bjp.156.2.188

Bhatt, Y. M., and de Carpentier, J. P. (2012). Musical hallucination following whiplash injury: case report and literature review. *J. Laryngol. Otol.* 126, 615–618. doi: 10.1017/S0022215112000242

Biran, I., and Steiner, I. (2006). Abnormal musical pacemaker in a patient with musical hallucinations. *Eur. J. Neurol.* 13, 1378–1380. doi: 10.1111/j.1468-1331.2006.01470.x

Bleich-Cohen, M., Hendler, T., Pashinian, A., Faragian, S., and Poyurovsky, M. (2011). Obsessive musical hallucinations in a Schizophrenia patient: psychopathological and fMRI characteristics. *CNS Spectr.* 16, 153–156. doi: 10.1017/S1092852912000326

Blom, J. D., Coebergh, J. A. F., Lauw, R., and Sommer, I. E. C. (2015). Musical hallucinations treated with acetylcholinesterase inhibitors. *Front. Psychiatry* 6:46. doi: 10.3389/fpsyt.2015.00046

Brusa, L., Panella, M., Koch, G., Bernardi, G., and Massa, R. (2003). Hashimoto's encephalopathy presenting with musical hallucinosis. *J. Neurol.* 250, 627–628. doi: 10.1007/s00415-003-1058-4

Calabrò, R. S., Baglieri, A., Ferlazzo, E., Passari, S., Marino, S., and Bramanti, P. (2012). Neurofunctional assessment in a stroke patient with musical hallucinations. *Neurocase* 18, 514–520. doi: 10.1080/13554794.2011.633530

Cambier, J., Decroix, J. P., and Masson, C. (1987). Auditory hallucinations in lesions of the brain stem. *Rev. Neurol. (Paris).* 143, 255–262.

Cerrato, P., Imperiale, D., Giraudo, M., Baima, C., Grasso, M., Lopiano, L., et al. (2001). Complex musical hallucinosis in a professional musician with a left subcortical haemorrhage. *J. Neurol. Neurosurg. Psychiatry* 71, 280–281. doi: 10.1136/jnnp.71.2.280

Clark, J. (1998). Case history of a patient with musical hallucinations and Parkinson's disease. *Int. J. Geriatr. Psychiatry* 13, 886–887.

Coebergh, J. A. F., Shaya, M., Koopman, J. P., and Blom, J. D. (2009). [Musical hallucinations]. *Ned. Tijdschr. Geneeskd.* 153, 862–865.

Cole, M. G., Dowson, L., Nandini, D., and Belzile, E. (2002). The prevalence and phenomenology of auditory hallucinations among elderly subjects attending an audiology clinic. *Int. J. Geriatr. Psychiatry* 17, 444–452. doi: 10.1002/gps.618

Colman, W. S. (1894). Hallucinations in the Sane, associated with local organic disease of the sensory organs, etc. *Br. Med. J.* 1, 1015–1017. doi: 10.1136/bmj.1.1741.1015

Colon-Rivera, H. A., and Oldham, M. A. (2014). The mind with a radio of its own: a case report and review of the literature on the treatment of musical hallucinations. *Gen. Hosp. Psychiatry* 36, 220–224. doi: 10.1016/j.genhosppsych.2013.10.021

Cope, T. E., and Baguley, D. M. (2009). Is musical hallucination an otological phenomenon? a review of the literature. *Clin. Otolaryngol.* 34, 423–430. doi: 10.1111/j.1749-4486.2009.02013.x

Cosentino, G., Giglia, G., Palermo, A., Panetta, M. L., Lo Baido, R., Brighina, F., et al. (2010). A case of post-traumatic complex auditory hallucinosis treated with rTMS. *Neurocase* 16, 267–272. doi: 10.1080/13554790903456191

Couper, J. (1994). Unilateral musical hallucinations and all that jazz. *Aust. N.Z. J. Psychiatry* 28, 516–519. doi: 10.3109/00048679409075882

Curtin, F., and Remund, C. (2002). Musical hallucinations during a treatment with benzodiazepine [6]. *Can. J. Psychiatry* 47, 789–790.

David, M. M., Hecaen, H., and Coulonjou, R. (1944). Hallucination auditives sans delire par affections neurologiques. *Ann. Med. Psychol.* 102, 139–143.

David, R. R., and Fernandez, H. H. (2000). Quetiapine for hypnogogic musical release hallucinations. *J. Geriatr. Psychiatry Neurol.* 13, 210–211. doi: 10.1177/089198870001300406

Davies, A. N., and Quinn, T. (2005). Opioid-related musical hallucinations. *J. Pain Symptom Manage*. 29, 327–328. doi: 10.1016/j.jpainsymman.2005.02.003

Dinges, M., Riemer, T., Schubert, T., and Prüss, H. (2013). Musical hallucinations after pontine ischemia: the auditory Charles Bonnet syndrome? *J. Neurol*. 260, 2678–2680. doi: 10.1007/s00415-013-7114-9

Donnet, A., and Régis, H. (1991). Musical hallucinations. *Rev. Med. Interne*. 12, 303–305. doi: 10.1016/S0248-8663(05)82869-3

Douen, A. G., and Bourque, P. R. (1997). Musical auditory hallucinosis from Listeria rhombencephalitis. *Can. J. Neurol. Sci*. 24, 70–72.

Duncan, R., Mitchell, J. D., and Critchley, E. M. R. (1989). Hallucinations and music. *Behav. Neurol.* 2, 115–124.

Engmann, B., and Reuter, M. (2009). Spontaneous perception of melodies - hallucination or epilepsy? *Nervenheilkunde* 28, 217–221.

Ergün, U., Bozbaş, A., Akin, U., and Inan, L. (2009). Musical hallucinations and Parkinson disease. *Neurologist* 15, 150–152. doi: 10.1097/NRL.0b013e3181872da7

Erkwoh, R., Ebel, H., Kachel, F., Reiche, W., Ringelstein, E. B., Büll, U., et al. (1993). 18FDG-PET and electroencephalographic findings in a patient suffering from musical hallucinations. *NuklearMedizin* 32, 159–163.

Evers, S., and Ellger, T. (2004). The clinical spectrum of musical hallucinations. *J. Neurol. Sci*. 227, 55–65. doi: 10.1016/j.jns.2004.08.004

Evers, S., Ellger, T., Ringelstein, E. B., and Knecht, S. (2002). Is hemispheric language dominance relevant in musical hallucinations? Two case reports. *Eur. Arch. Psychiatry Clin. Neurosci*. 252, 299–302. doi: 10.1007/s00406-002-0396-z

Feehan, C. J., and Birchwood, M. (1993). A case of monosymptomatic musical hallucinations. *Ir. J. Psychol. Med*. 10, 89–90.

Fénelon, G., Marie, S., Ferroir, J. P., and Guillard, A. (1993). Musical hallucinations: 7 cases. *Rev. Neurol*. 149, 462–467.

Fenton, G. W., and McRae, D. A. (1989). Musical hallucinations in a deaf elderly woman. *Br. J. Psychiatry* 155, 401–403.

Fernandez, A., and Crowther, T. R. V. W. (1998). Musical hallucinations induced by propranolol. *J. Nerv. Ment. Dis.*. 186, 192–194. doi: 10.1097/00005053-199803000-00010

Fischer, C. E., Marchie, A., and Norris, M. (2004). Musical and auditory hallucinations: a spectrum. *Psychiatry Clin. Neurosci.* 58, 96–98. doi: 10.1111/j.1440-1819.2004.01200.x

Fisman, M. (1991). Musical hallucinations: report of two unusual cases. *Can. J. Psychiatry*. 36, 609–611.

Freeland, A., and O'Reilly, R. (1992). Musical hallucinations: another case report. *Can. J. Psychiatry* 37:731.

Fukunishi, I., Horikawa, N., and Onai, H. (1998a). Prevalence rate of musical hallucinations in a general hospital setting. *Psychosomatics* 39:175. doi: 10.1016/S0033-3182(98)71368-4

Fukunishi, I., Kitaoka, T., Shirai, T., and Watanabe, S. (1998b). Musical hallucinations after childbirth in a female patient on hemodialysis. *Nephron* 79:105.

Fukunishi, I., Kita, Y., Hariharia, Y., Kubota, K., Takayama, T., Kawarasaki, H., et al. (1999). Musical hallucinations after living-donor liver transplantation. *Psychosomatics* 40, 531. doi: 10.1016/S0033-3182(99)71198-9

Futamura, A., Katoh, H., and Kawamura, M. (2014). [Successful treatment with anti-epileptic-drug of an 83-year-old man with musical hallucinosis]. *Brain Nerve* 66, 599–603.

Gentile, S., Ferrero, M., Giudice, R. L., Rainero, I., and Pinessi, L. (2007). Abdominal pain associated with musical hallucinations: a case report. *Eur. J. Neurol*. 14, e7–e8. doi: 10.1111/j.1468-1331.2007.01944.x

Gertz, H. J., Göhringer, K., and Schimmelpfennig, C. (1996). Successful carbamazepine therapy of 2 cases of music hallucinations. *Nervenarzt* 67, 387–389.

Giermanski, J., Bastiampillai, T., Gupta, A. (2013). "I"ve got an iPod in my head'. *Aust N.Z. J. Psychiatry* 47, 963–964. doi: 10.1177/0004867413482010

Gilbert, G. J. (1993). Pentoxifylline-induced musical hallucinations. *Neurology* 43, 1621–1622. doi: 10.1212/WNL.43.8.1621

Gilchrist, P. N., and Kalucy, R. S. (1983). Musical hallucinations in the elderly: a variation on the theme. *Aust. N.Z. J. Psychiatry* 17, 286–287. doi: 10.3109/00048678309161286

Gilhuis, H. J., Dara Hama-Amin, A., and Renier, W. (2007). Songs from childhood in the head. *Clin. Otolaryngol*. 32, 419–420. doi: 10.1111/j.1749-4486.2007.01515.x

Ginsberg, D. L. (2003). Benzodiazepine-associated musical hallucinations. *Prim. psychiatry* 10, 21–22.

Gomibuchi, T., Gomibuchi, K., Akiyama, T., Tsuda, H., and Hayakawa, T. (2000). Obsession of hearing music: from the viewpoint of Morita theory. *Psychiatry Clin. Neurosci*. 54, 203–206. doi: 10.1046/j.1440-1819.2000.00659.x

Gondim, F. A., Costa, H. A., Taunay, T. C., de Oliveira, G. R., Ferreira, J. M., and Rola, F. H. (2010). Transient amantadine-induced musical hallucinations in a patient with Parkinson's disease. *Mov. Disord*. 25, 1505–1506. doi: 10.1002/mds.22553

Hageman, G., Wagener-Schimmel, L., Nijhuis, I., and Vink, A. (2004). Liedjes in het hoofd: het syndroom van Oliver Sacks. *Tijdschr. Neurol. Neurochir*. 105, 26–31.

Hammeke, T. A., McQuillen, M. P., and Cohen, B. A. (1983). Musical hallucinations associated with acquired deafness. *J. Neurol. Neurosurg. Psychiatry* 46, 570–572. doi: 10.1136/jnnp.46.6.570

Hermesh, H., Konas, S., Shiloh, R., Dar, R., Marom, S., Weizman, A., et al. (2004). Musical hallucinations: prevalence in psychotic and nonpsychotic outpatients. *J. Clin. Psychiatry* 65, 191–197. doi: 10.4088/JCP.v65n0208

Holroyd, S., and Sabeen, S. (2008). Successful treatment of hallucinations associated with sensory impairment using gabapentin. *J. Neuropsychiatry Clin. Neurosci.* 20, 364–366. doi: 10.1176/jnp.2008.20.3.364

Hosty, G. (1994). Musical hallucinosis: auditory Cherles Bonnet syndrome? *Ir. J. Psychol. Med*. 11:29.

Huntley, J. D., Sandall, A., and Philpot, M. (2011). "In the midnight hour": a case report of musical hallucinations with multiple etiological factors treated with lamotrigine. *Int. Psychogeriatry*. 23, 322–324. doi: 10.1017/S1041610210001997

Husain, F., Levin, J., Scott, J., and Fjeldstad, C. (2014). Recurrent refrains in a patient with multiple sclerosis: earworms or musical hallucinations? *Mult. Scler. Relat. Disord*. 3, 276–278. doi: 10.1016/j.msard.2013.08.004

Iijima, M., Maeda, T., Tshubouchi, K., Sano, K., and Iwamoto, J. (2000). Musical hallucinations with post- pharyngolaryngoesophagectomyaphonia. *Gen. Hosp. Psychiatry* 22, 135–136. doi: 10.1016/S0163-8343(99)00050-X

Inzelberg, R., Vishnievskaya, S., and Korczyn, A. D. (1993). Transient musical hallucinosis. *J. Neurol. Neurosurg. Psychiatry*. 56:833. doi: 10.1136/jnnp.56.7.833

Isaacson, S. H., Carr, J., and Rowan, A. J. (1993). Ciprofloxacin-induced complex partial status epilepticus manifesting as an acute confusional state. *Neurology* 43, 1619–1621.

Islam, L., Scarone, S., and Gambini, O. (2014). Obsessive-compulsive disorder presenting with musical obsessions in otosclerosis: a case report. *J. Med. Case Rep*. 8:384. doi: 10.1186/1752-1947-8-384

Isolan, G. R., Bianchin, M. M., Bragatti, J. A., Torres, C., and Schwartsmann, G. (2010). Musical hallucinations following insular glioma resection. *Neurosurg. Focus* 28:E9. doi: 10.3171/2009.12.FOCUSFOCUS09243

Izumi, Y., Terao, T., Ishino, Y., and Nakamura, J. (2002). Differences in regional cerebral blood flow during musical and verbal hallucinations. *Psychiatry Res.* 116, 119–123. doi: 10.1016/S0925-4927(02)00083-5

Janakiraman, R., Wildgoose, K., and Seelam, K. (2006). ECT associated musical hallucinations in an elderly patient: a case report. *Ann. Gen. Psychiatry* 5:10. doi: 10.1186/1744-859X-5-10

Joe, S., Park, J., Lim, J., and Park, C. (2015). Unilateral musical hallucination after a hybrid cochlear implantation. *Gen. Hosp. Psychiatry* 37, 97.e1–97.e3. doi: 10.1016/j.genhosppsych.2014.09.014

Johns, C., and Zuromskis, T. (2012). The sound of silence. *Lancet* 380:1712. doi: 10.1016/S0140-6736(12)61331-2

Jonas, W. R. (1986). [Auditory hallucinations in hearing loss. Case report]. *Nervenarzt* 57, 252–254.

Kanemura, S., Tanimukai, H., and Tsuneto, S. (2010). Can "steroid switching" improve steroid-induced musical hallucinations in a patient with terminal cancer? *J. Palliat. Med*. 13, 1495–1498. doi: 10.1089/jpm.2010.9751

Kataoka, H., and Ueno, S. (2014). Auditory musical hallucinations associated with extended-release pramipexole in an elderly patient with Parkinson's disease. *Medicine (Baltimore)* 93:e251. doi: 10.1097/MD.0000000000000251

Keeley, P. W., Foster, G., and Whitelaw, L. (2000). Hear my song: auditory hallucinations with tramadol hydrochloride. *Br. Med. J.* 321:1608. doi: 10.1136/bmj.321.7276.1608

Keshavan, M. S., David, A. S., Steingard, S., and Lishman, W. A. (1992). Musical hallucinations: a review and synthesis. *Neuropsychiatry Neuropsychol. Behav. Neurol.* 5, 211–223.

Keshavan, M. S., Kahn, E. M., and Brar, J. S. (1988). Musical hallucinations following removal of a right frontal meningioma. *J. Neurol. Neurosurg. Psychiatry* 51:1235. doi: 10.1136/jnnp.51.9.1235

Klostermann, W., Vieregge, P., and Kömpf, D. (1992). Musical pseudo-hallucination in acquired hearing loss. *Fortschr. Neurol. Psychiatry* 60, 262–273. doi: 10.1055/s-2007-999146

Kobayashi, T., Miyata, Y., Okamoto, S., and Kato, S. (2004). Musical hallucinations induced by bromocriptine. *Psychogeriatrics* 4, 102–106. doi: 10.1111/j.1479-8301.2004.00056.x

Kumar, S., Sedley, W., Barnes, G. R., Teki, S., Friston, K. J., and Griffiths, T. D. (2014). A brain basis for musical hallucinations. *Cortex* 52, 86–97. doi: 10.1016/j.cortex.2013.12.002

Lanska, D. J., Lanska, M. J., and Mendez, M. F. (1987). Brainstem auditory hallucinosis. *Neurology* 37:1685.

Mackworth-Young, C. G. (1983). Sequential musical symptoms in a professional musician with presumed encephalitis. *Cortex* 19, 413–419.

Mahendran, R. (2007). The psychopathology of musical hallucinations. *Singapore Med. J.* 48:e68.

Mansoor, D., and Ganzini, L. (2014). Musical hallucinations successfully treated with antipsychotic medications: three case reports. *Psychosomatics* 55, 191–193. doi: 10.1016/j.psym.2013.02.004

Marneros, A., Beyenburg, S., and Berghaus, A. (1997). Unilateral hallucinations and other psychotic symptoms due to otosclerosis. *Psychopathology* 30, 89–92. doi: 10.1159/000285034

Matsui, T., Matsunaga, H., Ohya, K., Iwasaki, Y., Koshimune, K., Miyata, A., et al. (2003). Clinical features in two cases with musical obsessions who successfully responded to clomipramine. *Psychiatry Clin. Neurosci.*57, 47–51. doi: 10.1046/j.1440-1819.2003.01078.x

McLoughlin, I. (1990). Musical hallucinations. *Br. J. Psychiatry* 156:452.

Miller, T. C., and Crosby, T. W. (1979). Musical hallucinations in a deaf elderly *Patient* 5, 301–302.

Mittal, M., and Giron, L. T. (2010). Elvis is back: musical hallucinations in a Parkinson disease patient. *South. Med. J.* 103, 837–841. doi: 10.1097/SMJ.0b013e3181e63204

Mocellin, R., Walterfang, M., and Velakoulis, D. (2008). Musical hallucinosis: case reports and possible neurobiological models. *Acta Neuropsychiatry* 20, 91–95. doi: 10.1111/j.1601-5215.2007.00255.x

Moore, T. A. (2003). Musical hallucinations induced by oxycodone. *Am. J.Geriatr. Psychiatry* 11:470.

Mulder, D. W., and Daly, D. (1952). Psychiatric symptoms associated with lesions of temporal lobe. *J. Am. Med. Assoc.* 150, 173. doi: 10.1001/jama.1952.03680030005003

Murata, S., Naritomi, H., and Sawada, T. (1994). Musical auditory hallucinations caused by a brainstem lesion. *Neurology* 44, 156–158. doi: 10.1212/WNL.44.1.156

Nevins, M. A. (1991). Musical hallucinations and triazolam use. *N.J. Med*. 88, 907–908.

Ozsarac, M., Aksay, E., Kiyan, S., Unek, O., and Gulec, F. F. (2012). *De novo* cerebral arteriovenous malformation: pink Floyd's song "brick in the Wall" as a warning sign. *J. Emerg. Med.* 43, e17–e20. doi: 10.1016/j.jemermed.2009.05.035

Padala, K. P., Padala, P. R., Malloy, T., and Burke, W. J. (2010). New onset multimodal hallucinations associated with mirtazapine: a case report. *Int. Psychogeriatr.* 22, 837–839. doi: 10.1017/S1041610210000554

Paquier, P., van Vugt, P., Bal, P., Cras, P., Parizel, P. M., van Haesendonck, J., et al. (1992). Transient musical hallucinosis of central origin: a review and clinical study. *J. Neurol. Neurosurg. Psychiatry* 55, 1069–1073. doi: 10.1136/jnnp.55.11.1069

Patel, H. C., Keshavan, M. S., and Martin, S. (1987). A case of Charles Bonnet syndrome with musical hallucinations. *Can. J. Psychiatry* 32, 303–304.

Penfield, W., and Erickson, T. C. (1941). *Epilepsy and Cerebral Localization.* London: Bailliere, Tindall and Cox.

Podoll, K., Thilmann, A. F., and Noth, J. (1991). Musical hallucinations in hearing loss in the aged. *Nervenarzt* 62, 451–453.

Raghuram, R., Keshavan, M. D., and Channabasavanna, S. M. (1980). Musical hallucinations in a deaf middle-aged patient. *J. Clin. Psychiatry* 41:357.

Rennie, I. D. (1964). Musical hallucinations associated with epilepsy. *Guys Hosp. Rep.* 143–152.

Rentrop, M., Knebel, C., and Förstl, H. (2009). Opera-hallucinosis. *Int. J. Geriatr. Psychiatry* 24, 432–433. doi: 10.1002/gps.2124

Roberts, D. L., Tatini, U., Zimmerman, R. S., Bortz, J. J., and Sirven, J. I. (2001). Musical hallucinations associated with seizures originating from an intracranial aneurysm. *Mayo Clin. Proc.* 76, 423–426. doi: 10.1016/S0025-6196(11)62391-4

Ross, E. D. (1978). Musical hallucinations in deafness revisited. *JAMA* 240:1716.

Ross, E. D., Jossman, P. B., Bell, B., Sabin, T., and Geschwind, N. (1975). Muscial hallucinations in deafness. *JAMA* 231, 620–622. doi: 10.1001/jama.1975.03240180056018

Rozanski, J., and Rosen, H. (1952). Musical hallucinosis in otosclerosis. *Confin. Neurol.* 12, 49–54. doi: 10.1159/000105768

Sacks, O., and Blom, J. D. (2012). "Musical hallucinations," in *Hallucinations Research and Practice,* eds J. D. Blom and I. E. C. Sommer (New York, NY: Springer), 133–42.

Satoh, M., Kokubo, M., and Kuzuhara, S. (2007). A case of idiopathic musical hallucination with increasing repertoire. *J. Neurol. Neurosurg. Psychiatr.* 78, 203–204. doi: 10.1136/jnnp.2006.100313

Schakenraad, S. M. M., Teunisse, R. J., and Olde Rikkert, M. G. (2006). Musical hallucinations in psychiatric patients. *Int. J. Geriatr. Psychiatry* 21, 394–397. doi: 10.1002/gps.1463

Schielke, E., Reuter, U., Hoffmann, O., and Weber, J. R. (2000). Musical hallucinations with dorsal pontine lesions. *Neurology* 55, 454–455. doi: 10.1212/WNL.55.3.454

Schiffter, R., and Straschill, M. (1977). [Case report of a patient with sensory status epilepticus]. *Nervenarzt* 48, 321–325.

Scott, M. (1979). Musical hallucinations from meningioma. *JAMA* 241, 1683. doi: 10.1001/jama.1979.03290420011006

Scott, R. T. (1975). Hallucinations of music in alcohol withdrawal. *Neurology* 25:362.

Serrador-García, M., Santos-Bueso, E., Sáenz-Francés, F., Díaz-Valle, D., Martínez-De-La-Casa-Borrelia, J. M., and García-Feijóo, J. (2012). Charles Bonnet plus syndrome: apropos of a case. *Eur. J. Ophthalmol.* 22, 836–839. doi: 10.5301/ejo.5000130

Shapiro, C. M., Kasem, H., and Tewari, S. (1991). My music—a case of musical reminiscence diagnosed courtesy of the BBC. *J. Neurol. Neurosurg. Psychiatr.* 54, 88–89. doi: 10.1136/jnnp.54.1.88-a

Shinosaki, K., Yamamoto, M., Ukai, S., Kawaguchi, S., Ogawa, A., Ishii, R., et al. (2003). Desynchronization in the right auditory cortex during musical hallucinations: a MEG study. *Psychogeriatrics* 3, 88–92. doi: 10.1046/j.1479-8301.2003.00009.x

Shoyama, M., Ukai, S., Kitabata, Y., Yamamoto, M., Okumura, M., Kose, A., et al. (2010). Evaluation of regional cerebral blood flow in a patient with musical hallucinations. *Neurocase* 16, 1–6. doi: 10.1080/13554790903070265

Simões, S., Mesquita, J., Marçal, N., and Santos, M. (2012). Musical hallucinations: case report and review of the literature. *J. Neuropsychiatry Clin. Neurosci.* 24:E8. doi: 10.1176/appi.neuropsych.11050107

Stephane, M., and Hsu, L. K. (1996). Musical hallucinations: interplay of degenerative brain disease, psychosis, and culture in a Chinese woman. *J. Nerv. Ment. Dis.* 184, 59–61. doi: 10.1097/00005053-199601000-00012

Strauss, M., and Gertz, H.-J. (2009). Treatment of musical hallucinosis with acetylcholinesterase inhibitors. *J. Neurol. Neurosurg. Psychiatr.* 16, 1298–1299. doi: 10.1136/jnnp.2008.160978

Stricker, R. B., and Winger, E. E. (2003). Musical hallucinations in patients with Lyme disease. *South. Med. J.* 96, 711–715. doi: 10.1097/01.SMJ.0000053458.21691.2E

Tanriverdi, N., Sayilgan, M. A., and Ozçürümez, G. (2001). Musical hallucinations associated with abruptly developed bilateral loss of hearing. *Acta Psychiatr. Scand.*103, 153–155. doi: 10.1034/j.1600-0447.2001.00169.x

Terao, T. (1995). Tricyclic-induced musical hallucinations and states of relative sensory deprivation. *Biol. Psychiatry* 38, 192–193. doi: 10.1016/0006-3223(95)00058-O

Terao, T., and Matsunaga, K. (1999). Musical hallucinations and palinacousis. *Psychopathology* 32, 57–59. doi: 10.1159/000029068

Terao, T., and Tani, Y. (1998). Carbamazepine treatment in a case of musical hallucinations with temporal lobe abnormalities. *Aust. N.Z. J. Psychiatry* 32, 454–456. doi: 10.3109/00048679809065540

Teunisse, R. J., and Olde Rikkert, M. G. (2012). Prevalence of musical hallucinations in patients referred for audiometric testing. *Am. J. Geriatr. Psychiatry* 20, 1075–1077. doi: 10.1097/JGP.0b013e3182 3e31c4

Thorpe, L. (1997). The treatment of psychotic disorders in late life. *Can. J. Psychiatry* 42(Suppl. 1), 19S–27S.

Tomar, A., and Cheung, G. (2007). Musical hallucinations induced by drugs. *Int. Psychogeriatr.* 19, 1169–1172. doi: 10.1017/S1041610207005820

Tuerlings, J. H., Wijnen, H., Boerman, R., and Verwey, B. (2009). Music as an uninvited guest: the auditive variant of the Charles Bonnet syndrome. *Tijdschr. Psychiatr.* 51, 853–858.

Ukai, S., Yamamoto, M., Tanaka, M., Shinosaki, K., and Takeda, M. (2007). Donepezil in the treatment of musical hallucinations. *Psychiatry Clin. Neurosci.* 61, 190–192. doi: 10.1111/j.1440-1819.2007.01636.x

Umene, W., Yoshimura, R., Hori, H., and Nakamura, J. (2008). A case of vascular depression associated with musical hallucinations successfully treated with paroxetine and a low dose of risperidone. *Psychogeriatrics* 8, 38–41. doi: 10.1111/j.1479-8301.2007.00209.x

Vallada, H. P., and Gentil, V. (1991). Musical hallucinations triggered by clomipramine? *Br. J. Psychiatry* 159, 888–889. doi: 10.1192/bjp.159.6.888

Vitorovic, D., and Biller, J. (2013). Musical hallucinations and forgotten tunes - case report and brief literature review. *Front. Neurol.* 4:109. doi: 10.3389/fneur.2013.00109

Wagner, S., and Gertz, H. (1991). Musikalische halluzinationen bei scherhorigkeit-fallbericht. *Z. Gerontopsychol. Psychiatrie* 4, 89–193.

Wang, E. (2005). A case of musical hallucinations. *Clin. Geriatr.* 13, 11–13.

Warner, N., and Aziz, V. (2005). Hymns and arias: musical hallucinations in older people in Wales. *Int. J. Geriatr. Psychiatry* 20, 658–660. doi: 10.1002/gps.1338

Wengel, S. P., Burke, W. J., and Holemon, D. (1989). Musical hallucinations. The sounds of silence? *J. Am. Geriatr. Soc.* 37, 163–166. doi: 10.1111/j.1532-5415.1989.tb05877.x

Wieser, H. G. (1980). Temporal lobe or psychomotor status epilepticus. A case report. *Electroencephalogr. Clin. Neurophysiol.* 48, 558–572. doi: 10.1016/0013-4694(80)90291-6

Wilkinson, P., and Schuller, S. (2004). Late-onset auditory hallucinations treated with cognitive behaviour therapy. *Int. J. Geriatr. Psychiatry* 19, 598–599. doi: 10.1002/gps.1114

Williams, V. G., Tremont, G., and Blum, A. S. (2008). Musical hallucinations after left temporal lobectomy. *Cogn. Behav. Neurol.* 21, 38–40. doi: 10.1097/WNN.0b013e318165a9e1

Wodarz, N., Becker, T., and Deckert, J. (1995). Musical hallucinations associated with post-thyroidectomy hypoparathyroidism and symmetric basal ganglia calcifications. *J. Neurol. Neurosurg. Psychiatr.* 58, 763–764. doi: 10.1136/jnnp.58.6.763

Wong, C. L., and Bhalerao, S. (2010). Post-surgery musical hallucinations of a patriotic Canadian song. *Can. J. Neurol. Sci.* 37, 901–903.

Woo, P. Y., Leung, L. N., Cheng, S. T., and Chan, K.-Y. (2014). Monoaural musical hallucinations caused by a thalamocortical auditory radiation infarct: a case report. *J. Med. Case Rep.* 8:400. doi: 10.1186/1752-1947-8-400

Zungu-Dirwayi, N., Hugo, F., van Heerden, B. B., and Stein, D. J. (1999). Are musical obsessions a temporal lobe phenomenon? *J. Neuropsychiatry Clin. Neurosci.* 11, 398–400. doi: 10.1176/jnp.11.3.398

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The speaker behind the voice: therapeutic practice from the perspective of pragmatic theory

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Many attempts at understanding auditory verbal hallucinations have tried to explain why there is an auditory experience in the absence of an appropriate stimulus. We suggest that many instance of voice-hearing should be approached differently. More specifically, they could be viewed primarily as hallucinated acts of communication, rather than hallucinated sounds. We suggest that this change of perspective is reflected in, and helps to explain, the successes of two recent therapeutic techniques. These two techniques are: Relating Therapy for Voices and Avatar Therapy.

Keywords: pragmatics, voice-hearing, psychosis, avatar therapy, relating therapy, communication

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Introduction

In this paper, we examine the phenomenon of auditory verbal hallucinations (AVHs) from the perspective of pragmatic theory, the branch of linguistics that studies communication[1]. Many attempts at understanding AVHs have tried to explain why there is an auditory experience in the absence of an appropriate stimulus. In other words, they try to explain why certain people have an auditory experience in the absence of the usual conditions for having an auditory experience. Along with many clinicians, we think that voice-hearing should be understood differently. More specifically, we suggest it could be viewed, in many of the most troubling cases, primarily as a hallucinated act of communication, rather than a hallucinated sound. This is in keeping with the idea that human beings are not just perceptual creatures: they are deeply social and communicative. We suggest that this theoretical change of perspective has been foreshadowed by various therapeutic approaches. Furthermore, we suggest that this may provide theoretical insights into the apparent successes of recent therapeutic techniques. We examine two such techniques: *Relating Therapy for Voices* (Hayward et al., 2009) and *Avatar Therapy* (Leff et al., 2014).

We proceed as follows. We start by explaining the shift in focus that we endorse, namely, from audition to communication. Then we show how pragmatic theory, which examines how human beings extract meanings from utterances, might be applied to AVHs, conceived in the way we propose. Finally, we present the two therapeutic techniques mentioned above and give an explanation of why they might be effective from the perspective of pragmatic theory.

From Audition to Communication

Standard theoretical attempts to explain AVHs tend to try to explain why there is an auditory experience in the absence of an appropriate stimulus. This clearly builds on a particular

[1]For the record: FD is a linguist and SW is a philosopher.

characterization of the phenomenon to be explained. Thus, for example, Garrett and Silva (2003, p. 445) state that "the subjective quality of sensation is a near-universal feature of auditory hallucinations." Wu (2012, p. 90) states that, "in every instance of AVH, the relevant internal state is a type of auditory state." Even the well-known PSYRATS scale, which in many respects is in keeping with our approach, describes AVHs as:

> An auditory perception that has the compelling sense of reality of a true perception but occurs without external stimulation of the relevant sensory organ.
>
> (Haddock et al., 1999)

Our suggestion is that, for many of the most distressing AVHs, we should not focus on sounds and on auditory experiences, but rather on communication. In other words, these hallucinations are most fruitfully viewed as *communication hallucinations* that happen to be auditory, rather than *auditory hallucinations* that happen to be communicative.

We think that this position is motivated by the fact that an auditory-based approach mischaracterised several instances of the phenomenon. Firstly, some voice-hearers describe an experience of "soundless voices" (reports of which go at least as far back as Bleuler, 1950). For example, one participant in a recent study reports:

> It's hard to describe how I could 'hear' a voice that was not auditory; but the words used and the emotions they contained were completely clear, distinct and unmistakeable, maybe even more so than if I had heard them aurally.
>
> (Woods et al., 2015, p. 326)

Secondly, "voices" are also "heard" by congenitally deaf people with psychosis. Jo Atkinson (2006) has done very important work correcting the "audio-centrism" of mainstream perspectives. She has shown that deaf voice-hearers experience vague visual imagery like being addressed in sign-language, or of disembodied lips. But they do not have auditory experiences at all.

Of course, somebody might object that in congenitally deaf "voice-hearers," the visual imagery is the basis of the "voice" hallucination, in a way that is analogous to how, on an audition-centered view, the auditory experience forms the basis of voice-hearing experiences in voice-hearers who aren't deaf. This strikes us as implausible, in part because it fails to account for reported cases, which we have just mentioned, among the hearing population, of soundless voices, or experiences of "receiving a communication without any sensory component" (Frith, 1992, p. 73). Furthermore, it fails to make obvious use of what "voice-hearing" experiences in deaf and hearing populations have *in common*. We suggest that what they have in common is that they involve the experience of being communicated with. Once you do this, you can account for the differences relatively easily, since the communication is bound to be experienced in the way that communication tends to be experienced by that individual (viz., signing for the deaf). This also accounts for why there is a much higher prevalence of hallucinations reported in the auditory modality (within the hearing population) among subjects with psychosis, namely, because they tend to communicate auditorily, with speech (clearly there are hallucinations and sensory disturbances in other modalities, too, be we are explaining the *relative prevalence* of auditory hallucinations).

Another phenomenon, found in 64% of inpatients suffering from a psychotic disorder (Minas et al., 1992) which may also benefit from something like our approach, is delusions of reference. As Startup and Startup (2005) note, there seem to be at least two varieties of delusions of reference[2]. One variety concerns the mistaken sense that others are communicating by subtle non-verbal means (e.g., gestures, stances, arrangements of objects), while the other variety concerns the false belief that others are stealthily spying. It is the former kind that may both benefit from, and support, a communication-centered approach. The factors that may then account for the differences between communicative AVHs and communicative delusions of reference would be an interesting direction for research, but goes beyond the scope of this brief paper.

It is important, at this point, that we be clear as to which subset of the heterogeneous group of phenomena that get called AVHs we think are the most suitable to being viewed as communication hallucinations (that sometimes happen to be auditory). First of all, there are auditory hallucinations that aren't strictly AVHs, because they are not verbal (e.g., groans, clicks, bangs, music). However, among the clearly verbal cases, there is the issue of whether the subject is perceived as the specific addressee of the speech act. Cases where this is most clear are when the voice is either commanding, critical or abusive (these features are reported in Nayani and David, 1996 with a prevalence of 84, 77, and 70%, respectively). Cases where this is less clear, are cases where the voice is giving a neutral, running commentary (e.g., "John is raising his right arm and standing up to pick up the paper" etc.). Although these cases can be recognized as self-generated, they can be distressing because they are loud and interfere with the voice hearer's life[3]. These kinds of voices are not the kinds of voices that we think are best captured by our approach and it is worth noting that the kind of distress caused indirectly through the voice interfering with the subject's life is rather different from the kind of distress directly caused by the voice-hearer being abused, criticized and commanded by a malevolent agent. The prevalence of running commentary hallucinations is relatively high, but not as high as, for example, command hallucinations (55% vs. 67% in McCarthy-Jones et al., 2012). It is the latter, along with abusive and critical hallucinations, that are best captured by our communication-centered approach.

Pragmatic Theory and the Extraction of Meaning from Speech

The usual conditions of someone speaking, and one's understanding them, do not only involve the sounds that they

[2]We would like to thank one of the referees for pointing us in the direction of these communicative delusions of reference.

[3]We would like to thank one of the referees for pointing this out.

make, but also a grasp of what they intend to communicate. The study of communication is the territory of "pragmatic theory," the branch of linguistics that studies "utterances" (namely, linguistic communicative acts) rather than free-floating, de-contextualized, "sentences."

It is important to recognize that a voice-hearing experience is the experience of a spoken utterance, not a free-floating sentence. On hearing an utterance, a hearer will automatically interpret the meaning of that utterance. It is this interpretation process, which we think is important for explaining why there so often is a speaker (e.g., a person, a demon, or a god) behind the voice. In order to interpret the meaning of an utterance, a hearer must attribute the intentions behind its use at that moment, and intentions are never free-floating: they are always the intentions of an agent, of something with a mind (Wilson and Sperber, 2004).

A voice-hearer might hear the utterance "He is a loser." Without knowing whom the speaker intends to refer to with the pronoun 'he,' the hearer can't know what is meant by that utterance. And yet it seems that voice-hearers generally know who is being referred to in their voices, and what the voices mean. As Waters and Jardri (2015, p. 534) put it: "The clarity of hallucinated speech is indeed often low or fuzzy although the message is always clear to the patient.". This suggests that the voice-hearer takes there to be a speaker behind the voice, with an intention to communicate, and they interpret what it is that speaker is saying; who they are referring to, and why.

Likewise, a voice-hearer might hear a voice say "Nice one!" The meaning of this will depend entirely on the intention perceived. It could either be something positive, an expression of congratulation. Alternatively, it could be sneering and sarcastic. Somebody might object that this is something that the voice-hearer will tell from the way that the utterance is said, and ultimately from what it sounds like. But we suggest that 'the way it is said' or 'what it sounds like' is determined by the emotion of the speaker, e.g., elation, in the positive case, or, e.g., shame, in the negative case. This means that the fact that it is a person (a communicator) behind the voice, and that they are nasty, explains why the utterance sounds the way it does, and thus, why it is interpreted the way it is, rather than the other way around.

Within this approach, where voice-hearing experiences are primarily viewed as communicative rather than auditory, it becomes less surprising that the voice is taken to come from a speaker (communicative agent), since this is a necessary dimension of all communication. Going beyond suggestions from Bell (2013) and Wilkinson and Bell (forthcoming), it is relevant to say not only that representation of agency in general, and specific agents in particular, is a key aspect of many AVHs: but also that the representation of agents *as communicative*, and as *affording communicative interactions* is also crucial.

A Perspective on Therapeutic Interventions

Although clear and detailed theoretical formulations of this approach have been lacking, it is implicit (and at times explicit) in a number of recent therapeutic frameworks and techniques (see Thomas et al., 2014 for a review). Here we examine two promising such techniques: *Relating Therapy* and *Avatar Therapy*.

Relating Therapy

What is It?

Relating Therapy was developed by Hayward et al. (2009) with the aim of improving the relationship between voice hearers and their voices by encouraging them to interact closely with their voices and to relate to them in a more assertive manner.

A Relating Therapeutic intervention consists of multiple sessions, which make up three separate phases. The aim of phase 1 is to introduce the voice hearer to the notion of Relating Therapy, and to consider the implications of relating to and interacting with their voices. The objective of phase 2 is then to explore the themes within the voice hearer's history with regard to how they have related socially with other people as well as with their voices. Having completed phase 1 and 2, the voice hearer is then ready to enter into phase 3 by exploring and developing assertive approaches to relating to and socially interacting with their voices and other people. Together with the therapist, the voice hearer participates in role-plays to explore the intentions and motives of their voices and other people, and to practice a more assertive approach to social interaction.

Why Does It Work?

Relating Therapy was developed based on the intuition that, just as our perceptions of, reactions to and relationships with our colleagues, our family members and our friends are effected by how we relate to those individuals, a voice hearer's perception of, reaction to and ultimately their relationship with their voices might be affected by how they relate to those voices. For example, a voice hearer might assume a passive and submissive role in relation to their voice, thus allowing the voice to assume a dominant, bullying role. Hayward et al. (2009) conceived of the therapy as a tool for normalizing the voice-hearing experience by locating it in the realm of typical social interactions. They recognize the disparity between hearers' reported emotional responses to their voices (Garrett and Silva, 2003) and their passive relationship with them, and they intend the therapy to be a route out of this relationship and into one of a more reciprocal nature. Indeed, findings from an early feasibility study suggest that Relating Therapy reduces the distress caused by voices and triggers a change in how the hearers relates to their voices (Hayward et al., 2009).

Relating Therapy in its conception embraces the agentive aspect of the voice-hearing experience, and encourages voice hearers to view their voices as coming from intentional agents whose behavior is dependent on how the voice hearer relates to them. Indeed, when AVHs are viewed as intentional communicative acts, the speaker behind those communicative acts is more specifically a communicative agent who seeks to influence and bring about emotions and behaviors in the hearer via the production of (often) distressing utterances. As such, the voice hearer has the capacity to become an interlocutor in the experience and talk back to the speaker behind their voice, potentially bringing about change in the content of their verbal

hallucinations, and ultimately empowering the voice hearer by exposing them to the malleability of their voice-hearing experiences and their emotional responses to them. After all, a communicative exchange is an iterative process in which what one interlocutor says builds on what has already been said and influences what will then be said by the other interlocutor.

Avatar Therapy

What is It?

Avatar Therapy consists in encouraging the voice hearers to construct a visual "avatar," using a computer program. The voice hearer subsequently interacts with the avatar. In a pilot study, after up to seven 30 min sessions of Avatar Therapy, almost all of the patients reported an improvement in both the frequency and the severity of their voices. Three of the 16 patients stopped hearing voices completely after up to 16 years of experiencing AVHs.

Why Does It Work?

The intention behind the development of Avatar Therapy was to develop a tool to facilitate a dialog between voice hearers and their voices. Leff et al. (2014) propose that an avatar provides something for the voice hearer to stand up to, and, ultimately, something that they can control. As is pointed out in Leff et al. (2014), many clinicians are skeptical of this therapeutic approach, because it is seen as an extreme case of colluding with the patient's pathology, providing a 'real' physical manifestation of that which is hallucinated. Like Leff et al. (2014), we suggest that this line of thought is misguided. Leff et al. (2014), defend their approach by emphasizing that:

> Since the externalized voice is part of the patient's inner world, discounting it or refusing to acknowledge the patient's experience of this split-off part as real negates the possibility of the patient reintegrating it into their psychic structure.
>
> (Leff et al., 2014, p. 6)

We want to unpack this point a little further by emphasizing that when AVHs are viewed primarily as hallucinations of intentional communicative acts, the communicator behind the voice can be as much part of the experience as the sound of the voice, or as what the voice is saying. In fact, we suggest that the latter two aspects of the experience are likely to be dependent on the voice hearer's perception of the speaker behind their voice. It is implicit in the thinking behind Avatar Therapy that the speaker behind the voice is critical to the voice hearer's perception of and reaction to their voice, but Leff et al. (2014, p. 1) see "the entity" behind the voice as "invisible" in AVH. We suggest that quite the opposite to providing a physical manifestation of that which was 'invisible' before, Avatar Therapy affords the voice hearer the opportunity to have some control over the characteristics of the speaker behind their voice in a controlled and deliberate manner, where, before, the speaker behind the voice, though an ever present aspect of the AVH experience, had free reign to present in any way[4].

The positive outcomes of Avatar Therapy are not surprising if voice-hearing experiences are seen as primarily communication hallucinations. The distressing aspect of voice-hearing is often the intention behind the voice, i.e., to threaten, harass, or abuse. Indeed, pragmatic theory teaches us that the mere words heard without the underlying (perceived) intentions are not simply *weaker* threats (or harassments, or abuses): they fail to be threats at all. It makes sense that if the voice-hearer is able to create a benevolent avatar for their voices, then the attitude and content conveyed by the voices will invariably be less malicious and less distressing.

Conclusion

In keeping with recent therapies that seem effective, an important subset of AVHs should be viewed as hallucinations of intentional acts of communication, rather than primarily as hallucinated sounds. This manages to capture what we take to be important in many AVHs that are reported as auditory, as well as those experiences reported as soundless voices, and "voice-hearing" experiences in the congenitally deaf. Theorists who want to explain voice-hearing in terms of, e.g., spontaneous activation in auditory cortex (Cho and Wu, 2013), would either deny the existence of these phenomena, or say that they are not "real instances" of AVH. This latter option, we think, is revisionist and undesireable. We would rather encourage the grouping together of communication AVHs, some of which may be auditory, while others might not be, rather than a grouping along the axis of auditory phenomenology. Of course, this then makes the term "AVH" a bit of a misnomer. But superficial terminological considerations should not be what drives us when we group together clinically relevant phenomena. We could easily call them "verbal hallucinations" or "voice hallucinations," or even stick to the pre-theoretical term "voice-hearing experiences."

From our communication-centered perspective, the interpretations hearers derive from these experiences, and the distress they cause, can be better understood. Moreover, such an approach may allow pragmatic theory to provide insights into how a voice-hearer might be able to manipulate the content and delivery of their voices by engineering the identity and nature of the speaker behind the voice.

[4] Indeed a voice hearer recently told us: "My voices are always here, looking at you, even when they are silent."

References

Atkinson, J. R. (2006). The perceptual characteristics of voice-hallucinations in deaf people: insights into the nature of subvocal thought and sensory feedback loops. *Schizophr. Bull.* 32, 701–708. doi: 10.1093/schbul/sbj063

Bell, V. (2013). A community of one: social cognition and auditory verbal hallucinations. *PLoS Biol.* 11:e1001723. doi: 10.1371/journal.pbio.1001723

Bleuler, E. (1950). *Dementia Praecox or the Group of Schizophrenias*. New York, NY: International Universities Press.

Cho, R., and Wu, W. (2013). Mechanisms of auditory verbal hallucination in schizophrenia. *Front. Psychiatry* 4:155. doi: 10.3389/fpsyt.2013.00155

Frith, C. (1992). *The Cognitive Neuropsychology of Schizophrenia*. New York, NY: Psychology Press.

Garrett, M., and Silva, R. (2003). Auditory hallucinations, source monitoring and the belief that 'voices' are real. *Schizophr. Bull.* 29, 445–457.

Haddock, G., McCarron, J., Tarrier, N., and Faragher, E. B. (1999). Scales to measure dimensions of hallucinations and delusions: the psychotic symptom rating scales (PSYRATS). *Psychol. Med.* 29, 879–889. doi: 10.1017/S0033291799008661

Hayward, M., Overton, J., Dorey, T., and Denney, J. (2009). Relating therapy for people who hear voices: a case series. *Clin. Psychol. Psychother.* 16, 216–227. doi: 10.1002/cpp.615

Leff, J., Williams, G., Huckvale, M. A., Arbuthnot, M., and Leff, A. P. (2014). Avatar therapy for persecutory auditory hallucinations: what is it and how does it work? *Psychosis* 6, 166–176. doi: 10.1080/17522439.2013.773457

McCarthy-Jones, S., Trauer, T., Mackinnon, A., Sims, E., Thomas, N., and Copolov, D. L. (2012). A new phenomenological survey of auditory hallucinations: evidence for subtypes and implications for theory and practice. *Schizophr. Bull.* 40, 231–235. doi: 10.1093/schbul/sbs156

Minas, I. H., Stuart, G. W., Klimidis, S., Jackson, H. J., Singh, B. S., and Copolov, D. L. (1992). Positive and negative symptoms in the psychoses: multidimensional scaling of SAPS and SANS items. *Schizophr. Res.* 8, 143–156. doi: 10.1016/0920-9964(92)90031-Y

Nayani, T., and David, A. (1996). The auditory hallucination: a phenomenological survey. *Psychol. Med.* 26, 177–189. doi: 10.1017/S0033291700 03381X

Startup, M., and Startup, S. (2005). On two kinds of delusion of reference. *Psychiatry Res.* 137, 87–92. doi: 10.1016/j.psychres.2005.07.007

Thomas, N., Hayward, M., Peters, E., van der Gaag, M., Bentall, R. P., Jenner, J. et al. (2014). Psychological therapies for auditory hallucinations (Voices): current status and key directions for future research. *Schizophr. Bull.* 40(Suppl. 4), S202–S212. doi: 10.1093/schbul/sbu037

Waters, F., and Jardri, R. (2015). Auditory hallucinations: debunking the myth of language supremacy. *Schizophr. Bull.* 41, 533–534. doi: 10.1093/schbul/sbu166

Wilkinson, S., and Bell, V. (forthcoming). The representation of agents in auditory verbal hallucination. *Mind Lang.*

Wilson, D., and Sperber, D. (2004). "Relevance theory," in *The Handbook of Pragmatics*, eds L. Horn and G. Ward (Oxford: Blackwell), 607–632.

Woods, A., Jones, N., Alderson-Day, B., Callard, F., and Fernyhough, C. (2015). Experiences of hearing voices: analysis of a novel phenomenological survey. *Lancet Psychiatry* 2, 323–331. doi: 10.1016/S2215-0366(15)00006-1

Wu, W. (2012). Explaining schizophrenia: auditory verbal hallucination and self-monitoring. *Mind Lang.* 27, 86–107. doi: 10.1111/j.1468-0017.2011.01436.x

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Auditory verbal hallucinations in schizophrenia and post-traumatic stress disorder: common phenomenology, common cause, common interventions?

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Auditory verbal hallucinations (AVH: 'hearing voices') are found in both schizophrenia and post-traumatic stress disorder (PTSD). In this paper we first demonstrate that AVH in these two diagnoses share a qualitatively similar phenomenology. We then show that the presence of AVH in schizophrenia is often associated with earlier exposure to traumatic/emotionally overwhelming events, as it is by definition in PTSD. We next argue that the content of AVH relates to earlier traumatic events in a similar way in both PTSD and schizophrenia, most commonly having direct or indirect thematic links to emotionally overwhelming events, rather than being direct re-experiencing. We then propose, following cognitive models of PTSD, that the reconstructive nature of memory may be able to account for the nature of these associations between trauma and AVH content, as may threat-hypervigilance and the individual's personal goals. We conclude that a notable subset of people diagnosed with schizophrenia with AVH are having phenomenologically and aetiologically identical experiences to PTSD patients who hear voices. As such we propose that the iron curtain between AVH in PTSD (often termed 'dissociative AVH') and AVH in schizophrenia (so-called 'psychotic AVH') needs to be torn down, as these are often the same experience. One implication of this is that these trauma-related AVH require a common trans-diagnostic treatment strategy. Whilst antipsychotics are already increasingly being used to treat AVH in PTSD, we argue for the centrality of trauma-based interventions for trauma-based AVH in both PTSD and in people diagnosed with schizophrenia.

Keywords: abuse, dissociation, hallucinations, hearing voices, memory, PTSD, psychosis, traumatology

Introduction

Auditory verbal hallucinations (AVH), hearing voices in the absence of appropriate external stimuli, are reported by approximately three in four people diagnosed with schizophrenia (Thomas et al., 2007). They are also found with notable regularity in post-traumatic stress disorder (PTSD; Butler et al., 1996; Anketell et al., 2010; Brewin and Patel, 2010). In the most studied sub-group of people with PTSD, military veterans, recent studies have reported an

AVH prevalence ranging from 50–67% (Holmes and Tinnin, 1995; Anketell et al., 2010; Brewin and Patel, 2010).

In this paper we will first argue that AVH in PSTD (PTSD-AVH) have a qualitatively similar phenomenology to AVH in schizophrenia (SZ-AVH). We will then demonstrate that whilst traumatic life events are associated with AVH in PTSD by definition, they are also associated with AVH in schizophrenia. Next, we will show that the phenomenology of AVH in both schizophrenia and PTSD relate to earlier traumas, when present, in a comparable fashion, and examine how this can be accounted for. Finally, we will explore the implications of this for the treatment of SZ-AVH and PTSD-AVH.

The Phenomenology of AVH in PTSD and Schizophrenia

Arguments for Dissimilarities

Arguments that the phenomenology of PTSD-AVH is qualitatively distinct from that of SZ-AVH are not supported by contemporary research. One proposition is that PTSD-AVH are ego-syntonic 'pseudo hallucinations' (recognized as one's own cognitions), whereas SZ-AVH are ego-dystonic 'true hallucinations' (experienced as externally generated). Based on their finding that all thirty PTSD-AVH patients they interviewed regarded their AVH as a manifestation of their own thoughts, Brewin and Patel (2010, p. 424) argued that PTSD-AVH are a dissociative phenomenon, distinct from the "psychotic processes" that result in SZ-AVH. However, whilst Anketell et al. (2011, p. 93) found that some patients with PTSD did indeed recognize some congruence between the content of their AVH and their own thoughts, the majority reported AVH that were "experienced as ego-dystonic or alien to the extent that they were endowed with the qualities of an entirely separate entity or person." Just as some PTSD-AVH may be ego-dystonic, some SZ-AVH can be ego-syntonic, with McCarthy-Jones et al. (2014) finding that 34% of people diagnosed with schizophrenia-spectrum disorders with AVH said some of their AVH could have been their own voice/thoughts. Instead of being diagnostically specific, the extent to which voices are ego-syntonic or ego-dystonic appears comparably heterogeneous in PTSD-AVH and SZ-AVH.

As is well known, Schneider (1959) argued that certain types of voices (running commentaries and voices conversing) were diagnostic of schizophrenia, a distinction that was still reflected in DSM-IV-Tr (American Psychiatric Association, 2000). However, there are no differences between rates of running commentaries or voices conversing between patients with PTSD and patients with psychotic disorders (Scott et al., 2007), and Schneider's position has been abandoned in DSM-5 (American Psychiatric Association, 2013).

Another argument is that PTSD-AVH typically take the form of auditory flashbacks (re-experiencing of auditions surrounding the trauma), whereas SZ-AVH do not. Such a proposition is contradicted by the finding that PTSD-AVH are phenomenologically distinct from auditory flashbacks where the person acts or feels as if the traumatic event is actually recurring (Butler et al., 1996). Furthermore, PTSD-AVH are not confined to episodes of re-experiencing, but remain present continuously as in SZ-AVH (Braakman et al., 2009).

A final argument proposes that the content of AVH in patients with a psychosis subtype of PTSD is almost always trauma-related, whereas in schizophrenia they are not (Scott et al., 2007; Braakman et al., 2009). However, this argument is not empirically supported (Hardy et al., 2005; Anketell et al., 2010; Corstens and Longden, 2013), as we address in Section "Trauma, SZ-AVH, and PTSD-AVH."

Direct Phenomenological Comparisons

Studies directly comparing the phenomenology of PTSD-AVH and SZ-AVH have found no notable differences. To our knowledge, there have only been two such studies (Scott et al., 2007; Jessop et al., 2008). The first of these compared the AVH of 17 PTSD patients with those of 16 patients with psychotic disorders, and found no differences between the groups in the rates of Schneiderian-type voices (Scott et al., 2007). The study did find that command AVH were more common in SZ-AVH (63%) than PTSD-AVH (37%), and that only hearing internally located voices was more common in PTSD-AVH (35%) than SZ-AVH (11%).

The second study of this question, although drastically underpowered ($N = 18$; schizophrenia $n = 5$, PTSD $n = 13$) and hence largely reliant on indicative descriptions, found that the majority of both groups heard both externally and internally located AVH (Jessop et al., 2008). Around half of each group reported perceptually vivid voices. In terms of differences, Jessop et al. (2008) found that the frequency and duration of AVH were lower in PTSD than in schizophrenia, and that participants with PTSD reported greater subjective distress than those with schizophrenia. The study also found that command hallucinations and derogatory themes were more common in PTSD, contradicting the findings of Scott et al. (2007) There is hence no clear evidence for qualitative differences between PTSD-AVH and SZ-AVH from extant (albeit underpowered) research.

Indirect Phenomenological Comparisons

Due to the small numbers of patients involved in direct comparison studies, PTSD-AVH may be compared with SZ-AVH based on the wider phenomenological literature in this area. To do this, we characterized AVH in schizophrenia using the three largest studies of SZ-AVH (Nayani and David, 1996, $N = 100$; Corstens and Longden, 2013, $N = 100$; McCarthy-Jones et al., 2014, $N = 199$). Studies of the phenomenology of AVH in PTSD have been notably smaller. To characterize the phenomenology of PTSD-AVH we drew on the three largest detailed studies of this phenomenon we were aware of (Scott et al., 2007, $N = 20$; Anketell et al., 2010, $N = 20$; Brewin and Patel, 2010, $N = 30$). In one instance where a notable aspect of the phenomenology of AVH was described in the PTSD-AVH studies but not SZ-AVH (and vice versa for another aspect of AVH phenomenology), we drew on smaller studies to gather information about this property of AVH (Kent and Wahass, 1996; Hamner et al., 2000). The resultant comparisons are shown in

Table 1. As can be seen PTSD-AVH and SZ-AVH appear highly similar phenomenologically, and where differences do appear, these are quantitative rather than qualitative.

Summary

Available studies support the argument that PTSD-AVH and SZ-AVH are qualitatively similar in phenomenological terms. This implies that a description of an AVH in isolation should not permit a reliable discernment as to whether it was reported by someone diagnosed with either PTSD or schizophrenia. This appears to be the case. For example, take the following description of an AVH:

> *One [voice] tells me to hurt myself. . . And I did in the past. . . It's very nasty. . .always criticizing. . .continually at you. . .'try and do yourself in,' 'commit suicide'. . .they try and tell you how to do it. . . there's never anything good. . .Through time a girl appeared. . . She was more peaceful and more subdued. . . saying to me. . . 'just don't pay attention to him'. . . It's controlling my life. . . sometimes it's a battle with them. . . just to survive.*

We submit that only the referenced source of this quote (Anketell et al., 2011, p. 92) would allow the reader to correctly infer whether this was a voice heard by a person diagnosed with PTSD or schizophrenia. Although we cannot rule out that a large-scale study explicitly comparing AVH between people diagnosed with PTSD and people diagnosed with schizophrenia may highlight some important differences, it appears that PSTD-AVH and SZ-AVH frequently share a common phenomenology.

Trauma, SZ-AVH, and PTSD-AVH

Is Trauma Associated with SZ-AVH and PTSD-AVH?

Whilst PTSD-AVH have their roots in traumatic experiences by definition, the role of trauma in SZ-AVH has historically been drastically underestimated (Read et al., 2005). There is now good evidence for an association between traumas (particularly, but not exclusively, childhood abuse) and SZ-AVH (Read et al., 2003; McCarthy-Jones, 2011; Sheffield et al., 2013), as well as between trauma and AVH in the general population (Bentall et al., 2012). Dose–response relations between trauma and AVH (Bentall et al., 2012), and between trauma and psychosis in general (Varese et al., 2012b), suggest a causal relation. Commonalities in the neurological effects of trauma and the neurological changes associated with AVH are also consistent with a causal relation (Read et al., 2014). It is hence plausible that PTSD-AVH and SZ-AVH share a common phenomenology because they often share a common cause.

Are PTSD-AVH and SZ-AVH Phenomenologically Related to Trauma in Similar Ways?

Studies of people diagnosed with PTSD, as well as of people diagnosed with schizophrenia, have examined if and how the content of AVH may relate to previous traumatic events in the person's life, if present. Such studies have typically lacked the methodological rigor to allow concerns over the reliability and validity of links reported to be satisfactorily addressed.

The methodologically strongest of these studies, by Hardy et al. (2005), examined the relation between trauma and the content of hallucinations in patients with non-affective psychosis. Participants were assessed three months apart, being asked at baseline about the phenomenology of their hallucinations (which were predominantly, but not exclusively, AVH), and then asked at 3-month follow up about childhood traumatic experiences (using the Trauma History Questionnaire, Green, 1996). A bespoke coding framework was devised to classify the content of traumas and hallucinations, with each coding being independently made by two separate raters to allow assessment of inter-rater reliability. First, content ratings were made based on whether there was a literal correspondence between the content of trauma and the content of hallucinations. For example, a content association was deemed present if a person who was threatened with a gun experienced visions of guns. There was 100% inter-rater agreement on content associations. Second, both hallucinations and traumas were rated on four themes (humiliation, intrusiveness, threat, and guilt) to assess indirect associations between them. Clear operational definitions were created for these themes. The presence of these themes in hallucinations and traumas were assessed separately meaning that raters were blind to any associations of traumas with hallucinations. Kappa statistics for inter-rater reliabilities for the assessment of these themes in traumatic life events ranged from 0.45 to 0.62, and from 0.45 to 0.64 for these themes in hallucinations. These hence represented only moderate agreement, raising some concerns over the reliability of these judgements.

Of the 75 participants in the study, 40 reported having experienced trauma (e.g., sexual abuse, bullying, military combat). Of these 40 patients, 5 (12.5%) were found to have direct content associations between their trauma and their hallucination, 23 (57.5%) were found to have indirect, thematic associations between their trauma and their hallucinations (this figure included the five participants with direct content associations, as they also had thematic correspondences between their traumas and hallucinations), and 17 (42.5%) had no apparent relation between the content of their hallucinations and their trauma. This suggested that a subset of people diagnosed with a psychotic disorder have experienced trauma, and that a subset of these have links between their trauma and the content of their hallucinations. In this study, this subset of a subset who had links between their trauma and the content of their hallucinations represented 30.6% of the overall sample of patients with non-affective psychoses.

It is possible that this study underestimated links between AVH-content and traumatic life events by only inquiring about life-events deemed traumatic by Green's (1996) Trauma History Questionnaire. A more recent study by Corstens and Longden (2013) looked not just at trauma in relation to AVH-content, but at a wider range of emotionally overwhelming events covering a range of social and emotional problems. This was done with 100 people who heard voices (80% of who had received a

TABLE 1 | A phenomenological comparison of auditory verbal hallucinations (AVH) between post-traumatic stress disorder (PTSD) and schizophrenia.

Property	PTSD	Schizophrenia-spectrum disorders
Unpleasant voices	Present, more common than pleasant voices (Anketell et al., 2010; Brewin and Patel, 2010)	Present, more common than pleasant voices (Nayani and David, 1996; Corstens and Longden, 2013; McCarthy-Jones et al., 2014)
Pleasant voices	Present, but less common than negative voices (Anketell et al., 2010; Brewin and Patel, 2010)	Present, but less common than negative voices (Nayani and David, 1996; Corstens and Longden, 2013; McCarthy-Jones et al., 2014)
Voices issue commands?	Yes (Scott et al., 2007; Anketell et al., 2010)	Yes (Nayani and David, 1996; Corstens and Longden, 2013; McCarthy-Jones et al., 2014)
Commands to hurt self	Yes (Anketell et al., 2010)	Yes (Kent and Wahass, 1996)
Link to trauma	Only 40% linked voices to earlier traumas (Anketell et al., 2010)	Some but not all linked to trauma (Hardy et al., 2005; Corstens and Longden, 2013)
Location	Mostly internally located, but some external and some in both locations (Scott et al., 2007; Anketell et al., 2010)	Approximately equal mix between internal, external, and both (McCarthy-Jones et al., 2014)
Clarity	As clear as a real voice (Anketell et al., 2010)	Typically clear or very clear (McCarthy-Jones et al., 2014)
Unclear voices	In addition to clear content, may include "garbled voices" (Hamner et al., 2000)	In addition to clear content, may include "nonsense voices" (McCarthy-Jones et al., 2014)
Experienced as manifestation of own thoughts	Present in some (Brewin and Patel, 2010)	Present in some (McCarthy-Jones et al., 2014)
Gender	Voices are mainly male (Brewin and Patel, 2010)	Voices are mainly male (Corstens and Longden, 2013; McCarthy-Jones et al., 2014)
Identity of voice	Most recognized as being that of person known in the real world to the hearer (Anketell et al., 2010; Brewin and Patel, 2010)	Approximately equal mix between known, unknown, and both (McCarthy-Jones et al., 2014)
Form of address	Most commonly use 'you' (Brewin and Patel, 2010)	Most commonly use 'you' (Corstens and Longden, 2013; McCarthy-Jones et al., 2014)
Frequency	Voices heard many times a day (Brewin and Patel, 2010)	Most likely to be constantly with the person (McCarthy-Jones et al., 2014)
Control	Around a third can control their voices (Brewin and Patel, 2010)	Fifty-one percent can exercise some control over their voices (Nayani and David, 1996)
Number of voices heard	May hear one or more voices, and groups of voices (Anketell et al., 2010; Brewin and Patel, 2010)	May hear one or more voices, and groups of voices (Nayani and David, 1996; Corstens and Longden, 2013; McCarthy-Jones et al., 2014)

diagnosis of schizophrenia or other psychotic diagnosis). Themes of AVH-content were coded using a variety of coding schemes derived from clinical expertise, existing theoretical and empirical literature, and the work of Romme and Escher (2000). For example, codes applied to the key themes of voice-hearing were problems and conflicts relating to: shame and guilt, sexual identity, self-esteem, anger, and attachment and intimacy. One author initially coded all interviews, and to confirm agreement and consistency in this coding system, a subset of 30 constructs were selected at random and rated on the same criteria by both the second author and an independent rater external to the study. However, formal kappa ratings were not reported, and the reliability and validity of the ensuing conclusions are hard to assess. The study found that the vast majority of the sample (94%) had AVH whose content could be related to earlier emotionally overwhelming events, with both voices and adverse events often having emotional congruence (e.g., both involving low self-worth, anger, shame, and guilt) and identity congruence (e.g., both involving a family member, a past abuser).

A range of other studies have also produced findings consistent with the hypothesis that a significant proportion of patients diagnosed with schizophrenia-spectrum diagnoses have AVH with content that relates to earlier adversities. Reiff et al. (2012) interviewed 21 people who had both been diagnosed with schizophrenia-spectrum diagnoses (including hallucinations/delusions) and had experienced physical or sexual abuse as a child. They found that 14 (67%) patients had links between their child abuse and the content of their hallucinations/delusions. For example, one participant who had suffered child sexual abuse by their step-father later heard the hallucinated voice of the step-father; another who was raped in childhood later heard a hallucinated voice that threatened rape. Thompson et al. (2010) found that, in a population at ultra-high risk for psychosis, having a history of sexual trauma increased the odds ninefold that sub-threshold psychotic experiences with sexual content would be experienced. Raune et al. (2006) found attributes of stressful events in the year preceding psychosis onset were associated with core themes of both delusions and hallucinations, and Smith et al. (2006) found individuals with greater levels of depression and lower self-esteem had AVH of more intensely negative content.

All this suggests that a notable subset of people diagnosed with schizophrenia-spectrum disorders that who experience AVH have voices whose content is related to earlier traumatic or

adverse life-experiences. Hardy et al.'s (2005) study suggests such relations may exist in around a third of such patients, with Corstens and Longden's (2013) work suggesting that if the concept of trauma is expanded to cover a wider range of adverse or emotionally overwhelming events, that this percentage may be much higher. More detailed research is needed to create a more precise estimate. Nevertheless, what emerges clearly is that the nature of the relation between trauma and the content of AVH in psychosis is not typically one of re-experiencing (Fowler et al., 2006) but instead involves a direct or indirect, thematic relation. This is not to say that some SZ-AVH are not forms of re-experiencing, as McCarthy-Jones et al. (2014) found that 39% of patients with schizophrenia-spectrum diagnoses reported that their voices were in some way "replays" of memories of previous conversations they'd had/heard (although it was not enquired if these related to trauma), and that of these patients, 23% (i.e., 9% of the overall sample) said that these replays were identical to these earlier conversations (although such voices only completely made up 14% of these people' voices). Forms of direct re-experiencing may hence make up some SZ-AVH, but this appears to be a small corner of the experience.

A similar pattern of findings – predominantly indirect/thematic relations between trauma and AVH content – emerges from the PTSD research literature. Anketell et al. (2010) found 40% of PTSD patients directly related their voices to past experiences of abuse or trauma. For example, one patient who had been physically assaulted by two men subsequently heard the voices of two men saying, "We'll kill you." For others, the link between the content of the trauma and the AVH was not immediately evident, with one man who had suffered physical and sexual abuse reporting three distinct voices all "making a case for self-harm and suicide" that appeared to reflect the internalized message given to him by the abuser. This echoes the indirect, thematic link found between many SZ-AVH and trauma by Hardy et al. (2005). However, methodological safeguards to validity and reliability, as employed by Hardy et al. (2005) were not employed in this study.

Consistent with this finding though, other research has also found that PTSD-AVH appear to often have themes which indirectly reflect the nature of the trauma (e.g., derogatory comments referring to the participant's perceived inadequacy). For example, Jessop et al. (2008) found 46% of patients with PTSD reported an association between their AVH and earlier traumatic experiences, but that the content was not typically a direct reflection of a traumatic event. Instead, the AVH included themes that were understandable in the context of trauma (e.g., "you are hopeless," "you deserve to die," in the case of childhood physical and sexual abuse) or related to derogatory comments previously said to them. Similarly, Butler et al. (1996) report that AVH in persons with PTSD are often congruent with the trauma, but not identical to it (e.g., a dead soldier calling to the patient to kill himself). This moves the concept of AVH in PTSD away from PTSD-AVH as simple re-experiencing.

To illustrate how voices may be related to traumas in PTSD, but are clearly not re-experiencing of what actually happened consider the example of David (not his real name; taken from Bleich and Moskowits, 2000). David was a 25-year old tank crew member in the Lebanon War, when an artillery shell hit his tank. He was picked up and thrown by the blast. He survived but other crew members were killed. In the days immediately afterward he became restless and anxious. Worrying thoughts about the event kept coming into his mind, he became agoraphobic, emotionally volatile, suffered sleep disruption, and he avoided weapons whenever he could. Several weeks later he started hearing voices. They were the voices of his dead comrades, accusing David of betraying them by leaving them and remaining alive. They commanded him to join them by committing suicide. These were obviously words never actually spoken to David by his comrades whilst they were alive (i.e., they were not direct re-experiencing of actual speech), but the content of these voices was clearly related to his trauma. The content of AVH in PTSD hence seems to have a similar relationship to trauma as in SZ-AVH; related but different.

Only one study has directly compared the relationship of AVH-content to trauma in PTSD and schizophrenia. Scott et al. (2007) found that five out of 20 patients with PTSD reported that the content of their hallucinations represented a past psychologically traumatic experience (e.g., hearing the voice of a perpetrator), the trauma being sexual abuse in all cases. However, Scott et al. (2007, p. 46) they found that "Hallucinations representing psychological trauma did not occur in patients with psychotic disorder." No details were given on the methodology used to assess links between trauma and hallucination content. Given that studies employing more detailed, rigorous, and systematic approaches to assessing links between trauma and AVH-content in patients with schizophrenia-spectrum diagnosis have found links in many cases (see above; Hardy et al., 2005; Reiff et al., 2012; Corstens and Longden, 2013), it appears Scott et al.'s (2007) failure to find associations may have been due to methodological limitations.

In the context of methodological problems of extant studies, it may nevertheless be tentatively concluded that AVH with a basis in trauma, whether they occur in the context of a PTSD diagnosis or a schizophrenia diagnosis, often (but not always) relate to this trauma, and typically do so in a way that is indirect/thematic rather than taking the form of re-experiencing. However, there is a need for more methodologically rigorous studies to examine the nature and prevalence of relations between the content of AVH and earlier traumas, when present.

How Can We Account for the Varied Ways AVH are Related to Trauma?

A range of mechanisms have been proposed to account for the relation between traumatic life events and the later emergence of AVH, which span a range of levels of explanation (for reviews see, McCarthy-Jones, 2012; Read et al., 2014). These include the biological (altered hypothalamic–adrenal–pituitary axis activity, altered dopaminergic transmission), cognitive (source monitoring errors, content memory deficits), and affective (emotional suppression, altered emotion recognition). Here, we will first examine how a well-established model of re-experiencing in PTSD may be used to account for AVH (in both

PTSD and schizophrenia) that are linked to earlier traumatic events but which are not direct re-experiences, before briefly considering how other relations may be possible.

AVH as a Re-Experiencing Phenomenon

Ehlers and Clark (2000) argue that re-experiencing in PTSD results from intrusions from memory, due to traumatic experiences not being laid down in autobiographical memory in a consolidated fashion. Specifically, they propose that during trauma exposure cognitive processing becomes data-driven rather than conceptually driven. This altered form of processing has been referred to as dissociative (meaning the stimuli is processed in an unintegrated manner), and has been proposed to result in what Brewin (2001) has termed a situationally accessible memory (SAM), which can be difficult to recall voluntarily, but which can more easily be involuntarily triggered into consciousness when stimuli associated with the original trauma are encountered.

Modeling SZ-AVH as a form of re-experiencing symptom would be consistent with much SZ-AVH research. The proposal that re-experiencing results from the context of the traumatic event not being encoded (Ehlers and Clark, 2000), fits with evidence of context memory deficits in SZ-AVH (Waters et al., 2006). The dose–response relationship between trauma and AVH (Bentall et al., 2012) is congruent with Ehlers and Clark's (2000) proposal that a second traumatic event is even less likely to be integrated into autobiographical memory due to it triggering of memories of the original exposure and impairing the person's ability to conceptually process the event. Re-experiencing symptoms taking the form of intrusions from memory also have a strong sensory component, consistent with the phenomenology of many (although not all) AVH in both PTSD and schizophrenia. Yet, the question remains as to why AVH (in both PTSD and in SZ) are not typically re-experiences of trauma, but do have indirect or direct links to trauma.

Existing Attempts to Account for the Relation between AVH and Traumatic Events

We are only aware of one previous attempt to explain why utterances heard during a traumatic event may inform the content of AVH, but not be such words verbatim. Brewin et al. (1996) discuss how SAMs may be altered. SAMs cannot be deliberately accessed, occur automatically when the person is in a context where physical cues or meanings are encountered similar to those of the earlier traumatic situation, and are associated with a flashback type re-experiencing. Brewin et al. (1996, p. 678) argue that SAMs can be "automatically altered or added to whenever some or all of the information they contain happens to be paired with changes in concurrent bodily states or contents of consciousness." They further claim that (beneficial) changes to the SAM would be expected to follow changes such as the absolution of responsibility for the trauma, whereas negative changes would be expected if subsequent information changes the perception of the event in a negative way (further self-shaming information). They suggest that this may occur through an associative process, e.g., a SAM of the event occurs and is followed by the thought, "I should kill myself." This new thought then becomes a SAM in itself, and forms the basis of an AVH. This implies, although Brewin et al. (1996) do not explicitly make this point, that verbally accessible memories (VAMs) of the trauma (a series of autobiographical memories which can be deliberated and progressively edited) may interact and alter the SAMs of the event in a dynamic way.

Applying Theories of Reconsolidated Memory to AVH

Contemporary models of memory may also be employed to explain why the content of AVH is related to an earlier event, but not identical to it. Consolidation theory assumes that memories are labile for a limited time after encoding, but then consolidation occurs and these memories become fixed, or at least resistant to change (McGaugh, 2000). However, it has long been known that episodic memories can be reconstructed (Bartlett, 1932), and altered by post-event information. For instance, providing participants with misleading information after the encoding of an event can revise the original memory (Loftus, 2005). Yet, it was only more recently that reactivation of the memory was considered as a potential prerequisite for memory change. Hupbach et al. (2007) showed that modification of consolidated episodic memories is critically dependent upon their reactivation. It hence appears that after reactivation, apparently stable memories may re-enter an unstable state in which they are modifiable, requiring another phase of stabilization, ('reconsolidation'), and that in this transient plastic state, memories are susceptible to the incorporation of new information (Wichert et al., 2013).

Consistent with this, memories are now conceptualized as "transitory dynamic mental constructions" (Conway and Pleydell-Pearce, 2000, p. 261) that are "created in the present moment, according to the demands of the present" (Fernyhough, 2012, p. 6). Applying this to AVH, it can be hypothesized that if the original verbal memory of the trauma is reactivated, then it may be reconsolidated in altered form based on the current cognitive and affective state of the person. In this way, the contemporary emotions the voice-hearer has in relation to the trauma, which often involve guilt and shame (McCarthy-Jones, 2012; Corstens and Longden, 2013), could actively shape the representation in memory of the trauma, creating memories thematically related to the trauma, in turn seeding AVH thematically related to the trauma.

Goals

One factor that may influence whether such memories come to consciousness (a pre-requisite for them being experienced as AVH) is the voice-hearer's current goals. Conway and Pleydell-Pearce (2000) argue that patterns of activation continually arise and dissipate in the autobiographical knowledge base, and emerge as conscious memories when they can be linked to the person's current goals. Goals may thus influence the frequency of AVH, as well as their content. The idea that the content of voices may be related to the voice-hearer's goals was tested in a recent study by Varese et al. (2015). This was performed

with 22 clinical voice-hearers and 18 non-clinical voice-hearers (clinical/non-clinical status being assessed using the facets of the Structural Clinical Interview for DSM-IV-TR; Axis I Disorder; First et al., 2002). Participants' personal goals were assessed using a modified version of the Goal Task of Dickson and MacLeod (2004). Thematic associations between personal goals and voice-content were assessed using a variable-oriented coding procedure which focused on predefined, theory-driven variables and their relationships (Miles et al., 2014). A subsample of 20 coding matrices performed by the first author were also analyzed by a second coder. Inter-coder agreement was 95%, with kappa being 0.78, indicating a substantial agreement between coders. The study found that there was a thematic match between the content of voices and at least one reported personal goal in 83% of the total sample. Seventy percent of participants described voices that could be matched with two or more of their personal goals. For example, one participant's personal goal was "Being a confident and competent person." They heard a voice which said things such as "People think you are stupid," "You don't even know what you are talking about," "You will never be good at anything." Another participant had the goal of "Protect myself and my family," and heard voices saying "You are going to have to watch yourself mate, because he is going to attack you. So why don't you retaliate by grabbing hold of his neck and pushing him to the floor?" Goals (e.g., being safe) which are incongruent with earlier traumatic experiences, or whose development was spurred by earlier traumas, could hence be a source of AVH-content (whether this be through encouraging memories related to the trauma, or influencing ongoing inner speech or auditory verbal imagery; Jones and Fernyhough, 2007). The second example above, in which being safe was an important personal goal and relate to AVH content, can also be seen to link to another prominent theory of AVH, which is based in hypervigilance.

Beyond Memory: Hypervigilance

Hypervigilance for threat, a characteristic sequel of trauma and symptom of PTSD (Dalgleish et al., 2001; American Psychiatric Association, 2013) has been proposed be a causative mechanism underpinning at least some AVH (Dodgson and Gordon, 2009; Garwood et al., 2015). This offers a route through which current concerns may generate content that is related to previous traumatic events, but which is not a direct memory of things heard. To illustrate this, consider the example of Rick, who was referred to an Early Intervention in Psychosis service (Smailes et al., submitted). Rick had been involved in a violent confrontation with a local gang, in which he was trying to protect his father. After this he became hypervigilant for any signs that he was to be targeted in a reprisal attack. As a result, he began to hear comments from people passing his house at night suggesting that he would be assaulted. His voices were clearly thematically related to his traumatic encounter with the gang, but were not direct re-experiences of things said during this. Instead, hypervigilance resulted in auditory false positives (Dodgson and Gordon, 2009) for words and phrases of concern to Rick, which were naturally related to the trauma, but not identical to it.

Therapeutic Implications

Fernyhough (2012) has eloquently described how, "We remember the past through the lens of the present: what we believe now, what we want now. Memories might be about the past, but they are constructed in the present to suit the needs of the self." If traumatic memories form the basis of some AVH, this suggests that changing people's current beliefs and perspectives on themselves in relation to the trauma may both alter their memories they construct and the ability of voices to arise from these. The potential for trauma-based interventions to alter the negative content of voices is particularly important as there is currently no evidence that the dominant psychotherapy for voice-hearing, CBT for psychosis, is able to reduce the perceived malevolence of voices (Thomas et al., 2014; McCarthy-Jones et al., 2015). Could changes to how a person thinks and feels about an earlier traumatic event related to the voice alter the affective tone of the voice, e.g., changing malign voices into supportive ones?

Evidence for this is limited, but studies of compassion focussed therapy (CFT) are suggestive. CFT is based on theories of emotional regulation (Mayhew and Gilbert, 2008), and posits that hypersensitive threat processing (including threats to social-rank linked with shame and stigmatization and/or that originating from trauma exposure) can severely impair emotional regulation and reduce affiliation abilities. It therefore aims to help people develop the capacity for compassionate responding to self and others to help regulate emotion and mitigate distressing threat appraisals. In a small-scale case series, Mayhew and Gilbert (2008, p. 133) found CFT "had a major effect on. . .hostile voices, changing them into more reassuring, less persecutory and less malevolent voices." Preliminary results of CFT for psychosis more generally are also encouraging (Braehler et al., 2013).

In addition to working with beliefs about the emotional event at the root of the voice(s), voices themselves may be directly engaged with, dialogically, in order to reconsolidate them into a more benevolent form. The exploratory technique of Voice Dialoguing (Corstens et al., 2011, 2012) is premised on a dissociative model that frames SZ-AVH as disowned experiential/emotional representations that can be directly engaged with by a therapist in a manner that instigates integration and reconciliation. The trauma literature likewise describes instances of dynamic engagement with voices (Holmes and Tinnin, 1995; Brewin, 2003). However, it should be noted that the efficacy of these approaches have not yet been demonstrated in a systematic, standardized manner with randomized samples of either PTSD or psychosis patients. The potential to eliminate SZ-AVH, if this is the hearer's goal (Smailes et al., submitted), through addressing the traumatic life events underpinning them is also limited at the present time to tantalizing anecdotal evidence. For example, Leff et al. (2014) report that, in a trial of effectiveness of Avatar therapy for AVH, a participant's voices ceased after guilt he felt over childhood sexual abuse he had experienced was removed by the therapist helping him to realize that what had happened was not his fault.

Whilst such suggestions are not new to PTSD interventions, they are novel for SZ-AVH, which are not traditionally viewed

having content dynamically linked to earlier emotional traumas, but only being statically triggered by them. This suggests that CBT for psychosis, which currently focusses on changing beliefs about voices in order to reduce distress, may also benefit from the greater use of techniques that can change beliefs about any emotional events that inform AVH content (McCarthy-Jones, 2015). An essential first step would be to assess if the AVH is associated with an underpinning emotional trauma. In CBT terminology this would be accomplished with a longitudinal formulation (Johnstone and Dallos, 2006) or, using a more recent approach, creating a 'construct' of the voice that situates it in the context of a specific life-event (Romme and Escher, 2000; Corstens and Longden, 2013), thus encouraging association (rather than dissociation) between voice presence and adversity exposure, and providing a coherent framework for integrating dissimilated material into existing representational structures. In this respect, 'deconstructing' voices as latently psychologically interpretable/interpersonally significant is consistent with the premise that construing meaning and narrative from distressing experiences (including those in the context of psychosis) promotes hope, empowerment, reflectivity, and psychological adjustment (Romme and Escher, 2000; British Psychological Society [BPS], 2011). The next step would be to alter dysfunctional beliefs, not about the voices, but about the person's role in any traumatic or emotional precursor events. This is already standard practice in the PTSD literature, where attributions of guilt and shame will often be worked with therapeutically. Techniques already used in PTSD such as imaginal rescripting and the integration of such experiences into autobiographical memory, may be beneficial to people with SZ-AVH. The development of psychological formulations would also allow the exploration of personal goals potentially underling the content of voices, and guide the provision of support to help clients achieve unmet goals that may be feeding voice content and/or occurrence (Varese et al., 2015).

A further technique which could potentially be imported from the trauma field for SZ-AVH is Eye Movement Desensitization and Reprocessing (EMDR). This is a robustly evidence-based therapy for PTSD (National Institute for Clinical Excellence [NICE], 2005; Foa et al., 2009), with provisional indications of utility in psychosis (Helen, 2011; van den Berg and van der Gaag, 2012; Van Der Vleugel et al., 2012), although there remains the need for controlled evaluations.

Another option may be to pharmacologically 'defuse' traumatic memories underpinning SZ-AVH (although this intervention raises a number of ethical concerns; President's Council on Bioethics, 2003; Henry et al., 2007). Menzies (2012) found that five of six patients with PTSD, with memories ranging in age from four months to 31 years, all reported improvement when given propranolol shortly after having retrieved the traumatic memory. This included 'fragmentation' of the memory and difficulty accessing it, minimal or absent distress when thinking about it, and a feeling of emotional detachment, as if it were a normal non-traumatic memory or had happened to someone else. To our knowledge this has not been trialed with SZ-AVH to examine the effect of this on AVH.

The traditional role of antipsychotics in the treatment of SZ-AVH (Sommer et al., 2012) raises the potential risk that highlighting the equivalence of PTSD-AVH with many SZ-AVH could primarily be seen as suggesting the need to use antipsychotics for AVH and/or re-experiencing symptoms in PSTD, which is indeed now becoming increasingly common (Han et al., 2014). However, the insight that many SZ-AVH may have a similar cause to PTSD-AVH, namely trauma, argues more clearly for the importation of PTSD treatments into schizophrenia, rather than schizophrenia treatments into PTSD. Indeed, treatment-resistant schizophrenia is associated with a higher rate of lifetime adversities, with patients with four or more adversity exposures being four times more likely to find antipsychotics ineffective (Hassan and De Luca, 2015). This issue is further complicated by the potential for debilitating side-effects after long-term neuroleptic use (Ananth et al., 2004), and the elevated risk of suicide amongst patients experiencing distressing, treatment-refractory voices (Fialko et al., 2006).

Although we have focussed on PTSD and schizophrenia, clinical and conceptual overlaps between PTSD, psychosis, and dissociation have been explored by several theorists (Moskowitz and Corstens, 2007; Moskowitz et al., 2009; Craparo et al., 2014) with a number of hybrid diagnostic categories being proposed (e.g., dissociative subtypes of schizophrenia: Ross, 2008; and psychotic subtypes of PTSD: Braakman et al., 2009). Within such dissociative frameworks, AVH have been conceived as 'disowned,' disaggregated representations of past events (i.e., trauma-fixated) that aurally encroach on functioning-focused parts of the personality, consequently perceived as depersonalized and decontextualized stimuli (Moskowitz et al., 2009) that intrude into the executive self, wherein "disturbed connectivity or coherence. . .may negatively affect the normal patterns of synchronous activity. . .[that constitute] integrative functions of consciousness" (Bob and Mashour, 2011, p. 1046). Dissociation has been found to mediate the relation between childhood trauma and hallucinations in patients with schizophrenia-spectrum disorders (Varese et al., 2012a), demonstrating the utility of considering this concept in schizophrenia as well as PTSD. As psychosis patients are frequently excluded from treatment trials in PTSD and dissociative disorders, there remains limited data on the utility of applying dissociation-informed treatment protocols to individuals with complex comorbidity. As such, it should be noted that much existing evidence is therefore limited to small case series and observational data. An exception to this is non-randomized trials of PTSD-directed treatment in psychosis patients, which show that CBT programs based on cognitive restructuring (Rosenberg et al., 2004) and exposure paradigms (Frueh et al., 2009) provide clinical benefit for reducing posttraumatic symptoms without adverse effects.

Despite guidelines emphasizing the need to routinely assess adversity exposure in psychiatric service-users (National Health Service Confederation [NHS], 2008), such recommendations are not always adequately implemented (Hepworth and McGowan, 2013). While a history of maltreatment should not be presupposed, the evidence outlined here supports the contention that clinicians should receive adequate support and training for

making routine enquiries about abuse and adversity. This is particularly important given the significant under-detection of posttraumatic stress in people with diagnoses of schizophrenia-spectrum disorders (Lommen and Restifo, 2009), and that such individuals are less likely to receive an appropriate clinical response (e.g., trauma-focussed interventions) relative to those with non-psychotic diagnoses (Agar and Read, 2002) especially in cases where clinicians hold strong causal beliefs about biogenetic etiology (Young et al., 2001).

Conclusion

In this paper we firstly argued that AVH are regularly reported in both PTSD and schizophrenia, and furthermore that AVH are qualitatively similar in their phenomenology across these two diagnoses. One implication of this is the need to consider naming AVH as a characteristic symptom of PTSD, in addition to existing criterion of "Recurrent, involuntary, and intrusive memories" and "Dissociative reactions (e.g., flashbacks)," which share much in common with AVH and yet are distinct experiences. This is consistent with Bosson et al.'s (2011) contention that it is problematic that diagnostic guidelines for PTSD do not include criterion involving AVH that are related to but do not replicate the traumatic event.

Our second argument was that AVH in both PTSD and schizophrenia are often associated with earlier traumatic life-experiences (by definition in PTSD, but also commonly in people diagnosed schizophrenia). It is becoming clear that labeling AVH as a "psychotic symptom" is a Schneiderian hangover that the mind sciences need to sober up from. If AVH is viewed as a psychotic symptom, caused by schizophrenia-spectrum disorders, then it is naturally going to cause puzzlement when it is reported in people with non-psychotic diagnoses such as PTSD or borderline personality disorder. However, if AVH is viewed as often (although not always) being a post-traumatic reaction, then its presence in people with PTSD or borderline personality disorder (in which childhood trauma is common, and where AVH are also phenomenology similar to SZ-AVH; Kingdon et al., 2010) is to be expected. Rather than primarily searching for psychotic subtypes of PTSD or borderline personality disorder, future research may more profitably explore, (a) why trauma leads to AVH in some people but not others); (b) whether there exist trauma-based and non-trauma based subtypes of AVH in schizophrenia, each with a characteristic biological phenotype (such as an inflammatory phenotype in the case of the former; Dennison et al., 2012); and (c) why some AVH are more likely to be complicated by delusional elaboration than others (and are hence more likely to result in a diagnosis of schizophrenia), a process already tentatively linked with environmental risk factors and affective dysregulation (Smeets et al., 2012).

Our third argument was that the content of AVH in both PTSD and schizophrenia are related to trauma (when present in schizophrenia) in a similar way, most commonly in a manner involving indirect or directs links, and not involving re-experiencing. Starting from well-established cognitive models of re-experiencing symptoms in PTSD, we explored how contemporary models of memory could account for the nature of this relationship. We suggested this may be due to the memories of verbal material pertaining to trauma being shaped by the person's current thoughts and emotions pertaining to the trauma. We also noted that the intrusion into consciousness of this memory could be facilitated by linkages with current personal goals, as well as noting that other forms of mentation (i.e., inner speech, auditory verbal imagery) could also potentially be triggered by personal goals and form the source of AVH. Finally, we highlighted that hypervigilance following trauma could be another way to account for why AVH often have thematic links to earlier emotionally overwhelming events, without being re-experiences of them.

Building on these arguments, we proposed that psychotherapies that aim to formulate and revise unhelpful beliefs about any emotional events that underpin AVH may be beneficial in improving the affective valence of the voice, reducing accompanying distress through breaking down dissociative barriers, and encouraging psychological unity and integration. This review identifies important rationales for extending knowledge from the trauma literature more vigorously into psychosis research. An important caveat is that not all SZ-AVH may be related to earlier traumas, even when such traumas are present (Hardy et al., 2005). Although it may be particularly tempting to link SZ-AVH that have negative emotional content to earlier experiences of trauma, not only are there other potential reasons available for why SZ-AVH may have negative content (e.g., Sommer and Diederen, 2009), but it should be noted that Hardy et al. (2005) found that their participants with a history of trauma were equally likely as participants with no history of trauma to have voices with content involving themes of humiliation, guilt, or threat (although as we noted above, this study did not examine links between AVH and emotionally overwhelming events that we not assessed by the trauma questionnaire employed by their study). Research into SZ-AVH therefore needs to be open to the concept of equifinality (Cicchetti and Rogosch, 1996) which, as applied here, allows that there may be multiple aetiological routes to phenomenologically similar AVH, of which trauma may be only one. The developmental routes which lead to AVH, and the interaction of biological and environment events along these pathways, is in need of much greater understanding. Despite these caveats, it is nonetheless clear that the clinical exploration of potential links between AVH-content and trauma (or emotionally overwhelming events in general), the implementation of (trauma-specialized) psychotherapeutic interventions where appropriate, and the dismantling of the iron curtain between AVH in schizophrenia and AVH in PTSD, should have beneficial consequences for many patients. Psychotic and dissociative voice-hearing will likely, in many cases, turn out to be the same thing.

References

Agar, K., and Read, J. (2002). What happens when people disclose sexual or physical abuse to staff at a community mental health centre? *Int. J. Ment. Health Nurs.* 11, 70–79. doi: 10.1046/j.1440-0979.2002.00230.x

American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders*, 4th Edn (Washington, DC: American Psychiatric Association).

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders,* 5th Edn (Washington, DC: American Psychiatric Association).

Ananth, J., Parameswaran, S., and Gunatilake, S. (2004). Side effects of atypical antipsychotic drugs. *Curr. Pharm. Des.* 10, 2219–2229. doi: 10.2174/1381612043384088

Anketell, C., Dorahy, M. J., and Curran, D. (2011). A preliminary qualitative investigation of voice hearing and its association with dissociation in chronic PTSD. *J. Trauma Dissociation* 12, 88–101. doi: 10.1080/15299732.2010.514844

Anketell, C., Dorahy, M. J., Shannon, M., Elder, R., Hamilton, G., Corry, M., et al. (2010). An exploratory analysis of voice hearing in chronic PTSD: potential associated mechanisms. *J. Trauma. Dissociation* 11, 93–107. doi: 10.1080/15299730903143600

Bartlett, F. C. (1932). *Remembering: A Study in Experimental and Social Psychology*. Cambridge: Cambridge University Press.

Bentall, R. P., Wickham, S., Shevlin, M., and Varese, F. (2012). Do specific early-life adversities lead to specific symptoms of psychosis? A study from the 2007 the Adult Psychiatric Morbidity Survey. *Schizophr Bull.* 38, 734–740. doi: 10.1093/schbul/sbs049

Bleich, A., and Moskowits, L. (2000). Post traumatic stress disorder with psychotic features. *Croat. Med. J.* 41, 442–445.

Bob, P., and Mashour, G. A. (2011). Schizophrenia, dissociation, and consciousness. *Conscious. Cogn.* 20, 1042–1049. doi: 10.1016/j.concog.2011.04.013

Bosson, J. V., Reuther, E. T., and Cohen, A. S. (2011). The comorbidity of psychotic symptoms and posttraumatic stress disorder: evidence for a specifier in DSM-5. *Clin. Schizophr. Relat. Psychoses* 5, 147–154. doi: 10.3371/CSRP.5.3.5

Braakman, M. H., Kortmann, F. A., and van den Brink, W. (2009). Validity of 'post-traumatic stress disorder with secondary psychotic features': a review of the evidence. *Acta Psychiatr. Scand.* 119, 15–24. doi: 10.1111/j.1600-0447.2008.01252.x

Braehler, C., Gumley, A., Harper, J., Wallace, S., Norrie, J., and Gilbert, P. (2013). Exploring change processes in compassion focused therapy in psychosis: results of a feasibility randomized controlled trial. *Br. J. Clin. Psychol.* 52, 199–214. doi: 10.1111/bjc.12009

Brewin, C. (2001). A cognitive neuroscience account of posttraumatic stress disorder and its treatment. *Behav. Res. Ther.* 39, 373–393. doi: 10.1016/j.jpsychires.2012.05.006

Brewin, C. R. (2003). *Posttraumatic Stress Disorder: Malady or Myth*? New Haven, CT: Yale University Press.

Brewin, C. R., Dalgleish, T., and Joseph, S. (1996). A dual representation theory of post traumatic stress disorder. *Psychol. Rev.* 103, 670–686. doi: 10.1016/j.jbtep.2013.07.011

Brewin, C. R., and Patel, T. (2010). Auditory pseudohallucinations in United Kingdom war veterans and civilians with posttraumatic stress disorder. *J. Clin. Psychiatry* 71, 419–425. doi: 10.4088/JCP.09m05469blu

British Psychological Society [BPS]. (2011). *Good Practice Guidelines on the use of Psychological Formulation. A Report by the British Psychological Society Division of Clinical Psychology*. Leicester: British Psychological Society.

Butler, R. W., Mueser, K. T., Sprock, J., and Braff, D. L. (1996). Positive symptoms of psychosis in posttraumatic stress disorder. *Biol. Psychiatry* 39, 839–844. doi: 10.1016/0006-3223(95)00314-2

Cicchetti, D., and Rogosch, F. A. (1996). Equifinality and multifinality in developmental psychopathology. *Dev. Psychopathol.* 8, 597–600. doi: 10.1017/S0954579400007318

Conway, M. A., and Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychol. Rev.* 107, 261–288. doi: 10.1037/0033-295X.107.2.261

Corstens, D., and Longden, E. (2013). The origins of voices: links between voice hearing and life history in a survey of 100 cases. *Psychosis* 5, 270–285. doi: 10.1080/17522439.2013.816337

Corstens, D., Longden, E., and May, R. (2012). Talking with voices: exploring what is expressed by the voices people hear. *Psychosis* 4, 95–104. doi: 10.1080/17522439.2011.571705

Corstens, D., May, R., and Longden, E. (2011). "Talking with voices," in *Psychosis as a Personal Crisis: An Experience Based Approach,* eds M. Romme and S. Escher (London: Routledge), 166–178.

Craparo, G., Gori, A., Mazzola, E., Petruccelli, I., Pellerone, M., and Rotondo, G. (2014). Posttraumatic stress symptoms, dissociation, and alexithymia in an Italian sample of flood victims. *Neuropsychiatr. Dis. Treat.* 10, 2281–2284. doi: 10.2147/NDT.S74317

Dalgleish, T., Moradi, A. R., Taghavi, M. R., Neshat-Doost, H. T., and Yule, W. (2001). An experimental investigation of hypervigilance for threat in children and adolescents with post-traumatic stress disorder. *Psychol Med.* 31, 541–547. doi: 10.1017/S0033291701003567

Dennison, U., McKernan, D., Cryan, J., and Dinan, T. (2012). Schizophrenia patients with a history of childhood trauma have a pro-inflammatory phenotype. *Psychol. Med.* 42, 1865–1871. doi: 10.1017/S0033291712000074

Dickson, J. M., and MacLeod, A. K. (2004). Approach and avoidance goals and plans: their relationship to anxiety and depression. *Cognit. Ther. Res.* 28, 415–432. doi: 10.1023/B:COTR.0000031809.20488.ee

Dodgson, G., and Gordon, S. (2009). Avoiding false negatives: are some auditory hallucinations an evolved design flaw? *Behav. Cogn. Psychother.* 37, 325–334. doi: 10.1017/S1352465809005244

Ehlers, A., and Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behav. Res. Ther.* 38, 319–345. doi: 10.1016/s0005-7967(99)00123-0

Fernyhough, C. (2012). *Pieces of Light: The New Science of Memory*, Kindle Edition. London: Profile Books.

Fialko, L., Freeman, D., Bebbington, P. E., Kuipers, E., Garety, P. A., Dunn, G., et al. (2006). Understanding suicidal ideation in psychosis: findings from the psychological prevention of relapse in psychosis (PRP) trial. *Acta Psychiatr. Scand.* 114, 177–186. doi: 10.1111/j.1600-0447.2006.00849.x

First, M. B., Spitzer, R. L., Gibbon, M., and Williams, J. B. W. (2002). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version,* Patient Edition. New York, NY: Biometrics Research.

Foa, E. B., Keane, T. M., and Friedman, M. J. (2009). *Effective Treatments for PTST: Practice Guidelines of the International Society for Traumatic Stress Studies.* New York, NY: Guilford Press.

Fowler, D., Freeman, D., Steel, C., Hardy, A., Smith, B., Hackman, C., et al. (2006). "The catastrophic interaction hypothesis: how do stress, trauma, emotion and information processing abnormalities lead to psychosis?," in *Trauma and Psychosis: New Directions for Theory and Therapy Larkin,* ed. W. Morrison (London: Routledge), 101–124.

Frueh, B. C., Grubaugh, A. L., Cusack, K. J., Kimble, M. O., Elhai, J. D., and Knapp, R. G. (2009). Exposure-based cognitive-behavioral treatment of PTSD in adults with schizophrenia or schizoaffective disorder: a pilot study. *J. Anxiety Disord.* 23, 665–675. doi: 10.1016/j.janxdis.2009.02.005

Garwood, L., Dodgson, G., Bruce, V., and McCarthy-Jones, S. (2015). A preliminary investigation into the existence of a hypervigilance subtype of auditory hallucination in people with psychosis. *Behav. Cogn. Psychother.* 43, 52–62. doi: 10.1017/S1352465813000714

Green, B. L. (1996). "Trauma History Questionnaire," in *Measurement of Stress, Self-Report Trauma and Adaptation*, ed. B. H. Stamm (Lutervile, MD: Sidran Press), 366–368.

Hamner, M. B., Frueh, B. C., Ulmer, H. G., Huber, M. G., Twomey, T. J., Tyson, C., et al. (2000). Psychotic features in chronic posttraumatic stress disorder and schizophrenia: comparative severity. *J. Nerv. Ment. Dis.* 188, 217–221. doi: 10.1097/00005053-200004000-00004

Han, C., Pae, C.-U., Wang, S.-M., Lee, S.-J., Patkar, A. A., Masand, P. S., et al. (2014). The potential role of atypical antipsychotics for the treatment of posttraumatic stress disorder. *J. Psychiat. Res.* 56, 72–81. doi: 10.1016/j.jpsychires.2014.05.003

Hardy, A., Fowler, D., Freeman, D., Smith, B., Steel, C., Evans, J., et al. (2005). Trauma and hallucinatory experiences in psychosis. *J. Nerv. Ment. Dis.* 193, 501–507. doi: 10.1097/01.nmd.0000172480.56308.21

Hassan, A. N., and De Luca, V. (2015). The effect of lifetime adversities on resistance to antipsychotic treatment in schizophrenia patients. *Schizophr. Res.* 161, 496–500. doi: 10.1016/j.schres.2014.10.048

Helen. (2011). Child abuse and voice hearing: finding healing through EMDR. *Psychosis* 3, 90–95. doi: 10.1080/17522439.2010.542827

Henry, M., Fishman, J. R., and Youngner, S. J. (2007). Propranolol and the prevention of post-traumatic stress disorder: is it wrong to erase the "sting" of bad memories? *Am. J. Bioethics* 7, 12–20. doi: 10.1080/15265160701518474

Hepworth, L., and McGowan, L. (2013). Do mental health professionals enquire about childhood sexual abuse during routine mental health assessment in acute mental health settings? A substantive literature review. *J. Psychiatr. Ment. Health Nurs.* 20, 473–483. doi: 10.1111/j.1365-2850.2012.01939.x

Holmes, D. S., and Tinnin, L. W. (1995). The problem of auditory hallucinations in combat PTSD. *Traumatology* 1, 1. doi: 10.1177/153476569500100201

Hupbach, A., Gomez, R., Hardt, O., and Nadel, L. (2007). Reconsolidation of episodic memories: a subtle reminder triggers integration of new information. *Learn. Mem.* 14, 47–53. doi: 10.1101/lm.365707

Jessop, M., Scott, J., and Nurcombe, B. (2008). Hallucinations in adolescent inpatients with post-traumatic stress disorder and schizophrenia: similarities and differences. *Australas Psychiatry* 16, 268–272. doi: 10.1080/10398560801982580

Johnstone, L., and Dallos, R. (2006). *Formulation in Psychology and Psychotherapy: Making Sense of People's Problems*. London: Routledge.

Jones, S. R., and Fernyhough, C. (2007). Neural correlates of inner speech and auditory verbal hallucinations: a critical review and theoretical integration. *Clin. Psychol. Rev.* 27, 140–154. doi: 10.1016/j.cpr.2006.10.001

Kent, G., and Wahass, S. (1996). The content and characteristics of auditory hallucinations in Saudi Arabia and the UK: a cross-cultural comparison. *Acta Psychiatr. Scand.* 94, 433–437. doi: 10.1111/j.1600-0447.1996.tb09886.x

Kingdon, D. G., Ashcroft, K., Bhandari, B., Gleeson, S., Warikoo, N., Symons, M., et al. (2010). Schizophrenia and borderline personality disorder: similarities and differences in the experience of auditory hallucinations, paranoia, and childhood trauma. *J. Nerv. Ment. Dis.* 198, 399–403. doi: 10.1097/NMD.0b013e3181e08c27

Leff, J., Williams, G., Huckvale, M., Arbuthnot, M., and Leff, A. P. (2014). Avatar therapy for persecutory auditory hallucinations: what is it and how does it work? *Psychosis* 6, 166–176. doi: 10.1080/17522439.2013.773457

Loftus, E. F. (2005). Planting misinformation in the human mind: a 30-year investigation of the malleability of memory. *Learn. Mem.* 12, 361–366. doi: 10.1101/lm.94705

Lommen, M. J. J., and Restifo, K. (2009). Trauma and posttraumatic stress disorder (PTSD) in patients with schizophrenia or schizoaffective disorder. *Commun. Ment. Health J.* 45, 485–496. doi: 10.1007/s10597-009-9248-x

Mayhew, S. L., and Gilbert, P. (2008). Compassionate mind training with people who hear malevolent voices: a case series report. *Clin. Psychol. Psychother.* 15, 113–138. doi: 10.1002/cpp.566

McCarthy-Jones, S. (2011). Voices from the storm: a critical review of quantitative studies of auditory verbal hallucinations and childhood sexual abuse. *Clin. Psychol. Rev.* 31, 983–992. doi: 10.1016/j.cpr.2011.05.004

McCarthy-Jones, S. (2012). *Hearing Voices: The Histories, Meanings and Causes of Auditory Verbal Hallucinations*. Cambridge, MA: Cambridge University Press. doi: 10.1017/CBO9781139017534

McCarthy-Jones, S. (2015). "What have we learnt about the phenomenology of voice-hearing," in *Hallucinations: From Theory to Therapy*, eds M. Hayward, C. Strauss, and S. McCarthy-Jones (London: Taylor & Francis), 5–26.

McCarthy-Jones, S., Thomas, N., Dodgson, G., Fernyhough, C., Brotherhood, E., Wilson, G., et al. (2015). "What have we learnt about the ability of cognitive behavioural therapy to help with voice-hearing?," in *Hallucinations: From Theory to Therapy*, eds M. Hayward, C. Strauss, and S. McCarthy-Jones (London: Taylor and Francis).

McCarthy-Jones, S., Trauer, T., Mackinnon, A., Sims, E., Thomas, N., and Copolov, D. L. (2014). A new phenomenological survey of auditory hallucinations: evidence for subtypes and implications for theory and practice. *Schizophr. Bull.* 40, 231–235. doi: 10.1093/schbul/sbs156

McGaugh, J. L. (2000). Memory–a century of consolidation. *Science* 287, 248–251. doi: 10.1038/nn739

Menzies, R. P. (2012). Propranolol, traumatic memories, and amnesia: a study of 36 cases. *J. Clin. Psychiatry* 73, 129–130. doi: 10.4088/JCP.11l07121

Miles, M. B., Huberman, A. M., and Saldana, J. (2014). *Qualitative Data Analysis: A Method Sourcebook*. London: Sage.

Moskowitz, A., and Corstens, D. (2007). Auditory hallucinations: psychotic symptom or dissociative experience? *J. Psychol. Trauma*. 6, 35–63. doi: 10.1300/J513v06n02_04

Moskowitz, A., Read, J., Farrelly, S., Rudegeair, T., and Williams, O. (2009). "Are psychotic symptoms traumatic in origin and dissociative in kind?," in *Dissociation and the Dissociative Disorders: DSM-V and Beyond*, eds P. F. Dell and J. A. O'Neill (New York, NY: Routledge), 521–533.

National Health Service Confederation [NHS]. (2008). *Briefing 162: Implementing National Policy on Violence and Abuse.* London: National Health Service Confederation.

National Institute for Clinical Excellence [NICE]. (2005). *Post Traumatic Stress Disorder (PTSD): The Management of Adults and Children in Primary and Secondary Care.* London: NICE Guidelines.

Nayani, T. H., and David, A. S. (1996). The auditory hallucination: a phenomenological survey. *Psychol. Med.* 26, 177–189. doi: 10.1017/S003329170003381X

President's Council on Bioethics. (2003). *Beyond Therapy: Biotechnology and the Pursuit of Happiness.* Washington, DC: President's Council on Bioethics, Dana Press.

Raune, D., Bebbington, P., Dunn, G., and Kuipers, E. (2006). Event attributes and the content of psychotic experiences in first-episode psychosis. *Psychol. Med.* 36, 221–230. doi: 10.1017/S003329170500615X

Read, J., Agar, K., Argyle, N., and Aderhold, V. (2003). Sexual and physical abuse during childhood and adulthood as predictors of hallucinations, delusions and thought disorder. *Psychol. Psychother.* 76, 1–22. doi: 10.1348/14760830260569210. 2003

Read, J., Fosse, R., Moskowitz, A., and Perry, B. (2014). The traumagenic neurodevelopmental model of psychosis revisited. *Neuropsychiatry* 4, 65–79. doi: 10.2217/npy.13.89

Read, J., van Os, J., Morrison, A. P., and Ross, C. A. (2005). Childhood trauma, psychosis and schizophrenia: a literature review with theoretical and clinical implications. *Acta Psychiatr. Scand.* 112, 330–350. doi: 10.1111/j.1600-0447.2005.00634.x

Reiff, M., Castille, D. M., Muenzenmaier, K., and Link, B. (2012). Childhood abuse and the content of adult psychotic symptoms. *Psychol. Trauma* 4, 356–369. doi: 10.1037/a0024203

Romme, M., and Escher, S. (2000). *Making sense of Voices*. London: Mind Publications.

Rosenberg, S. D., Mueser, K. T., Jankowski, K., Salyers, M. P., and Acker, K. (2004). Cognitive-behavioral treatment of PTSD in severe mental illness: results of a pilot study. *Am. J. Psychiatr. Rehabil.* 7, 171–186. doi: 10.1080/15487760802615863

Ross, C. A. (2008). "Dissociative schizophrenia," in *Psychosis, Trauma and Dissociation: Emerging Perspectives on Severe Psychopathology*, eds A. Moskowitz, I. Schäfer, and M. J. Dorahy (Chichester: John Wiley & Sons, Ltd), 281–294. doi: 10.1002/9780470699652.ch20

Schneider, K. (1959). *Clinical Psychopathology*. New York: Grune and Stratton.

Scott, J. G., Nurcombe, B., Sheridan, J., and McFarland, M. (2007). Hallucinations in adolescents with post-traumatic stress disorder and psychotic disorder. *Australas Psychiatry* 15, 44–48. doi: 10.1080/10398560601083084

Sheffield, J. M., Williams, L. E., Blackford, J. U., and Heckers, S. (2013). Childhood sexual abuse increases risk of auditory hallucinations in psychotic disorders. *Compr. Psychiatry* 54, 1098–1104. doi: 10.1016/j.comppsych.2013.05.013

Smeets, F., Lataster, T., Hommes, J., Lieb, R., Wittchen, H. U., and van Os, J. (2012). Evidence that onset of psychosis in the population reflects early hallucinatory experiences that through environmental risks and affective dysregulation become complicated by delusions. *Schizophr. Bull.* 38, 531–542. doi: 10.1093/schbul/sbq117

Smith, B., Fowler, D. G., Freeman, D., Bebbington, P., Bashforth, H., Garety, P., et al. (2006). Emotion and psychosis: links between depression, self-esteem,

negative schematic beliefs and delusions and hallucinations. *Schizophr. Res.* 86, 181–188. doi: 10.1016/j.schres.2006.06.018

Sommer, I., and Diederen, K. (2009). Language production in the non-dominant hemisphere as a potential source of auditory verbal hallucinations. *Brain* 132, 1–2. doi: 10.1093/brain/awp040

Sommer, I. E., Slotema, C. W., Daskalakis, Z. J., Derks, E. M., Blom, J. D., and van der Gaag, M. (2012). The treatment of hallucinations in schizophrenia spectrum disorders. *Schizophr. Bull.* 38, 704–714. doi: 10.1093/schbul/sbs034

Thomas, N., Hayward, M., Peters, E., van der Gaag, M., Bentall, R. P., Jenner, J., et al. (2014). Psychological therapies for auditory verbal hallucinations (voices): current status and key research directions. *Schizophr. Bull.* 40, S202–S212. doi: 10.1093/schbul/sbu037

Thomas, P., Mathur, P., Gottesman, I. I., Nagpal, R., Nimgaonkar, V. L., and Deshpande, S. N. (2007). Correlates of hallucinations in schizophrenia: a cross-cultural evaluation. *Schizophr. Res.* 92, 41–49. doi: 10.1016/j.schres.2007.01.017

Thompson, A., Nelson, B., McNab, C., Simmons, M., Leicester, S., McGorry, P. D., et al. (2010). Psychotic symptoms with sexual content in the "ultra high risk" for psychosis population: frequency and association with sexual trauma. *Psychiatr. Res.* 177, 84–91. doi: 10.1016/j.psychres.2010.02.011

van den Berg, D. P., and van der Gaag, M. (2012). Treating trauma in psychosis with EMDR: a pilot study. *J. Behav. Ther. Exp. Psychiatry* 43, 664–671. doi: 10.1016/j.jbtep.2011.09.011

Van Der Vleugel, B. M., van den Berg, D. P. G., and Staring, A. B. P. (2012). Trauma, psychosis, post-traumatic stress disorder and the application of EMDR. *Riv. Psichiatr.* 47(Suppl. 2), 33–38. doi: 10.1708/1071.11737

Varese, F., Barkus, E., and Bentall, R. P. (2012a). Dissociation mediates the relationship between childhood trauma and hallucination-proneness. *Psychol Med*. 42, 1025–1036. doi: 10.1017/S0033291711001826

Varese, F., Smeets, F., Drukker, M., Lieverse, R., Lataster, T., Viechtbauer, W., et al. (2012b). Childhood trauma increases the risk of psychosis: a meta-analysis of patient-control, prospective- and cross sectional cohort studies. *Schizophr. Bull.* 38, 661–671. doi: 10.1016/j.jpsychires.2012.01.023

Varese, F., Tai, S. J., Pearson, L., and Mansell, W. (2015). Thematic associations between personal goals and clinical and non-clinical voices (auditory verbal hallucinations). *Psychosis* (in press). doi: 10.1080/17522439.2015.1040442

Waters, F. A., Badcock, J. C., and Maybery, M. T. (2006). The 'who' and 'when' of context memory: different patterns of association with auditory hallucinations. *Schizophr. Res.* 82, 271–273. doi: 10.1016/j.schres.2005.12.847

Wichert, S., Wolf, O. T., and Schwabe, L. (2013). Updating of episodic memories depends on the strength of new learning after memory reactivation. *Behav. Neurosci*. 127, 331–338. doi: 10.1037/a0032028

Young, M., Read, J., Barker-Collo, S., and Harrison, R. (2001). Evaluating and overcoming barriers to taking abuse histories. *Prof. Psychol. Res. Pract.* 32, 407–414. doi: 10.1037//0735-7028.32.4.407

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Hallucinations as a trauma-based memory: implications for psychological interventions

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The relationship between hallucinations and life events is a topic of significant clinical importance. This review discusses the extent to which auditory and visual hallucinations may be *directly* related to traumatic events. Evidence suggests that intrusive images occur frequently within individuals who also report hallucinatory experiences. However, there has been limited research specifically investigating the extent to which hallucinations are the re-experiencing of a traumatic event. Our current theoretical understanding of these relationships, along with methodological difficulties associated with research in this area, are considered. Recent clinical studies, which adopt interventions aimed at the symptoms of posttraumatic stress disorder in people diagnosed with a psychotic disorder, are reviewed. There is a need for the development of evidence-based interventions in this area.

Keywords: hallucinations, posttraumatic stress disorder, intrusive memory, voices, visions

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Introduction

The idea that stressful and traumatic life events may be relevant to the content of hallucinatory experiences is not a new one. Freud (1936) argued that the phenomenon of hallucinations was a product of forgotten or repressed traumatic memories entering the conscious mind. Naturally, as the disciplines of psychology and psychiatry develop, our understanding of these relationships also develops. This review discusses the extent to which the content of auditory and visual hallucinations, hereafter referred to as voices and visions, may be *directly* related to traumatic events. Implications for current clinical practice and future research are also discussed.

Recently, there has been increased awareness of the prevalence of traumatic life events within individuals diagnosed with schizophrenia (see Grubaugh et al., 2011, for a review). It has been estimated that 15% of this group will also be suffering from posttraumatic stress disorder (PTSD; Achim et al., 2011). However, there is debate as to whether these diagnoses are distinct conditions or whether the same phenomena may fulfill the diagnostic criteria for both disorders. For example, hearing voices/seeing visions may be both a hallucination, in terms of the diagnostic criteria for schizophrenia, and categorized as the re-experiencing of a traumatic event with respect to PTSD. At this point it is worth noting that the hallmark symptom of PTSD is considered an intrusive memory of a traumatic event, most likely in the form of a visual image. Whereas, with respect to schizophrenia, the intrusive sensory phenomena that have received most attention are in the auditory modality, i.e., hearing voices. Consequently, most of the research aimed at understanding psychotic phenomena with respect to traumatic events has focussed on hearing voices. Whereas theoretical developments drawing on psychological models of PTSD have predominantly focussed on intrusive images.

Linking the Content of Hallucinations with the Content of Trauma Memories

An early study in this field involved the assessment of case records of 100 patients admitted to a psychiatric unit. Read and Argyle (1999) report that approximately half the symptoms for which content was recorded appeared to be related to childhood abuse. However, with respect to hearing voices, the available data was limited to seven patients. Morrison et al. (2002) interviewed 35 people with a diagnosis of schizophrenia and reported that 74.3% were able to identify an image in relation to their psychotic symptoms and, of those, 70.8% ($n = 17$) made an explicit link between the image and a particular event in their past. Examples include an individual who had been raped and sexually abused as a child, reporting an intrusive image of a bearded man shouting. In this study individuals were required to report if their images were "associated" with a past event, so it is unclear whether the content was a direct re-experiencing.

The largest phenomenological survey of auditory hallucinations to date involved interviewing 199 voice hearers (McCarthy-Jones et al., 2014). Of these, 12% reported that they heard voices which were identical replays of memories of previous conversations that they had heard, whilst 31% reported that the relationship was similar but not identical. However, the previous conversations being assessed were not necessarily stressful or traumatic experiences. Reiff et al. (2011) assessed 30 individuals for potential relationships between childhood abuse and adult psychotic symptoms. They reported that individuals who had suffered abuse scored high on their measure of "trauma related content score." However, this measure contained nine items only one of which assessed a direct memory of a traumatic event. The other items referred to a wider range of emotional and content links with hallucinations and delusions. These "thematic" links can be clinically observed at the level of emotional experience, for example having suffered a humiliating traumatic event and also experiencing humiliation in relation to current voice hearing experiences. Raune et al. (2006) also focussed on thematic associations and highlighted a specific relationship between persecutory voices and intrusive traumatic events.

One study specifically aimed to identify the prevalence of both direct and indirect relationships between traumatic events and the content of voices. Hardy et al. (2005) extracted a short amount of information describing the main traumatic event and hallucinatory content, which were then rated as either having a direct link, an indirect (emotional) link or no link at all. Based on 40 participants, 12.5% of hallucinations contained content which was a direct replication of trauma content, with 45% rated as having an emotional link.

The paucity of studies in this area may, in part, be due to the methodological difficulties involved when assessing a direct link between the content of a current intrusive sensation (voice or vision) and the content of a past traumatic event. Regardless of diagnostic disorder, traumatic memories are often formed of information which is not an identical representation of the experienced stressful event (Conway and Pleydell-Pearce, 2000). This issue is likely to exacerbate the potential for confusion when an individual experiences fleeting highly emotive intrusions and attempts to locate the origin of these phenomena. The need to rely on self-report data in these studies is therefore a major limitation.

Theoretical Accounts of Trauma Memories and Hallucinations

In order to understand the process through which intrusive trauma-related memories may form the basis of the voices and visions associated with a psychotic episode, clinical researchers have drawn on psychological models of posttraumatic stress disorder. Steel et al. (2005) focus on information-processing models of PTSD which refer to a shift in information processing style during stressful and traumatic events (Ehlers and Clark, 2000; Brewin, 2001). Routine information processing involves a process called "contextual integration" whereby detailed encoding of incoming stimuli takes place, which facilitates later memory recall. For example, being able to remember who was at your birthday by recalling a full contextual image of the event. Also, being able to remember what happened before, and after, a specific event due to the integration of relevant temporal information. However, during a traumatic event, the need for a quick behavioral response requires rapid information processing. This is achieved through a temporary decrease in contextual integration and a quick response based on a basic perceptual processing. The provision of a rapid response to danger has the consequence of a vulnerability to experiencing intrusive memories of the stressful event at a future date. The reduced contextual processing of the trauma stimuli makes them difficult to recall on a voluntary basis, due to the lack of integration with cues which normally facilitate recall. However, the information is typically triggered involuntarily by stimuli which have a perceptual match to some aspect of the traumatic event (e.g., the smell of an attacker's aftershave on someone else). Therefore, within these theories, reduced levels of contextual integration are considered central to the development of trauma-related intrusive memories. Thereafter, the intrusions may be maintained through a number of cognitive and behavioral processes, such as avoidance, in order to develop a presentation of PTSD. However, in order to be diagnosed with PTSD the individual, or their clinician, is likely to be confident that the intrusions are in fact memories of a stressful event.

Steel et al. (2005) note that individuals who score high on schizotypal personality questionnaires exhibit reduced levels of contextual integration when they are not stressed. It is argued that the consequent intrusions contribute to the unusual beliefs and experiences which are characteristic of high schizotypal personality. Exposure to traumatic events is likely to result in more frequent and distressing intrusive trauma-related memories. Crucially, it may be particularly confusing for these individuals to identify these intrusive phenomena as a memory. Given schizotypal personality is associated with unusual beliefs such as clairvoyance and telepathy, they may be predisposed to making sense of highly emotive intrusive phenomena within the context of these beliefs. For example, a short extract of speech may be given an external origin, thus becoming a voice hearing experience. Or a visual intrusive memory of being

attacked may be interpreted as a vision, or premonition, of a planned future attack. The latter example highlights how the interpretation of intrusive memories may contribute to the development and maintenance of a number of psychotic symptoms, including paranoia (see Morrison, 2001). This is supported by a recent report showing that 73% of people classified as suffering from persecutory delusions experienced recurrent intrusive threatening images (Schulze et al., 2013). However, this study did not explicitly assess links between intrusive images and stressful life events.

Evidence supporting this account has been derived from laboratory experiments and clinical settings. Individuals who score high on schizotypal personality questionnaires report experiencing more frequent intrusions after having watched a stressful film in the laboratory (Holmes and Steel, 2004). High schizotypes also report more frequent distressing intrusions after being involved in a road traffic accident (Steel et al., 2008), and when awaiting treatment within a specialist psychology trauma service (Marzillier and Steel, 2007). It should be noted that in these studies the participants reported intrusions that contained a content match with the stressful or traumatic event they had experienced, and thus they recognized the intrusion as a memory. Further, poor contextual memory has been associated with more vivid and detailed intrusive images within psychosis-prone individuals (Glazer et al., 2013). Jones and Steel (2012), using a modified version of a free association task, reported that schizotypal personality was associated with an increased vulnerability to experience involuntary autobiographical memories.

With reference to the process in which individuals may become confused as to the origin of intrusive memories, Larøi et al. (2005) provide evidence of those scoring high on hallucination proneness (a subgroup of positive schizotypal personality) being particularly likely to make source monitoring errors. However, this relationship is still to be tested in relation to stressful or traumatic memories.

Waters et al. (2006) also refer to the role of contextual memory in the formation of hearing voices. They argue that deficits in intentional inhibition and contextual memory result in the unintentional activation of memories, which without contextual cues, are not recognized as such. The authors present experimental evidence for the role of intentional inhibition and suggest a number of potential explanations as to the relationship with hallucinatory experiences. An important difference, therefore, between this account and that of Steel et al. (2005) is that the former is not based specifically on traumatic events forming the memories which may be experienced as a voice.

The theoretical accounts discussed above would indicate a specific link between intrusive memories and the positive symptoms of psychosis. Of interest, there have been a number of recent reviews reporting on this topic. These studies provide conflicting conclusions with Bentall et al. (2014) suggesting a specific link between childhood sexual abuse and hallucinations, whilst van Dam et al. (2015) argue that childhood trauma is not related to a differential course of symptoms. However, with reference to the role of intrusive memories, these phenomena may contribute not just to voices, but also to visions and paranoid experiences. Therefore, the lack of specificity reported by van Dam et al. (2015) does not negate the role of intrusive memories within a range of symptoms.

The Role of Dissociation

Psychological models of posttraumatic stress disorder also refer to the role of peritraumatic dissociation in the development of traumatic memories. It is therefore of interest that the tendency to dissociate has been associated with an increased likelihood to hear voices within a number of studies (e.g., Schafer et al., 2008; Perona-Garcelan et al., 2012a). Although our theoretical understanding of dissociation is limited, there is likely to be some overlap in the processes of reduced contextual integration and increased levels of perceptual processing, with the presence of dissociative states. With reference to Steel et al. (2005), this overlap is at the level of schizotypal personality and dissociation. That is, dissociative experiences can be considered a form of unusual experience and, as such, they form part of the beliefs and experiences which comprise schizotypal personality. Accordingly, Laposa and Alden (2008) report a high level of trait dissociation to be a vulnerability factor for more frequent intrusions within the previously discussed stressful-film paradigm employed by Holmes and Steel (2004). A recent study by Varese et al. (2012) indicates that dissociation positively mediates the effect of childhood trauma on hallucination-proneness within individuals diagnosed with schizophrenia spectrum disorders. With reference to a population of military veterans diagnosed with PTSD, Brewin and Patel (2010) found that those who reported hearing voices also reported higher levels of dissociation. It should be noted that these studies used the Dissociative Experiences Scale (DES; Bernstein and Putnam, 1986), which is a measure of trait dissociation and not a measure of dissociation at the time of the traumatic event. Longitudinal studies are therefore required. Escher et al. (2002) followed up a sample of 80 adolescents and found the trait dissociation (as measured by the DES) was a significant predictor of voice persistence over a 3-year period.

Few studies have attempted to disentangle the roles of dissociation and schizotypy in the development of psychotic symptoms. The previously reported study by Steel et al. (2008) suggests that schizotypal personality is the primary driver in the development of trauma-related intrusions, which may form the basis of some psychotic experiences. However, Altman et al. (1997) argue that "subclinical auditory hallucinations" have an especially strong link with dissociation, whereas "subclinical delusions" were related to schizotypal cognitions.

Our current understanding of the role of dissociation in the development of hearing voices and seeing visions is restricted due to the need for theoretical development in our understanding of dissociation itself. Many researchers argue that dissociation is not a unitary construct, and there has been some theoretical speculation as to whether the phenomenon can be split into two forms, namely detachment and compartmentalization (Holmes et al., 2005; Brown, 2006). Adopting this approach, Perona-Garcelan et al. (2012b) found that the depersonalization

component of dissociation, a form of detachment, was the mediator between childhood trauma and hearing voices. They also identified that this relationship was specific to hallucinations and not delusions.

In summary, existing research suggests that individuals scoring high in trait schizotypy are also likely to score high on trait dissociation. Accordingly, these individuals are prone to higher levels of state dissociation during stressful and traumatic events. Dissociation, at an information processing level, is associated with a breakdown in contextual processing. This style of information processing leaves an individual vulnerable to an increased level of trauma-related intrusive memories (Steel et al., 2005; Waters et al., 2006), which may be appraised in a manner consistent with the experience of hearing voices or seeing visions.

Clinical Implications

Although the prevalence of PTSD is estimated at 15% in people diagnosed with schizophrenia, there is only one published randomized controlled trial which targets this "co-morbid" group. van den Berg et al. (2015) report that both Eye movement desensitization and reprocessing (EMDR) and exposure interventions were successful in reducing the severity of posttraumatic stress symptoms in this population. However, reduced levels of PTSD symptoms were not associated with a reduction in hallucinatory experiences (van der Gaag, 2015) suggesting a less direct link between these phenomena than suggested within the theoretical accounts discussed above.

There are no reports on the explicit targeting of dissociation within individuals who hear voices or see visions. As discussed, our limited theoretical understanding of dissociation may have restrained clinical development in this field. However, the phenomena has been discussed in the context of individuals being formed of multiple selves, rather than a single personality construct. It has been argued that the content of voices may originate from a breakdown in the integration of these multiple selves, with more than one self being heard at one time (Longden et al., 2012). This perspective forms the basis of the Voice Dialogue approach, within which a voice hearer is encouraged to open a verbal dialogue with their voices (other selves) in order to work toward a more functional relationship with them (Corstens et al., 2011).

Neither of the interventions discussed so far are based on targeting a direct link between traumatic events and the content of voices and visions. Current reports of the prevalence of such links are likely to be an underestimate given the methodological difficulties discussed earlier, and the tendency for links not to be noticed rather than identified in error. This issue is also relevant during clinical assessment. Morrison (2001) highlights how the appraisal of an intrusive experience may impact on whether an individual is diagnosed with an anxiety disorder or a psychotic disorder. The latter being characterized by "socially-unacceptable" interpretations of their intrusive experiences, e.g., the government are putting these pictures in my head using a machine. Further, Steel et al. (2005) describe how existing unusual, or schizotypal, beliefs are likely to contribute to this type of appraisal. The role of appraisal is a key process in cognitive behavior therapy, and as such has been adopted within a large number of clinical trials. A small to moderate effect size has been reported for this generic intervention in relation to hearing voices (van der Gaag et al., 2014). There would, therefore, seem to be room for improvement. It is possible that interventions which target intrusive memories, where the content of psychotic symptoms directly relate to a traumatic event, may, where relevant, be more effective.

To date there has been little clinical development in this area. The most relevant interventions would seem to be those developed for use with distressing intrusive experiences associated with PTSD, such as "reliving," or exposure to the original traumatic event. Recent studies suggest acceptability and effectiveness when using exposure with people diagnosed with schizophrenia (Frueh et al., 2009; van den Berg et al., 2015). It is also worth noting that even high levels of dissociation do not have an adverse impact on the outcome of this intervention within a non-psychotic population (Hagenaars et al., 2010). Another intervention originating from the field of trauma is "imagery rescripting." The aim is to modify the meaning of the intrusive memory by first imagining the accurate memory and then rewriting a new ending to the narrative. Rescripts typically include the individual gaining more control, or arriving at a peaceful resolution to an unresolved emotional situation. Whilst first developed for use with survivors of childhood sexual abuse (Smucker et al., 1995), it has recently been adopted for use with a range of different disorders. Unlike reliving this intervention does not require prolonged exposure to an emotionally distressing memory. This is likely to contribute to lower drop-outs during an imagery rescripting intervention than an exposure intervention (Arntz et al., 2013).

At the time of writing, there is one published study reporting the use of imagery rescripting with individuals who hear voices (Ison et al., 2014). The authors report a small case series in which they successfully focused on rescripting repetitive intrusive memories, however the content of the memory was not necessarily explicitly linked to the content of voices. Given that a recent study indicates that imagery rescripting is a highly acceptable and effective intervention when working with reactions to complex trauma (e.g., Arntz et al., 2013) future research applied to distressing voices and visions would seem a priority.

In summary, the relationship between hearing voices, seeing visions and traumatic events continues to intrigue clinical researchers. However, a full theoretical understanding remains elusive. The subgroup of voices and visions which are directly linked to stressful events are likely to be responsive to interventions which are based on a well developed theoretical understanding of reactions to trauma.

References

Achim, A. M., Maziade, M., Raymond, E., Olivier, D., Mérette, C., and Roy, M. A. (2011). How prevalent are anxiety disorders in schizophrenia? A meta-analysis and critical review on a significant association. *Schizophr. Bull.* 37, 811–821. doi: 10.1093/schbul/sbp148

Altman, A., Collins, M., and Mundy, P. (1997). Subclinical hallucinations and delusions in nonpsychotic adolescents. *J. Child*

Psychol. Psychiatry 38, 413–420. doi: 10.1111/j.1469-7610.1997.tb01526.x

Arntz, A., Sofi, D., and van Breukelen, G. (2013). Imagery Rescripting as treatment for complicated PTSD in refugees: a multiple baseline case series study. *Behav. Res. Ther.* 51, 274–283. doi: 10.1016/j.brat.2013.02.009

Bentall, R., Sousa, P., Varese, F., Wickham, S., Sitko, K., Haarmans, M., et al. (2014). From adversity to psychosis: pathways and mechanisms from specific adversities to specific symptoms. *Soc. Psychiatry Psychiatr. Epidemiol.* 49, 1011–1022. doi: 10.1007/s00127-014-0914-0

Bernstein, E. M., and Putnam, F. W. (1986). Development, reliability, and validity of a dissociation scale. *J. Nerv. Ment. Dis.* 174, 727–735. doi: 10.1097/00005053-198612000-00004

Brewin, C. R. (2001). A cognitive neuroscience account of post-traumatic stress disorder and its treatment. *Behav. Res. Ther.* 38, 373–393. doi: 10.1016/S0005-7967(00)00087-5

Brewin, C., and Patel, T. (2010). Auditory pseudohallucinations in United Kingdom war veterans and civilians with posttraumatic stress disorder. *J. Clin. Psychiatry* 71, 419–425. doi: 10.4088/JCP.09m05469blu

Brown, R. J. (2006). Different types of "dissociation" have different psychological mechanisms. *J. Trauma Dissociation* 7, 7–28. doi: 10.1300/J229v07n04_02

Conway, M. A., and Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychol. Rev.* 107, 261–288. doi: 10.1037/0033-295X.107.2.261

Corstens, D., Longden, E., and May, R. (2011). Talking with voices: exploring what is expressed by the voices people hear. *Psychosis* 4, 1–10. doi: 10.1080/17522439.2011.571705

Ehlers, A., and Clark, D. M. (2000). A cognitive model of post-traumatic stress disorder. *Behav. Res. Ther.* 38, 319–345. doi: 10.1016/S0005-7967(99)00123-0

Escher, S., Romme, M., Buiks, A., Delespaul, P., and van Os, J. (2002). Independent course of childhood auditory hallucinations: a sequential 3-year follow up study. *Br. J. Psychiatry* 181, s10–s18. doi: 10.1192/bjp.181.43.s10

Freud, S. (1936). *A Disturbance of Memory on the Acropolis*, Standard Edn. London: Hogarth.

Frueh, B. C., Grubaugh, A. L., Cusack, K. J., Kimble, M. O., Elhai, J. D., and Knapp, R. G. (2009). Exposure-based cognitive-behavioral treatment of PTSD in adults with schizophrenia or schizoaffective disorder: a pilot study. *J. Anxiety Disord.* 23, 665–675. doi: 10.1016/j.janxdis.2009.02.005

Glazer, D. A., Mason, O., King, J., and Brewin, C. (2013). Contextual memory, psychosis-proneness, and the experience of intrusive imagery. *Cogn. Emot.* 27, 150–157. doi: 10.1080/02699931.2012.683850

Grubaugh, A. L., Zinzow, H. M., Paul, L., Egede, L. E., and Frueh, B. C. (2011). Trauma exposure and posttraumatic stress disorder in adults with severe mental illness: a critical review. *Clin. Psychol. Rev.* 31, 883–899. doi: 10.1016/j.cpr.2011.04.003

Hagenaars, M., van Minnen, A., and Hoogduin, K. (2010). The impact of dissociation and depression on the efficacy of prolonged exposure treatment for PTSD. *Behav. Res. Ther.* 48, 19–27. doi: 10.1016/j.brat.2009.09.001

Hardy, A., Fowler, D., Freeman, D., Smith, B., Steel, C., Kuipers, E., et al. (2005). Trauma and hallucinatory experience in psychosis. *J. Nerv. Ment. Dis.* 193, 501–507. doi: 10.1097/01.nmd.0000172480.56308.21

Holmes, E., Brown, R. J., Mansell, W., Fearon, R. P., Hunter, E., Frasquilho, F., et al. (2005). Are there two qualitatively distinct forms of dissociation? A review and some clinical implications. *Clin. Psychol. Rev.* 25, 1–23. doi: 10.1016/j.cpr.2004.08.006

Holmes, E. A., and Steel, C. (2004). Schizotypy: a vulnerability factor for traumatic intrusions. *J. Nerv. Ment. Dis.* 192, 28–34. doi: 10.1097/01.nmd.0000105997.28152.4b

Ison, R., Medoro, L., Keen, N., and Kuipers, E. (2014). The use of rescripting imagery for people with psychosis who hear voices. *Behav. Cogn. Psychother.* 42, 129–142.

Jones, V., and Steel, C. (2012). Involuntary memories and schizotypal personality. *J. Behav. Ther. Exp. Psychiatry* 43, 871–876. doi: 10.1016/j.jbtep.2011.12.008

Laposa, J. M., and Alden, L. E. (2008). The effect of pre-existing vulnerability factors on a laboratory analogue trauma experience. *J. Behav. Ther. Exp. Psychiatry* 39, 424–435. doi: 10.1016/j.jbtep.2007.11.002

Larøi, F., Collignon, O., and Van der Linden, M. (2005). Source monitoring for actions in hallucination proneness. *Cogn. Neuropsychiatry* 10, 105–123. doi: 10.1080/13546800344000354

Longden, E., Madill, A., and Waterman, M. (2012). Dissociation, trauma, and the role of lived experience: towards a new conceptualization of voice hearing. *Psychol. Bull.* 138, 28–76. doi: 10.1037/a0025995

Marzillier, S., and Steel, C. (2007). Positive schizotypy and trauma-related intrusions. *J. Nerv. Ment. Dis.* 195, 60–64. doi: 10.1097/01.nmd.0000252383.28760.39

McCarthy-Jones, S., Trauer, T., Mackinnon, A., Sims, E., Thomas, N., and Copolov, D. (2014). A new phenomenological survey of auditory hallucinations: evidence for subtypes and implications for theory and practice. *Schizophr. Bull.* 40, 231–235. doi: 10.1093/schbul/sbs156

Morrison, A. P. (2001). The interpretation of intrusions in psychosis: an integrative cognitive approach to hallucinations and delusion. *Behav. Cogn. Psychother.* 29, 257–276. doi: 10.1017/S1352465801003010

Morrison, A. P., Beck, A., Glentworth, D., Dunn, H., Reid, G., Larkin, W., et al. (2002). Imagery and psychotic symptoms: a preliminary investigation. *Behav. Res. Ther.* 40, 1053–1062. doi: 10.1016/S0005-7967(01)00128-0

Perona-Garcelan, S., Carrascoso-Lopez, F., Garcia-Montes, J. M., Ductor-Recuerda, M. J., Jimenez, A. M. L., Vallina-Fernandez, O., et al. (2012a). Dissociative experiences as mediators between childhood trauma and auditory hallucinations. *J. Trauma. Stress* 25, 323–329. doi: 10.1002/jts.21693

Perona-Garcelan, S., Carrascoso-Lopez, F., Garcia-Montes, J. M., Vallina-Fernandez, O., Perez-Alvarez, M., Ductor-Recuerda, M. J., et al. (2012b). Depersonalization as a mediator in the relationship between self-focused attention and auditory hallucinations. *J. Trauma Dissociation* 12, 535–548. doi: 10.1080/15299732.2011.602181

Raune, D., Bebbington, P., Dunn, G., and Kuipers, E. (2006). Event attributes and the content of psychotic experiences in first episode psychosis. *Psychol. Med.* 36, 221–230. doi: 10.1017/S003329170500615X

Read, J., and Argyle, N. (1999). Hallucinations, delusions and thought disorder among adult psychiatric inpatients with a history of child abuse. *Psychiatr. Serv.* 50, 1467–1472. doi: 10.1176/ps.50.11.1467

Reiff, M., Castille, D. M., Muenzenmaier, K., and Link, B. (2011). Childhood abuse and the content of adult psychotic symptoms. *Psychol. Trauma* 4, 356–369. doi: 10.1037/a0024203

Schafer, I., Reitmeier, B., Langer, L., Aderhold, V., and Harfst, T. (2008). Dissociation in patients with schizophrenia: relationships with childhood trauma and psychotic symptoms. *Eur. Psychiatry* 23(Suppl. 2), S144. doi: 10.1016/j.eurpsy.2008.01.882

Schulze, K., Freeman, D., Green, C., and Kuipers, E. (2013). Intrusive mental imagery in patients with persecutory delusions. *Behav. Res. Ther.* 51, 7–14. doi: 10.1016/j.brat.2012.10.002

Smucker, M., Dancu, C., Foa, E., and Niederee, J. (1995). Imagery rescripting: a new treatment for survivors of childhood sexual abuse suffering from posttraumatic stress disorder. *J. Cogn. Psychother.* 9, 3–17.

Steel, C., Fowler, D., and Holmes, E. A. (2005). Traumatic intrusions in psychosis: an information processing account. *Behav. Cogn. Psychother.* 33, 139–152. doi: 10.1017/S1352465804001924

Steel, C., Mahmood, M., and Holmes, E. (2008). Schizotypy and dissociation as predictors of posttraumatic distress. *Br. J. Clin. Psychol.* 47, 245–249.

van Dam, D., Van Nierop, M., Viechtbauer, W., Velthorst, E., van Winkel, R., Genetic Risk and Outcome of Psychosis (GROUP) investigators, et al. (2015). Childhood abuse and neglect in relation to the presence and persistence of psychotic and depressive symptomatology. *Psychol. Med.* 45, 1363–1377. doi: 10.1017/S0033291714001561

van den Berg, D. P., de Bont, P. A., van der Vleugel, B. M., de Roos, C., de Jongh, A., van Minnen, A., et al. (2015). Prolonged exposure vs eye movement desensitization and reprocessing vs waiting list for posttraumatic stress disorder in patients with a psychotic disorder: a randomized clinical trial. *JAMA Psychiatry* 72, 259–267. doi: 10.1001/jamapsychiatry.2014.2637

van der Gaag, M. (2015). "The effects of trauma treatment on comorbid symptoms in PTSD in psychotic patients," in *Proceedings of the 43rd Annual Conference of the British Association for Behavioural and Cognitive Psychotherapy*, Warwick.

Varese, F., Barkus, E., and Bentall, R. P. (2012). Dissociation mediates the relationship between childhood trauma and hallucination-proneness. *Psychol. Med.* 42, 1025–1036. doi: 10.1017/S0033291711001826

van der Gaag, M., Valmaggia, L., and Smit, F. (2014). The effects of individually tailored formulation-based cognitive behavioural therapy in auditory hallucinations and delusions: a meta-analysis. *Schizophr. Res.* 156, 30–37. doi: 10.1016/j.schres.2014.03.016

Waters, F. A. V., Badcock, J. C., Michie, P. T., and Maybery, M. T. (2006). Auditory hallucinations in schizophrenia: intrusive thoughts and forgotten memories. *Cogn. Neuropsychiatry* 11, 65–83. doi: 10.1080/13546800444000191

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OPINION
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What's really wrong with cognitive behavioral therapy for psychosis?

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The CBT Debate

For persons with medication-refractory psychotic experiences such as auditory hallucinations, a psychological therapy referred to as cognitive behavioral therapy for psychosis (CBTp) has emerged as the standard recommended treatment in clinical practice guidelines (e.g., Kreyenbuhl et al., 2010; National Institute for Health and Clinical Excellence [NICE], 2014). However, the past few years have seen impassioned debate regarding the endorsement of CBTp as evidence-based practice, with some arguing that evidence in its favor has been "oversold" (McKenna and Kingdon, 2014). As a follow up to their earlier controversial review (Lynch et al., 2010), which claimed no evidence that CBTp was effective in "well-conducted" trials, a recent meta-analysis by Jauhar et al. (2014) drew the only slightly less pessimistic conclusion that CBTp's therapeutic effect was only in the small range. Coinciding with the continuing recommendation of CBTp for routine provision in the 2014 NICE guidelines, this has led to debates published in several journals, and a flurry of further meta-analyses analysing different permutations of trial characteristics and measures. These meta-analyses have formed the more optimistic conclusions that CBTp shows good effects for hallucinations (van der Gaag et al., 2014), for overall psychotic symptoms in people with persisting symptoms (Burns et al., 2014), and in direct contrasts with other interventions (Turner et al., 2014).

As a battle fought with meta-analysis, debate has focused on which data should be included in effect size calculations: for example, whether trials with different intervention targets should be included, conducted during acute psychosis should be mixed with persisting psychosis, and whether both group and one-to-one format intervention should be included (Birchwood et al., 2014; Burns et al., 2014; Mueser and Glynn, 2014; Peters, 2014). There has also been criticism of an excessive focus on overall psychotic symptom severity at post-treatment as the primary outcome (e.g., on measures like the Positive and Negative Symptom Scales, PANSS), when there is stronger evidence for effects on specific symptom measures (Peters, 2014; van der Gaag et al., 2014), and at follow-up time points (Peters, 2014), and when, in any case, CBTp primarily targets the emotional impact of psychotic experiences rather than their presence or frequency (Birchwood et al., 2014).

Beyond the Effect Size Debate

This debate has been valuable in drawing attention to the need for critical thinking in this field. However, the present paper argues that debate about which data to include in analyses, and how to interpret them, needs to consider some fundamental limitations of using broad CBTp protocols as a focus of study, and highlights that this whole debate has overlooked some potentially more fundamental limitations of what CBTp provides as an intervention for routine practice.

The term "cognitive behavioral therapy for psychosis" emerged in the 1990s within the context of a number of researchers beginning to study the application of psychological methods to help people

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manage their psychotic symptoms. At this time, this was helpful in grouping together a number of similar approaches, united by a pragmatic focus on reducing the impact of symptoms, and use of methods from a cognitive behavioral tradition, such as training in different skills in responding to symptoms, and restructuring distress-related appraisals. Hence, the operationalization of a CBTp served a useful purpose in defining an emerging literature, in developing therapy manuals for RCTs, and, ultimately, in providing data for the meta-analyses which have informed guidelines. However, as the field has progressed, the concept of CBTp has become less relevant and more limited, both as an object of scientific enquiry, and as a model of provision in practice.

Limitations of the CBTp Protocol as an Object of Scientific Enquiry

One of the key limitations of using CBTp as a trial protocol is the level of within-trial heterogeneity of therapy delivery. Trials have usually included persons with some combination of positive symptoms (hallucinations, delusions, or both), often in combination with negative symptoms and emotional symptoms, which means a variety of therapy targets are possible. Intervention protocols also describe a variety of therapeutic methods (e.g., coping enhancement, modification of delusions, relapse prevention), employed on the basis of an individualized case formulation, which makes it difficult to derive conclusions about the helpfulness and importance of component methods. In contemporary practice, as further intervention methods are incorporated, such as the use of mindfulness and imagery, CBTp represents an increasingly varied smorgasbord of intervention methods used in various combinations according to the person's presentation.

One consequence of this within-trial variability is that CBTp trials have required outcome measures sufficiently broad to capture the expected (variable) outcome domains. Whilst viable for broad outcomes such as quality of life and service use, within-trial variability reduces sensitivity to more direct but individualized outcomes such as hallucination- or delusion-related distress, compliance with command hallucinations, and interference of specific symptoms with social functioning. This has resulted in an overreliance on omnibus psychosis measures like the PANSS, which are so broad and indirect that they may measure more things that are not targeted by the intervention than things that are (Thomas, 2014). Such measures are inevitably going to lack sensitivity to individual outcomes, and, subsequently, provide trials with little more than a fairly insensitive test of a null hypothesis that CBTp does nothing at all. It would be misleading to consider the magnitude of effect sizes produced from these data as especially meaningful.

A second consequence of using an individualized formulation-based approach is that trials do not reveal which of the many intervention components that were included in the intervention contributed to outcome. For example, a recent review of psychological intervention methods for auditory hallucinations found that relatively little could be concluded about the relative usefulness of specific components of CBTp used with voices, with many assumptions untested, and a need for much more study at this level (Thomas et al., 2014).

A related, third, limitation regards the amenability of CBTp as a protocol for RCT designs contrasting with control conditions that match for therapist time, analogous to the use of placebo control in drug trials, argued by Lynch et al. to be a feature of "well-conducted" trials. In principle, this trial design could provide a strong experimental approach to examining therapeutic technologies: it would work well if there were a more tightly operationalised intervention, and more tightly defined outcome measure, to test whether the specific content of the intervention contributes over more contextual factors in delivery. However, this degree of specificity is not provided by the broad CBTp protocol, where the intervention arm involves a variably utilized package of intervention methods rather than a specific intervention. This, combined with broad outcome measurement, and the reality that psychological therapy control conditions have more active components than placebo/expectancy alone, means that such designs are likely to be very difficult to power adequately.

Limitations of CBTp as a Model of Best-Practice Therapy

Meanwhile, the second key issue regards how well the broad CBTp model, which has been the focus of trials, informs practice. Ultimately, the purpose of developing any intervention is to see it delivered. In the 1990s, CBTp was exciting in providing promise to target symptoms which were being left to pharmacotherapy alone. However, whilst clinical practice guidelines have been encouraging routine provision of CBTp since 2002, there continues to be discussion of it failing to be delivered (e.g., Farhall and Thomas, 2013; Nordentoft and Austin, 2014; van der Gaag, 2014). In explaining this, it is often argued that services need to better prioritize psychological interventions. However, what does CBTp actually offer? CBTp mainly provides a framework for adapting existing cognitive and behavioral methods to psychosis, thereby primarily being suited to delivery by practitioners with advanced levels of cognitive-behavioral skill, typically clinical psychologists. Indeed, the competency framework described for CBTp (Roth and Pilling, 2013) indicates a high and exclusive bar for delivery. In practice, the CBTp intervention we have validated as evidence-based practice within RCTs outlines a treatment protocol requiring such high prerequisite skill that it can only be used by a small—and expensive—segment of the mental health workforce.

Furthermore, without understanding which components of the CBTp black box are useful, this creates a challenge of either disseminating a simplified version of CBTp to less thoroughly trained practitioners, or increasing the workforce of skilled therapists. Both have been attempted with less success than would be hoped. Early initiatives such as THORN in the UK have had relatively poor success in leading to changes in delivery (Couldwell and Stickley, 2007), and it is notable that the most recent descriptions of "low intensity" CBT for psychosis have not, in fact, utilized elements of CBTp, but, rather, behavioral activation and graded exposure (Waller et al., 2013). Meanwhile, recent UK

pilots have examined whether it is possible to increase delivery of CBTp by boosting the workforce of CBT practitioners. Jolley et al. (2015) recently described the outcomes in a demonstration site in which a total of 10 additional whole time equivalent NHS staff focused on delivering CBTp to psychosis services with approximately 7000 service users. They reported being successful in leading to a threefold increase in persons delivered CBTp with evidence for good outcomes and high satisfaction in participants within a year. However, with delivery reported to increase at a rate of approximately 20 cases per whole time equivalent therapist per year, the total increase in delivery would have represented less than 3% of the overall caseload. This suggests that, even with significant investment and prioritization, only quite low absolute levels of delivery can be realized, illustrating challenges in meeting consumers' treatment needs in a widespread way using CBTp as a model.

What can we Learn from this for the Ongoing Development of Interventions?

These limitations highlight issues, not of CBTp lacking efficacy, but of it providing a research focus not particularly revealing of its component methods or specific effects, and producing an all-or-nothing therapeutic technology that is not well-suited to being widely accessed. It is important to recognize when the CBTp protocol has uses and when it is limited. In research, it works well as a protocol representing current best-practice expert psychological therapy, something useful, for example, in contrasts with routine care to address cost-effectiveness questions, or when considering applications in particular contexts, such as with persons not taking medication (e.g., Morrison et al., 2014). However, its operationalization is not tight enough to know what exactly is working. Likewise, in practice, CBTp provides a useful operationalization of how to work psychologically with psychosis for persons already fluent in CBT, but is less accessible as an intervention for practitioners new to CBT to learn.

So what can we learn from this in advancing the field of psychological interventions for psychotic symptoms such as auditory hallucinations? Being much broader than, for example, cognitive therapy for depression, CBTp is not well-suited to dismantling trials. However, there is value in individual examination of more discrete intervention components, both old and new, that can be isolated more precisely, which has been showing some success with delusions (see Freeman, 2011; Thomas et al., 2014). This lesson is important not just for cognitive behavioral interventions, but also for the direction of ongoing research into new broad therapy paradigms being applied to psychotic experiences, such as acceptance and commitment therapy (e.g., Thomas et al., 2013) which may run into similar challenges in future.

In doing this, it appears particularly important to be focusing more attention to simple methods amenable to being widely delivered in practice. In considering the challenges that have been faced in disseminating CBTp, there is potential value in questioning the approach of starting with what expert therapists can do, and seeking to disseminate it, and instead starting with what patients need (e.g., Byrne and Morrison, 2014), and what mental health practitioners and services can deliver, and building interventions around this. This might include greater focus on consumer-defined ideas of personal recovery, and consumer-identified subjective and functional impacts of psychotic experiences found most problematic; as well as considering what can be provided by current mental health practitioners, and new elements such as a growing peer workforce (e.g., Dent-Pearce et al., 2015) and digital technologies (Alvarez-Jiminez et al., 2014).

References

Alvarez-Jiminez, M., Alcazar-Corcoles, M. A., Gonzalez-Blanch, C., Bendall, S., McGorry, P. D., and Gleeson, J. (2014). Online, social media and mobile technologies for psychosis treatment: a systematic review on novel user-led intervention. *Schizophr. Res.* 156, 96–106. doi: 10.1016/j.schres.2014.03.021

Birchwood, M. J., Shiers, D., and Smith, J. (2014). CBT for psychosis: not a quasi-neuroleptic. *Br. J. Psychiatry* 204, 488–489. doi: 10.1192/bjp.204.6.488a

Burns, A. M. N., Erickso, D. H., and Brenner, C. A. (2014). Cognitive-behavioural therapy for medication-resistant psychosis: a meta-analytic review. *Psychiatr. Serv.* 65, 874–880. doi: 10.1176/appi.ps.201300213

Byrne, R., and Morrison, A. P. (2014). Service users' priorities and preferences for treatment of psychosis: a user-led Delphi study. *Psychiatr. Serv.* 65, 1167–1169. doi: 10.1176/appi.ps.201300289

Couldwell, A., and Stickley, T. (2007). The Thorn course: rhetoric and reality. *J. Psychiatr. Ment. Health Nurs.* 14, 625–634. doi: 10.1111/j.1365-2850.2007.01143.x

Dent-Pearce, L., Daya, I., Karagounis, J., and Thomas, N. (2015). "Integrating peer work with a specific therapeutic target: experiences from the voice exchange program," in *Contemporary TheMHS in Mental Health Services: Proceedings of the 24th TheMHS Conference*, eds K. Kellehear, A. Lane, M. Cassaniti, B. Tooth, C. Chapman, S. Robertson, et al. (Balmain, NSW: TheMHS).

Farhall, J., and Thomas, N. (2013). Cognitive and behavioural therapies for psychosis. *Aus. N. Z. J. Psychiatry* 47, 508–511. doi: 10.1177/0004867413483370

Freeman, D. (2011). Improving cognitive treatments for delusions. *Schizophr. Res.* 132, 135–139. doi: 10.1016/j.schres.2011.08.012

Jauhar, S., McKenna, P. J., Radua, J., Fung, E., Salvador, R., and Laws, K. R. (2014). Cognitive-behavioural therapy for the symptoms of schizophrenia: systematic review and meta-analysis with examination of potential bias. *Br. J. Psychiatry*, 204, 20–29. doi: 10.1192/bjp.bp.112.116285

Jolley, S., Garety, P., Peters, E., Fornells-Ambrojo, M., Onwumere, J., Harris, V., et al. (2015). Opportunities and challenges in Improving Access to Psychological Therapies for people with Severe Mental Illness (IAPT-SMI): evaluating the first operational year of the South London and Maudsley (SLaM) demonstration site for psychosis. *Behav. Res. Ther.* 64, 24–30. doi: 10.1016/j.brat.2014.11.006

Kreyenbuhl, J., Buchanan, R. W., Dickerson, F. B., and Dixon, L. B. (2010). The Schizophrenia Patient Outcomes Research Team (PORT): updated treatment recommendations 2009. *Schizophr. Bull.* 36, 94–103. doi: 10.1093/schbul/sbp130

Lynch, D., Laws, K. R., and McKenna, P. J. (2010). Cognitive behavioural therapy for major psychiatric disorder: does it really work? A meta-analytical review of well-controlled trials. *Psychol. Med.* 40, 9–24. doi: 10.1017/S003329170900590X

McKenna, P., and Kingdon, D. (2014). Has cognitive behavioural therapy for psychosis been oversold? *BMJ* 348:g2295. doi: 10.1136/bmj.g2295

Morrison, A. P., Turkington, D., Pyle, M., Spencer, H., Brabban, A., Dunn, G., et al. (2014). Cognitive therapy for people with schizophrenia spectrum disroders not taking antipsychotic drugs: a single-blind randomised controlled trial. *Lancet* 383, 1395–1403. doi: 10.1016/S0140-6736(13)62246-1

Mueser, K., and Glynn, S. M. (2014). Have the potential benefits of CBT for severe mental disorder been undersold? *World Psychiatry* 13, 253–256. doi: 10.1002/wps.20160

National Institute for Health and Clinical Excellence. (2014). *Psychosis and Schizophrenia in Adults: Treatment and Management*. Available online at: http://www.nice.org.uk

Nordentoft, M., and Austin, S. (2014). CBT for psychotic disorders: beyond meta-analyses and guidelines: it is time to implement! *World Psychiatry* 13, 260–261. doi: 10.1002/wps.20164

Peters, E. (2014). Jauhar et al: an oversimplification of psychosis, its treatment, and its outcomes? *Br. J. Psychiatry* 205, 159–160. doi: 10.1192/bjp.205.2.159a

Roth, A. D., and Pilling, S. (2013). *A Competence Framework for Psychological Interventions with People with Psychosis and Bipolar Disorder*. Available online at: http://www.ucl.ac.uk/clinical-psychology/CORE/competence_ mentalillness_psychosisandbipolar.html

Thomas, N. (2014). "What have we learnt about how to capture and measure the outcomes of psychological therapies for voices?," in *Psychological Approaches to Understanding and Treating Auditory Hallucinations: from Theory to Therapy*, eds M. Hayward, C. Strauss, and S. McCarthy-Jones (London: Routledge), 100–128.

Thomas, N., Hayward, M., Peters, E., van der Gaag, M., Bentall, R. P., Jenner, J. M., et al. (2014). Psychological therapies for auditory hallucinations (voices): current status and key research directions. *Schizophr. Bull.* 40, s202–s212. doi: 10.1093/schbul/sbu037

Thomas, N., Morris, E. M. J., Shawyer, F., and Farhall, J. (2013). "Acceptance and commitment therapy for voices," in *Acceptance and Commitment Therapy and Mindfulness for Psychosis*, eds E. M. J. Morris, L. C. Johns, and J. E. Oliver (E Chichester: Wiley-Blackwell), 95–111.

Turner, D. T., van der Gaag, M., Karyotaki, E., and Cuijpers, P. (2014). Psychological interventions for psychosis: a meta-analysis of comparative outcome studies. *Am. J. Psychiatry* 171, 523–538. doi: 10.1176/appi.ajp.2013.13081159

van der Gaag, M. (2014). The efficacy of CBT for severe mental illness and the challenge of dissemination in routine care. *World Psychiatry* 13, 257–258. doi: 10.1002/wps.20162

van der Gaag, M., Valmaggia, L. R., and Smit, F. (2014). The effects of individually tailored formulation-based cognitive behavioural therapy in auditory hallucinations and delusions: a meta-analysis. *Schizophr. Res.* 156, 30–37. doi: 10.1016/j.schres.2014.03.016

Waller, H., Garety, P. A., Jolley, S., Fornells-Ambrojo, M., Kuipers, E., Craig, T., et al. (2013). Low intensity cognitive behavioural therapy for psychosis: a pilot study. *J. Behav. Ther. Exp. Psychiatry* 44, 98–104. doi: 10.1016/j.jbtep.2012.07.013

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HYPOTHESIS AND THEORY
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Bringing the "self" into focus: conceptualising the role of self-experience for understanding and working with distressing voices

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A primary goal of cognitive behavior therapy for psychosis (CBTp) is to reduce distress and disability, not to change the positive symptoms of psychosis, such as hearing voices. Despite demonstrated associations between beliefs about voices and distress, the effects of CBTp on reducing voice distress are disappointing. Research has begun to explore the role that the psychological construct of "self" (which includes numerous facets such as self-reflection, self-schema and self-concept) might play in causing and maintaining distress and disability in voice hearers. However, attempts to clarify and integrate these different perspectives within the voice hearing literature, or to explore their clinical implications, are still in their infancy. This paper outlines how the self has been conceptualised in the psychosis and CBT literatures, followed by a review of the evidence regarding the proposed role of this construct in the etiology of and adaptation to voice hearing experiences. We go on to discuss some of the specific intervention methods that aim to target these aspects of self-experience and end by identifying key research questions in this area. Notably, we suggest that interventions specifically targeting aspects of self-experience, including self-affection, self-reflection, self-schema and self-concept, may be sufficient to reduce distress and disruption in the context of hearing voices, a suggestion that now requires further empirical investigation.

Keywords: self, self-experience, voice hearing, auditory verbal hallucinations, psychosis, schizophrenia, phenomenology, psychological intervention

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Introduction

Voice hearing experiences are common in a range of mental health conditions (Waters et al., 2012a), and often contribute significantly to distress, disability and need for care (Nayani and David, 1996). Cognitive behavioral therapy for psychosis (CBTp) is the recommended first-line psychological treatment for distressing voice hearing experiences occurring in the context of psychotic disorder (American Psychiatric Association, 2004; Royal Australian and New Zealand College of Psychiatrists, 2005; National Collaborating Centre for Mental Health, 2014). When working with people distressed by voice hearing experiences, this approach aims to modify appraisals about the identity, power, knowledge and intent of voices, as these are proposed to determine the degree

of distress and interference with functioning experienced by the hearer (Thomas et al., 2014).

Randomized controlled trials (RCTs) are consistent in demonstrating evidence for beneficial but modest effects of CBTp on global measures of voice hearing experiences (van der Gaag et al., 2014). Some RCTs have found evidence for changes in physical, cognitive and behavioral, but not emotional, dimensions of voices (Valmaggia et al., 2005; Peters et al., 2010), a surprising finding given that symptom-related distress is the intended outcome of CBTp. Farhall et al. (2009) suggest that this might be due, in part, to insufficient attention toward targeting voice-related mechanisms in CBTp trials. However, whilst a recent trial targeting a specific type of voice appraisal (voice power beliefs) in people experiencing command hallucinations found a significant reduction in compliance behavior, again, no significant treatment effect was found on voice-related distress (Birchwood et al., 2014).

Given these modest treatment effects, and in particular the limited impact of therapy on voice distress, researchers have suggested that the development of interventions should be further guided by research on processes specific to voice hearing (Thomas et al., 2014). One potential therapeutic approach is suggested by evidence of a range of disturbances in self-experience in people diagnosed with psychosis, including perceived loss of self-coherence, self-identity and self-esteem, amongst other self-related constructs (McCarthy-Jones et al., 2013b). Since voice hearing is one of the defining features of schizophrenia (it has been estimated that approximately 60% of those receiving this diagnosis hear voices; Slade and Bentall, 1988), it is possible that disturbances in self-experience are in some way related to the emergence of and adaptation to voice hearing experiences in (and possibly beyond) psychosis. Indeed, many researchers have posited a central role of self-disturbance in the development of voice hearing experiences in schizophrenia (Sass and Parnas, 2003; Raballo and Larøi, 2011; Larøi et al., 2012; Perona-Garcelán et al., 2015), and cognitive models of psychosis emphasize the role of anomalous self-experiences and beliefs about the self in the nature of and adaptation to voices (Garety et al., 2001; Morrison, 2001; Paulik, 2012).

This evidence suggests that self-experience might represent a viable target for therapeutic intervention in voice hearing. Such a therapeutic focus on self-experience confers several advantages. If disturbances of self-experience do indeed represent the core vulnerability underlying psychotic experiences such as voices, targeting self-experience may have broader effects extending to other symptoms associated with voice hearing, such as paranoia, negative symptoms, depression and anxiety. Furthermore, targeting self-experience may be an alternative, less confronting, means of reducing distress with persons for whom beliefs about voices are maintained with delusional conviction, or who do not wish to engage directly with their voices in therapy. This is also consistent with evolutions of cognitive therapy which see a focus on self-acceptance and a richer understanding of self as an integral part of a person-based approach (Chadwick, 2003, 2006).

However, cognitive behavioral research and intervention to date has typically focused on only two elements of self-experience in voice hearing; negative self-schema and self-esteem, largely neglecting significant advances in the understanding of self-experience from research in phenomenological psychiatry and cognitive and social psychology (García-Montes et al., 2012). Furthermore, the sheer range of concepts embraced by the concept of "self-experience" currently precludes attempts to move beyond this preliminary understanding within the voice hearing literature (Berry and Bucci, 2014). Developing a shared conceptualisation of how these various elements of self-experience relate to one another, and the role that these might play in voice hearing experiences, may help to develop intervention strategies that target these aspects more efficiently. The current paper therefore aims to bring together some of the diverse literature on self-experience, in order to present a conceptual framework for understanding and researching self-experience in voice hearers.

The paper will first outline the current conceptualisation of self-experience in the cognitive behavioral literature, before introducing a framework for understanding the structure of self-experience, based on research in phenomenological psychiatry, cognitive science and social psychology. This framework will be discussed in relation to research findings on disturbed self-experience in psychosis and voice hearing. We will consider a range of potential treatment targets suggested by this framework, and discuss how current intervention strategies may directly or indirectly target these mechanisms. The paper concludes with a discussion of the future research that will be necessary to validate this framework within voice hearers and identify effective intervention strategies to target elements of disturbed self-experience.

Current Conceptualisations of "self" in CBT for Psychosis

Whilst many researchers within the cognitive behavioral tradition have investigated the relationship between voices and elements of self-experience such as self-schema and self-esteem, Beck, Bentall, Chadwick and colleagues are amongst the few who have attempted to integrate these constructs within a cohesive cognitive framework (Bentall et al., 1994; Beck and Rector, 2003; Bentall, 2003; Chadwick, 2003, 2006; Beck et al., 2008). These authors build on work from cognitive and social psychology in order to describe the content, organization and functioning of the self-concept in people experiencing psychosis.

Social cognitive models propose that the self-concept comprises a collection of abstract and language-based cognitive representations stored in memory which serve to interpret and organize self-relevant actions and experiences (Markus and Wurf, 1987). These self-representations concern various aspects of individuals' relations with the outside world and with themselves (Higgins, 1987; Beck et al., 2008), including representations of "actual" self (i.e., the specific model of the self that we currently hold in mind), "ideal" self (the self that I would like to be), "ought" self (the self that I ought to be) and "possible" self (the self that I imagine I might become in the future). These representations are proposed to be constructed via continuous reciprocal interaction between the self and the social world (Markus and Wurf, 1987). What results from this process of construction is a dynamic

interpretive structure that both derives from and mediates most significant intra- and inter-personal functions, including information processing, affective and behavioral regulation, social perception, and the selection of, and behavior within, social interactions (Markus and Wurf, 1987).

These various self-representations are proposed to be organized within higher-order cognitive structures, which Beck et al. (2008) referred to as schemas. At any one time, only a subset of self-schema are accessed and invoked, depending on both the self-motives being served and the particular demands and affordances of the immediate social situation (Markus and Wurf, 1987). Chadwick (2006) reserves the term schema for the cognitive–affective *experience* of self that we are aware of in any given moment as a particular subset of self-representations become activated. This continually shifting experience of self, which can include associated cognitive, affective and physiological states, has alternatively been referred to as the *working* self-concept (Markus and Wurf, 1987; Bentall, 2003).

Contemporary cognitive models emphasize the significance of recognizing the complex and dynamic nature of the self-concept (Bentall, 2003; Chadwick, 2006). For example, a distinction has recently been made in the psychosis literature between knowledge and evaluative components of the self-concept (Fowler et al., 2006). Whilst the stored schematic representations described previously make up the knowledge component of the self (i.e., what people believe about themselves), the evaluative component comprises constructs such as self-esteem (i.e., how people feel about what they believe about themselves; Maddux and Gosselin, 2012) and self-efficacy beliefs (i.e., what people believe they can do and achieve with their skills and abilities under certain conditions; Maddux and Gosselin, 2012). It has been suggested that the accessibility of, and interactions between, these diverse knowledge-based and evaluative self-representations is as central to functioning as schematic content (Chadwick, 2006). Self-representations will differ in terms of their tendency to become activated or to enter conscious awareness, and different self-representations may be contradictory or poorly integrated, potentially resulting in the actuation of negative emotional states (Bentall, 2003).

These concepts have been explored predominantly within the paranoia and persecutory delusions literature (e.g., Bentall et al., 2001; Freeman et al., 2002; Tiernan et al., 2014). Early cognitive models proposed that persecutory delusions reflect an attributional defense, preventing latent negative self-representations from entering conscious awareness (Bentall et al., 1994, 2001). More recent theories (e.g., Freeman et al., 2002) suggest that paranoia and delusions do not serve a defensive function, but instead build directly upon negative beliefs about the self (e.g., that the self is weak or vulnerable), whereby such beliefs may lead to an experience of oneself as an "easy target" in interpersonal interactions, in turn prompting the anticipation of threat that characterizes persecutory delusions (Salvatore et al., 2012b). In support of the latter theory, empirical work has consistently demonstrated the presence of both negative explicit and implicit self-representations in individuals with paranoia (Tiernan et al., 2014).

In relation to voice hearing specifically, research to date (recently reviewed by Berry and Bucci, 2014) suggests a close link between negative knowledge-based self representations and voice content (Close and Garety, 1998; Barrowclough et al., 2003), appraisals of voice power (Birchwood et al., 2000, 2004; Thomas et al., 2015), and emotional and behavioral responses to voices such as distress (Birchwood et al., 2004; Smith et al., 2006) and compliance (Fox et al., 2004). Whilst some descriptions of the cognitive model suggest a reciprocal relationship between voices and self-beliefs, whereby negative self-schema are suggested to influence both voice content (Beck and Rector, 2003) and appraisals of voices (e.g., Morrison, 2001), and negative voices reinforce and strengthen negative distressing core beliefs about the self (Close and Garety, 1998; Freeman et al., 2002; Chadwick, 2006), the directionality of these effects have yet to be established empirically.

Research into the relationship between the evaluative component of the self-concept and voice hearing experiences has focused predominantly on self-esteem. Recent research has found evidence of an association between low trait self-esteem and negative voice content (Smith et al., 2006), power appraisals (Peters et al., 2012) and distress (Smith et al., 2006), whilst Fannon et al. (2009) found that low self-esteem predicted depression in voice hearers *independently* of voice appraisals. To date, there has been less of a focus on the role of self-efficacy beliefs (another aspect of the evaluative component of the self-concept) in voice hearing, although this is frequently stated as a target for psychological therapy (e.g., Chadwick, 2003; Hayward et al., 2009). However, self-efficacy beliefs have been shown to be an important variable in determining whether voice hearers require psychiatric care (Honig and Romme, 1998), and have been suggested to be undermined by enduring experiences of critical or commanding voices (Rector and Leahy, 2006).

Bringing the "self" into Focus: A Phenomenologically-informed Framework

These conceptualisations of self within the CBTp literature emphasize the role of stored higher-level representations, evaluations and reflective processes in the experience of self. This is not surprising, since cognitive behavioral approaches are typically reliant on processes of conscious self-reflection to foster insight and facilitate change (Chadwick, 2006). However, it is widely acknowledged that stored knowledge and evaluations are only one aspect of self-experience (Sedikides and Skowronski, 1997; Damasio, 2003), and much more fundamental disturbances of self are also characteristic of psychosis (Moe and Docherty, 2014; Nelson et al., 2014). Indeed, the negative or disordered higher level self-representations which have been described may develop in reaction to more fundamental, pre-reflective disturbances in experience of self (Nelson et al., 2014; Stanghellini and Rosfort, 2015). Specifically, parallel developments in the fields of phenomenological psychiatry and cognitive psychology suggest that these disturbances in self-experience might well: (a) underlie the emergence of and adaptation to voice hearing; (b) contribute to additional distress/disruption in those who hear voices.

Whilst anomalous self-experiences are acknowledged to be an important pre-disposing factor in cognitive models of psychosis (Garety et al., 2001; Paulik, 2012), little attempt has been made to fully integrate these higher and lower-level conceptualisations of self in relation to voice hearing experiences, despite the suggestion that it is the *interaction* between bottom-up and top-town representations and processes that ultimately determines the perception of and adaptation to voice hearing experiences (Waters et al., 2012a; Aleman and Vercammen, 2013). The aim here is therefore to introduce a framework for conceptualising the contribution of various dimensions of self-experience to voice hearing, incorporating insights from phenomenological psychiatry, cognitive, social and developmental psychology.

These literatures present a vast array of overlapping definitions, perspectives and explanations of the self, each with their own associated terminology. Despite this range of perspectives, the majority appear to assume that there is some elementary form of order, structure, or "essence" to our experience (or "sense") of self, which remains relatively consistent both within and between individuals (Markus and Wurf, 1987; Damasio, 2003; Gallagher and Zahavi, 2012). Furthermore, there appears to be a certain degree of convergence between disciplines around how we might begin to conceptualise this fundamental structure of self.

For the present purpose, self-experience, or sense of self, is defined as the feelings of singularity, coherence, individuality, and unity that define one as a unique and particular human being (Harré, 1998; Damasio, 2003; Prebble et al., 2013). The present framework takes as its basis Parnas's (2003) description of the structure of the self, which is founded on insights from phenomenological investigations of self-experience within both healthy individuals and those with a diagnosis of schizophrenia (Sass and Parnas, 2003). This framework corresponds closely to those derived independently within the fields of social psychology (e.g., Sedikides and Skowronski, 1997) and cognitive neuroscience (Damasio, 1999), and thus sits on firm empirical ground. This framework posits that there are three inter-dependent levels of self-experience, termed the pre-reflective, reflective, and narrative selves. These will each be described in turn, and evidence for their role in relation to the emergence of and adaptation to voice hearing experiences examined.

The Pre-reflective Self

According to Parnas (2003), the pre-reflective self (also referred to as minimal, ecological, basic, or proto self, selfhood or self-as-subject; James, 1890; Gibson, 1986; Damasio, 1999; Nelson et al., 2014; Stanghellini and Rosfort, 2015) constitutes the foundational level of selfhood on which other levels of self-experience are built (Nelson et al., 2014) and as such is the basis of various aspects of conscious experience (Nelson et al., 2014a). It is a pre-conceptual, tacit level of selfhood that refers to the implicit sense of being a subject of experience, i.e., a non-inferential first-person awareness that our on-going experiences, thoughts, perceptions, feelings, or actions are our own, accompanied by a sense of immersion in the surrounding world (Parnas, 2003).

A body of phenomenological research provides evidence of disturbances at the level of pre-reflective self-experience in people diagnosed with schizophrenia, which manifest as a range of anomalous subjective experiences (Nelson et al., 2009). These experiences include disturbed presence (disrupted sense of "inhabiting" ones own experience), corporeality (anomalous bodily experiences, such as perceived morphological change or motor disturbances), stream of consciousness (anomalous cognitive processes, such as perceptualization of inner speech or thought, or thought interference), self-demarcation (loss or permeability of self-world boundary, such as confusion between oneself and other people), and existential reorientation (fundamental reorientation with respect to worldview). Sass and Parnas (2003) propose that these basic disturbances in ipseity lie at the core of voice hearing experiences, and may even be a trait marker for psychotic vulnerability (Nelson et al., 2014). In line with this, Kim et al. (2010) have found a significant association between anomalous self-experiences and voice hearing (but not delusions) in patients with schizophrenia, and Raballo and Larøi (2011) present evidence from first-person accounts that anomalous self-experiences could prelude to the development of voice hearing experiences. Varese et al. (2011) have demonstrated using the experience sampling method (ESM) that patients with auditory hallucinations are more vulnerable to dissociative states (an example of disrupted self experience) in response to daily life stress compared to non-hallucinating patients and healthy controls. Furthermore, within the hallucinating patient group, auditory hallucinations were significantly predicted by dissociation, especially under high stress.

Distorted or unstable self-experience is proposed to result from two complementary aspects (Sass, 2014): diminished self-affection (a weakened sense of existing as a subject of awareness or agent of action) and operative hyper-reflexivity (a non-volitional tendency for focal attention to be directed toward processes and phenomena that are normally tacit or implicit). Gallagher and Zahavi (2012) propose that in the case of voice hearing experiences, diminished self-affection reflects a disturbance in the pre-reflective sense of agency (i.e., the sense of being the agent of an action) over inner speech, with ownership of these experiences (i.e., the sense that I am the one who is undergoing these experiences) remaining relatively intact. This proposition is evidenced by the observation that in general, voice hearers remain aware that they, themselves, are hearing voices, rather than somebody else. This disrupted sense of agency, in combination with operative hyper-reflexivity, is suggested to underlie the external attribution of inner dialogue; inner speech becomes the object, rather than the subject, of experience, resulting in the emergence of voices (Gallagher and Zahavi, 2012).

Researchers have recently highlighted a correspondence between these phenomenological disturbances and findings within the neurocognitive literature (Nelson et al., 2014a,b). Specifically, it is suggested that disturbances of self-affection are associated with source monitoring deficits (which result in difficulty identifying self-generated events, and are proposed to result in the misattribution of inner speech; Bentall, 1990), whilst operative hyper-reflexivity correlates with compromised memory-prediction processes (which promote excessive attention to information that is irrelevant or highly familiar, a phenomenon known as "aberrant salience"; Kapur, 2003). Indeed, errors on source monitoring tasks are one of the most robust findings in

relation to hallucinations; for example, Waters et al. (2012b) have presented meta-analytic evidence that source monitoring/self-recognition is impaired in patients with schizophrenia, and particularly in those who hear voices. However, it is unclear whether these neurocognitive disturbances constitute the neural underpinnings of disturbed self-affection, or whether they lie downstream from a more core alteration of basic self-experience (Sass, 2014).

If a disorder of basic self-experience were primary, this would help to explain phenomenological differences between inner speech and voices (Parnas, 2003). Among the most characteristic features of voices in psychosis are so-called "Schneiderian" hallucinations (Daalman et al., 2011); a voice describing the patient's on-going behavior or experience, or two or more voices discussing the patient in the third person. Such third-person commentary is not a common feature of typical inner speech (Langdon et al., 2009), creating problems for theories which suggest that voices simply reflect misattributed inner speech. Parnas suggests that the processes of diminished self-affection and operative hyper-reflexivity result in a transformation in the *nature* of inner speech; experiences of self-alienation result in a shift away from inner speech referring to self-as-subject (e.g., "I need to make breakfast and get the kids to school in 20 min") toward self-as-object (e.g., "he's going into the kitchen. . . . .now he's opening the fridge. . ."). This "higher-level" inner speech (which reflects the self-consciousness that generates self-alienation) is proposed to form the content of Schneiderian hallucinations (Parnas, 2003). However, whilst it might be expected from this account that voice hearers should experience less "typical" inner speech than non-voice hearers, a recent phenomenological study of inner speech found that this is not the case (Langdon et al., 2009). It is possible that inner speech referring to the hearer in the second or third person is simply more likely than typical inner speech to be misattributed; however, the potential reasons for this are not specified within either the phenomenological or source monitoring accounts of voice hearing.

The Reflective Self

The reflective self, also referred to as the core self (Damasio, 1999), self-as-object (James, 1890) or objectified self (Sedikides and Skowronski, 1997) refers to a primitive cognitive representation of the self as the invariant and persisting subject pole of experience and action (Parnas, 2003). This representation is accessed via reflective consciousness (i.e., the capacity of an organism to become the object of its own attention). This reflexive, or metacognitive, capacity occurs at a substantially more explicit or conscious level than the elementary sense of ipseity provided by the pre-reflective self (Sedikides and Skowronski, 1997), but is both derivative and dependent upon it (Parnas, 2003). Research in individuals with a diagnosis of schizophrenia has found evidence for disturbances in the reflexive consciousness that is central to the functioning of the reflective self.

Phenomenological theorists such as Sass and Parnas (2003) suggest that the lack of automatic identification of experiences as one's own (which results from diminished affection and operative hyper-reflexivity at the level of the pre-reflective self—see The Pre-reflective Self), may subsequently prompt more reflective forms of hyper-reflexivity (Nelson et al., 2014b). Such "hyper-reflection" (or increased conscious self-reflection) might occur as an in-the-moment reaction (e.g., the sense that this "voice" did not originate in me leads to reflection about its potential origins), but it may also turn into something more habitual, such as increased attentional focus on particular elements of experience (Nelson et al., 2014b). It has been proposed that these consequential and compensatory processes may serve to further a sense of alienation and diminished self-affection (Parnas, 2003), potentially reinforced by the "objectifying" content of Schneiderian hallucinations. This notion of hyper-reflection demonstrates clear parallels with self-focused attention, which has been at the center of much cognitive behavioral research (García-Montes et al., 2012). Thus, in support of this phenomenological account, there is evidence that high levels of self-focused attention are associated with the experience of, or predisposition toward, hallucinations in both patients (Morrison and Haddock, 1997; Ensum and Morrison, 2003) and non-clinical participants (Allen et al., 2005). Furthermore, Perona-Garcelán et al. (2008) demonstrated a positive correlation between self-focused attention and dissociative experiences in patients with hallucinations, but not in patients with psychoses who have never experienced hallucinations.

Contemporary dialogical theories agree that processes such as hyper-reflexivity and hyper-reflection contribute to basic problems with self-recognition of thoughts and emotions (Lysaker et al., 2012), but they posit that these issues are further compounded by additional metacognitive deficits, which can result in an inability to see one's own thoughts processes as subjective and fallible (Dimaggio and Lysaker, 2015). Specifically, Lysaker and Dimaggio (2014) propose a deficit in *synthetic* metacognition; the capacity to recognize and integrate basic elements of experience into complex representations of self and others, and to adopt a superordinate meta-position which allows one to question one's beliefs and use one's knowledge to respond to psychosocial challenges. It can easily be imagined how difficulties in adopting a superordinate stance might even serve to promote further hyper-reflection around individual elements of experience, further exacerbating anomalous experiences such as voice hearing. In line with this view, people with a diagnosis of schizophrenia have been found to experience trait like deficits in the ability to form and use complex metacognitive self-representations (Lysaker and Dimaggio, 2014), and reduced metacognitive capacity to comprehend one's own mental states has been found to predict increased severity of auditory hallucinations in people with psychosis (Lysaker et al., 2005).

The Narrative Self

The narrative self (Nelson et al., 2014), also referred to as the symbolic (Sedikides and Skowronski, 1997; Chadwick, 2006), social (Parnas, 2003) or autobiographical self (Damasio, 1999), dynamic self-concept (Markus and Wurf, 1987) or personhood (Stanghellini and Rosfort, 2015) refers to the collection of abstract and language-based cognitive representations stored in memory which serve to interpret and organize self-relevant actions and experiences (Markus and Wurf, 1987). This is the level at which the majority of cognitive behavioral research in psychosis has been conducted (see Current Conceptualisations of "self" in CBT for

Psychosis). This level of self is widely understood to presuppose the pre-reflective and reflective selves (Sedikides and Skowronski, 1997; Damasio, 1999; Nelson et al., 2014), and to rely on the reflective self, in addition to a capacity for encoding and retrieving episodic–autobiographical memories (Gallagher, 2003; Prebble et al., 2013), for the development, consolidation, and refinement of its content, structure and functions (Sedikides and Skowronski, 1997; Nelson et al., 2014).

As we have seen, cognitive models discuss how constructs associated with the narrative self, such as low self-esteem and negative self-beliefs, might influence the way in which anomalous experiences, such as voice hearing, are interpreted (Waters et al., 2012a). However, a recent meta-synthesis of qualitative accounts of the lived experience of psychosis highlights the reported loss of additional aspects associated with the narrative self, including self-coherence and self-identity (McCarthy-Jones et al., 2013b). There has been much less emphasis within the cognitive literature on how these higher level self-constructs might relate to psychotic experiences such as voice hearing.

Salvatore et al. (2012b) have recently attempted to integrate the cognitive and phenomenological conceptions of the role self-experience in paranoia, suggesting that negative beliefs about self as weak or vulnerable may in fact emerge from, or be compounded by, the pre-reflective self-disturbances discussed previously, resulting in an experience of self as "ontologically vulnerable" (Salvatore et al., 2012b). Stanghellini and Rosfort (2015) elaborate on this idea, suggesting that "self-disorder, being at the core of the vulnerability to schizophrenia, is refracted through the prism of the person's background of values and beliefs that determine what things and events in the world mean for us" (p. 4). Whilst this idea demonstrates clear parallels with the cognitive notion that the meaning and impact of anomalous experiences are mediated by beliefs (Chadwick et al., 1996; Garety et al., 2001), the phenomenological conception goes further to suggest that anomalous pre-reflective self-experience may represent the foundations on which both psychotic experiences and self-identity are reciprocally constructed and appraised. Thinking about voice hearing experiences specifically, experiencing the self as "ontologically vulnerable" could serve to reinforce appraisals of voice power, proposed by cognitive models to be an important factor in determining voice-related distress (Birchwood et al., 2000, 2004; Gilbert et al., 2001).

Similarly, dialogical theorists have elaborated significantly on suggestions by Bentall (2003) and Chadwick (2006) in the cognitive literature that the accessibility and dynamic interactions between different self-representations is as important as the content of these representations in determining functional adaptation to anomalous experiences (Lysaker and Lysaker, 2002, 2004). Dimaggio et al. (2010) cite evidence from the clinical and social psychology literature suggesting that psychological health and social adaptation might depend on; (i) the existance of a sufficient number of self-representations (or "positions"), enabling a range of strategies for coping with the complexities of social life; (ii) the ability to have conscious access to self-representations that are context-relevant; (iii) the ability of different self-representations to be aware of each other and engage in a "dialogue" (achieved via inner speech) during inter- and intra-personal exchanges; (iv) the ability of the person to adopt a superordinate point of view, or metaposition, allowing an adaptive decision or resolution to be achieved via the coordination of and negotiation between different self-representations. In the context of psychosis, it is suggested that the aforementioned deficits in synthetic metacognition (see The Reflective Self) may result in difficulties at each of these levels (Dimaggio et al., 2010; Lysaker et al., 2012; Lysaker and Dimaggio, 2014) resulting in the disturbances in self-coherence and self-identity described in the psychosis literature, including an overly negative, disordered or "barren" self- concept (Lysaker et al., 2012).

This theory predicts that individuals with a diagnosis of psychosis might demonstrate disturbances in terms of; (i) self-concept clarity (i.e., the degree to which one's beliefs about one's attributes are clear, confidently held and cognitively accessible; Stinson et al., 2008); (ii) self complexity (i.e., the number and distinctiveness of accessible self-representations; Linville, 1987); (iii) the complexity and/or phenomenology of inner speech. In support of these suggestions, in non-clinical populations, low self-concept clarity, in combination with a tendency toward experiences of aberant salience (i.e., in which stimuli that ordinarily would not seem significant become much more salient and important; Kapur, 2003), is associated with an increased risk of psychotic-like experiences (Cicero et al., 2013). In individuals with a diagnosis of schizophrenia, low self-concept clarity has been found to predict higher levels of positive symptoms, lower subjective quality of life and increased risk of perceived exposure to stigmatization (Weinberg et al., 2012; Noyman-Veksler et al., 2013). In relation to voice hearing specifically, Bell and Wittkowski (2009) found evidence for reduced *positive* self complexity in voice hearers, and an association between higher positive self complexity and increased psychological wellbeing. However, at odds with the predictions of early dialogical theories, a recent study found that the phenomenology of inner speech in voice hearers does not differ significantly from that of non-clinical participants (Langdon et al., 2009).

Perona-Garcelán et al. (2015) have suggested that, rather than voice hearing experiences simply serving to disrupt the flow of internal conversation (as suggested by Lysaker and Lysaker, 2005), voices might in fact *themselves be a product of the dissociation of different self-positions*. In this view, increased self-focused attention/hyper-reflection on particular self-positions lead to a loss of metacognitive perspective, whereby these self-positions are no longer experienced as "belonging" to the owner. Instead, certain self-positions are experienced as interpersonal "others," prompting individuals to interact with voices in a similar manner to their interactions with others in the social environment. Support for this view includes evidence of an increased tendency toward dissociative experiences in voice hearers (Perona-Garcelán et al., 2008); findings that voice hearing experiences share some of the pragmatic properties of communication between people (Leudar et al., 1997); and finally, evidence that the relationship between the person and his or her voices is similar to the relationship between individuals in a social context (Hayward, 2003). However, many questions still remain as to the nature of the relationship between voice hearing experiences, inner dialogue and disturbed higher-level self-concept.

Targeting Self-experience in Voice Hearers

Researchers have recently highlighted the need to identify novel targets for psychological therapy for distressing voices, given the modest effects of CBT-based treatment approaches on both global measures of voice hearing experiences, and outcomes related to emotional dimensions of voices such as voice-related distress (Thomas et al., 2014). The evidence outlined in the previous section suggests that disturbances in self-experience occurring at the pre-reflective, reflective and narrative levels are likely to be intimately connected with the experience of voice hearing, in terms of both etiology and functional and emotional adaptation, and as such, may represent viable therapeutic targets in attempts to provide relief from distressing voices.

It is worth noting that whilst CBT-based approaches have tended to consider distress primarily as a consequence of hearing voices, to be addressed by intervening with how voices are appraised and responded to, it is likely that the relationship between voice hearing, voice-related distress and emotional distress more generally is complex, reciprocal, and difficult to partition. It is possible that the limited impact of CBTp on voice-related distress might reflect this complex relationship; for example, the cognitive and behavioral mechanisms targeted by CBTp may well lie "downstream" of distress in the causal pathway, or some latent third variable may underlie the emergence of both voice hearing experiences and psychological distress. Considering the contribution of self experience to this picture may be a means of conceptualising broader ways in which voice experience interacts with distress, rather than it merely being an adaptational endpoint.

For example, it is likely that disrupted self-experience may in itself be distressing for many voice hearers; the sense of ontological vulnerability associated with pre-reflective self disturbance may contribute to a basic feeling of unease with oneself, additional stress whilst navigating social interactions with other people, and reduced resilience in the face of critical voice content. Further, distress and emotional arousal could directly serve to influence pre-reflective self-experience, perhaps by disrupting neurocognitive processes that ordinarily facilitate a stable, situated sense of self.

As such, targeting aspects of self-experience might be expected to have effects that extend beyond symptom-related distress, to include many other facets of psychological distress. Indeed, many current interventions for schizophrenia, psychosis, and distressing voices incorporate methods that explicitly aim to target some of these aspects of self-experience. Given the recent emphasis within the literature on developing focused intervention methods that aim to modify specific therapeutic targets and processes (e.g., Thomas et al., 2014), we will now briefly consider what therapeutic methods may be suited to targeting self-experience, with reference to potential applications of components of current interventions that have been described in the literature.

Pre-reflective Self

At the pre-reflective level of self-hood, interventions are required that target the phenomenological disturbances proposed to underlie anomalous self-experiences, voice hearing and other psychotic symptoms, such as disrupted self-affection and hyper-reflexivity (see The Pre-reflective Self).

Targeting Disrupted Self-affection and Hyper-reflexivity

Two main approaches have been described which might enhance basic sense of self (Nelson et al., 2014b). There is preliminary evidence that reconstructive mind-body exercises (used within body-oriented psychotherapy; Röhricht and Priebe, 2006) might help to reduce basic self-disturbances in outpatients with a diagnosis of schizophrenia, re-establishing a coherent sense of embodied self, self-directed and vitalized social interaction and emotional expressiveness (Röhricht et al., 2009). These movement-based exercises enable participants to directly engage with their bodies in order to recognize and articulate unusual reflections suggestive of disembodiment, somatic disintegration and other abnormal bodily sensations. Whilst it might be expected that the restored ipseity achieved by this approach might translate into a reduction in voice hearing experiences and associated distress, this possibility has yet to be explored.

A second approach is to correct neurocognitive processes which may be contributing to disrupted self-affection and hyper-reflexivity. There is a demonstrated association between these phenomenological disturbances and deficits in attention, sensory processing and source monitoring, and it has been suggested that neurocognitive remediation therapies targeting these mechanisms may be beneficial (Nelson et al., 2014a,b; Postmes et al., 2014). Of course, the success of these approaches will depend crucially upon the nature of the relationship between these processes and self-disturbance; it is currently unclear whether these neurocognitive correlates lie up- or down-stream from alterations of basic self-experience (Sass, 2014). If neurocognitive disturbances are causal in the genesis of anomalous self-experience, and ipseity disturbances are related to the emergence of voice hearing experience in the way proposed by phenomenologists, cognitive remediation might be expected to fundamentally alter the voice hearing experiences of those undergoing treatment. However, again, the success of these approaches in restoring basic self-experience, and any associated impact on voices, has not yet been evaluated.

Reflective Self

Interventions can alternatively aim to target disturbances of self consciousness proposed to underlie or reinforce disrupted self-experience, such as hyper-reflection and impaired metacognitive processing (see The Reflective Self).

Minimizing Hyper-reflection

Results of phenomenological investigations suggest that the sense of loss of self in schizophrenia involves compromised first- and second- person awareness, leaving affected individuals able only to view themselves from "the outside" (Stanghellini and Lysaker, 2007). From the perspective of phenomenological researchers such as Nelson and Sass (2009), the aim of psychological therapy is to enable patients to "re-inhabit," rather than objectify or externalize, their experience, and to assist a patient in beginning

to recapture the ability to engage in first- then second-person experiences (Stanghellini and Lysaker, 2007). This approach warns that traditional cognitive approaches, particularly those which challenge the negative content of thoughts and schemas, might exacerbate hyper-reflective processes, leading to increased focus on the self as the object, rather than the subject, of experience (Pérez-Álvarez et al., 2011).

Stanghellini and Lysaker (2007) outline four general principles of phenomenonologically-informed therapy; (i) highlighting disturbances of intersubjectivity; (ii) aiming at achieving a shared partnership, (iii) focusing on the here-and-now, you-and-I relationship, and (iv) pointing to shared meaningfulness. This approach focuses on the promotion of the experience of self in the second person as a necessary first step to change. It is suggested that the primary task of the therapist is promoting the construction of micro-narratives focussed on real world situations, by consistently reflecting back a second-person perspective on the person's experiences (e.g., "*you* are feeling bad"; "*you* feel that you can't do anything right"). The aim of these micro-narratives is to assist in dialogically co-constructing a shared second-person view of the patients experiences, improving the person's capacity to sense experiences as his or her own, reflect upon them, and take an intentional stance over them, re-establishing disrupted immediate connectedness between the self and the present situation (Stanghellini and Lysaker, 2007).

Whilst the phenomenological conception warns against hyper-reflective processes promoted by traditional cognitive therapy, it additionally endorses strategies that stimulate a mindful awareness and acceptance of subjective experiences, particularly when these allow exploration of personal meaning (Pérez-Álvarez et al., 2011). Such approaches may be particularly helpful in addressing the contribution of "Schneidarian" voice content toward the exacerbation of hyper-reflective processes. Other recommended treatment approaches include those which encourage gradual engagement in activities and social interaction, thereby promoting a sense of immersion in present activity (Nelson and Sass, 2009). Such approaches are seen as beneficial not only in reducing hyper-reflection, but also in re-establishing normal ipseity at a pre-reflective level, as they promote a "forgetting" of the self as an objective focus of awareness, so that a more foundational sense of oneself as a subjective perspective on the world can be grounded (Nelson and Sass, 2009). Social and occupational engagement are emphasized by a number of exisiting interventions, for example Social Recovery Focused Cognitive Therapy (Fowler et al., 2009), Acceptance and Commitment Therapy (Gaudiano et al., 2010) and Person Based Cognitive Therapy (Chadwick, 2006), and may be particularly helpful for voice hearers given evidence that the intensity of voice hearing decreases during active engagement in leisure activity (Delespaul et al., 2002).

Enhancing Metacognitive Awareness

Lysaker and Dimaggio (2014) suggest that interventions should aim to help patients to recapture the ability to notice and integrate the different elements that make up mental activities, and to become capable of increasingly complex metacognitive acts. Lysaker et al. (2011) suggest that the first step of a metacognition oriented therapy (MOT) should be to assess a clients capacity for self-reflectivity; for example, determining whether they are able to notice that they have thoughts in their head, recognize these thoughts as their own, distinguish between different cognitive operations, and/or notice and identify their own feelings. This is seen to be a critical first stage of therapy, since discussing feelings or attempting to challenge cognitions when these cannot be recognized is assumed to be counterproductive, perhaps constibuting to frustration and distress on the part of both client and therapist.

The second step of therapy is to offer interventions appropriate to the patient's current level of metacognitive functioning. Lysaker et al. (2011) offer a variety of suggestions for interventions appropriate to different levels of metacognitive capacity for self-reflectivity, all of which use a consultative process in which the therapist adopts a reflective, questioning stance in order to create a space in which clients internal experiences can be openly thought about (Bargenquast and Schweitzer, 2013). For example, if a client is currently unable to determine whether there are thoughts in their own mind, an appropriate approach might be to provide reflections on the specific thoughts that a client may currently be experiencing, based on what the client chooses to talk about. As with the phenomenological approach, reflections in the second-person are thought to be useful since these reflections implicitly treat clients as participants in their lives, recognizing that they are more than passive observers (Lysaker and Lysaker, 2011). If a client is able to recognize and articulate different thoughts as they arise, the focus of therapy would shift toward discussing and reflecting back these specific mental operations, and supporting the client to build these fragments into a more complex, coherent and personalized narrative.

At higher levels of metacognitive functioning, interventions may involve supporting clients to think about their or other's thinking and feelings in an ever more complex manner, by asking questions such as "what was that like for you?" or "how do you think that made × feel?" (Bargenquast and Schweitzer, 2013). At the highest levels of self-reflectivity, the therapist aims to work alongside the client to consider the fallibility of their thinking, take a step back from firmly held ideas, and begin to consider alternative world views. Again, points of internal debate can be brought into focus by providing reflections based on ongoing discussion, for example; it seems that there is a part of you that believes ×, but also another part of you that has some doubts" (Lysaker et al., 2011).

Whilst the effect of MOT on reducing distress and disruption in relation to voice hearing experiences has yet to be directly assessed, reductions in voice frequency have been observed in individual case studies (Salvatore et al., 2012a), and it is likely that such an approach would facilitate interventions aimed at restoring processes of narrative self-construction (described in see Targeting Higher-level Constructs: Self Esteem and Self Concept). Furthermore, evidence from the delusions literature suggests that similar metacognitive training approaches can be used to promote insight into the cognitive biases serving to maintain unusual beliefs (Kumar et al., 2014), which may serve to augment cognitive behavioral interventions for voice hearing.

Narrative Self

Interventions operating at the narrative level can aim to target lower-level constructs, such as the content, meaning, accessibility and impact of positive and negative self schema, and/or to influence the way in which these lower-level self representations interact to produce higher-level constructs such as self-esteem, self-concept and identity.

Modifying the Content, Meaning, and Impact of Negative Self-schemas

Traditional cognitive approaches attempt to modify self-schematic content. This starts with the collaborative formulation of negative self-schema (Padesky, 1994; Chadwick, 2006) and is followed by the use of Socratic techniques to review and evaluate evidence (naturally occuring evidence as well as evidence gathered through behavioral experiments) as to the accuracy of negative self-schemas (Padesky, 1993) and/or to strengthen positive self beliefs, such as beliefs about personal power and status relative to voices (Trower et al., 2004).

However, modifying negative schematic content might not always be possible, as this content may be stored in memory in a way that is not easily amenable to change (Hayes, 2004; Brewin, 2006; Longmore and Worrell, 2007). An alternative approach with the narrative self is to modify meta-cognitive beliefs about negative schematic experiences using a combination of behavioral, mindfulness- and acceptance-based methods—that is, shifting away from the meta-cognitive belief that self-schema are literal truths about self and toward a recognition of their contradictory, transient and non-literal nature. Paul Chadwick's "two chair method" aims to highlight the transient and non-literal nature of self-schematic experiences through promoting metacognitive distancing from these experiences (Chadwick, 2003, 2006). Adapted mindfulness practice, metaphors and experiential exercises can be used to further facilitate re-appraisal of the status, rather than the content, of negative self-schema (Chadwick, 2006; Thomas et al., 2013).

In addition to modifying meta-cognitive beliefs about self-schema, habituation to schematic distress (as opposed to changing content) has also been proposed. Strategies demonstrated to be effective for voice hearers include shame attacking exercises (drawn from Rational Emotive Therapy) which create opportunities through repeated voluntary exposure to feel and accept how schematic distress can be tolerated, and will habituate (Chadwick, 2006).

Finally, approaches that enhance self-compassion are showing promise for people experiencing psychosis in reducing distress and social marginalization (Braehler et al., 2013), with benefits also found specifically for people hearing voices (Mayhew and Gilbert, 2008). Compassion-focused therapy (CFT; Gilbert, 2009) does not directly aim to alter self-schematic content but rather attempts to enhance self-soothing and to dampen activation of the threat system through compassion-focused exercises. Similarly, one of the mechanisms of mindfulness-based approaches appears to be through enhanced self-compassion (Gu et al., 2015) and this may be due to the emphasis on acceptance and non-judgement, including of self-schematic experiences, in these approaches. Approaches that enhance self-compassion therefore have potential to reduce the impact of negative self-schematic experiences as the person learns to self-sooth and to accept and not judge these experiences.

Given the demonstrated links between negative self-schema and voices (Close and Garety, 1998; Birchwood et al., 2000, 2004; Barrowclough et al., 2003; Fox et al., 2004; Smith et al., 2006), such treatment approaches might be expected to influence the content, appraisal and impact of voice hearing experiences, in addition to addressing any independent contribution of negative self-schema to wellbeing.

Enhancing the Accessibility and Content of Positive Self-schemas

Many researchers have argued that work on negative self-schema should be complimented by attempts to enhance awareness of and strengthen conviction in positive self-schema (e.g., Chadwick, 2006). Furthermore, demonstrated associations between positive self-schema and positive beliefs about voices (Thomas et al., 2015) are consistent with the suggestion that attempts to enhance positive self-schemas might have an impact on voice appraisals, although the causal direction of these effects is not yet known and is likely to be complicated.

Traditional CBT methods such as evidence gathering (historical, in current daily life and through behavioral tasks) and mental rehearsal can be used to strengthen conviction in and accessibility of positive schema (Tarrier, 2001; Hall and Tarrier, 2003), including self-efficacy beliefs such as "I have some control even when voices are around" (Morrison et al., 2004; Chadwick, 2006).

Other techniques aim to increase the accessibility of positive self-schema. For example, the two chair method used within PBCT allows patients to articulate and "embody" positive schema whilst momentarily distancing themselves from negative schematic experiences (Chadwick, 2003). A similar approach is used within Competitive Memory Training (COMET; van der Gaag et al., 2012), whereby patients are asked to repeatedly recollect and relive past experiences in which they felt successful or competent. This "re-living" involves imagining these positive experiences whilst adopting a congruent posture and facial expression and (sub) vocalizing a congruent positive self-statement (van der Gaag et al., 2012).

A final approach is to promote the development of new positive schematic content. Since the development and maintenance of self-schema are dependent upon interpersonal experience (Markus and Wurf, 1987), behavioral approaches which promote social and occupational engagement (e.g., Hodgekins and Fowler, 2010) or target assertiveness and communication skills (Hayward et al., 2009) could all potentially contribute to the development of new positive schematic content.

Targeting Higher-level Constructs: Self Esteem and Self Concept

Whilst attempts have been made to directly target higher-level concepts such as self esteem (Lecomte et al., 1999), it has been suggested these constructs may be more helpfully viewed as treatment outcomes (or intermediaries between target and

outcome), rather than targets for intervention *per se* (Hayes et al., 2013). It has been proposed that such "global" or "aggregate" concepts subsume a number of lower-level constructs, which might represent more viable targets for intervention (Kazdin, 2007; Hayes et al., 2013). In line with this idea, the most robust improvements in self-esteem in those with a psychosis diagnosis have been demonstrated in an intervention targeting the accessibility of positive self-schema (Hall and Tarrier, 2003). Similarly, improvements in self-concept clarity and complexity are most likely to be achieved by targeting the processes via which lower-level self-representations interact and integrate to form complex and consciously accessible higher-level self-constructs (Dimaggio et al., 2010). Since this process is likely to rely upon reflexive capacities, restoration of synthetic metacognitive awareness using the techniques outlined previously (see Enhancing Metacognitive Awareness) is proposed to provide a platform for further narrative self-construction (Chadwick, 2006; Lysaker and Dimaggio, 2014).

Beyond the enhancement of metacognitive capacities, the process of self-construction can be facilitated using a number of techniques. The two-chair method provides an opportunity for clients to explore the interactions between newly elaborated positive and negative self-schema, allowing their eventual integration within a new metacognitive model of self as complex and changing (Chadwick, 2006; Dannahy et al., 2011). Alternatively, narrative metacognitive therapies place an emphasis on enhancing the client's capacity for dialogical self-narration (Bargenquast and Schweitzer, 2013). This approach aims to first enhance the client's awareness of themselves as storyteller by encouraging narration of their experience in-session, and exploring and expanding upon story fragments expressed by the client. As in metacognition oriented therapy, techniques such as reflection and questioning are used to facilitate the discovery of undeveloped or suppressed self-aspects, and to develop complexity in a client's narratives. Therapy additionally aims to target problems with dialogue between different self-positions, by collaboratively exploring and connecting material discussed within the current and previous sessions, highlighting the existence of alternative and potentially conflicting self facets, and modeling functional interpersonal dialogue in-session (Lysaker and Lysaker, 2011). Finally, addressing the content and meaning of voice hearing experiences within a broader life narrative is likely to be an important element of therapy, a perspective that is emphasized by approaches associated with the Hearing Voices Movement (e.g., Corstens et al., 2008; Longden et al., 2012).

Key Research Questions

Future research should aim to validate and refine this model within voice hearers in order to improve intervention strategies. A number of key research questions can be identified.

What is the Relationship Between Self- and Voice-experience?

Whilst there is good evidence for disturbances occurring at all three levels of self in people with psychosis, the extent to which these various disturbances in self-experience are related specifically to (i) voice hearing experiences and (ii) voice-related distress and disruption is currently unclear. In order to determine the specific role of disrupted self-experience in voice hearing experiences, future research should first seek to compare the prevalence and nature of these experiences in people with a diagnosis of psychosis who hear, or do not hear, voices.

This research should start with an in-depth exploration of the phenomenology of self- and voice-experience (McCarthy-Jones et al., 2013a), and subsequently extend beyond an assessment of the role of negative self-schema and low trait self-esteem, to include both lower- and higher-level aspects of self-experience such as disturbed ipseity, metacognitive awareness and various dimensions of self-concept (Tiernan et al., 2014). In doing so, it will be important to return to the social psychology literature in order to clarify the conceptual and theoretical relationship between different constructs such as implicit and explicit self-esteem, self-concept complexity, clarity and flexibility. One reason for doing so is the evidence of a close relationship between self-concept clarity and state self-esteem (Campbell, 1990; Nezlek and Plesko, 2001), which might have important implications for how to target low self-esteem in voice hearers.

Understanding of the role of these experiences in voice-related distress and disruption will be aided by an exploration of the nature and prevalence of disturbed self-experience across the voice hearing continuum (for example, in voice hearers with diagnoses other than psychosis, and in those without any need for care). Not only can such an approach be helpful toward identifying key targets for psychological therapy, but given the suggestion that a disturbance of the basic sense of self is a phenotypic trait marker of psychotic vulnerability, might also inform future strategies for early intervention (Nelson et al., 2009).

What is the Direction of any Relationship Between Self- and Voice-experience?

The cross-sectional research outlined above will determine whether disturbances in self-experience are a reliable trait marker of distressing voice hearing experiences, but such approaches say little about (a) the temporal association between these experiences; (b) the directionality of this relationship. Whilst disrupted self-experience is likely to represent a worthy treatment target in its own right, as it can in itself lead to distress and disruption to quality of life, such interventions will have limited impact on voice hearing experiences or associated distress if changes in self-experience are a consequence, rather than a cause of voices.

The temporal association between voice hearing and disrupted self-experience can be assessed using longitudinal approaches that compare the nature of self-experience in; (i) current and past voice hearers, (ii) people within and outside of voice hearing episodes. However, such approaches are still reliant on trait measures of self-experience and voices, and there is good evidence that both voices and self-experiences are likely to vary within-person (i.e., they are state variables; Nezlek and Plesko, 2001; Thewissen et al., 2011). Therefore, of potentially greater relevance to the development of effective psychological interventions for distressing voices is whether various disturbances in self-experience are associated

with, and indeed predictive of, the onset of voices during the course of daily life.

Micro-longitudinal momentary assessment approaches such as the ESM (Csikszentmihalyi and Larson, 1987; Oorschot et al., 2009) can shed light on the dynamic relationship between voices, self-experience, and contextual factors (i.e., potential triggers), providing an indication of directionality. McCarthy-Jones et al. (2013a) suggest that ESM could be used to assess the locus of attention of voice-hearers immediately preceding AVHs, potentially revealing whether these experiences are indeed characterized by hyper-reflective processes as suggested by Sass (2003). Such an approach could additionally be used to determine the daily dynamics of the association between voice hearing experiences and (i) altered states of pre-reflective self-awareness (such as dissociation) and (ii) negative self- and social-appraisals at the level of the narrative self. ESM could also be used to shed light on the extent to which disrupted self-experience may contribute to distress and dysfunction *independently* of voice hearing experiences. Given evidence that low self-esteem predicts depression independently of voice appraisals (Fannon et al., 2009), this is likely to be an important consideration when working with voice hearers.

In addition to establishing the temporal relationship between self- and voice-hearing experiences, it will be important to investigate their developmental relationship. Determining the developmental pathways of voice hearing experiences can shed light on potential treatment targets at different stages during development, in addition to having implications for early identification and intervention for voice hearers who are at greater risk of developing a future need for care. Raballo and Larøi (2011) have provided evidence from first-person accounts that anomalous self-experiences could prelude to the development of distressing voices. Furthermore, evidence of a link between both voices and dissociation (a disruption to pre-reflective self-experience) and early traumatic experiences (Varese et al., 2012) hints toward a potential common developmental origin. Prospective epidemiological studies can shed further light on whether disturbances in self-experience precede voices developmentally (or vice versa), and the relationship between these experiences and environmental and demographic factors.

What Mechanisms Underlie the Relationship Between Self- and Voice-experience?

Future research should additionally seek to determine the nature of the cognitive processes and neurocognitive mechanisms underlying operations occurring at different levels of selfhood. For example, it will be important to determine the nature of the neurocognitive processes underlying diminished self-affection and operative hyper-reflexivity, and of disturbances at the level of the reflective self. Such research can determine the degree to which these phenomena are influenced by context, or are neurologically determined, and thus shed light on potential targets for neurocognitive remediation therapies, which have been demonstrated to be effective in improving global cognition, functioning and symptoms in individuals with a diagnosis of schizophrenia (Wykes et al., 2011). Sass (2014) suggests that psychological manipulations of self-experience (e.g., using meditative techniques or introspection) might help to determine associations with symptoms, neurocognitive performance, and neural correlates in healthy individuals and voice hearers. Such experimental findings could be triangulated with real-time quantitative data obtained using ESM approaches (Eisenberger et al., 2007), in order to identify the neurocognitive correlates of disturbed self-experience during daily life.

A further question is how operations at these different levels of self might interact in the experience of voice hearing. Whilst it is helpful to conceptualise voice hearing experiences in relation to processes occurring at the three levels of selfhood described previously, it is important to emphasize that in reality there are no clear boundaries between these levels, and all interact to produce a dynamic experience of self (Sedikides and Skowronski, 1997). Such an interaction between operations occurring at the different levels of self is consistent with recent neurocognitive models of voice hearing (Waters et al., 2012a; Aleman and Vercammen, 2013), which propose that auditory hallucinations are caused by a blend of distorted input from bottom-up sensory information and aberrant top-down factors (including prior knowledge and memories, perceptual expectations, and mental imagery).

Preliminary evidence suggests that self-representations at the level of narrative self might have a "top-down" influence upon the interpretation of anomalous self-experiences occurring at a pre-reflective level (Synofzik et al., 2008; Cicero et al., 2013), and likewise, it has been suggested that disturbances occurring at the pre-reflective and reflective levels of self-hood contribute fundamentally to the formation of idiosyncratic beliefs at the level of the narrative self (Nelson et al., 2014; Stanghellini and Rosfort, 2015). Both anomalous self-experiences and higher-level self-narratives will additionally motivate behaviors (such as avoidance) which may serve to reinforce both lower- and higher-level self disturbance. Empirical investigation of these ideas will serve to further enrich psychological models of voice hearing.

How Can Self-experience be Targeted in Therapy?

Whilst many current interventions for schizophrenia, psychosis, and distressing voices incorporate methods that explicitly aim to target aspects of self-experience, few studies have investigated; (a) whether these multicomponent interventions are effective in modifying self-related constructs; (b) whether such changes mediate therapeutic gains; (c) which specific therapeutic elements are responsible for these changes.

These are important questions for future research, given recent calls to improve the scientific basis of interventions for distressing voices (Thomas et al., 2014). One approach is to incorporate measurement of self-related treatment targets and mechanisms within the context of RCTs of interventions such as CBTp. However, with self-experience representing one of many targets, and without standardization of the extent to which this is addressed during therapy, this is likely to provide a relatively indirect test.

Research in this field would be aided by the use of dismantling approaches to determine the impact of existing techniques within multi-component interventions (Kazdin, 2007), and

interventionist-causal approaches (Kendler and Campbell, 2009; Freeman, 2011), in which specific aspects of self-experience are targeted experimentally in order to determine whether changes in voice experience and its impact can be produced. Such targeted proof-of-concept intervention studies can provide an early indication of which targets are most amenable to change prior to full-scale RCTs (Hayes et al., 2013). However, these approaches require attention to the best operationalization and measurement of outcomes, both in terms of the aspects of self that are being targeted and how to conceptualise and measure voice-related outcomes (Thomas et al., 2014).

Conclusion

This paper has introduced a framework for conceptualising the role of self-experience in voice hearing. Whilst there is emerging evidence for associations between various aspects of disturbed self-experience in voice hearing, and preliminary attempts to target some elements of self-experience in interventions for voices, further research is required to understand the directionality of this relationship, and its potential for therapeutic intervention. Multi-disciplinary approaches will be central to developing our understanding of the role of self-experience in distressing voices.

References

Aleman, A., and Vercammen, A. (2013). "The "Bottom-Up" and "Top-Down" Components of the Hallucinatory Phenomenon," in *The Neuroscience of Hallucinations*, eds R. Jardri, A. Cachia, P. Thomas, and D. Pins (New York: Springer), 107–121.

Allen, P., Freeman, D., McGuire, P. K., Garety, P. A., Kuipers, E., Fowler, D. G., et al. (2005). The prediction of hallucinatory predisposition in non-clinical individuals: examining the contribution of emotion and reasoning. *Br. J. Clin. Psychol.* 44, 127–132. doi: 10.1348/014466504X20044

American Psychiatric Association. (2004). Practice guideline for the treatment of patients with schizophrenia, second edition. *Am. J. Psychiatry* 161, 1–56.

Bargenquast, R., and Schweitzer, R. (2013). Metacognitive Narrative Psychotherapy for people diagnosed with schizophrenia: an outline of a principle-based treatment manual. *Psychosis* 6, 155–165. doi: 10.1080/17522439.2012.753935

Barrowclough, C., Tarrier, N., Humphreys, L., Ward, J., Gregg, L., and Andrews, B. (2003). Self-esteem in schizophrenia: relationships between self-evaluation, family attitudes, and symptomatology. *J. Abnorm. Psychol.* 112, 92–99. doi: 10.1037/0021-843X.112.1.92

Beck, A. T., and Rector, N. A. (2003). A cognitive model of hallucinations. *Cogn. Ther. Res.* 27, 19–52. doi: 10.1023/A:1022534613005

Beck, A. T., Rector, N. A., Stolar, N., and Grant, P. (2008). *Schizophrenia: Cognitive Theory, Research and Therapy*. New York: Guildford Press.

Bell, V., and Wittkowski, A. (2009). An exploration of self-complexity in individuals experiencing auditory hallucinations. *Clin. Psychol. Psychother.* 16, 172–181. doi: 10.1002/cpp.608

Bentall, R. P. (1990). The illusion of reality: a review and integration of psychological research on hallucinations. *Psychol. Bull.* 107, 82–95. doi: 10.1037/0033-2909.107.1.82

Bentall, R. P. (2003). "The paranoid self," in *The Self in Neuroscience and Psychiatry*, eds T. Kircher and A. S. David (Cambridge: Cambridge University Press), 293–318.

Bentall, R. P., Corcoran, R., Howard, R., Blackwood, N., and Kinderman, P. (2001). Persecutory delusions: a review and theoretical integration. *Clin. Psychol. Rev.* 21, 1143–1192. doi: 10.1016/S0272-7358(01)00106-4

Bentall, R. P., Kinderman, P., and Kaney, S. (1994). The self, attributional processes and abnormal beliefs: towards a model of persecutory delusions. *Behav. Res. Ther.* 32, 331–341. doi: 10.1016/0005-7967(94)90131-7

Berry, K., and Bucci, S. (2014). "What have we learnt about cognitive appraisals of the self?" in *Psychological Approaches to Understanding and Treating Auditory Hallucinations*, eds M. Hayward, C. Strauss, and S. McCarthy-Jones (Hove: Routledge), 61–77.

Birchwood, M., Gilbert, P., Gilbert, J., Trower, P., Meaden, A., Hay, J., et al. (2004). Interpersonal and role-related schema influence the relationship with the dominant "voice" in schizophrenia: a comparison of three models. *Psychol. Med.* 34, 1571–1580. doi: 10.1017/S0033291704002636

Birchwood, M., Meaden, A, Trower, P., Gilbert, P., and Plaistow, J. (2000). The power and omnipotence of voices: subordination and entrapment by voices and significant others. *Psychol. Med.* 30, 337–344. doi: 10.1017/S0033291799001828

Birchwood, M., Michail, M., Meaden, A., Tarrier, N., Lewis, S. W., Wykes, T., et al. (2014). Cognitive behaviour therapy to prevent harmful compliance with command hallucinations (COMMAND): a randomised controlled trial. *Lancet Psychiatry* 1, 23–33. doi: 10.1016/S2215-0366(14)70247-0

Braehler, C., Gumley, A., Harper, J., Wallace, S., Norrie, J., and Gilbert, P. (2013). Exploring change processes in compassion focused therapy in psychosis: results of a feasibility randomized controlled trial. *Br. J. Clin. Psychol.* 52, 199–214. doi: 10.1111/bjc.12009

Brewin, C. R. (2006). Understanding cognitive behaviour therapy: a retrieval competition account. *Behav. Res. Ther.* 44, 765–784. doi: 10.1016/j.brat.2006.02.005

Campbell, J. D. (1990). Self-esteem and clarity of the self-concept. *J. Pers. Soc. Psychol.* 59, 538–549. doi: 10.1037//0022-3514.59.3.538

Chadwick, P. (2003). Two chairs, self-schemata and a person based approach to psychosis. *Behav. Cogn. Psychother.* 31, 339–349. doi: 10.1017/S1352465803004053

Chadwick, P. (2006). *Person-based Cognitive Therapy for Distressing Psychosis*. Chichester: John Wiley & Sons, Ltd.

Chadwick, P., Birchwood, M., and Trower, P. (1996). *Cognitive Therapy for Delusions, Voices and Paranoia*. Chichester: John Wiley & Sons, Ltd.

Cicero, D. C., Becker, T. M., Martin, E. A., Docherty, A. R., and Kerns, J. G. (2013). The role of aberrant salience and self-concept clarity in psychotic-like experiences. *Personal. Disord.* 4, 33–42. doi: 10.1037/a0027361

Close, H., and Garety, P. A. (1998). Cognitive assessment of voices: further developments in understanding the emotional impact of voices. *Br. J. Clin. Psychol.* 37, 173–188.

Corstens, D., Escher, S., and Romme, M. (2008). "Accepting and working with voices: the Maastricht approach," in *Psychosis, Trauma, and Dissociation: Emerging Perspectives on Severe Psychopathology*, eds A. Moskowitz, I. Schafer, and M. J. Dorahy (Chichester: John Wiley & Sons Ltd), 319–332.

Csikszentmihalyi, M., and Larson, R. (1987). Validity and reliability of the experience sampling method. *J. Nerv. Ment. Dis.* 175, 526–536.

Daalman, K., Boks, M. P. M., Diederen, K. M. J., de Weijer, A. D., Blom, J. D., Kahn, R. S., et al. (2011). The same or different? A phenomenological comparison of auditory verbal hallucinations in healthy and psychotic individuals. *J. Clin. Psychiatry* 72, 320–325. doi: 10.4088/JCP.09m05797yel

Damasio, A. (1999). *The Feeling of what Happens: Body and Emotion in the Making of Consciousness*. New York: Harcourt Brace.

Damasio, A. (2003). Feelings of emotion and the self. *Ann. N. Y. Acad. Sci.* 1001, 253–261. doi: 10.1196/annals.1279.014

Dannahy, L., Hayward, M., Strauss, C., Turton, W., Harding, E., and Chadwick, P. (2011). Group person-based cognitive therapy for distressing voices: pilot data from nine groups. *J. Behav. Ther. Exp. Psychiatry* 42, 111–116. doi: 10.1016/j.jbtep.2010.07.006

Delespaul, P., Devries, M., and van Os, J. (2002). Determinants of occurrence and recovery from hallucinations in daily life. *Soc. Psychiatry Psychiatr. Epidemiol.* 37, 97–104. doi: 10.1007/s001270200000

Dimaggio, G., Hermans, H. J. M., and Lysaker, P. H. (2010). Health and adaptation in a multiple self: the role of absence of dialogue and poor metacognition in clinical populations. *Theory Psychol.* 20, 379–399. doi: 10.1177/0959354310363319

Dimaggio, G., and Lysaker, P. H. (2015). Metacognition and mentalizing in the psychotherapy of patients with psychosis and personality disorders. *J. Clin. Psychol.* 71, 117–124. doi: 10.1002/jclp.22147

Eisenberger, N. I., Gable, S. L., and Lieberman, M. D. (2007). Functional magnetic resonance imaging responses relate to differences in real-world social experience. *Emotion* 7, 745–754. doi: 10.1037/1528-3542.7.4.745

Ensum, I., and Morrison, A. P. (2003). The effects of focus of attention on attributional bias in patients experiencing auditory hallucinations. *Behav. Res. Ther.* 41, 895–907. doi: 10.1016/S0005-7967(02)00102-X

Fannon, D., Hayward, P., Thompson, N., Green, N., Surguladze, S., and Wykes, T. (2009). The self or the voice? Relative contributions of self-esteem and voice appraisal in persistent auditory hallucinations. *Schizophr. Res.* 112, 174–180. doi: 10.1016/j.schres.2009.03.031

Farhall, J., Freeman, N. C., Shawyer, F., and Trauer, T. (2009). An effectiveness trial of cognitive behaviour therapy in a representative sample of outpatients with psychosis. *Br. J. Clin. Psychol.* 48, 47–62.

Fowler, D. G., Freeman, D., Smith, B., Kuipers, E., Bebbington, P. E., Bashforth, H., et al. (2006). The Brief Core Schema Scales (BCSS): psychometric properties and associations with paranoia and grandiosity in non-clinical and psychosis samples. *Psychol. Med.* 36, 749–759. doi: 10.1017/S0033291706007355

Fowler, D., Hodgekins, J., Painter, M., Reilly, T., Crane, C., Macmillan, I., et al. (2009). Cognitive behaviour therapy for improving social recovery in psychosis: a report from the ISREP MRC Trial Platform Study (Improving Social Recovery in Early Psychosis). *Psychol. Med.* 39, 1627–1636. doi: 10.1017/S0033291709005467

Fox, J. R., Gray, N. S., and Lewis, H. (2004). Factors determining compliance with command hallucinations with violent content: the role of social rank, perceived power of the voice and voice malevolence. *J. Forensic Psychiatry Psychol.* 15, 511–531. doi: 10.1080/1478994042000226741

Freeman, D. (2011). Improving cognitive treatments for delusions. *Schizophr. Res.* 132, 135–139. doi: 10.1016/j.schres.2011.08.012

Freeman, D., Garety, P. A., Kuipers, E., Fowler, D., and Bebbington, P. E. (2002). A cognitive model of persecutory delusions. *Br. J. Clin. Psychol.* 41, 331–347. doi: 10.1348/014466502760387461

Gallagher, S. (2003). "Self-narrative in schizophrenia," in *The Self in Neuroscience and Psychiatry*, eds T. Kircher and A. David (Cambridge: Cambridge University Press), 336–357.

Gallagher, S., and Zahavi, D. (2012). *The Phenomenological Mind*. Abingdon: Routledge.

García-Montes, J. M., Pérez-Álvarez, M., and Perona-Garcelán, S. (2012). Affinities in the phenomenological perspective of schizophrenia and recent cognitive research: towards mutual enrichment. *Theory Psychol.* 22, 756–770. doi: 10.1177/0959354312456600

Garety, P. A., Kuipers, E., Fowler, D. G., Freeman, D., and Bebbington, P. E. (2001). A cognitive model of the positive symptoms of psychosis. *Psychol. Med.* 31, 189–195. doi: 10.1017/S0033291701003312

Gaudiano, B. A., Herbert, J. D., and Hayes, S. C. (2010). Is it the symptom or the relation to it? Investigating potential mediators of change in acceptance and commitment therapy for psychosis. *Behav. Ther.* 41, 543–554. doi: 10.1016/j.beth.2010.03.001

Gibson, J. J. (1986). *The Ecological Approach to Visual Perception*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Gilbert, P. (2009). Introducing compassion-focused therapy. *Adv. Psychiatr. Treat.* 15, 199–208. doi: 10.1192/apt.bp.107.005264

Gilbert, P., Birchwood, M., Gilbert, J., Trower, P., Hay, J., Murray, B., et al. (2001). An exploration of evolved mental mechanisms for dominant and subordinate behaviour in relation to auditory hallucinations in schizophrenia and critical thoughts in depression. *Psychol. Med.* 31, 1117–1127. doi: 10.1017/S0033291701004093

Gu, J., Strauss, C., Bond, R., and Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clin. Psychol. Rev* 37, 1–12. doi: 10.1016/j.cpr.2015.01.006

Hall, P. L., and Tarrier, N. (2003). The cognitive-behavioural treatment of low self-esteem in psychotic patients: a pilot study. *Behav. Res. Ther.* 41, 317–332. doi: 10.1016/S0005-7967(02)00013-X

Harré, R. (1998). *The Singular Self: An Introduction to the Psychology of Personhood*. Thousand Oaks, CA: Sage.

Hayes, S. (2004). Acceptance and commitment therapy, relational frame theory, and the third wave of behavioral and cognitive therapies. *Behav. Ther.* 35, 639–665. doi: 10.1016/S0005-7894(04)80013-3

Hayes, S. C., Long, D. M., Levin, M. E., and Follette, W. C. (2013). Treatment development: can we find a better way? *Clin. Psychol. Rev.* 33, 870–882. doi: 10.1016/j.cpr.2012.09.009

Hayward, M. (2003). Interpersonal relating and voice hearing: to what extent does relating to the voice reflect social relating? *Psychol. Psychother.* 76, 369–383. doi: 10.1348/147608303770584737

Hayward, M., Overton, J., Dorey, T., and Denney, J. (2009). Relating therapy for people who hear voices: a case series. *Clin. Psychol. Psychother.* 16, 216–227. doi: 10.1002/cpp.615

Higgins, E. T. (1987). Self-discrepancy: a theory relating self and affect. *Psychol. Rev.* 94, 319–340. doi: 10.1037//0033-295X.94.3.319

Hodgekins, J., and Fowler, D. (2010). CBT and recovery from psychosis in the ISREP trial: mediating effects of hope and positive beliefs on activity. *Psychiatr. Serv.* 61, 321–324. doi: 10.1176/appi.ps.61.3.321

Honig, A., and Romme, M. (1998). Auditory hallucinations: a comparison between patients and nonpatients. *J. Nerv. Ment. Dis.* 186, 646–651.

James, W. (1890). *The Principles of Psychology*, Vol. 1. New York, NY: Holt.

Kapur, S. (2003). Psychosis as a state of aberrant salience: a framework linking biology, phenomenology, and pharmacology in schizophrenia. *Am. J. Psychiatry* 160, 13–23. doi: 10.1176/appi.ajp.160.1.13

Kazdin, A. E. (2007). Mediators and mechanisms of change in psychotherapy research. *Annu. Rev. Clin. Psychol.* 3, 1–27. doi: 10.1146/annurev.clinpsy.3.022806.091432

Kendler, K., and Campbell, J. (2009). Interventionist causal models in psychiatry: repositioning the mind-body problem. *Psychol. Med.* 39, 881–887. doi: 10.1017/S0033291708004467

Kim, J. H., Byun, H. J., Ann, J. H., and Lee, J. (2010). Relationship between subjective experiences and psychopathological dimensions in schizophrenia. *Aust. N. Z. J. Psychiatry.* 44, 952–957. doi: 10.3109/00048674.2010.495940

Kumar, D., Menon, M., Moritz, S., and Woodward, T. S. (2014). Using the back door: metacognitive training for psychosis. *Psychosis* 7, 166–178. doi: 10.1080/17522439.2014.913073

Langdon, R., Jones, S. R., Connaughton, E., and Fernyhough, C. (2009). The phenomenology of inner speech: comparison of schizophrenia patients with auditory verbal hallucinations and healthy controls. *Psychol. Med.* 39, 655–663. doi: 10.1017/S0033291708003978

Larøi, F., Sommer, I. E., Blom, J. D., Fernyhough, C., Ffytche, D. H., Hugdahl, K., et al. (2012). The characteristic features of auditory verbal hallucinations in clinical and nonclinical groups: state-of-the-art overview and future directions. *Schizophr. Bull.* 38, 724–733. doi: 10.1093/schbul/sbs061

Lecomte, T., Cyr, M., Lesage, A., Wilde, J., Leclerc, C., and Ricard, N. P. (1999). Efficacy of a self-esteem module in the empowerment of individuals with schizophrenia. *J. Nerv. Ment. Dis.* 187, 406–413.

Leudar, I., Thomas, P., McNally, D., and Glinski, A. (1997). What voices can do with words: pragmatics of verbal hallucinations. *Psychol. Med.* 27, 885–898. doi: 10.1017/S0033291797005138

Linville, P. W. (1987). Self-complexity as a cognitive buffer against stress-related illness and depression. *J. Pers. Soc. Psychol.* 52, 663–676. doi: 10.1037/0022-3514.52.4.663

Longden, E., Corstens, D., Escher, S., and Romme, M. A. (2012). Voice hearing in a biographical context: a model for formulating the relationship between voices and life history. *Psychosis* 4, 224–234. doi: 10.1080/17522439.2011.596566

Longmore, R. J., and Worrell, M. (2007). Do we need to challenge thoughts in cognitive behavior therapy? *Clin. Psychol. Rev.* 27, 173–187. doi: 10.1016/j.cpr.2006.08.001

Lysaker, J. T., and Lysaker, P. H. (2005). Being interrupted: the self and schizophrenia. *J. Speculative Philosophy* 19, 1–21. doi: 10.1353/jsp.2005.0001

Lysaker, P. H., Buck, B., and Lysaker, J. T. (2012). Schizophrenia and alterations in the experience of self and agency: comparisons of dialogical and phenomenological views. *Theory Psychol.* 22, 738–755. doi: 10.1177/0959354311435376

Lysaker, P. H., Buck, K. D., Carcione, A., Procacci, M., Salvatore, G., Nicolò, G., et al. (2011). Addressing metacognitive capacity for self reflection in the psychotherapy for schizophrenia: a conceptual model of the key tasks and processes. *Psychol. Psychother.* 84, 58–69. doi: 10.1348/147608310X520436

Lysaker, P. H., Carcione, A., Dimaggio, G., Johannesen, J. K., Nicolò, G., Procacci, M., et al. (2005). Metacognition amidst narratives of self and illness in schizophrenia: associations with neurocognition, symptoms, insight and quality of life. *Acta Psychiatr. Scand.* 112, 64–71. doi: 10.1111/j.1600-0447.2005.00514.x

Lysaker, P. H., and Dimaggio, G. (2014). Metacognitive capacities for reflection in schizophrenia: implications for developing treatments. *Schizophr. Bull.* 40, 487–491. doi: 10.1093/schbul/sbu038

Lysaker, P. H., and Lysaker, J. T. (2002). Narrative structure in psychosis schizophrenia and disruptions in the dialogical self. *Theory Psychol.* 12, 207–220. doi: 10.1177/0959354302012002630

Lysaker, P. H., and Lysaker, J. T. (2004). Schizophrenia as dialogue at the ends of its tether: the relationship of disruptions in identity with positive and negative symptoms. *J. Constr. Psychol.* 17, 105–119. doi: 10.1080/10720530490273890

Lysaker, P. H., and Lysaker, J. T. (2011). Psychotherapy and recovery from schizophrenia: a model of treatment as informed by a dialogical model of the self experience in psychosis. *J. Contemp. Psychother.* 41, 125–133. doi: 10.1007/s10879-010-9157-x

Maddux, J. E., and Gosselin, J. T. (2012). "Self-efficacy," in *Handbook of Self and Identity*, 2nd Edn, eds M. R. Leary and J. P. Tangney (New York: The Guildford Press), 198–224.

Markus, H., and Wurf, E. (1987). The dynamic self-concept: a social psychological perspective. *Ann. Rev. Psychol.* 38, 299–337.

Mayhew, S. L., and Gilbert, P. (2008). Compassionate mind training with people who hear malevolent voices: a case series report. *Clin. Psychol. Psychother.* 138, 113–138. doi: 10.1002/cpp.566

McCarthy-Jones, S., Krueger, J., Larøi, F., Broome, M., and Fernyhough, C. (2013a). Stop, look, listen: the need for philosophical phenomenological perspectives on auditory verbal hallucinations. *Front. Hum. Neurosci.* 7:127. doi: 10.3389/fnhum.2013.00127

McCarthy-Jones, S., Marriott, M., Knowles, R., Rowse, G., and Thompson, A. R. (2013b). What is psychosis? A meta-synthesis of inductive qualitative studies exploring the experience of psychosis. *Psychosis* 5, 1–16. doi: 10.1080/17522439.2011.647051

Moe, A. M., and Docherty, N. M. (2014). Schizophrenia and the sense of self. *Schizophr. Bull.* 40, 161–168. doi: 10.1093/schbul/sbt121

Morrison, A. (2001). The interpretation of intrusions in psychosis: an integrative cognitive approach to hallucinations and delusions. *Behav. Cogn. Psychother.* 29, 257–276. doi: 10.1017/S1352465801003010

Morrison, A. P., and Haddock, G. (1997). Self-focused attention in schizophrenic patients with and without auditory hallucinations and normal subjects: a comparative study. *Pers. Indiv. Dif.* 23, 937–941. doi: 10.1016/S0191-8869(97)00130-X

Morrison, A. P., Renton, J., Dunn, H., Williams, S. L., and Bentall, R. P. (2004). *Cognitive Therapy for Psychosis: A Formulation-based Approach*. Hove: Routledge.

National Collaborating Centre for Mental Health. (2014). *"Psychosis and Schizophrenia in Adults: Treatment and Management" NICE Clinical Guideline 178*, London: National Institute for Health and Care Excellence. 1–59.

Nayani, T. H., and David, A. S. (1996). The auditory hallucination: a phenomenological survey. *Psychol. Med.* 26, 177–189. doi: 10.1017/S003329170003381X

Nelson, B., Parnas, J., and Sass, L. A. (2014). Disturbance of minimal self (ipseity) in schizophrenia: clarification and current status. *Schizophr. Bull.* 40, 479–482. doi: 10.1093/schbul/sbu034

Nelson, B., and Sass, L. A. (2009). Medusa's stare: a case study of working with self-disturbance in the early phase of schizophrenia. *Clin. Case Studi.* 8, 489–504. doi: 10.1177/1534650109351931

Nelson, B., Sass, L. A., and Skodlar, B. (2009). The phenomenological model of psychotic vulnerability and its possible implications for psychological interventions in the ultra-high risk ('prodromal') population. *Psychopathology* 42, 283–292. doi: 10.1159/000228837

Nelson, B., Whitford, T. J., Lavoie, S., and Sass, L. A. (2014a). What are the neurocognitive correlates of basic self-disturbance in schizophrenia? Integrating phenomenology and neurocognition. Part 2 (Aberrant salience). *Schizophr. Res.* 152, 20–27. doi: 10.1016/j.schres.2013.06.033

Nelson, B., Whitford, T. J., Lavoie, S., and Sass, L. A. (2014b). What are the neurocognitive correlates of basic self-disturbance in schizophrenia? Integrating phenomenology and neurocognition. Part 1 (Source monitoring deficits). *Schizophr. Res.* 152, 12–19. doi: 10.1016/j.schres.2013.06.022

Nezlek, J. B., and Plesko, R. M. (2001). Day-to-day relationships among self-concept clarity, self-esteem, daily events, and mood. *Pers. Soc. Psychol. Bull.* 27, 201–211. doi: 10.1177/0146167201272006

Noyman-Veksler, G., Weinberg, D., Fennig, S., Davidson, L., and Shahar, G. (2013). Perceived stigma exposure in schizophrenia: the key role of self-concept clarity. *Self Identity* 12, 663–674. doi: 10.1080/15298868.2012.732265

Oorschot, M., Kwapil, T., Delespaul, P., and Myin-Germeys, I. (2009). Momentary assessment research in psychosis. *Psychol. Assess.* 21, 498–505. doi: 10.1037/a0017077

Padesky, C. A. (1993). Socratic questioning: changing minds or guiding discovery? *Invited Keynote Address Presented at the 1993 European Congress of Behaviour and Cognitive Therapies*, London.

Padesky, C. A. (1994). Schema Change Processes in Cognitive Therapy. *Clin. Psychol. Psychother.* 1, 267–278.

Parnas, J. (2003). "Self and schizophrenia: a phenomenological perspective," in *The Self in Neuroscience and Psychiatry*, eds T. Kircher and A. David (Cambridge: Cambridge University Press), 217–241.

Paulik, G. (2012). The role of social schema in the experience of auditory hallucinations: a systematic review and a proposal for the inclusion of social schema in a cognitive behavioural model of voice hearing. *Clin. Psychol. Psychother.* 19, 459–472. doi: 10.1002/cpp.768

Pérez-Álvarez, M., García Montes, J. M., Vallina-Fernández, O., Perona-Garcelán, S., and Cuevas-Yust, C. (2011). New life for schizophrenia psychotherapy in the light of phenomenology. *Clin. Psychol. Psychother.* 18, 187–201. doi: 10.1002/cpp.716

Perona-Garcelán, S., Cuevas-Yust, C., García Montes, J. M., Pérez-Álvarez, M., Ductor-Recuerda, M. J., Salas-Azcona, R., et al. (2008). Relationship between self-focused attention and dissociation in patients with and without auditory hallucinations. *J. Nerv. Ment. Dis.* 196, 190–197. doi: 10.1097/NMD.0b013e318165c7c1

Perona-Garcelán, S., Pérez-Álvarez, M., García-Montes, J. M., and Cangas, A. J. (2015). Auditory verbal hallucinations as dialogical experiences. *J. Constr. Psychol.* 28, 264–280. doi: 10.1080/10720537.2014.938847

Peters, E. R., Landau, S., McCrone, P., Cooke, M., Fisher, P., Steel, C., et al. (2010). A randomised controlled trial of cognitive behaviour therapy for psychosis in a routine clinical service. *Acta Psychiatr. Scand.* 122, 302–318. doi: 10.1111/j.1600-0447.2010.01572.x

Peters, E. R., Williams, S. L., Cooke, M. A., and Kuipers, E. (2012). It's not what you hear, it's the way you think about it: appraisals as determinants of affect and behaviour in voice hearers. *Psychol. Med.* 42, 1507–1514. doi: 10.1017/S0033291711002650

Postmes, L., Sno, H. N., Goedhart, S., van der Stel, J., Heering, H. D., and de Haan, L. (2014). Schizophrenia as a self-disorder due to perceptual incoherence. *Schizophr. Res.* 152, 41–50. doi: 10.1016/j.schres.2013.07.027

Prebble, S. C., Addis, D. R., and Tippett, L. J. (2013). Autobiographical memory and sense of self. *Psychol. Bull.* 139, 815–840. doi: 10.1037/a0030146

Royal Australian and New Zealand College of Psychiatrists. (2005). Royal Australian and New Zealand College of Psychiatrists clinical practice guidelines for the treatment of schizophrenia and related disorders. *Aust. N. Z. J. Psychiatry* 39, 1–30. doi: 10.1111/j.1440-1614.2005.01516.x

Raballo, A., and Larøi, F. (2011). Murmurs of thought: phenomenology of hallucinatory consciousness in impending psychosis. *Psychosis* 3, 163–166. doi: 10.1080/17522439.2010.529617

Rector, N. A., and Leahy, R. L. (2006). "Cognitive theory and therapy of schizophrenia," in *Contemporary Cognitive Therapy: Theory, Research, and Practice*, ed. R. L. Leahy (New York: Guildford Press), 244–265.

Röhricht, F., Papadopoulos, N., Suzuki, I., and Priebe, S. (2009). Ego-pathology, body experience, and body psychotherapy in chronic schizophrenia. *Psychol. Psychother.* 82, 19–30. doi: 10.1348/147608308X342932

Röhricht, F., and Priebe, S. (2006). Effect of body-oriented psychological therapy on negative symptoms in schizophrenia: a randomized controlled trial. *Psychol. Med.* 36, 669–678. doi: 10.1017/S0033291706007161

Salvatore, G., Lysaker, P. H., Gumley, A., Popolo, R., Mari, J., and Dimaggio, G. (2012a). Out of illness experience: metacognition-oriented therapy for promoting self-awareness in individuals with psychosis. *Am. J. Psychother.* 66, 85–106.

Salvatore, G., Lysaker, P. H., Popolo, R., Procacci, M., Carcione, A., and Dimaggio, G. (2012b). Vulnerable self, poor understanding of others' minds, threat anticipation and cognitive biases as triggers for delusional experience in schizophrenia: a theoretical model. *Clin. Psychol. Psychother.* 19, 247–259. doi: 10.1002/cpp.746

Sass, L. A. (2003). "Self-disturbance in schizophrenia: hyperreflexivity and diminished self-affection," in *The Self in Neuroscience and Psychiatry*, eds T. Kircher and A. S. David (Cambridge: Cambridge University Press), 242–271.

Sass, L. A. (2014). Self-disturbance and schizophrenia: structure, specificity, pathogenesis (Current issues, New directions). *Schizophr. Res.* 152, 5–11. doi: 10.1016/j.schres.2013.05.017

Sass, L. A., and Parnas, J. (2003). Schizophrenia, consciousness, and the self. *Schizophr. Bull.* 29, 427–444. doi: 10.1093/oxfordjournals.schbul.a007017

Sedikides, C., and Skowronski, J. J. (1997). The symbolic self in evolutionary context. *Pers. Soc. Psychol. Rev.* 1, 80–102.

Slade, P., and Bentall, R. P. (1988). *Sensory Deception: A Scientific Analysis of Hallucination*. London: Croom Helm.

Smith, B., Fowler, D. G., Freeman, D., Bebbington, P. E., Bashforth, H., Garety, P. A., et al. (2006). Emotion and psychosis: links between depression, self-esteem, negative schematic beliefs and delusions and hallucinations. *Schizophr. Res.* 86, 181–188. doi: 10.1016/j.schres.2006.06.018

Stanghellini, G., and Lysaker, P. H. (2007). The Psychotherapy of Schizophrenia through the Lens of Phenomenology: intersubjectivity and the Search for the Recovery of First- and Second-Person Awareness. *Am. J. Psychother.* 6, 163–179.

Stanghellini, G., and Rosfort, R. (2015). Disordered selves or persons with schizophrenia? *Curr. Opin. Psychiatry* 28, 256–263. doi: 10.1097/YCO.0000000000000155

Stinson, D. A., Wood, J. V., and Doxey, J. R. (2008). In search of clarity: self-esteem and domains of confidence and confusion. *Pers. Soc. Psychol. Bull.* 34, 1541–1555. doi: 10.1177/0146167208323102

Synofzik, M., Vosgerau, G., and Newen, A. (2008). Beyond the comparator model: a multifactorial two-step account of agency. *Conscious. Cogn.* 17, 219–239. doi: 10.1016/j.concog.2007.03.010

Tarrier, N. (2001). "The use of coping strategies and self-regulation in the treatment of psychosis," in *Casebook of Cognitive Therapy for Psychosis*, ed. A. Morrison (London: Routledge), 79–107.

Thewissen, V., Bentall, R. P., Oorschot, M., A Campo, J., van Lierop, T., van Os, J., et al. (2011). Emotions, self-esteem, and paranoid episodes: an experience sampling study. *Br. J. Clin. Psychol.* 50, 178–195. doi: 10.1348/014466510X508677

Thomas, N., Farhall, J., and Shawyer, F. (2015). Beliefs about voices and schemas about self and others in psychosis. *Behav. Cogn. Psychother.* 43, 209–223. doi: 10.1017/S1352465813000817

Thomas, N., Hayward, M., Peters, E. R., van der Gaag, M., Bentall, R. P., Jenner, J., et al. (2014). Psychological therapies for auditory hallucinations (voices): current status and key directions for future research. *Schizophr. Bull.* 40, S202–S212. doi: 10.1093/schbul/sbu037

Thomas, N., Morris, E. M. J., Shawyer, F., and Farhall, J. (2013). "Acceptance and commitment therapy for voices," in *Acceptance and Commitment Therapy and Mindfulness for Psychosis*, eds E. M. J. Morris, L. C. Johns, and J. Oliver (Chichester: Wiley), 95–111.

Tiernan, B., Tracey, R., and Shannon, C. (2014). Paranoia and self-concepts in psychosis: a systematic review of the literature. *Psychiatry Res.* 216, 303–313. doi: 10.1016/j.psychres.2014.02.003

Trower, P., Birchwood, M., Meaden, A., Byrne, S., Nelson, A., and Ross, K. (2004). Cognitive therapy for command hallucinations: randomised controlled trial. *Br. J. Psychiatry* 184, 312–320. doi: 10.1192/bjp.184.4.312

Valmaggia, L. R., van der Gaag, M., Tarrier, N., Pijnenborg, M., and Slooff, C. J. (2005). Cognitive-behavioural therapy for refractory psychotic symptoms of schizophrenia resistant to atypical antipsychotic medication. Randomised controlled trial. *Br. J. Psychiatry* 186, 324–330. doi: 10.1192/bjp.186.4.324

van der Gaag, M., van Oosterhout, B., Daalman, K., Sommer, I. E. C., and Korrelboom, K. (2012). Initial evaluation of the effects of competitive memory training (COMET) on depression in schizophrenia-spectrum patients with persistent auditory verbal hallucinations: a randomized controlled trial. *Br. J. Clin. Psychol.* 51, 158–171. doi: 10.1111/j.2044-8260.2011.02025.x

van der Gaag M., Valmaggia, L. R., and Smit, F. (2014). The effects of individually tailored formulation-based cognitive behavioural therapy in auditory hallucinations and delusions: A meta-analysis. *Schizophr. Res.* 156, 30–37. doi: 10.1016/j.schres.2014.03.016

Varese, F., Barkus, E., and Bentall, R. (2012). Dissociation mediates the relationship between childhood trauma and hallucination-proneness. *Psychol. Med.* 42, 1025–1036. doi: 10.1017/S0033291711001826

Varese, F., Udachina, A., and Myin-Germeys, I. (2011). The relationship between dissociation and auditory verbal hallucinations in the flow of daily life of patients with psychosis. *Psychosis* 3, 37–41. doi: 10.1080/17522439.2010.548564

Waters, F. A. V., Allen, P., Aleman, A., Fernyhough, C., Woodward, T. S., Badcock, J. C., et al. (2012a). Auditory hallucinations in schizophrenia and nonschizophrenia populations: a review and integrated model of cognitive mechanisms. *Schizophr. Bull.* 38, 683–693. doi: 10.1093/schbul/sbs045

Waters, F. A. V., Woodward, T. S., Allen, P., Aleman, A., and Sommer, I. E. C. (2012b). Self-recognition deficits in schizophrenia patients with auditory hallucinations: a meta-analysis of the literature. *Schizophr. Bull.* 38, 741–750. doi: 10.1093/schbul/sbq144

Weinberg, D., Shahar, G., Noyman-Veksler, G., Davidson, L., McGlashan, T. H., and Fennig, S. (2012). Role of the self in schizophrenia: a multidimensional examination of short-term outcomes. *Psychiatry* 75, 285–297. doi: 10.1521/psyc.2012.75.3.285

Wykes, T., Huddy, V., Cellard, C., McGurk, S. R., and Czobor, P. (2011). A meta-analysis of cognitive remediation for schizophrenia: methodology and effect sizes. *Am. J. Psychiatry* 168, 472–485. doi: 10.1176/appi.ajp.2010.10060855

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Tailoring Cognitive Behavioral Therapy to Subtypes of Voice-Hearing

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Cognitive behavioral therapy (CBT) for voice-hearing (i.e., auditory verbal hallucinations; AVH) has, at best, small to moderate effects. One possible reason for this limited efficacy is that current CBT approaches tend to conceptualize voice-hearing as a homogenous experience in terms of the cognitive processes involved in AVH. However, the highly heterogeneous nature of voice-hearing suggests that many different cognitive processes may be involved in the etiology of AVH. These heterogeneous voice-hearing experiences do, however, appear to cluster into a set of subtypes, opening up the possibility of tailoring treatment to the subtype of AVH that a voice-hearer reports. In this paper, we (a) outline our rationale for tailoring CBT to subtypes of voice-hearing, (b) describe CBT for three putative subtypes of AVH (inner speech-based AVH, memory-based AVH, and hypervigilance AVH), and (c) discuss potential limitations and problems with such an approach. We conclude by arguing that tailoring CBT to subtypes of voice-hearing could prove to be a valuable therapeutic development, which may be especially effective when used in early intervention in psychosis services.

Keywords: hallucinations, voice-hearing, psychosis, schizophrenia, cognitive behavioral therapy

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INTRODUCTION

Auditory verbal hallucinations (AVH), or "voice-hearing," refers to the experience of hearing a voice in the absence of an appropriate external stimulus and which "has a sufficient sense of reality to resemble a veridical perception, over which the subject does not feel s/he has direct and voluntary control, and which occurs in the awake state" (David, 2004, p. 110). Whilst some voice-hearers report that their experiences have a broadly positive impact on their lives (e.g., Jenner et al., 2008) and a significant proportion do not have a need for psychiatric or psychological help (Johns et al., 2014), others are very distressed and impaired by their experiences. When such people come into contact with psychiatric or psychological services, they are typically diagnosed with a psychotic disorder, such as schizophrenia (although AVH are reported by people with other mental health problems, e.g., mood disorders, borderline personality disorder, and dissociative disorders; Larøi et al., 2012), and they receive medication, psychological therapy, or a combination of both, to help them cope with their voice-hearing and any co-morbid experiences (e.g., persecutory delusions).

Cognitive behavioral therapy (CBTp; e.g., Morrison et al., 2004) is the most well-known and widely researched psychological intervention for psychosis (McCarthy-Jones et al., 2015). CBTp typically aims to reduce the distress associated with psychotic experiences, rather than attempting

to reduce the frequency of those experiences (Morrison and Barratt, 2010). To achieve this aim, a wide range of different techniques are used and, thus, CBTp refers to a relatively broad range of psychological interventions (Thomas et al., 2014; Thomas, 2015). As a result, there is considerable debate about what the essential components of CBTp are (Morrison and Barratt, 2010) and about which interventions "count" as CBTp (e.g., Lincoln, 2010; McKenna et al., 2010; Laws et al., 2014). For the purposes of this paper, we consider CBTp to refer to the interventions outlined in treatment manuals such as Morrison et al. (2004), Kingdon and Turkington (2005), and Beck et al. (2009), which focus on alleviating the distress associated with AVH through changing a voice-hearer's appraisal of their AVH, based on a developmental, individualized formulation. This aim is achieved through the normalization of psychotic experiences, the use of behavioral experiments to test unhelpful beliefs about voices, the development of better coping strategies, the adoption of more effective emotion regulation strategies in place of unhelpful strategies (such as safety behaviors), and the revision of negative beliefs about the self. While these manuals were published between 6 and 11 years ago, they continue to guide treatment in many CBTp studies (e.g., Morrison et al., 2014).

CBTp is recommended by the National Institute for Health and Care Excellence (NICE) in the UK (National Institute for Health and Care Excellence (NICE), 2009, 2015), as well by bodies in the United States of America (Dixon et al., 2010) and Australia (Royal Australian and New Zealand College of Psychiatrists, 2005). In the UK, the recommendation that CBTp be offered to people who are diagnosed with a psychotic disorder is largely based on a series of meta-analyses that reported CBTp to be moderately effective in reducing the severity of the positive psychotic symptoms (e.g., Zimmerman et al., 2005; Wykes et al., 2008). However, these meta-analyses did not examine the effects of CBT on voice-hearing specifically (i.e., reductions in positive symptoms might refer to reductions in delusions, thought disorder, and/or hallucinations in any modality). Recent meta-analyses have found that that CBTp is effective at reducing the severity of auditory hallucinations (van der Gaag et al., 2014, Hedges' $g = 0.49$; Jauhar et al., 2014, Hedges' $g = 0.34$).

Despite these studies, there is good evidence to suggest that these effect sizes are not representative of CBT's true effect on voice-hearing. First, there is evidence that the effects of CBTp on positive symptoms are substantially reduced when potential sources of bias (e.g., failure to blind assessors to the treatment assignment of participants, researcher allegiance) in trials are taken into account (Jauhar et al., 2014). For example, Jauhar et al. reported that masking moderated the effect of CBT on positive symptoms (although see McKenna and Kingdon, 2014, for a critique of the way in which Jauhar et al. examined masking). In studies where masking appears to have been compromised (i.e., raters may not have been blind to the treatment allocation), there was a moderate, significant effect of CBTp on positive symptoms (Hedges' $g = 0.57$), while in studies where it appeared unlikely that masking was compromised, there was a non-significant effect of CBTp on positive symptoms (Hedges' $g = 0.08$). In terms of hallucinations, Jauhar et al. reported a large difference between the effect size of CBTp for auditory hallucinations between masked (Hedges' $g = 0.18$) and non-masked studies (Hedges' $g = 0.91$). Second, van der Gaag et al.'s meta-analysis has been criticized by Laws et al. (2014) for including studies which found large effect sizes for CBT, but (a) were small-scale pilot studies (e.g., McLeod et al., 2007), which some argue should be excluded from meta-analyses (Kraemer et al., 1998; Coyne et al., 2010), or (b) used a form of therapy (Avatar therapy; Leff et al., 2013) that some researchers and clinicians do not regard as a CBT intervention (Laws et al., 2014; Leff et al., 2014). It should be noted, however, that the concerns raised by Laws et al. are not shared by other researchers (e.g., some researchers argue that small studies should be included in meta-analyses, so long as they are methodologically sound in other ways, such as having adequate randomization and blinding procedures in place; Sackett and Cook, 1993; Schulz and Grimes, 2005). In summary, CBT has been shown to have small-to-moderate effects on voice-hearing, but these effects may be inflated because of methodological problems in some RCTs.

WHY ISN'T CBT MORE EFFECTIVE FOR VOICE-HEARING?

One reason why CBT for voice-hearing may have limited effectiveness is that current interventions typically treat voice-hearing as a relatively homogenous experience in terms of underlying cognitive processes. While most researchers and clinicians acknowledge heterogeneity in voice-hearing and suggest that this must be addressed by interventions (e.g., they report that the interventions provided in a study were individually tailored treatments based on case formulations), it is unclear what specific facets of the diverse voice-hearing experience determine what kind of intervention is delivered. For example, the coping strategies and behavioral experiments employed in CBT for voice-hearing often refer to ways that a voice-hearer can interrupt inner speech, based on the assumption that if one is able to interfere with the production of inner speech, one can prevent the generation of the "raw material" of an AVH. This is demonstrated by one recent CBT for voice-hearing intervention, which included participants learning coping skills such as humming, singing, reading, reading out loud, and talking to someone (Zanello et al., 2014). Similar strategies that involve subvocalization are endorsed by Kingdon and Turkington (2005) and by Beck et al. (2009) as ways in which a voice-hearer may attempt to interrupt AVH. Meanwhile, Morrison et al. (2004) suggested that, to encourage a voice-hearer to consider the possibility that their voices may be internally generated, they should "conduct behavioral experiments using subvocalization" (p. 134) and observe how this interrupts their AVH. These approaches seem to imply that voices have their basis in a form of inner speech, which may be the case for some voice-hearers but not for others (Jones, 2010; McCarthy-Jones, 2012). Heterogeneity in the involvement of processes related to inner speech in voice-hearing may account for the variability in the success of this coping strategy. For example, subvocal counting

has also been found to be an effective long-term intervention in less than a fifth of voice-hearers (Nelson et al., 1991).

Thus, it is possible that current CBT interventions for voice-hearing fail to address the range of different cognitive processes that underlie AVH. This could be considered to be the only reasonable strategy available to clinicians, given the enormous heterogeneity (e.g., Nayani and David, 1996; McCarthy-Jones et al., 2014b; Woods et al., 2015) of AVH reported by voice-hearers. However, analysis of the phenomenology of voice-hearing suggests that, from this huge diversity, it is possible to identify a meaningful set of subtypes of voice-hearing, for which one might be able to develop specific sets of treatments. In the next section we briefly review evidence supporting the existence of subtypes of AVH.

EVIDENCE FOR SUBTYPES OF VOICE-HEARING

Despite the heterogeneity of AVH (e.g., Nayani and David, 1996; McCarthy-Jones et al., 2014b; Woods et al., 2015), the phenomenology of AVH reported by voice-hearers suggests that they can be divided into a relatively small number of subtypes. For example, Stephane et al. (2003) performed a cluster analysis of 21 phenomenological properties of AVHs reported by 30 participants (most of whom were diagnosed with schizophrenia), which indicated the existence of two subtypes. One subtype was characterized by repetitive, simple content (e.g., AVH consisted of repeatedly hearing one or two words), by clear acoustics, by hearing the voice in external space, by being accompanied by other hallucinations, and by recognition of the self as the source of the AVH. The other subtype was characterized by non-repetitive content, which was moderately to highly complex (e.g., AVH ranged from sentences to conversations), by an inner space location, by multiple voices, by a lack of clear triggers, and by a belief that the source of the AVH was another person. More recently, McCarthy-Jones et al. (2014b) performed a cluster analysis of 13 phenomenological properties of auditory hallucinations reported by 199 participants (most of whom, again, were diagnosed with schizophrenia), which suggested the existence of three subtypes of AVH (as well as a nonverbal auditory hallucinations subtype). The first AVH subtype, termed "Constant Commenting and Commanding AVH," was characterized by repetitive commands, or almost constant commentary, and were typically in the first or third person. The second AVH subtype, termed "Own Thought AVH," was characterized by content that was not directed at a person and was in the first person, by being similar to memory, and by possibly being one's own "voice" or thoughts. The third AVH subtype, termed "Replay AVH," was characterized by being "identical to a memory of heard speech" (p. 229). While these two studies do not wholly concur on which subtypes of AVH may exist, they both indicate that it is possible to categorize AVH into a small number of subtypes.

Based, in part, on these findings, McCarthy-Jones et al. (2014a) tentatively suggested the existence of five subtypes of voice-hearing. The first, hypervigilance AVH occur when a person perceives the presence of a threat-related word or phrase in environmental noise (e.g., a young man may hear the insult "nonce" in the chatter of a crowd; Dodgson and Gordon, 2009). The second, memory-based AVH occur when processes normally involved in retrieving memories generate an intrusive verbal cognition (e.g., which resembles something derogatory said by a critical caregiver, or something said during a traumatic experience) and a person misattributes this to an external, non-self source. The third, inner speech-based AVH occur when processes normally involved in producing inner speech generate a cognition which a person misattributes to an external, non-self source. The fourth, epileptic AVH occur—by definition—in people with a diagnosis of epilepsy, appear to be a result of specific lesions in posterior temporal language areas, and differ in a number of important ways from the AVH reported by voice-hearers who do not have epilepsy (Serino et al., 2014). The fifth, deafferentation AVH occur when deafferentation-like changes occur in auditory cortex or other language processing regions, brought on by hearing loss (Cole et al., 2002), or social isolation (Hoffman, 2007). These changes are thought to elicit neural activity that creates internal, self-generated cognitions that are very difficult to distinguish from external, non-self-generated events, and so these cognitions are experienced as AVH.

IMPLICATIONS OF THE EXISTENCE OF SUBTYPES OF VOICE-HEARING

If these putative AVH subtypes can be reliably identified in voice-hearers, there are important implications for therapeutic interventions. For example, Jones (2010) claimed that different subtypes of voice-hearing may be caused by different neurobiological and/or cognitive mechanisms. If one accepts this claim, it is tempting to argue that different therapeutic interventions will be required for different subtypes, given that each intervention will have to address a different set of neurobiological alterations (if it is a pharmacological intervention) or of cognitive problems or biases (if it is a psychological intervention). This argument has received support from a small number of studies.

For example, Stephane et al. (2001) reported two cases of service-users who experienced AVH that were fixed and repetitive. Anti-psychotic medication appeared to be ineffective in reducing the frequency of these AVH. Given the nature of the voices reported by the two service-users (i.e., in some ways they were similar to the intrusive thoughts experienced in OCD), both were prescribed fluvoxamine (an anti-obsessional agent). In both cases, fluvoxamine appeared to be effective in reducing the frequency of AVH. Thus, Stephane et al. suggest that the AVH experienced by these two service-users may belong to an obsessional subtype of AVH, which differ from other AVH in terms of their fixed, repetitive content. Moreover, they argued that these AVH may have a distinct neural substrate, which can be modified by anti-obsessional rather than anti-psychotic medication. To take an example from clinical psychology, Kingdon and Turkington (1998) postulated the existence of four subtypes of psychosis—obsessional psychosis, drug-related

psychosis, anxiety psychosis, and sensitivity psychosis—and described how interventions for AVH needed to be modified according to each subtype. For example, they suggested that obsessional AVH tend to occur when a person experiences a thought that they deem to be unacceptable (e.g., they have an unpleasant thought and think, "I would never think that and so I cannot be the source of that thought"). Accordingly, therapy for this type of AVH involved psychoeducation about the nature of unwanted, intrusive thoughts. In contrast, Kingdon and Turkington suggested that sensitivity AVH occur in people who struggle to cope with relatively minor stressors (e.g., moving away to university) and so therapy involved training of social skills and novel coping strategies that would enable a voice-hearer to better cope with minor stressors.

The idea of tailoring CBT to subtypes of AVH is not, therefore, entirely novel. However, none of the approaches that have encouraged clinicians to tailor therapy to subtypes of AVH have been formally evaluated. Moreover, these approaches have provided little theoretical basis for the interventions they propose and they have given little guidance on how a clinician should decide which intervention is right for whom. In the next section, we describe a novel CBT manual for voice-hearing, which contains clinician- and client-oriented information (a) showing how a subtype of AVH may be identified, (b) explaining how CBT should be modified according to the subtype of AVH that has been identified, and (c) providing a theoretical rationale for why CBT should be tailored in a particular manner for each subtype. The manual is concerned with three of the subtypes proposed by McCarthy-Jones et al. (2014a)—inner speech-based AVH, memory-based AVH, and hypervigilance AVH. The two other subtypes proposed by McCarthy-Jones et al.—epileptic AVH and deafferentation AVH—are not considered in the manual given that these experiences are probably much more amenable to biological than psychological interventions. In addition, McCarthy-Jones et al. propose that within the inner speech- and memory-based subtypes, further subtypes may exist (e.g., inner speech-based AVH could be divided into "own thought," "novel," and "obsessional"). However, in its present form, the manual does not consider these within-subtype distinctions (i.e., the manual would propose the same intervention for own thought inner speech-based AVH as for novel inner speech-based AVH).

CBT FOR SUBTYPES OF VOICE-HEARING

As in other forms of CBTp, the manual encourages the clinician to develop a shared problem list with a service-user and to respect their interpretation of their experiences (i.e., voices should not be dismissed as "just externally misattributed inner speech" or "just externally misattributed memories"). The manual (Dodgson et al., 2014; available on request) begins by trying to establish the subtype of AVH that a service-user is experiencing, primarily through questions about phenomenological properties of the voice (or voices) they hear. The clinician is encouraged to ask questions about the auditory properties of the voices (e.g., do they sound as if someone is speaking to you, or are they sometimes silent?), about whether the voice appears to originate from (e.g., inside or outside the head), about the length of the voice's utterances (i.e., short vs. long utterances), and about the identity of the voice. In addition to these questions about the phenomenology of the AVH, the service-user is asked a series of questions about the triggers of AVH and about the contexts in which AVH occur. For example, the voice-hearer is asked about where their attention is focused (e.g., internally, on their own thoughts and feelings, or externally, on other people) when they experience an AVH, about the situations they are in when they typically experience AVH (e.g., alone, in a quiet room or in a noisy room with lots of people), and about what emotions tend to precede the occurrence of an AVH.

The voice-hearer's answers to these questions should enable the clinician to come to a decision about the subtype of AVH the voice-hearer is experiencing. None of these questions are "diagnostic" of a person experiencing a particular subtype, but they can provide strong indications that a person is experiencing one subtype rather than another. For example, while both inner speech-based and memory-based AVH may sound as if they are sometimes coming from inside and sometimes from outside the head, hypervigilance AVH should only ever be experienced as coming from outside the head (Dodgson and Gordon, 2009; Garwood et al., 2015). Similarly, both memory-based and hypervigilance AVH are characterized by having repetitive content; the former because the AVH is based on a memory, which should stay relatively stable over time, the latter because this type of AVH is a product of a person scanning the environment for a particular phrase or set of phrases. However, if a voice-hearer reports that the content is similar to what was often said to them by, for example, an abusive parent, and that they tend to experience the voice when they are alone at home, this would suggest that they are experiencing memory-based AVH (given that hypervigilance AVH are typically experienced in noisy, social environments). Drawing on this information, the clinician should then develop an individualized longitudinal formulation with the voice-hearer, which explains how and why the AVH has developed, and which subtype of AVH the service-user is experiencing.

Based on the decision about what subtype of AVH a voice-hearer is experiencing, the clinician is encouraged to flexibly draw on a series of treatment options, which are based on current models of each subtype of AVH (e.g., Fernyhough, 2004; Waters et al., 2006; Dodgson and Gordon, 2009) or of related phenomena (e.g., intrusive memories in PTSD; Ehlers and Clark, 2000). While there is some overlap in the three treatment packages (e.g., affective problems are thought to play an important role in each subtype of AVH), there are important differences between each approach. The three treatment approaches are outlined below.

CBT FOR INNER SPEECH-BASED AVH

Inner speech-based AVH are thought to occur when a person generates a cognition, using many of the process normally involved in generating inner speech, and misattributes that cognition to an external, non-self source (Frith and Done, 1988; Fernyhough, 2004). A number of cognitive mechanisms are hypothesized to play a role in the development of this type

of AVH. First, a person is thought to generate a cognition that has a dialogic structure (i.e., it takes the form of a to and fro conversation, rather than a monolog), and that has the auditory qualities of another person's voice (Hoffman et al., 2008; for fuller accounts of the different forms inner speech can take and how this relates to voice-hearing, see Fernyhough, 2004; McCarthy-Jones and Fernyhough, 2011). Second, this cognition is thought to occur with little effort. Thus, it lacks one of the key characteristics (i.e., cognitive effort) that we use to identify self-generated cognitions from non-self-generated events (Johnson, 1997). Third, this cognition may have been subject to thought suppression, which can make the cognition feel even less self-generated and, ironically, increases the frequency of the intrusions (Salkovskis and Campbell, 1994). Fourth, some voice-hearers are thought to have a trait-like bias in their reality discrimination skills, so that they tend to misattribute internal, self-generated cognitions to an external, non-self source (Brookwell et al., 2013). Moreover, this bias can be exacerbated by negative affect (Hoskin et al., 2014; Smailes et al., 2014).

Psychoeducation for this subtype involves guided discovery in which voice-hearers are presented with information about (a) how inner speech develops, based on a Vygotskian (Vygotsky, 1934/1987) model; (b) the different forms of inner speech that we can experience; (c) how low effort cognitions are hard to identify as self-generated; (d) how ineffective thought suppression can be, and how it typically leads to a paradoxical increase in the suppressed thought; (e) how stress/negative affect can make it difficult to recognize cognitions as self-generated. Thus, a core aim of psychoeducation for inner speech-based AVH is to help a voice-hearer understand how diverse normal inner speech is and how, in some situations, we can feel that we have no control over the content of our thoughts.

The coping strategies suggested for inner speech-based AVH are, to some extent, similar to the coping strategies employed in traditional CBT for voice-hearing. For example, they involve activities that will block the phonological loop, such as soothing self-talk, humming, and singing to oneself. In addition, behavioral experiments that involve using inner speech to practice transforming either the content of the voice (into something positive) or the sound of the voice (from an unpleasant, dominant-sounding voice to a less powerful, even amusing voice) may help to reduce the distress experienced by voice-hearers as it shows ways in which they can try to control AVHs when they occur. Beyond activities focused on inner speech, the manual encourages the avoidance of thought suppression strategies and rumination, and the use of effective emotion regulation strategies, such as distraction and seeking social support.

Case Vignette

Philip had become acutely unwell, leading to a hospital admission, where he described a belief that he had been kidnapped by psychologists for an experiment. He believed that he had been placed in a false town that copied his home town and his parents and family were imposters. Philip could hear and see the psychologists, particularly at night. Treatment initially focused on reducing the risk to his parents and testing out his delusional beliefs, before the focus turned to his voices. Philip described being distressed by conversations with the psychologists and also intrusive critical voices. Philip's experiences were classified as inner speech-based AVH as they typically provided a running commentary on his activities and happened more often when he was alone and focused on his own thoughts. Therapy involved presenting an explanation of how inner speech develops and an exercise on various ways people can experience inner speech, including forms of inner speech that "sound" like other people's voices. The role of the phonological loop in a person's inner speech was described and Philip was encouraged to try to block the loop with humming and listening to music in his head. The success of these strategies increased his belief that the voices were similar to his inner speech. Philip was then encouraged to summon the psychologists in his mind and transform both their voice and appearance. He enjoyed forcing them into comic voices and appearances, which provided further evidence that they were similar to his inner speech and that he could exercise control over them. When Philip experienced the voice he became adept at blocking the phonological loop or transforming the voice into something comic, which reduced his distress and the voices started to reduce in frequency.

CBT FOR MEMORY-BASED AVH

Memory-based AVH are thought to occur when a person experiences an intrusive (typically unpleasant) verbal cognition, through many of the process normally involved in generating auditory memories, and misattributes it to an external, non-self source (McCarthy-Jones et al., 2014a). Again, a number of cognitive mechanisms are hypothesized to play a role in the development of this type of AVH, many of which are also involved in the development of inner speech-based AVH. First (and most obviously), a person is thought to experience an intrusive verbal cognition. The intrusive nature of the cognition may be a result of it being related to a memory that was encoded during a traumatic event. Memories of traumatic events are often encoded in a data-driven manner, rather than in conceptually-driven manner (Ehlers and Clark, 2000). That is, they are frequently encoded in terms of sensory impressions and perceptual characteristics, rather than in terms of context and meaning. As a result, these memories tend to be recalled involuntarily, as a result of perceptual or emotional cues rather than by intentional recall (Ehlers et al., 2004). Thus, by their very nature, these memories—or in this case, cognitions related to these memories—occur without any cognitive effort (i.e., they are triggered by being in a place that resembles the place where a traumatic event occurred), and so will be experienced as intrusive (hence participants who report high levels of data-driven processing at the time of a trauma are more likely to develop PTSD, or PTSD symptoms, than are participants who report low levels of data-driven processing at the time of a trauma; Murray et al., 2002; Halligan et al., 2003). Alternatively, the cognition may be related to a memory that was not encoded during a traumatic experience (e.g., it may be an unpleasant comment made repeatedly by a teacher at school), but given its negative content, it may have been subject to thought suppression. As described

above, suppressed cognitions are more likely to rebound into consciousness, and so will be experienced as intrusive. Thus, through these mechanisms, a person will experience an intrusive cognition that lacks one of the key characteristics (i.e., cognitive effort) that we use to identify self-generated cognitions from non-self-generated events (Johnson, 1997). When these intrusions are experienced in the context of biased reality discrimination, they are experienced as AVH, rather than being identified as an internal, self-generated cognition.

Psychoeducation for this subtype involves guided discovery in which voice-hearers are presented with information about (a) how memory normally works; (b) how memories of traumatic experiences tend to differ from normal memories; (c) how low effort cognitions are hard to identify as self-generated; (d) how ineffective thought suppression can be, and how it typically leads to a paradoxical increase in the suppressed thought; (e) how stress/negative affect can make it difficult to recognize cognitions as self-generated. Thus, a core aim of CBT for memory-based AVH is to help a voice-hearer to understand that AVH can be seen as a relatively normal response to some type of traumatic experience.

Many of the coping strategies for memory-based AVH are drawn from interventions for PTSD (e.g., Ehlers et al., 2005), given that the memory intrusions experienced in PTSD and memory-based AVH can be considered similar phenomena (some would go so far as to say that these are sometimes the same phenomena; Read et al., 2005). The aim of these coping strategies is to reduce a person's reliance on the use of avoidant coping strategies (such as thought suppression, avoidance of reminders of a traumatic experience, and other safety behaviors), to encourage the use of effective emotion regulation strategies (e.g., distraction), and to change excessively negative appraisals and interpretations of a trauma and its consequences. Careful discussion of a traumatic event can help to achieve several of these aims (Smith et al., 2006). First, effective emotion regulation strategies can be employed when a service-user experiences high levels of distress during the discussion. Second, a service-user can learn that they are able to cope with the negative emotions that thinking about the trauma evokes. This is important as fear of not being able to cope with these emotions may have been one reason for adopting avoidant strategies. Third, this discussion, and the therapist's reactions during the discussion, can be a way in which a service-user can disconfirm some of their negative trauma-related beliefs (e.g., "It was my fault," "I will never get over this experience," "People will think bad things about me if they know about what happened"). In addition, it is possible that through this discussion, memories and other cognitions related to the traumatic event can begin to be re-integrated into everyday autobiographical memory meaning that trauma-related memories should be less likely to be unintentionally recalled as a result of sensory or emotional cues (Conway, 1997; Ehlers and Clark, 2000).

Case Vignette

Grant had survived sexual, physical, and emotional abuse in a children's home but had started to experience voices in his early adulthood. These were constant and highly distressing and disabling, even when on high levels of medication. Grant had been reluctant to engage with therapy, but agreed to attend when the therapist provided information about the prevalence of voice-hearing in people who had experienced multiple forms of abuse, suggesting that voice-hearing may be a problem linked to his abusive past. Reducing the effects of voice-hearing on his functioning was his initial goal for therapy. An initial assessment of his voice-hearing suggested that Grant experienced inner speech-based AVH, with intrusive thoughts that mirrored his beliefs about himself, which were worse when he was unoccupied. However, when questioned about his first experience of voice-hearing, he described hearing footsteps and laughter at the end of a corridor. Grant was already aware of the link between trauma and voice hearing and quickly made the link with his experiences of lying awake at night listening out to see if abusers would come to his room. When he understood that his first experience of voice-hearing had been similar to experiencing an intrusive memory, Grant was able to understand that his current experiences were also self-generated and that the content was thematically similar to the comments of his abusers. With this increased insight, he was able to engage in specific distraction techniques which increased his sense of control over his voices, reduced the distress associated with this voices, and is starting to experience his voices less often.

CBT FOR HYPERVIGILANCE AVH

Hypervigilance AVH are thought to occur when a person is concerned that others hold specific negative beliefs about them (e.g., that they are a pedophile). As a result, a person becomes very anxious, scans the environment for comments related to those beliefs, and begins to misinterpret environmental noise (e.g., traffic noise, crowd noise, or mechanical hums) as containing those comments (see Dodgson and Gordon, 2009). In part, these "false alarms" appear to occur because arousal shifts the balance of perceptual systems, so that top-down processes have a larger influence on our perceptions (Dudley et al., 2014).

Psychoeducation for this subtype involves guided discovery in which voice-hearers are presented with information about (a) the role of top-down influences on perception; (b) how our perceptual systems have evolved to help us survive by quickly detecting threat; (c) how feelings of fear and anxiety make us more likely to misperceive threat to be present when it is not; and (d) how when our perceptual systems are dealing with degraded or noisy data, they are more likely to make mistakes. Thus, a core aim of psychoeducation for hypervigilance AVH is to help a voice-hearer understand that our perceptions are influenced by what we expect to see and hear, and that when we expect to find threats in our environment, we are very likely to find them, even when they are not present.

The coping strategies suggested for hypervigilance AVH involve reducing physiological arousal, reducing perceived threat, reality testing, rational self-talk, and distraction. These coping strategies aim to help a person control feelings of fear and anxiety by either reducing bodily arousal (e.g., via progressive muscle relaxation) or their beliefs about the threats present in

their environment (e.g., by discussing their beliefs with a trusted friend). If this is achieved, the likelihood that a service-user will experience a hypervigilance AVH should be reduced. Moreover, should they experience an AVH, their ability to control their levels of fear and anxiety should enable a service-user to engage in rational self-talk, where they can question whether what they have heard could really have been said to them, and/or to use distraction techniques to divert their attention away from scanning for threat and thus reduce AVH-related distress.

Case Vignette

Rick had been involved in a violent confrontation with a local gang, where he had tried to protect his father. He became very vigilant for any signs that he was to be targeted in a reprisal attack. He began to hear comments from people passing his house at night suggesting that he would be assaulted and this created a vicious circle where he stayed awake throughout the night to listen for signs of threat and began to hear more signs of this threat. This vicious circle was broken when Rick was hospitalized and began medication. On discharge he felt stigmatized by his mental health problems, remained convinced that he was in danger, and was, therefore, reluctant to leave his house. His voice hearing experiences were classified as hypervigilance AVH, as they occurred when his attention was externally-focused and their content was consistent with the threat he predicted he was under. Therapy focused on providing a longitudinal formulation of what had happened to Rick prior to his admission. The formulation highlighted that it would be natural for him to become more conscious of threat after the violent incident. Rick's situation was likened to a soldier in a dangerous situation where hypervigilance for threat has more positive than negative effects (i.e., the value of detecting genuine threats as early as possible outweighs the cost of making some false alarms). However, in Rick's situation, hypervigilance for threat had more negative than positive effects, and his sense of threat had escalated through sleep deprivation, substance misuse, and the onset of his voices. Psychoeducation included reviewing the importance of top-down processing or expectations on perception and error management theory. Rick found the formulation compelling and normalizing and it reduced the stigma he felt. Recognizing that the threatening comments he had heard were a result of him scanning his environment for threat, rather than genuine indicators of a threat, enabled him to reassess the level of danger he was in, allowing him to engage in graded exposure so that he was able to leave the house.

POINTS OF DEPARTURE FROM TRADITIONAL CBT FOR VOICE-HEARING

The manual described here thus differs from traditional CBT for voice-hearing in that it provides multiple formulation templates that should aid the creation of a shared formulation concerning how a voice-hearer's AVH developed. These templates will reflect the individual factors for each voice-hearer (e.g., the specific role of abusive experiences, or of difficult family relationships, or of other stressful life events), but they guide the clinician to consider that varied cognitive/emotional processes may be driving different types of AVH. Thus, the clinician should be more able to (a) provide psycho-education that is a better "fit" with a voice-hearer's experiences, (b) identify behavioral experiments that are more likely help to change a voice-hearer's appraisals of their AVH, and (c) suggest coping strategies that are more likely to reduce the frequency of AVH. That being said, the approach we describe is not intended to "replace" existing CBT for voice-hearing; rather, its aim is to complement and enhance the options available to clinicians. We envisage it being used in tandem with other CBTp interventions with a specific focus, such as those that attempt to improve self-esteem (e.g., Freeman et al., 2014), or reduce compliance with commanding AVH (e.g., Birchwood et al., 2014).

PROBLEMS WITH A SUBTYPING APPROACH

While there are reasons to believe that adopting the approach described here will lead to the development of more effective psychological interventions for voice-hearing, there are also a number of reasons to be cautious. First, there is a relatively long history of approaches that involve subtyping of hallucinatory experiences being of little practical use in terms of developing better interventions (Stephane, 2013). For example, Jaspers (1962) distinguished "true" AVH, which are heard in external space, from pseudohallucinations, which are heard in internal space (i.e., from inside the head), and suggested that the latter are a more benign form of AVH. However, it has been shown that this is not the case: internal and external AVH are equally distressing for voice-hearers (Copolov et al., 2004). Thus, one could argue that the present approach is yet another attempt to subtype AVH, which is unlikely to be of any practical value. While it is important to acknowledge this possibility, the present subtyping approach differs from some previous attempts to subtype AVH in that there is relatively strong theoretical (e.g., Ehlers and Clark, 2000; Fernyhough, 2004; Waters et al., 2006; Dodgson and Gordon, 2009) and empirical (e.g., Waters et al., 2006; Rapin et al., 2013; Dudley et al., 2014; Garwood et al., 2015) support for the three subtypes described here. This evidence indicates that the subtypes described here are related to separate cognitive processes, meaning that different interventions are likely to be required to help a voice-hearer cope with these different forms of AVH.

That being said, claims about these subtypes remain tentative and further research examining the subtypes of AVH described here is required. For example, it needs to be determined whether these subtypes can be reliably identified. While previous research (e.g., McCarthy-Jones et al., 2014b) employed existing measures to identify subtypes of AVH, it is likely that bespoke measures will need to be developed. In addition, research examining whether these subtypes of AVH are associated with different cognitive processes is required. For example, one would expect voice-hearers who experience inner speech-based AVH to report higher levels of dialogic inner speech as well as higher levels of inner speech that has the auditory qualities of another person's voice (as assessed by, e.g., the Varieties of

Inner Speech Questionnaire, McCarthy-Jones and Fernyhough, 2011) than voice-hearers who do not experience inner speech-based AVH. In contrast, one would expect that voice-hearers who experience memory-based AVH to perform poorly on tasks involving the inhibition of unwanted memories (e.g., on Schnider and Ptak's, 1999, inhibition of currently irrelevant memories task) in comparison to voice-hearers who do not experience memory-based AVH. Finally, one would expect voice-hearers who experience hypervigilance AVH to show greater top-down influences on perception (e.g., using the jumbled speech task, Fernyhough et al., 2007, or the task employed in Daalman et al., 2012) than would voice-hearers who do not experience hypervigilance AVH. If these predictions hold true, it would provide support for the argument that different cognitive processes underlie different subtypes of AVH, which is consistent with the idea that different interventions may be required for the different subtypes. Clearly, however, the best way to investigate this claim would be to compare the efficacy of the manual described here with traditional CBT for AVH interventions (e.g., Morrison et al., 2004), as the most important step in establishing whether a subtyping approach is worthwhile would be to demonstrate that this approach is useful in clinical settings.

Another issue is that most voice-hearers report that they experience multiple subtypes of AVH. For example, McCarthy-Jones et al. (2014b) reported that the majority of their sample (59%) could be classified as experiencing more than one auditory hallucination subtype. One could claim, therefore, that it makes little sense to tailor CBT to the subtype of AVH a person reports when voice-hearers typically experience multiple subtypes. This claim can, however, be countered in a number of ways. First, it is important to emphasize that this approach aims to identify the subtype of AVH a person experiences, rather than aiming to subtype voice-hearers. In addition, it may be that, even in voice-hearers who report multiple subtypes of AVH, tailoring CBT to the subtypes they experience may be helpful. For example, it may prove helpful to work with a voice-hearer to establish that they experience two subtypes of AVH, to encourage them to employ different coping strategies when they experience different types of voices, and to ask them to focus on using the coping strategies to better control their most distressing voices first. Finally, it may be that experiencing only a single subtype of AVH is more common in people who have a short history of voice-hearing (e.g., who are experiencing their first episode of psychosis) and that, over time, multiple subtypes of AVH develop (see Jones, 2010, for a fuller account of this idea, which he calls the dynamic developmental progression of AVH). If this is the case, then a subtyping approach may be more appropriate for first episode or early intervention services.

A final concern is that the aims of this particular subtyping approach are to reduce the frequency of AVH and to reduce the distress associated with AVH. Aiming to reduce the frequency of AVH is, to some extent, inconsistent with one of the core tenet of CBT for psychosis: that clinicians should seek to reduce the distress associated with AVH by changing a voice-hearer's appraisals of their experience, and that reducing the frequency of psychotic experiences is not typically a target in therapy (Morrison and Barratt, 2010). Aiming to reduce the frequency of AVH is also at odds with the key values of the Hearing Voices Movement—a prominent, international user-led organization—who argue that interventions for AVH should encourage acceptance of voice-hearing, rather attempting to suppress it, or to reduce its frequency (Corstens et al., 2014). Despite this, many people with psychosis report that reducing the frequency of their AVH (or delusions) is a priority for them (e.g., Fischer et al., 2002; Rosenheck et al., 2005). This is true even for positive voices. For example, Jenner et al. (2008) reported that, in a sample of 138 participants who heard positive as well as negative voices, 57% did not want to keep their positive voices. The intervention we have described, therefore, may be suitable for voice-hearers who are seeking to reduce the frequency of their AVH, but may not suitable for voice-hearers who do not set this as a therapeutic goal.

CONCLUSIONS

At present CBT for voice-hearing has only limited effectiveness. There is growing evidence that AVHs may be usefully divided into a set of subtypes and the existence of these subtypes might, in part, account for this limited effectiveness of CBT for voice-hearing. In this article we have described how CBT for voice-hearing could be tailored for three putative subtypes of AVH. At present, we are examining the acceptability of this approach for both clinicians and service-users and, if acceptability is demonstrated, we will investigate its efficacy in a randomized controlled trial.

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REFERENCES

Beck, A. T., Rector, N. A., Stolar, N., and Grant, P. (2009). *Schizophrenia: Cognitive Theory, Research, and Therapy.* New York, NY: Guilford Press.

Birchwood, M., Michail, M., Meaden, A., Tarrier, N., Lewis, S., Wykes, T., et al. (2014). Cognitive behaviour therapy to prevent harmful compliance with command hallucinations (COMMAND): a randomised controlled trial. *Lancet Psychiatry* 1, 23–33. doi: 10.1016/S2215-0366(14)70247-0

Brookwell, M. L., Bentall, R. P., and Varese, F. (2013). Externalizing biases and hallucinations in source-monitoring, self-monitoring and signal detection studies: a meta-analytic review. *Psychol. Med.* 43, 2465–2475. doi: 10.1017/S0033291712002760

Cole, M. G., Dowson, L., Dendukuri, N., and Belzile, E. (2002). The prevalence and phenomenology of auditory hallucinations among elderly subjects attending an audiology clinic. *Int. J. Geriatr. Psychiatry* 17, 444–452. doi: 10.1002/gps.618

Conway, M. A. (1997). "Past and present: recovered memories and false memories," in *Recovered Memories and False Memories,* ed M. A. Conway (Oxford, UK: Oxford University Press), 150–191.

Copolov, D., Trauer, T., and MacKinnon, A. (2004). On the non-significance of internal versus external auditory hallucinations. *Schizophr. Res.* 69, 1–6. doi: 10.1016/S0920-9964(03)00092-6

Corstens, D., Longden, E., McCarthy-Jones, S., Waddingham, R., and Thomas, N. (2014). Emerging perspective from the hearing voices movement: implications for research and practice. *Schizophr. Bull.* 40, S285–S294. doi: 10.1093/schbul/sbu007

Coyne, J. C., Thombs, B. D., and Hagedoorn, M. (2010). Ain't necessarily so: review and critique of recent meta-analyses of behavioural medicine interventions in health psychology. *Health Psychol.* 29, 107–116. doi: 10.1037/a0017633

Daalman, K., Verkooijen, S., Derks, E. M., Aleman, A., and Sommer, I. E. (2012). The influence of semantic top-down processing in auditory verbal hallucinations. *Schizophr. Res.* 139, 82–86. doi: 10.1037/a0017633

David, A. S. (2004). The cognitive neuropsychiatry of auditory verbal hallucinations: an overview. *Cogn. Neuropsychiatry* 9, 107–123. doi: 10.1080/13546800344000183

Dixon, L. B., Dickerson, F., Bellack, A. S., Bennett, M., Dickinson, D., Goldberg, R. W., et al. (2010). The 2009 Schizophrenia PORT Psychosocial Treatment Recommendations and summary statements. *Schizophr. Bull.* 36, 48–70. doi: 10.1093/schbul/sbp115

Dodgson, G., and Gordon, S. (2009). Avoiding false negatives: are some hallucinations an evolved design flaw? *Behav. Cogn. Psychother.* 37, 325–334. doi: 10.1017/S1352465809005244

Dodgson, G., Robson, J., Alderson-Day, B., McCarthy-Jones, S. R., Smailes, D., and Fernyhough, C. (2014). *Tailoring CBT to Subtypes of Voice-Hearing.* Durham: Department of Psychology; Durham University.

Dudley, R., Dodgson, G., Sarll, G., Halhead, R., Bolas, H., and McCarthy-Jones, S. R. (2014). The effect of arousal on auditory threat detection and the relationship to auditory hallucinations. *J. Behav. Ther. Exp. Psychiatry* 45, 311–318. doi: 10.1016/j.jbtep.2014.02.002

Ehlers, A., and Clark, D. (2000). A cognitive model of posttraumatic stress disorder. *Behav. Res. Ther.* 38, 319–345. doi: 10.1016/S0005-7967(99)00123-0

Ehlers, A., Clark, D. M., Hackmann, A., McManus, F., and Fennell, M. (2005). Cognitive therapy for post-traumatic stress disorder: development and evaluation. *Behav. Res. Ther.* 43, 413–431. doi: 10.1016/j.brat.2004.03.006

Ehlers, A., Hackmann, A., and Michael, T. (2004). Intrusive re-experiencing in posttraumatic stress disorder: phenomenology, theory, and therapy. *Memory* 12, 403–415. doi: 10.1080/09658210444000025

Fernyhough, C. (2004). Alien voices and inner dialogue: towards a developmental account of AVH. *New Ideas Psychol.* 22, 49–68. doi: 10.1016/j.newideapsych.2004.09.001

Fernyhough, C., Bland, K., Meins, E., and Coltheart, M. (2007). Imaginary companions and young children's responses to ambiguous auditory stimuli: implications for typical and atypical development. *J. Child Psychol. Psychiatry* 48, 1094–1101. doi: 10.1111/j.1469-7610.2007.01789.x

Fischer, E. P., Shumway, M., and Owen, R. R. (2002). Priorities of consumers, providers, and family members in the treatment of schizophrenia. *Psychiatr. Serv.* 53, 724–729. doi: 10.1176/appi.ps.53.6.724

Freeman, D., Pugh, K., Dunn, G., Evans, N., Sheaves, B., Waite, F., et al. (2014). An early Phase II randomised controlled trial testing the effect on persecutory delusions of using CBT to reduce negative cognitions about the self: the potential benefits of enhancing self confidence. *Schizophr. Res.* 160, 186–192. doi: 10.1016/j.schres.2014.10.038

Frith, C. D., and Done, D. J. (1988). Towards a neuropsychology of schizophrenia. *Br. J. Psychiatry* 153, 437–443. doi: 10.1016/j.schres.2014.10.038

Garwood, L., Dodgson, G., Bruce, V., and McCarthy-Jones, S. R. (2015). A preliminary investigation into the existence of a hypervigilance subtype of auditory hallucination in people with psychosis. *Behav. Cogn. Psychother.* 43, 52–62. doi: 10.1017/S1352465813000714

Halligan, S. L., Michael, T., Clark, D. M., and Ehlers, A. (2003). Posttraumatic stress disorder following assault: the role of cognitive processing, trauma memory, and appraisals. *J. Consult. Clin. Psychol.* 71, 419–431. doi: 10.1037/0022-006X.71.3.419

Hoffman, R. E. (2007). A social deafferentation hypothesis for induction of active schizophrenia. *Schizophr. Bull.* 33, 1066–1070. doi: 10.1093/schbul/sbm079

Hoffman, R. E., Varanko, M., Gilmore, J., and Mishara, A. L. (2008). Experiential features used by patients with schizophrenia to differentiate 'voices' from ordinary verbal thought. *Psychol. Med.* 38, 1167–1176. doi: 10.1017/S0033291707002395

Hoskin, R., Hunter, M. D., and Woodruff, P. W. R. (2014). The effect of psychological stress and expectation on auditory perception: a signal detection analysis. *Br. J. Psychol.* 105, 524–546. doi: 10.1111/bjop.12048

Jaspers, K. (1962). *General Psychopathology.* Manchester, UK: Manchester University Press.

Jauhar, S., McKenna, P. J., Radua, J., Fung, E., Salvador, R., and Laws, K. R. (2014). Cognitive-behavioural therapy for the symptoms of schizophrenia: systematic review and meta-analysis with examination of potential bias. *Br. J. Psychiatry* 204, 20–29. doi: 10.1192/bjp.bp.112.116285

Jenner, J. A., Rutten, S., Beuckens, J., Boonstra, N., and Sytema, S. (2008). Positive and useful auditory verbal hallucinations. *Acta Psychiatr. Scand.* 118, 238–245. doi: 10.1111/j.1600-0447.2008.01226.x

Johns, L., Kompus, K., Connell, M., Humpston, C., Lincoln, T., Longden, E., et al. (2014). Auditory verbal hallucinations in persons with and without a need for care. *Schizophr. Bull.* 40, S255–S264. doi: 10.1093/schbul/sbu005

Johnson, M. K. (1997). Source monitoring and memory distortions. *Philos. Trans. R. Soc. B Biol. Sci.* 352, 1733–1745. doi: 10.1098/rstb.1997.0156

Jones, S. R. (2010). Do we need multiple models of auditory verbal hallucinations? Examining the phenomenological fit of cognitive and neurological models. *Schizophr. Bull.* 36, 566–575. doi: 10.1093/schbul/sbn129

Kingdon, D., and Turkington, D. (1998). "Cognitive behavioural therapy of schizophrenia," in *Outcome and Innovation in Psychological Treatment of Schizophrenia, eds* T. Wykes, N. Tarrier, and S. Lewis (Chichester, UK: Wiley), 59–79.

Kingdon, D., and Turkington, D. (2005). *Cognitive Therapy of Schizophrenia.* New York, NY: Guilford Press.

Kraemer, H. C., Gardner, C., Brooks, J. O., and Yesavage, J. A. (1998). Advantages of excluding underpowered studies in meta-analysis: inclusionist versus exclusionist viewpoints. *Psychol. Methods* 3, 23–31. doi: 10.1037/1082-989X.3.1.23

Laws, K. R., McKenna, P. J., and Jauhar, S. (2014). *The Odd One Out. Evidence-Based Mental Health.* Retrieved from: http://ebmh.bmj.com/content/17/3/67/reply#ebmental_el_12207

Larøi, F., Sommer, I. E., Blom, J. D., Fernyhough, C., Ffytche, D. H., Waters, F., et al. (2012). The characteristic features of auditory verbal hallucinations in clinical and nonclinical groups: state-of-the-art overview and future directions. *Schizophr. Bull.* 38, 724–733. doi: 10.1093/schbul/sbs061

Leff, J., Williams, G., Huckvale, M. A., Arbuthnot, M., and Leff, A. (2013). Computer-assisted therapy for medication-resistant auditory hallucinations: proof-of-concept study. *Br. J. Psychiatry* 202, 428–433. doi: 10.1192/bjp.bp.112.124883

Leff, J., Williams, G., Huckvale, M. A., Arbuthnot, M., and Leff, A. (2014). Avatar therapy for persecutory delusions: what is it and how does it work? *Psychosis* 6, 166–176. doi: 10.1080/17522439.2013.773457

Lincoln, T. M. (2010). Letter to the editor: a comment on Lynch et al. (2009). *Psychol. Med.* 40, 878–879. doi: 10.1017/S0033291709991838

McCarthy-Jones, S. R. (2012). *Hearing Voices: The Histories, Meanings and Phenomenologies of Auditory Verbal Hallucinations.* Cambridge, UK: Cambridge University Press.

McCarthy-Jones, S. R., and Fernyhough, C. (2011). The varieties of inner speech: links between quality of inner speech and psychopathological variables in a sample of young adults. *Conscious. Cogn.* 20, 1586–1593. doi: 10.1016/j.concog.2011.08.005

McCarthy-Jones, S. R., Thomas, N., Dodgson, G., Fernyhough, C., Brotherhood, E., and Dudley, R. (2015). "What have we learnt about the ability of cognitive behavioural therapy to help with voice-hearing?," in *Hallucinations: From Theory to Therapy,* eds M. Hayward, C. Strauss, and S. R. McCarthy-Jones (London: Taylor & Francis), 78–99.

McCarthy-Jones, S. R., Thomas, N., Strauss, C., Dodgson, G., Jones, N., and Sommer, I. E. (2014a). Better than mermaids and stray dogs? *Subtyping auditory verbal hallucinations and its implications for research and practice. Schizophr. Bull.* 40, S275–S284. doi: 10.1093/schbul/sbu018

McCarthy-Jones, S. R., Trauer, T., Mackinnon, A., Sims, E., Thomas, N., and Copolov, D. L. (2014b). A new phenomenological survey of auditory hallucinations: evidence of subtypes and implications for theory and practice. *Schizophr. Bull.* 40, 225–235. doi: 10.1093/schbul/sbs156

McKenna, P., and Kingdon, D. (2014). Has cognitive behavioural therapy for psychosis been oversold? *Br. Med. J.* 348:g2295. doi: 10.1136/bmj.g2295

McKenna, P., Lynch, D., and Laws, K. (2010). Letter to the editor: authors' reply. *Psychol. Med.* 40, 879–880. doi: 10.1017/S0033291709991838

McLeod, T., Morris, M., Birchwood, M., and Dovey, A. (2007). Cognitive behavioural therapy group work with voice hearers. Part 1. *Br. J. Nurs.* 16, 248–252. doi: 10.12968/bjon.2007.16.4.22995

Morrison, A. P., and Barratt, S. (2010). What are the components of CBT for psychosis? A Delphi study. *Schizophr. Bull.* 36, 136–142. doi: 10.1093/schbul/sbp118

Morrison, A. P., Renton, J. C., Dunn, H., Williams, S., and Bentall, R. P. (2004). *Cognitive Therapy for Psychosis: A Formulation-Based Approach.* London: Brunner-Routledge.

Morrison, A. P., Turkington, D., Pyle, M., Spencer, H., Brabban, A., Dunn, G., et al. (2014). Cognitive therapy for people with schizophrenia spectrum disorders not taking antipsychotic drugs: a single-blind randomised controlled trial. *Lancet* 383, 1395–1403. doi: 10.1016/S0140-6736(13)62569-6

Murray, J., Ehlers, A., and Mayou, R. A. (2002). Dissociation and post-traumatic stress disorder: two prospective studies of road traffic accident survivors. *Br. J. Psychiatry* 180, 363–368. doi: 10.1192/bjp.180.4.363

National Institute for Health and Care Excellence (NICE) (2009). *Schizophrenia: Core Interventions in the Treatment and Management of Schizophrenia in Primary and Secondary Care. NICE clinical Guideline 82.* London: National Institute for Health and Care Excellence.

National Institute for Health and Care Excellence (NICE) (2015). *Psychosis and Schizophrenia in Adults. NICE Quality Standard 80.* London: National Institute for Health and Care Excellence.

Nayani, T. H., and David, A. S. (1996). The auditory hallucination: a phenomenological survey. *Psychol. Med.* 26, 177–189. doi: 10.1017/S0033291 70003381X

Nelson, H. E., Thrasher, S., and Barnes, T. R. (1991). Practical ways of alleviating auditory hallucinations. *BMJ* 302:327. doi: 10.1136/bmj.302.6772.327

Rapin, L., Dohen, M., Polosan, M., Perrier, P., and Lœvenbruck, H. (2013). An EMG study of the lip muscles during covert auditory verbal hallucinations in schizophrenia. *J. Speech Lang. Hear. Res.* 56, S1882–S1893. doi: 10.1044/1092-4388(2013/12-0210)

Read, J., van Os, J., Morrison, A. P., and Ross, C. A. (2005). Childhood trauma, psychosis and schizophrenia: a literature review with theoretical and clinical implications. *Acta Psychiatr. Scand.* 112, 330–350. doi: 10.1111/j.1600-0447.2005.00634.x

Rosenheck, R., Stroup, S., Keefe, R. S., McEvoy, J., Swartz, M., Perkins, D., et al. (2005). Measuring outcome priorities and preferences in people with schizophrenia. *Br. J. Psychiatry* 187, 529–536. doi: 10.1192/bjp.187.6.529

Royal Australian and New Zealand College of Psychiatrists (2005). Royal Australian and New Zealand College of Psychiatrists clinical practice guidelines for the treatment of schizophrenia and related disorders. *Aust. N.Z. J. Psychiatry* 39, 1–30. doi: 10.1111/j.1440-1614.2005.01516.x

Sackett, D. L., and Cook, D. J. (1993). Can we learn anything from small trials? *Ann. N.Y. Acad. Sci.* 703, 25–32. doi: 10.1111/j.1749-6632.1993.tb26331.x

Salkovskis, P. M., and Campbell, P. (1994). Thought suppression induces intrusion in naturally occurring negative intrusive thoughts. *Behav. Res. Ther.* 32, 1–8.

Schnider, A., and Ptak, R. (1999). Spontaneous confabulators fail to suppress currently irrelevant memory traces. *Nat. Neurosci.* 2, 677–681. doi: 10.1016/0005-7967(94)90077-9

Schulz, K. F., and Grimes, D. A. (2005). Sample size calculations in randomised trials: mandatory and mystical. *Lancet* 365, 1348–1353. doi: 10.1016/S0140-6736(05)61034-3

Serino, A., Heydrich, L., Kurian, M., Spinelli, L., Seeck, M., and Blanke, O. (2014). Auditory verbal hallucinations of epileptic origin. *Epilepsy Behav.* 31, 87–90. doi: 10.1016/j.yebeh.2013.12.014

Smailes, D., Meins, E., and Fernyhough, C. (2014). The impact of negative affect on reality discrimination. *J. Behav. Ther. Exp. Psychiatry* 45, 389–395. doi: 10.1016/j.jbtep.2014.04.001

Smith, B., Steel, C., Rollinson, R., Freeman, D., Hardy, A., and Fowler, D. (2006). "The importance of traumatic events in formulation and intervention in cognitive behavioural therapy for psychosis: three case examples," in *Trauma and Psychosis* eds W. Larkin and A. P. Morrison (London: Routledge), 239–258.

Stephane, M. (2013). Auditory verbal hallucinations result from combinatoric associations of multiple neural events. *Front. Hum. Neurosci.* 7:239. doi: 10.3389/fnhum.2013.00239

Stephane, M., Polis, I., and Barton, S. N. (2001). A subtype of auditory verbal hallucinations respond to treatment by Fluvoxamine. *J. Neuropsychiatry Clin. Neurosci.* 13, 425–427. doi: 10.1176/jnp.13.3.425

Stephane, M., Thuras, P., Nasrallah, H., and Georgopoulos, A. P. (2003). The internal structure of the phenomenology of auditory verbal hallucinations. *Schizophr. Res.* 61, 185–193. doi: 10.1016/S0920-9964(03)00013-6

Thomas, N. (2015). What's really wrong with cognitive behavioural therapy for psychosis? *Front. Psychol.* 6:323. doi: 10.3389/fpsyg.2015.00323

Thomas, N., Hayward, M., Peters, E., van der Gaag, M., Bentall, R. P., and McCarthy-Jones, S. (2014). Psychological therapies for auditory hallucinations (voices): current status and key directions for future research. *Schizophr. Bull.* 40, S202–S212. doi: 10.1093/schbul/sbu037

van der Gaag, M., Valmaggia, L. R., and Smit, F. (2014). The effects of individually tailored formulation-based cognitive behavioural therapy in auditory hallucinations and delusions: a meta-analysis. *Schizophr. Res.* 156, 30–37. doi: 10.1016/j.schres.2014.03.016

Vygotsky, L. S. (1934/1987). "Thinking and speech," in *The Collected Works of L. S. Vygotsky,* Vol. 4, eds R. W. Rieber and A. S. Carton (New York, NY: Plenum Press), 97–119. (Original work published 1934.).

Waters, F., Badcock, J. C., Michie, P., and Mayberry, M. (2006). Auditory hallucinations in schizophrenia: intrusive thoughts and forgotten memories. *Cogn. Neuropsychiatry* 11, 65–83. doi: 10.1080/135468004 44000191

Woods, A., Jones, N., Alderson-Day, B. A., Callard, F., and Fernyhough, C. (2015). Experiences of hearing voices: analysis of a novel phenomenological survey. *Lancet Psychiatry* 2, 323–331. doi: 10.1016/S2215-0366(15)00006-1

Wykes, T., Steel, C., Everitt, B., and Tarrier, N. (2008). Cognitive behaviour therapy for schizophrenia: effect sizes, clinical models, and methodological rigor. *Schizophr. Bull.* 34, 523–537. doi: 10.1093/schbul/sbm114

Zanello, A., Mohr, S., Merlo, M. C., Huguelet, P., and Rey-Bellet, P. (2014). Effectiveness of a brief group cognitive behavioural therapy for auditory verbal hallucinations. *J. Nerv. Ment. Dis.* 202, 144–153. doi: 10.1097/NMD.0000000000000084

Zimmerman, G., Favrod, J., Trieu, V. H., and Pomini, V. (2005). The effect of cognitive behavioural treatment on the positive symptoms of schizophrenia spectrum disorders: a meta-analysis. *Schizophr. Res.* 77, 1–9. doi: 10.1016/j.schres.2005.02.018

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REVIEW
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Can we respond mindfully to distressing voices? A systematic review of evidence for engagement, acceptability, effectiveness and mechanisms of change for mindfulness-based interventions for people distressed by hearing voices

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Adapted mindfulness-based interventions (MBIs) could be of benefit for people distressed by hearing voices. This paper presents a systematic review of studies exploring this possibility and we ask five questions: (1) Is trait mindfulness associated with reduced distress and disturbance in relation to hearing voices? (2) Are MBIs feasible for people distressed by hearing voices? (3) Are MBIs acceptable and safe for people distressed by hearing voices? (4) Are MBIs effective at reducing distress and disturbance in people distressed by hearing voices? (5) If effective, what are the mechanisms of change through which MBIs for distressing voices work? Fifteen studies were identified through a systematic search ($n = 479$). In relation to the five review questions: (1) data from cross-sectional studies showed an association between trait mindfulness and distress and disturbance in relation to hearing voices; (2) evidence from qualitative studies suggested that people distressed by hearing voices could engage meaningfully in mindfulness practice; (3) MBIs were seen as acceptable and safe; (4) there were no adequately powered RCTs allowing conclusions about effectiveness to be drawn; and (5) it was not possible to draw on robust empirical data to comment on potential mechanisms of change although findings from the qualitative studies identified three potential change processes; (i) reorientation of attention; (ii) decentring; and (iii) acceptance of voices. This review provided evidence that MBIs are engaging, acceptable, and safe. Evidence for effectiveness in reducing distress and disturbance is lacking however. We call for funding for adequately powered RCTs that will allow questions of effectiveness, maintenance of effects, mechanisms of change and moderators of outcome to be definitively addressed.

Keywords: mindfulness, person-based cognitive therapy, acceptance and commitment therapy, auditory hallucinations, hearing voices, psychosis, schizophrenia

Introduction

Auditory verbal hallucinations, (or "voices"), are a characteristic feature of psychotic conditions such as schizophrenia (American Psychiatric Association, 2013), as well as being present in a range of other conditions including borderline personality disorder (Slotema et al., 2012), post-traumatic stress disorder (Butler et al., 1996) and Parkinson's disease (Inzelberg et al., 1998) and in non-clinical populations (Daalman et al., 2011). The phenomenology of voice hearing appears similar across diagnostic and non-clinical groups (Daalman et al., 2011; Slotema et al., 2012) and the experience may or may not cause distress and disruption to functioning (Romme and Escher, 1993). For all these reasons, a symptom-based approach to understanding the voice hearing experience, associations with distress and disturbance, and therapeutic interventions is called for.

The dominant psychological therapeutic approach to working with people distressed by hearing voices has been cognitive behavioral therapy for psychosis (CBTp) which has been evaluated in a large number of randomized controlled trials and subsequent meta-analyses (Wykes et al., 2008; van der Gaag et al., 2014). The efficacy of CBTp has been questioned when looking at effects of broad measures on positive symptoms of psychosis (Jauhar et al., 2014), however, when looking at measures of hallucinations specifically, CBTp shows benefits with a moderate effect size, including in the highest quality trials (van der Gaag et al., 2014). Most research in this area has been of CBTp for people experiencing a broad range of psychotic difficulties and dedicated trials of CBT for voice hearers as a specific group are few. There is however good evidence from two randomized trials of CBT for command hallucinations that targeting beliefs about voice power reduces harmful compliance in people who have a history of complying (Trower et al., 2004; Birchwood et al., 2014). Whilst this is an important finding, the primary goal of CBTp is to reduce distress and disturbance to quality of life (Birchwood and Trower, 2006) and CBT may not reduce distress in the context of hearing voices, even when voices are the specific therapeutic target (Birchwood et al., 2014) and improvements to a wide range of quality of life variables has not been well demonstrated. An alternative approach may be warranted therefore when specifically targeting voice-related distress and disturbance.

A recent review (Thomas et al., 2014a) identified the application of mindfulness-based interventions (MBIs) as one of the most significant areas of intervention development since CBTp. Mindfulness refers to a state of consciousness that is characterized by an intentional and non-judgmental awareness of present-moment experiences (e.g., physical sensations, thoughts, sounds, voices). Rather than attempting to alter current experiences or to eliminate them from awareness, a mindful response is one that accepts what is currently present without striving to change it and without becoming absorbed in ruminating on or worrying about these experiences. Mindfulness can be considered both at the state and trait levels. Whilst the degree to which an individual is mindful might fluctuate from 1 h to the next (i.e., state mindfulness) there are also substantial individual differences between people in their tendency to be mindful (i.e., trait mindfulness) (Baer et al., 2006).

It is possible to increase trait mindfulness through MBIs (Eberth and Sedlmeier, 2012) and there is evidence that MBIs can be effective for people diagnosed with a current mental health condition. A recent meta-analysis found that MBIs relative to control conditions were effective at targeting depression symptom severity in people diagnosed with a current episode of major depression (Strauss et al., 2014) and there are a number of reasons why MBIs could also be of benefit for people experiencing distressing voices. First, MBIs are designed to increase non-judgmental acceptance of difficult experiences. Voice hearers often describe trying to resist and suppress their voices, a response which is associated with voice-related distress (Chadwick et al., 2000). The possibility that active acceptance of voices may provide a more useful alternative than seeking to eliminate them has been supported by research on coping (Farhall et al., 2007), and, amongst other approaches, is advocated by the voice-hearer led Hearing Voices Movement (Corstens et al., 2014).

Second, MBIs have been used, in particular, to target rumination and worry, transdiagnostic processes that can cause and maintain depression and anxiety (Nolen-Hoeksema et al., 2008), and a recent meta-analysis of mediation studies has shown that rumination and worry mediate the beneficial effects of MBIs on mental health outcomes (Gu et al., 2015). Rumination and worry have been reported in people with psychosis (Freeman and Garety, 1999; Thomas et al., 2014b) and, when tracking voice activity over time, rumination and worry appear to prospectively predict voice hearing episodes in day to day life (Hartley et al., 2014).

Third, voices are characteristically verbal phenomena, in which negative self-referent content can predominate (Nayani and David, 1996; McCarthy-Jones et al., 2014). Mindfulness-based interventions are thought to involve decentring from current experiences (including voices) and changing meta-cognitive beliefs about the importance and accuracy of thoughts and voice comments (Strauss and Hayward, 2013). In combination with the self-compassionate attitude fostered by MBIs (Gu et al., 2015), this may provide a means through which MBIs can buffer against the impact of negative cognition.

Fourth, whist guided approaches to talking with voices are showing promise (Corstens et al., 2012), people can also become drawn into unhelpful verbal dialogue with them (Thomas, 2015a). Mindful observation of voices provides an alternative response to talking with voices, and may disrupt an unhelpful preoccupation with internal verbal experiences in a similar way to the disruption of rumination by MBIs in depression.

There are therefore a number of good theoretical reasons why MBIs might successfully reduce voice-related distress and disturbance—through promoting acceptance, reducing rumination and worry, through increasing the ability to decenter from negative (especially self-referent) content, through changing meta-cognitive beliefs about the importance and accuracy of voice comments, and by disrupting interaction with voices. Although there are a range of theoretical reasons

for offering MBIs to people distressed by hearing voices, historically caution has been advised due to concerns that lengthy mindfulness practices might exacerbate symptoms (Chadwick, 2014). Kuijpers et al. (2007) reviewed case studies and found a number of instances of meditation-induced psychotic episodes ranging from 2 days to 5 months in duration. However, the form (which may or may not have included mindfulness practice) and duration of meditation practice in these case studies is not clear and MBIs offered in clinical settings typically include relatively short mindfulness practices (<40 min), close support by the group factiliator and limited periods of silence (Segal et al., 2002). Moreover, MBIs designed for people distressed by hearing voices are typically adapted in additional ways. This includes mindfulness practices being particularly brief (<10 min), including guidance on attending to voices and having frequent verbal instructions with no long periods of silence (Chadwick, 2006; Dannahy et al., 2011). Despite the brief length of these practices, there is evidence that people with a mental health diagnosis can learn mindfulness (Strauss et al., 2015) and gain therapeutic benefits (Strauss et al., 2012) with these types of brief practice.

This paper presents a systematic review of the MBI for distressing voices literature with the aim of making recommendations about clinical practice and future research priorities. Whilst other reviews exist evaluating mindfulness and acceptance-based interventions for psychosis overall (Khoury et al., 2013), none, to our knowledge, have considered the specific effects of MBIs on distressing voices. Indeed, from the CBTp literature we know there are different effects on different psychotic experiences (van der Gaag et al., 2014) and a symptom-based approach that can better target core mechanisms has the potential to achieve better outcomes. There are a broad range of psychological interventions that include elements of mindfulness principles, such as Acceptance and Commitment Therapy (ACT) (Hayes et al., 1999). However, ACT is a multi-component approach of which mindfulness principles and mindfulness practice is typically only a part. Therefore, in order for this paper to explore the specific effects of mindfulness principles and practice on distressing voices we will focus on mindfulness-based interventions. We define MBIs as an intervention where the therapeutic foundation is based on mindfulness principles, where mindfulness practice is included in at least half of therapy sessions and where mindfulness home practice is encouraged. This definition allows for the inclusion studies of ACT interventions where mindfulness practice was a core part of the therapy (Shawyer et al., 2012; Bacon et al., 2014) whilst excluding ACT studies where mindfulness practice was not a core element (Bach and Hayes, 2002; Gaudiano and Herbert, 2006). In addition, as we are interested in the effects of MBIs specifically on distressing voices we are restricting this paper to a review of studies that either specifically focus on voices or that include voice-related outcomes in their data analysis.

In this systematic review we ask five questions: (1) Is there evidence that trait mindfulness is associated with reduced levels of distress and disturbance in relation to hearing voices? (2) Is it feasible to apply MBIs to people distressed by hearing voices, that is can people hearing distressing voices engage in mindfulness practice in a meaningful way and apply mindfulness to voice hearing experiences? (3) Are MBIs for distressing voices acceptable and safe, that is, are participants satisfied with the intervention, are drop-out rates low and is there evidence that distress and disturbance worsen following MBIs? (4) Are MBIs for distressing voices effective, that is, do they lead to improvements in distress and disturbance relative to a control condition and are changes sustained? (5) If effective, what are the mechanisms by which MBIs for distressing voices are having their effect? In order to address these questions we present evidence from cross-sectional studies assessing the association between trait mindfulness and voice-related constructs, qualitative studies exploring participant experiences of MBIs, single case evaluations of MBIs, uncontrolled pre-post MBI evaluations as well as RCTs of MBIs for distressing voices.

Method

Mindfulness-based interventions were defined here as an intervention based on mindfulness principles, where mindfulness practice was included in at least half of therapy sessions and where mindfulness home practice was encouraged. Furthermore, studies with participants with psychosis, as opposed specifically for those hearing voices, were excluded unless voice-specific outcomes were reported.

Inclusion Criteria were that studies: (1) either evaluated mindfulness-based interventions (MBI) or were cross-sectional studies of mindfulness-based constructs; (2) either only included participants who had voice hearing experiences or reported findings separately for participants hearing voices; (3) were published in a peer-reviewed journal; (4) reported primary data (i.e., not reviews); (5) reported quantitative or qualitative data analysis; and (6) were available in the English language.

Titles from PsycInfo, Medline, Scopus, and Web of Science were searched on 28 February 2015 combining the terms: [(mindfulness or mindfully or acceptance or "person-based cognitive therapy") and (psychosis or "distressing voices" or hallucination* or "voice hearers" or "voice hearing" or "hearing voices" or "voice acceptance")]. Reference sections of retrieved papers were also searched in order to identify any papers that may have been missed from the database search.

Results

Study Characteristics

After removing duplicates 42 studies remained and were screened. Six studies were removed on the basis of the article title. Abstracts and full texts of the remaining 36 studies were reviewed and 21 rejected, leaving 15 studies to be included in this review. Reference sections of the final set of papers were screened and no additional studies were identified which suggests that the search strategy was sufficiently robust. Details of the search process are shown in the PRISMA diagram in **Figure 1** and details of included studies are shown in **Table 1**.

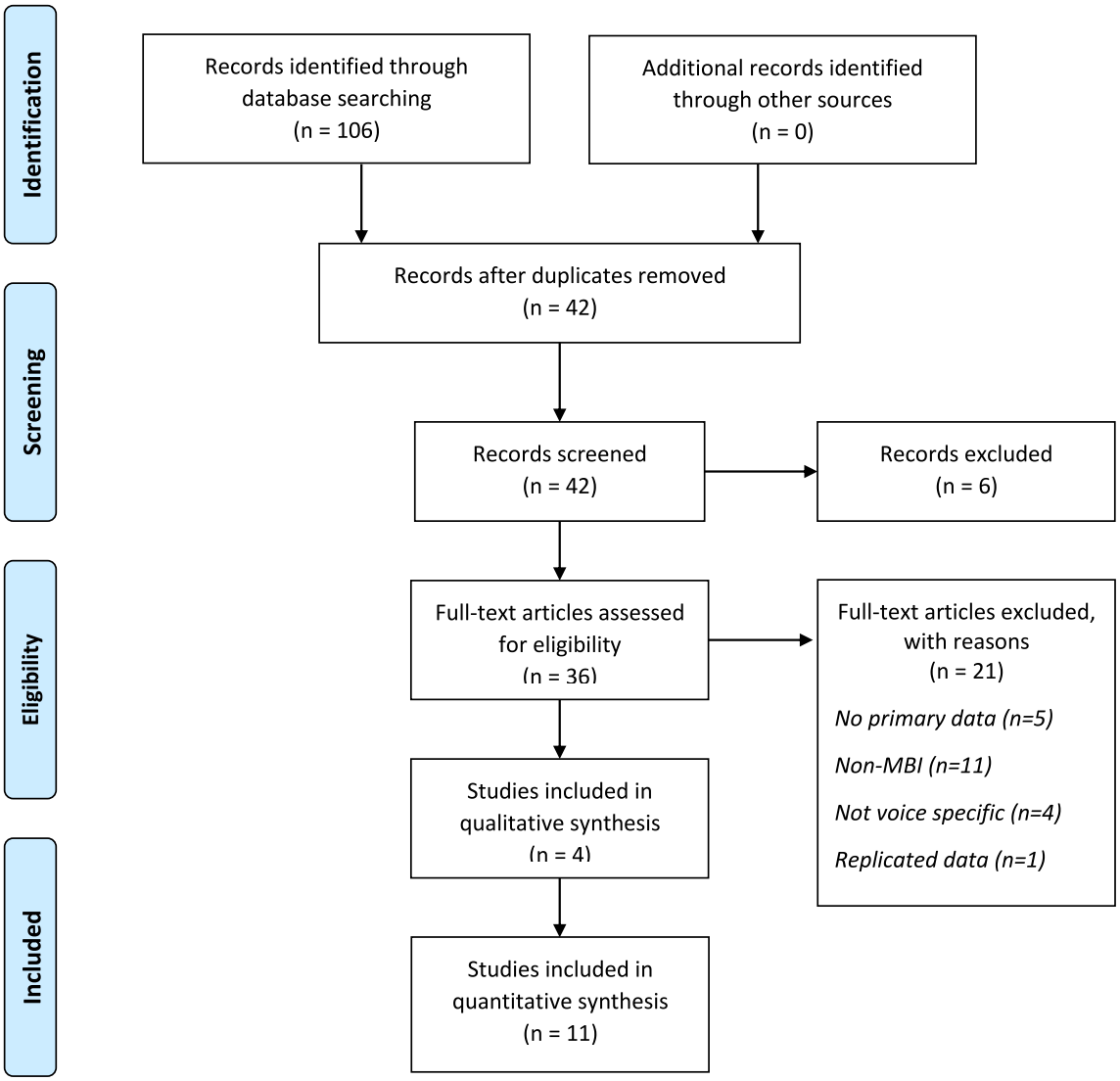

FIGURE 1 | PRISMA diagram showing study selection process.

There were a total of 479 participants across the 15 studies. Of these, five were cross-sectional studies assessing the association between trait mindfulness and voice-related constructs and/or global measures of distress ($n = 247$) (Chadwick et al., 2007; Shawyer et al., 2007; Brockman et al., 2014; Morris et al., 2014; Perona-Garcelán et al., 2014), four were qualitative studies of participant experiences of MBIs ($n = 53$) (Abba et al., 2008; Goodliffe et al., 2010; Bacon et al., 2014; May et al., 2014), one was a case study ($n = 2$) (Newman Taylor et al., 2009), two were uncontrolled pre-post studies ($n = 73$) (Chadwick et al., 2005; Dannahy et al., 2011), and three were RCTs ($n = 104$) (Chadwick et al., 2009; Langer et al., 2010; Shawyer et al., 2012).

Intervention Characteristics

Three forms of MBI were included across the 10 intervention studies. Seven interventional studies (Chadwick et al., 2005, 2009; Abba et al., 2008; Newman Taylor et al., 2009; Goodliffe et al., 2010; Dannahy et al., 2011; May et al., 2014) evaluated therapies based on person-based cognitive therapy (PBCT) (Chadwick, 2006). PBCT in grounded in mindfulness principles. Typically PBCT includes mindfulness practice in each therapy session and daily home practice is recommended. PBCT also draws on CBTp principles and these are integrated within a wider mindfulness-based conceptual framework (e.g., meta-cognitive belief change about the importance and accuracy of voice comments is targeted through cognitive therapy techniques and through mindfulness practice). The therapy can be delivered in groups or to individuals (Chadwick, 2006) with the number of sessions ranging from six (Chadwick et al., 2005) to 12 (May et al., 2014) or more (Newman Taylor et al., 2009). Data from two ACT trials were included (Shawyer et al., 2012; Bacon et al., 2014). In each of these in-session and between-session mindfulness practice

TABLE 1 | Table of included studies.

References	Population (n)	Type of MBI	Study design	Key findings
Brockman et al., 2014	40 adults meeting diagnostic criteria for schizophrenia or schizoaffective disorder and hearing voices in the past 3 months	na	Cross-sectional study reported correlations between acceptance of voices and depression, anxiety, stress, and negative affect	Acceptance of voices (as measured by the VAAS) was significantly negatively correlated with depression, anxiety, and stress (as measured by the DASS-21) and with negative affect (PANAS-negative). The size of the correlation coefficients is not reported in the paper
Chadwick et al., 2007	59 people meeting DSM-IV diagnostic criteria for schizophrenia and currently hearing voices	na	Cross-sectional study reporting correlations between measures of mindfulness, affect, and distress	Mindfulness of distressing voices (SMVQ) was negatively correlated ($r = -0.69$) with negative affect (PANAS-negative) and with self-rated distress in response to hearing voices ($r = -0.63$)
Morris et al., 2014	50 people meeting ICD-10 diagnostic criteria for a psychotic disorder or a severe depressive episode with psychotic symptoms currently hearing voices	na	Cross-sectional study reported correlations between measures of mindfulness, depression, anxiety, and behavioral and emotional resistance to voices	Mindfulness (KIMS—accept without judgment) was negatively correlated with depression (BDI-II: $r = -0.40$) and anxiety (BAI: $r = -0.38$) and with behavioral and emotional resistance to voices (BAVQ-R: *rho* = 0.42 and 0.48, respectively)
Perona-Garcelán et al., 2014	55 university students with high hallucination proneness (scoring >1 sd above mean on LSHS-R) and 28 university students with low hallucination proneness (>1 below mean on LSHS-R)	na	Cross-sectional	Participants with high hallucination proneness were less mindful (SMQ) than participants low on hallucination proneness [$t_{(81)} = -4.56$, $p < 0.001$)
Shawyer et al., 2007	43 adults diagnosed with a psychotic disorder and hearing voices during past 6 months	na	Cross-sectional study reporting correlations between measures of acceptance, depression and quality of life	Acceptance (VAAS-acceptance) was negatively correlated with depression (CDS: *rho* = −0.51) and positively correlated with quality of life (Q-LES-Q: *rho* = 0.56 and 0.35 for subjective feelings and general activities respectively)
Abba et al., 2008	16 people distressing psychosis (11 hearing voices) with voice specific effects mentioned	MBI	Qualitative using grounded theory	A three-stage process of relating differently to psychosis (not just distressing voices) was developed: centring in awareness of psychosis; allowing voices, thoughts, and images to come and go without reacting or struggle; and reclaiming power through acceptance of psychosis and the self
Bacon et al., 2014	9 with persisting positive symptoms and schizophrenia-related diagnosis	ACT including mindfulness practice in-session and encouraged for homework	Qualitative using thematic analysis	Mindfulness is one component of ACT. Amongst other components, mindfulness and acceptance were perceived as helpful, with these seen to contribute to positive changes
Goodliffe et al., 2010	18 adults receiving secondary mental health care and distressed by hearing voices. Most, but not all, had a diagnosis of schizophrenia or schizoaffective disorder	An 8-session PBCT group. A brief (<10 min) mindfulness practice was included in sessions 5–8	Qualitative using grounded theory	One of the four derived categories was "acceptance of voices and self" However, none of the participants explicitly attributed increased acceptance to mindfulness practice and so it is possible that other elements of the therapy were responsible for a change in acceptance
May et al., 2014	10 voice hearers	12 session MBI	Qualitative using thematic analysis	Three themes were derived. The value of mindfulness emerged as a sub-theme within the "Relating to voices" theme
Newman Taylor et al., 2009	2 adults with meeting DSM-IV criteria for schizophrenia and currently hearing voices	12 weekly sessions (1 h each) of an individual MBI based on PBCT approach (Chadwick, 2006)	Case study design reporting weekly changes in self-reported distress	Both participants showed a reduction in self-reported distress (rated weekly on 0–10 scale). For participant A ratings of distress at baseline were 10/10 and 4/10 at the final follow-up and for participant B distress ratings fell from 6/10 at baseline to 0/10 at final follow-up
Chadwick et al., 2005	11 adults meeting diagnostic criteria for a psychotic disorder with 6/11 hearing voices	6 session MBI group based on PBCT approach (Chadwick, 2006)	Pre-post uncontrolled evaluation reporting pre- to post-intervention changes in psychological health	10 people provided pre- and post-therapy data. There were significant pre-post improvements on a measure of psychologist health (CORE-OM: $z = -2.655$, $p = 0.008$)

(Continued)

TABLE 1 | Continued

References	Population (n)	Type of MBI	Study design	Key findings
Dannahy et al., 2011	62 secondary care mental health service users distressed by hearing voices irrespective of psychiatric diagnosis	8–12 session MBI group based on PBCT approach (Chadwick, 2006; Strauss and Hayward, 2013)	Pre-post uncontrolled evaluation reporting pre- to post-intervention changes in psychological health	Using the last-observation-carried forward method to replace missing data there were significant pre-post ($MD = 0.34$, $p < 0.001$) and pre- to 1-month follow-up ($MD = 0.38$, $p < 0.001$) improvements in psychological health [CORE-OM: $F_{(2,\ 122)} = 12.17$, $p < 0.001$]
Chadwick et al., 2009	22 adults meeting DSM-IV diagnostic criteria for schizophrenia and hearing distressing voices for at least two years	10-session MBI group based on PBCT approach (Chadwick, 2006)	RCT of MBI group versus wait-list reporting between-group differences in psychological health and mindfulness	18 participants gave pre and post data. Differences in psychological health (CORE-OM: change score $d = 0.56$) and mindfulness (SMQ and SMVQ: change score $d = 0.86$ and 0.47, respectively) between the MBI and wait-list participants were in the hypothesized direction but not significant
Langer et al., 2010	38 university students with distressing hallucinations (distress rated at 5/10 or higher) provided complete data	8 session MBI group with each session lasting 1 h. Protocol based on MBCT protocol (Segal et al., 2002)	RCT with quasi-randomization. Active control condition involved taking part in 8 one-h video for a about social issues. Reporting between-group differences in distress and anxiety	There were no significant between-group differences in reductions distress at post-intervention, although the effect size was in the medium and in the hypothesized direction ($d = 0.48$). There was a large and significant between-group difference in improvements in anxiety ($d = 0.88$). At 16-weeks post-intervention there were non-significant effects on distress ($d = 0.60$) and a significant effect with a large effect size for anxiety ($d = 0.91$)
Shawyer et al., 2012	44 adults diagnosed with schizophrenia, schizo-affective disorder or an affective psychosis	15 individual CBT + ACT sessions including in-session mindfulness practice and home practice was encouraged	RCT comparing CBT + ACT to an active control (befriending) on a range of measures including distress and disruption in response to hearing voices	There were non-significant post-intervention between-group differences in the small to moderate range in favor of the befriending condition on measures of distress and disruption in response to voices (PSYRATS-AH distress and disruption: $d = 0.37$ and 0.52, respectively)

BAI, Beck Anxiety Inventory (Beck et al., 1988); BAVQ-R, Beliefs about Voices Questionnaires—revised (Chadwick et al., 2000); BDI-II, (Beck et al., 1996); CDS, Calgary Depression Scale (Addington et al., 1993); CORE-OM, Clinical Outcomes in Routine Evaluation—Outcome Measure (Evans et al., 2002); DASS-21, Depression Anxiety and Stress Scales—21 item version (Henry and Crawford, 2005); KIMS, Kentucky Inventory of Mindfulness Skills (Baer et al., 2004); LSHS-R, Launay-Slade Hallucinations Scale-revised (Bentall and Slade, 1985); PANAS-negative, Positive, and Negative Affect Scale—negative affect (Crawford and Henry, 2004); PSYRATS-AH, Psychotic Symptom Rating Scales—Auditory Hallucinations (Haddock et al., 1999); Q-LES-Q, Quality of Life Enjoyment and Satisfaction Questionnaire (Endicott et al., 1993); SMQ, Southampton Mindfulness Questionnaire (Chadwick et al., 2008); SMVQ, Southampton Mindfulness of Voices Questionnaire (Chadwick et al., 2007); VAAS, Voices Acceptance and Action Scale (Shawyer et al., 2007). ACT, Acceptance and Commitment Therapy (Hayes et al., 1999); MBCT, Mindfulness-Based Cognitive Therapy (Segal et al., 2002); PBCT, Person-Based Cognitive Therapy (Chadwick, 2006).

was part of the therapy protocol. In the first of these trials (Shawyer et al., 2012) the intervention was a hybrid of ACT and CBT, combining mindfulness and other ACT methods with cognitive restructuring of beliefs about voice power. The second study (Thomas et al., 2014c) has not yet published quantitative findings however a qualitative paper has been published and was included in this review (Bacon et al., 2014). This was a trial of an 8-session pure ACT intervention for people with persisting hallucinations and/or delusions. In addition to mindfulness principles and practice ACT methods used in these trials were use of metaphors and experiential exercises to promote abandoning unproductive struggle to eliminate persisting experiences (such as voices), to defuse negative thought and voice content, to clarify personal values, and to free behavior from being dominated by avoidance and immersion in psychotic experiences (see Thomas et al. (2013) for details of the therapeutic approach). The final study (Langer et al., 2010) evaluated an adapted MBCT group (Segal et al., 2002). Group MBCT was originally designed as a relapse prevention intervention for recurrent depression. It combines a range of mindfulness practices both in-session and between-sessions with discussion about learning from mindfulness practice forming an important part of the therapy process. In this study MBCT was delivered over the usual eight sessions but sessions were half the typical length (1 h rather than the usual 2–2½h).

Cross-sectional Findings

In a student sample study, Perona-Garcelán et al. (2014), observed that participants highly prone to hallucinations [scoring 1 or more standard deviations above the mean on the Launay-Slade Hallucination Scale—revised (LSHS-R)] (Bentall and Slade, 1985) reported lower levels of mindfulness than participants who were not prone to hallucinations (scoring 1 or more standard deviations below the mean on the LSHS-R). Whilst this study did not specifically explore associations with distress and disturbance it does suggest that the tendency to experience hallucinations is associated with low levels of trait mindfulness and therefore it is plausible to speculate that trait mindfulness might protect from hallucinatory experiences.

The remaining four studies were with clinical groups experiencing voices, each finding a negative association between mindfulness constructs and distress and/or disturbance. In one

study (Chadwick et al., 2007) that reported psychometric properties of the Southampton Mindfulness of Voices Questionnaire, mindfulness of voices correlated negatively with measures of negative affect, voice-related distress and resistance to voices. Similarly, in the second study, Shawyer et al. (2007) reporting the psychometric properties of the Voice Acceptance and Action Scale (VAAS), found that acceptance of voices was associated with less harmful compliance with command hallucinations, lower levels of depression, and improved quality of life. Similarly, in the third study (Brockman et al., 2014) acceptance of voices (also measured by the VAAS) was correlated with depression and anxiety. In the final study (Morris et al., 2014), a negative association was found between mindfulness (as measured by the Kentucky Inventory of Mindfulness Skills) (Baer et al., 2004) and behavioral and emotional resistance to voices as well as with depression and anxiety. Overall, all of the cross-sectional studies showed that greater mindfulness and acceptance of voices were associated with less distress (including voice-related distress, depression, and anxiety) and less disturbance (including resistance to voices, quality of life, and harmful compliance to voice commands).

These studies have used a range of measures, both of mindfulness (including general trait mindfulness and mindfulness and acceptance specifically in relation to voices) and distress (including direct measures of the impact of voices as well as general measures of depression or anxiety). Nonetheless, overall, these findings are consistent with a hypothesis that trait mindfulness can have a positive impact on distress and disturbance in the context of hearing voices. However, findings are equally consistent with a suggestion that lower levels of distress and disturbance promote greater acceptance of voices and enable people to be more mindful. That is, as data from these studies are cross sectional definitive cause-effect conclusions cannot be drawn. They do however provide a mandate for investigating the feasibility, acceptability, and effectiveness of mindfulness-based interventions and it is this evidence to which we now turn.

MBIs: Qualitative Findings

A total of 53 people experiencing psychosis were interviewed about their experience of taking part in an MBI. Interview transcripts were analyzed using thematic analysis ($n = 19$) (Bacon et al., 2014; May et al., 2014) or grounded theory ($n = 34$) (Abba et al., 2008; Goodliffe et al., 2010). Many interviewees in the study by May et al. (2014) spoke of practicing mindfulness between sessions and after therapy had ended, and the majority of the interviewees in the study by Bacon et al. (2014) regarded mindfulness as a particularly useful part of the ACT intervention. However, it is striking that interviewees in the study by Goodliffe et al. (2010) offered no reflections on mindfulness practice. The authors suggested that this may be due to the very limited time made available for mindfulness practice during the therapy, with only one brief practice per session in each of the final four sessions.

Although not everyone found the experience to be helpful, and some struggled to engage with mindfulness practices, most interviewees identified a number of ways in which mindfulness had been beneficial for them. Beneficial processes included; (i) mindfulness helping to reorient attention away from voices and thereby reducing distress as "it helps me focus on something other than the voices so they don't become as distressing" (Participant 3) (Bacon et al., 2014) and (ii) mindfulness facilitating the ability to decenter and allowing oneself to "step back from your thoughts and feelings, become more aware of them" (Alison) (Abba et al., 2008) and being "able to absorb it rather than, rather than have it hit me" (Adam) (May et al., 2014). Interviewees also spoke about acquiring a different attitude toward voices—(iii) one of acceptance of voices as transient, unpleasant sensations, rather than entities that needed to be fought with and eliminated, for example, "we learnt to not put our voices out of our head, but work with them rather than try and get rid of them" (Richard) (May et al., 2014) and "voices can come and go as they please, don't get distressed, just allow it to go away" (Martin) (Abba et al., 2008).

This synthesis of findings from qualitative studies has a number of limitations. Firstly, whilst mindfulness practices were common to the experience of all interviewees, the practices were offered within the context of a range of different MBIs. Secondly, the interviewees represented only a minority of participants who received the MBIs within the trials, and it is likely that they were amongst the participants who had a more positive experience of the therapy. Finally, the study of Goodliffe et al. (2010) did not contribute to the synthesis of process themes as interviewees offered no reflections on practices. Very limited time was made available for mindfulness practice in this study, with only one brief practice per session in each of the final four sessions. This is important as it may suggest that if too little time is devoted to mindfulness practice and discussion of mindfulness principles then participants may perceive few benefits.

MBIs: Uncontrolled Study Findings

The two uncontrolled studies were of PBCT groups for people distressed by hearing voices (Chadwick et al., 2005; Dannahy et al., 2011). In both studies there were significant pre- to post-MBI improvements in general psychological health as measured by the CORE-OM (Clinical Outcomes in Routine Evaluation Outcome Measure) (Evans et al., 2002) with pre-post Cohen's d effect sizes in the moderate range ($d = 0.53$ and 0.57, respectively). The CORE-OM is a broad measure of psychological health rather than being specifically related to voices, however, Dannahy et al. (2011) additionally found significant improvements on a measure of voice distress with a large effect size ($d = 0.75$) and on a measure of voice control with a medium-large effect size ($d = 0.62$).

Whilst these findings are promising, as a control group was not included it is not possible to rule out the possibility that improvements would have occurred without therapy. What is reassuring about these findings, however, is that they do not indicate that the MBI was harmful for people distressed by hearing voices, as overall significant improvements were noted in psychological health as well as on voice-specific measures of distress and control. Moreover, 81% of participants completed therapy in the Dannahy et al. (2011) study which

is an indicator of acceptability—i.e., we would assume higher rates of drop-out if the therapy was unhelpful or harmful to participants.

MBIs: Controlled Study Findings

Langer et al. (2010) invited 63 students who scored highly on the Revised Hallucinations Scale (RHS) (Morrison et al., 2000) and who also reported distress or anxiety in response to these experiences (at greater than 4/10) to take part in their MBI evaluation study. Thirty eight participants completed the full study (60% of those invited). Participants were allocated alternately (rather than randomly) to either the MBI condition or the control group. The MBI was an eight-session course based on mindfulness-based cognitive therapy (MBCT) (Segal et al., 2002) with 1 h sessions rather than the usual 2–2½h sessions. The active control condition involved attending eight 1 h sessions of viewing and commenting on videos of social and political relevance (e.g., religion, immigration). Data are presented for completers only and analysis showed no significant between-group differences in improvements in auditory and visual hallucinations ($d = 0.08$) or in improvements in distress, although the effect size was in the medium range ($d = 0.48$). There was however a large and significant between-group difference in improvements in anxiety ($d = 0.88$). The general pattern of findings was maintained at the 16-week post-intervention follow-up with non-significant but moderate effects on hallucinations and distress ($d = 0.41$ and 0.60) and a significant effect remaining with a large effect size for anxiety ($d = 0.91$).

The experience of hearing voices is not exclusive to those diagnosed with a psychotic condition and is perhaps more common in the non-clinical, non-help seeking population than in the clinical population (Honig et al., 1998). Despite this, non-clinical hallucinations can be associated with at least moderate levels of distress and anxiety, as demonstrated in the study by Langer et al. (2010) and there is no theoretical reason to suspect that the mechanisms through which MBIs work would be different for non-clinical and clinical groups. Effects of the MBI at improving anxiety were large relative to the control condition and sustained over a 4 month period following the intervention. Effects on distress were not significant, although, because these were moderate in size and in the hypothesized direction this may be a type II error as the study was underpowered to detect medium effects. The inclusion of an active control condition is a particular strength of this study as time and attention were controlled for. However, the 40% of participants lost to the study is a concern as it is possible that those failing to benefit were disproportionately likely to drop-out.

Chadwick et al. (2009) randomized 22 people meeting diagnostic criteria for schizophrenia and who had been distressed by hearing voices for at least 2 years to an MBI group or to a wait-list control. Participants were offered a 10 session MBI group that included mindfulness practice in session and between sessions. As this was a feasibility study, it was not powered to detect statistically significant between-group differences and all differences were non-significant. Non-significant between-group differences in improvements in psychological health (CORE-OM) were in the moderate range ($d = 0.56$), improvements in mindfulness were in the large range ($d = 0.86$) and improvements on a measure of AVHs (PSYRATS-AH) were in the small range ($d = 0.26$).

Finally, the RCT by Shawyer et al. (2012) randomized 43 people experiencing command hallucinations to either individual CBT + ACT sessions or to an active befriending condition. Again, this study was underpowered to detect anything other than large between-group effects and no between-group significant differences were found. Post-intervention between-group effect sizes on voice-related outcomes (distress and disruption) were in the small to moderate range, favoring the befriending condition ($d = 0.37$ and 0.52, respectively), which questions the benefits of the intervention condition.

In summary, to date there have only been underpowered RCTs of MBIs for distressing voices with between-group effects mostly being non-significant. The size and direction of between-group effect sizes in the studies by Langer et al. (2010) and Chadwick et al. (2009) suggest that MBIs adapted for distressing voices have promise, however, the findings from the RCT by Shawyer et al. (2012) add a note of caution to this and underline the potential risks in over interpreting effect sizes in small-scale studies. These three studies however do provide a platform for a fully powered trial of MBI for distressing voices which will help to elucidate the size of effects and ascertain the probably by which effects are due to chance.

Discussion

This systematic review set out to answer five questions: (1) Is there evidence that trait mindfulness is associated with reduced levels of distress and disturbance in relation to hearing voices? (2) Is it feasible to apply MBIs to people distressed by hearing voices, that is can people hearing distressing voices engage in mindfulness practice in a meaningful way and apply mindfulness principles to voice hearing experiences? (3) Are MBIs for distressing voices acceptable and safe? (4) Are MBIs for distressing voices effective? (5) If effective, what are the mechanisms by which MBIs for distressing voices are having their effect?

Fifteen studies meeting inclusion criteria were included in the review. In relation to the five review questions: (1) data from cross-sectional studies were consistent in showing an association between trait mindfulness and distress and disturbance in relation to hearing voices; (2) evidence from qualitative studies suggested that people distressed by hearing voices could engage meaningfully in mindfulness practice, including outside of therapy sessions; (3) MBIs were seen as acceptable (high rates of satisfaction and low drop-out rates) and safe (with pre-post MBI improvements on measures of distress and disturbance); (4) there were no adequately powered RCTs allowing us to draw conclusions about effectiveness in reducing distress and disturbance; and (5) given the lack of effectiveness studies it was not possible to draw on robust empirical data to comment on potential mechanisms of change although findings from the qualitative studies identified three potential change processes; (i) reorientation of attention; (ii) decentring; and (iii) acceptance of voices.

In relation to question 1 the review of cross-sectional studies found consistent evidence that trait mindfulness was

associated with reduced hallucination proneness and, more importantly from a therapeutic perspective, that mindfulness is associated with reduced levels of distress (including voice-related distress as well as depression and anxiety) and reduced disturbance (including quality of life and harmful compliance to command hallucinations). These findings corroborate findings in the broader mindfulness literature that trait mindfulness is associated with a wide range of mental health and well-being variables (Brown and Ryan, 2003). Whilst the direction of the relationship between mindfulness, distress, and disturbance cannot be determined from such cross-sectional studies the findings are consistent with (though not proof of) the suggestion that mindfulness might lead to reduced distress and disturbance in response to hearing voices. We can therefore further speculate that training people in mindfulness through MBIs might help to alleviate voice-related distress and disturbance.

The review of qualitative studies (question 2) suggest that at least some people experiencing distressing voices can engage meaningfully in mindfulness practices in MBIs and this finding is important as it has been suggested that distressing voices might be a barrier to meaningful engagement (Kuijpers et al., 2007). Contrary to this suggestion, participants reported practicing mindfulness outside of therapy sessions—at home and also after the therapy had ended—suggesting a willingness to practice beyond the confines of a therapy group. In addition to formal mindfulness practices, participants reported bringing mindfulness to voice hearing experiences in daily life. A caveat to these findings however is that participants willing to take part in qualitative interviews may not have been representative of the wider study sample and they may have been disproportionately likely to have had a positive experience of the therapy. This means that it is possible that some participants struggled to engage with mindfulness practice but that their perspectives were not included in the qualitative analyses. Future qualitative research should actively attempt to recruit participants who have found engagement difficult (e.g., interviewing those people dropping out from MBI groups) in order to explore this possibility further.

Mindfulness-based interventions for distressing voices appear to be acceptable to participants (question 3) both as ratings of satisfaction were high (Bacon et al., 2014) but also because drop-out rates were low (Dannahy et al., 2011), a reasonable proxy for acceptability. They also appear to be safe, at least on a group level, as pre- to post-MBI improvements in distress and disturbance were found in the quantitative evaluation studies. This suggests at the very least that the MBIs under investigation were not leading to (group-level) worsening of difficulties in terms of distress and disturbance, although some evidence was found for increases in voice activity following mindfulness practice (Bacon et al., 2014). The lack of evidence for exacerbating distress along with low rates of therapy drop-out and high satisfaction ratings are of interest and clinical relevance as historically people experiencing active symptoms of psychosis have often been excluded from MBIs due to concerns about detrimental effects (Chadwick, 2014). It is important to note however that all the MBIs evaluated in this review included adapted, brief mindfulness practices. Mindfulness-based interventions such as MBCT include much longer mindfulness practices (up to 40 min) and our findings do not allow us to comment on the acceptability or safety of these longer practices. As such we would recommend the use of brief practices, with the most common form of practice used in the studies in this review taken from Chadwick (2006).

The question of effectiveness in improving distress and disturbance (question 4) is still outstanding due in part to only having findings from underpowered studies to draw on. In the current review one trial with students distressed by hallucinatory experiences (Langer et al., 2010) did find improvements in anxiety following an MBI relative to a control condition and improvements were sustained for 16 weeks following therapy. However, the two RCTs with clinical samples were underpowered to detect anything other than large effect sizes and the lack of significant between-group differences on measures of distress and disturbance are therefore difficult to interpret. Whilst the pilot RCT by Chadwick et al. (2009) found non-significant effects in favor MBI in comparison to the wait-list control group, the larger RCT by Shawyer et al. (2012) found non-significant between-group effects on measures of voice-related distress and disruption in favor of the befriending control condition. This latter finding is important as it highlights the need for an adequately powered RCT that is able to answer questions of effectiveness definitively. Therefore, as yet we do not know if MBIs for distressing voices are effective at targeting voice-related distress and disturbance and as such we would advocate caution in routinely offering these groups in clinical settings.

The lack of certainty about effectiveness, coupled with the multi-component nature of many of the interventions under review, means that it is also somewhat premature to answer questions about mechanisms of change (question 5). Findings from the four qualitative studies shed some light on possible therapeutic processes however. In particular, becoming more mindful was seen by participants to enhance the ability to: (i) reorient attention; (ii) cultivate the ability to decenter from difficult thoughts and voices; and (iii) accept voices. These processes are in line with three of the five proposed mechanisms of change outlined in the introduction. We suggested that MBIs for distressing voices could potentially be of benefit through reducing interaction with voices, enabling decentring from voice hearing experiences and increasing acceptance of voices. Current qualitative findings are in line with these suggestions but further scrutiny of effectiveness and potential mechanisms of change is now needed.

Limitations

This review is limited in its ability to answer all of the five posed questions as this is an area of research in its early stages. Whilst the evidence to date allows us to suggest that research investigating MBIs for distressing voices is warranted and that MBIs for distressing voices can be meaningful engaged with, acceptable and safe we do not yet know if these interventions lead to improvements in distress and disturbance, if improvements can be sustained over time or what the precise mechanisms of change are that underlie improvements, although findings from the qualitative studies begin to elucidate what these mechanisms might be.

A significant limitation is a lack of adequately powered RCTs. This makes it difficult to distinguish between a genuine lack of effectiveness on the one hand and genuine effects that have not

been detected on the other (i.e., type II errors). Now that we can more confidently answer the first three of our posed questions future research can focus on addressing questions of effectiveness (question 4) in definitive RCTs. Effectiveness questions should not just focus on short-term outcomes but also on maintenance of any changes, as if effects are quickly lost following the end of the therapy it is questionable if it is a good use of scarce therapeutic resources to invest in MBIs for distressing voices.

A further limitation is that even if MBIs for distressing voices are effective we do not know the mechanisms by which they might be having their effects (question 5) and most studies in this review failed to measure the broad range of potential mechanisms that might be at play. As noted earlier, theoretically we would expect MBIs for distressing voices to work through a number of mechanisms including enhancing acceptance, reducing rumination and worry, increasing decentring (especially in relation to negative self-referent voice content), increasing self-compassion and disengaging from interacting with voices. Whilst definitive RCTs could better address questions of effectiveness these would be further enhanced by including measures of these mechanisms during the MBI process and using mediation analyses to investigate which, if any, are important mechanisms of therapeutic change.

A particular limitation in this review and in the field more broadly is the lack of consensus on primary therapeutic targets and on agreeing on reliable and valid measures of these targets. We argue along with others (Birchwood and Trower, 2006) that the primary aim of psychological therapies for distressing voices is to reduce distress and disturbance. However, precisely what is meant by this is not well-established. By reducing distress do we mean specifically in relation to hearing voices, and so we would want valid and reliable measures of voice-related distress, or do we mean distress more globally, beyond voices, in which case we might want to focus on valid and reliable measures of depression and anxiety? By reducing disturbance do we mean specifically in relation to voices, such as compliance with harmful command hallucinations, or do we mean globally? If the latter, what do we mean by and how do we measure disturbance? Might this be through measuring recovery, time use, life satisfaction or quality of life? These are clearly still open questions without agreement and we would do well to reach a consensus amongst researchers in the field before moving forward with large research trials.

Finally, many of the intervention studies in this review included non-mindfulness components in their interventions through the inclusion of elements from CBTp (Goodliffe et al., 2010; Dannahy et al., 2011; Shawyer et al., 2012; May et al., 2014) and values-directed behavior change elements from ACT (Shawyer et al., 2012; Bacon et al., 2014). Going forward and needing a clearer understanding about the effectiveness of MBIs for distressing voices and their mechanisms of change it would be worthwhile exploring the specific-effects of learning mindfulness independent of effects of other potentially therapeutic elements.

Future Research

Questions for future research arise from the limitations noted above. A research priority is to reach a consensus in the field on the primary therapeutic targets for MBIs for distressing voices specifically but also ideally for psychological therapies for distressing voices more broadly. If this could be achieved a next step would be to agree on a core set of valid and reliable measures and this could involve a process of developing and testing new measures. Challenges should be noted given limitations in metacognitive ability in this client group which might make reliable self-report difficult to achieve using standard self-report tools (Farhall et al., 2013). New technologies including neuroimaging methods applied to brain regions involved in voice-hearing and inner verbalization, and ecological momentary assessment of preoccupation with voices may provide useful complements to these traditional self-report measures (Thomas, 2015b).

Another priority for future research is to conduct adequately powered RCTs of MBIs that conform to CONSORT criteria, that include long-term follow-up, that include control conditions that themselves do not contain active elements of the therapy under investigation and that include measures of the proposed mechanisms outlined above. These studies could provide answers to the questions 4 and 5 that we posed but were unable to adequately answer and would help to elucidate mechanisms of change (if any). Elucidating mechanisms of change would mean that therapy protocols for MBIs for distressing voices could be further refined to better target the most important of the mechanisms and thereby potentially lead to improved outcomes.

Last but not least, we perhaps need to pay better attention to what works for whom across the psychological therapies for distressing voices field. It may well be the case that "one size does not fit all" and that different therapeutic approaches (e.g., CBTp, ACT, MBI) benefit different groups of people. For instance, neuropsychological factors such as attention do not seem to be a barrier to CBTp (Premkumar et al., 2011) but may impede the ability to engage with and benefit from MBIs given the emphasis on sustained attention to present moment experience. Whilst expensive to conduct, questions of moderation of effect could be included in future RCTs comparing different therapeutic approaches with a view to elucidating what works for whom or indeed whether MBIs can be effective for people with a broad range of presentations (see Hayward et al., this volume for further discussion of the "what works for whom" question).

Conclusions

In this systematic review we set out to answer five questions. We have shown that mindfulness-based interventions adapted for distressing voices are warranted (as trait mindfulness was associated with distress and disturbance in people hearing voices), engaging, acceptable, and safe. Potential mechanisms of change have been highlighted through qualitative studies including reorientation of attention, decentring from voices and acceptance of voices. There are however insufficient randomized controlled trials to date to allow us to answer questions about effectiveness—we cannot say whether or not MBIs for people distressed by hearing voices are effective at targeting distress and disturbance either in the short or longer term. Future research therefore needs to focus on adequately powered RCTs with long-term follow-up and measurement of proposed MBI mechanisms

and moderators. Before this research is taken forward we suggest that an attempt is made to reach consensus in the psychological therapies for distressing voices field as to primary therapeutic targets and measurement tools for these targets. If this could be achieved it will allow us to better integrate findings across studies with a view to providing definitive answers to the questions about the effectiveness and mechanisms of change of MBIs for distressing voices and thereby offering people distressed by hearing voices an informed choice about therapeutic approaches.

References

Abba, N., Chadwick, P., and Stevenson, C. (2008). Responding mindfully to distressing psychosis: a grounded theory analysis. *Psychother. Res.* 18, 77–87. doi: 10.1080/10503300701367992

Addington, D., Addington, J., and Maticka-Tyndale, E. (1993). Assessing depression in schizophrenia: the Calgary Depression Scale. *Br. J. Psychiatry* 163, 39–44.

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders, 5th Edn.* Washington, DC: Author.

Bach, P., and Hayes, S. C. (2002). The use of acceptance and commitment therapy to prevent the rehospitalization of psychotic patients: a randomized controlled trial. *J. Consult. Clin. Psychol.* 70, 1129–1139. doi: 10.1037/0022-006X.70.5.1129

Bacon, T., Farhall, J., and Fossey, E. (2014). The active therapeutic processes of acceptance and commitment therapy for persistent symptoms of psychosis: clients' perspectives. *Behav. Cogn. Psychother.* 42, 402–420. doi: 10.1017/S1352465813000209

Baer, R. A., Smith, G. T., and Allen, K. B. (2004). Assessment of mindfulness by self-report: the Kentucky inventory of mindfulness skills. *Assessment* 11, 191–206. doi: 10.1177/1073191104268029

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., and Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment* 13, 27–45. doi: 10.1177/1073191105283504

Beck, A. T., Epstein, N., Brown, G., and Steer, R. A. (1988). An inventory for measuring clinical anxiety: psychometric properties. *J. Consult. Clin. Psychol.* 56, 893–897. doi: 10.1037/0022-006X.56.6.893

Beck, A. T., Steer, R. A., and Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II.* San Antonio, TX: Pearson.

Bentall, R. P., and Slade, P. (1985). Reliability of a scale measuring disposition towards hallucination: a brief report. *Personal. Individ. Dif.* 6, 527–529.

Birchwood, M., Michail, M., Meaden, A., Tarrier, N., Lewis, S., Wykes, T., et al. (2014). Cognitive behaviour therapy to prevent harmful compliance with command hallucinations (COMMAND): a randomised controlled trial. *Lancet Psychiatry* 1, 23–33. doi: 10.1016/S2215-0366(14)70247-0

Birchwood, M., and Trower, P. (2006). Cognitive therapy for command hallucinations: not a quasi-neuroleptic. *J. Contemp. Psychother.* 36, 1–7. doi: 10.1007/s10879-005-9000-y

Brockman, R., Kiernan, M., and Murrell, E. (2014). Psychometric properties of two brief versions of the voices acceptance and action scale (VAAS): implications for the second-wave and third-wave behavioural and cognitive approaches to auditory hallucinations. *Clin. Psychol. Psychother.* doi: 10.1002/cpp.1916. [Epub ahead of print].

Brown, K. W., and Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *J. Pers. Soc. Psychol.* 84, 822–848. doi: 10.1037/0022-3514.84.4.822

Butler, R. W., Mueser, K. T., Sprock, J., and Braff, D. L. (1996). Positive symptoms of psychosis in posttraumatic stress disorder. *Biol. Psychiatry* 39, 839–844. doi: 10.1016/0006-3223(95)00314-2

Chadwick, P. (2006). *Person-based Cognitive Therapy for Distressing Psychosis.* London: Wiley.

Chadwick, P. (2014). Mindfulness for psychosis. *Br. J. Psychiatry* 204, 333–334. doi: 10.1192/bjp.bp.113.136044

Chadwick, P., Barnbrook, E., and Newman-Taylor, K. (2007). Responding mindfully to distressing voices: links with meaning, affect and relationship with voice. *Tidsskr. Nor. Psykologforen.* 44, 581–587. Available online at: http://www.psykologtidsskriftet.no/index.php?seks_id=19102&a=2

Chadwick, P., Hember, M., Symes, J., Peters, E., Kuipers, E., and Dagnan, D. (2008). Responding mindfully to unpleasant thoughts and images: reliability and validity of the Southampton mindfulness questionnaire (SMQ). *Br. J. Clin. Psychol.* 47(Pt 4), 451–455. doi: 10.1348/014466508X314891

Chadwick, P., Hughes, S., Russell, D., Russell, I., and Dagnan, D. (2009). Mindfulness groups for distressing voices and paranoia: a replication and randomized feasibility trial. *Behav. Cogn. Psychother.* 37, 403–412. doi: 10.1017/S1352465809990166

Chadwick, P., Lees, S., and Birchwood, M. (2000). The revised beliefs about voices questionnaire (BAVQ-R). *Br. J. Psychiatry* 177, 229–232. doi: 10.1192/bjp.177.3.229

Chadwick, P., Taylor, K. N., and Abba, N. (2005). Mindfulness Groups for People with Psychosis. *Behav. Cogn. Psychother.* 33, 351–359. doi: 10.1017/S1352465805002158

Corstens, D., Longden, E., and May, R. (2012). Talking with voices: exploring what is expressed by the voices people hear. *Psychosis* 4, 95–104. doi: 10.1080/17522439.2011.571705

Corstens, D., Longden, E., McCarthy-Jones, S., Waddingham, R., and Thomas, N. (2014). Emerging perspectives from the hearing voices movement: implications for research and practice. *Schizophr. Bull.* 40(Suppl. 4), S285–S294. doi: 10.1093/schbul/sbu007

Crawford, J. R., and Henry, J. D. (2004). The positive and negative affect schedule (PANAS): construct validity, measurement properties and normative data in a large non-clinical sample. *Br. J. Clin. Psychol.* 43(Pt 3), 245–265. doi: 10.1348/0144665031752934

Daalman, K., Boks, M. P. M., Diederen, K. M. J., de Weijer, A. D., Blom, J. D., Kahn, R. S., et al. (2011). The same or different? A phenomenological comparison of auditory verbal hallucinations in healthy and psychotic individuals. *J. Clin. Psychiatry* 72, 320–325. doi: 10.4088/JCP.09m05797yel

Dannahy, L., Hayward, M., Strauss, C., Turton, W., Harding, E., and Chadwick, P. (2011). Group person-based cognitive therapy for distressing voices: pilot data from nine groups. *J. Behav. Ther. Exp. Psychiatry* 42, 111–116. doi: 10.1016/j.jbtep.2010.07.006

Eberth, J., and Sedlmeier, P. (2012). The Effects of mindfulness meditation: a meta-analysis. *Mindfulness* 3, 174–189. doi: 10.1007/s12671-012-0101-x

Endicott, J., Nee, J., Harrison, W., and Blumenthal, R. (1993). Quality of life enjoyment and satisfaction questionnaire: a new measure. *Psychopharmacol. Bull.* 29, 321–326.

Evans, C., Connell, J., Barkham, M., Margison, F., McGrath, G., Mellor-Clark, J., et al. (2002). Towards a standardised brief outcome measure: psychometric properties and utility of the CORE-OM. *Br. J. Psychiatry* 180, 51–60. doi: 10.1192/bjp.180.1.51

Farhall, J., Greenwood, K., and Jackson, H. (2007). Coping with hallucinated voices in schizophrenia: a review of self-initiated strategies and therapeutic interventions. *Clin. Psychol. Rev.* 27, 476–493. doi: 10.1016/j.cpr.2006.12.002

Farhall, J., Shawyer, F., Thomas, N., and Morris, E. (2013). "Clinical assessment and assessment measures," in *Acceptance and Commitment Therapy and Mindfulness for Psychosis*, eds E. Morris, L. Johns, and J. Olive (Chichester: Wiley-Blackwell), 47–63.

Freeman, D., and Garety, P. A. (1999). Worry, worry processes and dimensions of delusions. *Behav. Cogn. Psychother.* 27, 47–62.

Gaudiano, B. A., and Herbert, J. D. (2006). Acute treatment of inpatients with psychotic symptoms using acceptance and commitment therapy: pilot results. *Behav. Res. Ther.* 44, 415–437. doi: 10.1016/j.brat.2005.02.007

Goodliffe, L., Hayward, M., Brown, D., Turton, W., and Dannahy, L. (2010). Group person-based cognitive therapy for distressing voices: views from the hearers. *Psychother. Res.* 20, 447–461. doi: 10.1080/10503301003671305

Gu, J., Strauss, C., Bond, R., and Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clin. Psychol. Rev.* 37, 1–12. doi: 10.1016/j.cpr.2015.01.006

Haddock, G., McCarron, J., Tarrier, N., and Faragher, E. B. (1999). Scales to measure dimensions of hallucinations and delusions: the psychotic symptom rating scales (PSYRATS). *Psychol. Med.* 29, 879–889.

Hartley, S., Haddock, G., Vasconcelos, E., Sa, D., Emsley, R., and Barrowclough, C. (2014). An experience sampling study of worry and rumination in psychosis. *Psychol. Med.* 44, 1605–1614. doi: 10.1017/S0033291713002080

Hayes, S., Strosahl, K., and Wilson, K. (1999). *Acceptance and Commitment Therapy: The Process and Practice of Mindful Change, Second Edition: An Experiential Approach to Behaviour Change*. New York, NY: Guildford Press.

Henry, J. D., and Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): construct validity and normative data in a large non-clinical sample. *Br. J. Clin. Psychol.* 44(Pt 2), 227–239. doi: 10.1348/014466505X29657

Honig, A., Romme, M. A., Ensink, B. J., Escher, S. D., Pennings, M. H., and Devries, M. V. (1998). Auditory hallucinations: a comparison between patients and nonpatients. *J. Nerv. Mental Dis.* 186, 646–651.

Inzelberg, R., Kipervasser, S., and Korczyn, A. D. (1998). Auditory hallucinations in Parkinson's disease. *J. Neurol. Neurosurg. Psychiatry* 64, 533–535. doi: 10.1136/jnnp.64.4.533

Jauhar, S., McKenna, P. J., Radua, J., Fung, E., Salvador, R., and Laws, K. R. (2014). Cognitive-behavioural therapy for the symptoms of schizophrenia: systematic review and meta-analysis with examination of potential bias. *Br. J. Psychiatry* 204, 20–29. doi: 10.1192/bjp.bp.112.116285

Khoury, B., Lecomte, T., Gaudiano, B. A., and Paquin, K. (2013). Mindfulness interventions for psychosis: a meta-analysis. *Schizophr. Res.* 150, 176–184. doi: 10.1016/j.schres.2013.07.055

Kuijpers, H. J., van der Heijden, F. M., Tuinier, S., and Verhoeven, W. M. (2007). Meditation-induced psychosis. *Psychopathology* 40, 461–464. doi: 10.1159/000108125

Langer, A. I., Cangas, A. J., and Gallego, J. (2010). Mindfulness-based intervention on distressing hallucination-like experiences in a nonclinical sample. *Behav. Change* 27, 176–183. doi: 10.1375/bech.27.3.176

May, K., Strauss, C., Coyle, A., and Hayward, M. (2014). Person-based cognitive therapy groups for distressing voices: a thematic analysis of participant experiences of the therapy. *Psychosis* 6, 16–26. doi: 10.1080/17522439.2012.708775

McCarthy-Jones, S., Trauer, T., Mackinnon, A., Sims, E., Thomas, N., and Copolov, D. (2014). A new phenomenological survey of auditory verbal hallucinations: evidence for subtypes and implications for theory and practice. *Schizophr. Bull.* 40, 231–235. doi: 10.1093/schbul/sbs156

Morris, E. M., Garety, P., and Peters, E. (2014). Psychological flexibility and nonjudgemental acceptance in voice hearers: relationships with omnipotence and distress. *Aust. N.Z. J. Psychiatry* 48, 1150–1162. doi: 10.1177/0004867414535671

Morrison, A. P., Wells, A., and Nothard, S. (2000). Cognitive factors in predisposition to auditory and visual hallucinations. *Br. J. Clin. Psychol.* 39, 67–78. doi: 10.1348/014466500163112

Nayani, T. H., and David, A. S. (1996). The auditory hallucination: a phenomenological survey. *Psychol. Med.* 26, 177–189.

Newman Taylor, K., Harper, S., and Chadwick, P. (2009). Impact of mindfulness on cognition and affect in voice hearing: evidence from two case studies. *Behav. Cogn. Psychother.* 37, 397–402. doi: 10.1017/S135246580999018X

Nolen-Hoeksema, S., Wisco, B. E., and Lyubomirsky, S. (2008). Rethinking rumination. *Perspect. Psychol. Sci.* 3, 400–424. doi: 10.1111/j.1745-6924.2008.00088.x

Perona-Garcelán, S., García-Montes, J. M., López-Jiménez, A. M., Rodríguez-Testal, J. F., Ruiz-Veguilla, M., Ductor-Recuerda, M. J., et al. (2014). Relationship between self-focused attention and mindfulness in people with and without hallucination proneness. *Span. J. Psychol.* 17, 1–8. doi: 10.1017/sjp.2014.23

Premkumar, P., Peters, E. R., Fannon, D., Anilkumar, A. P., Kuipers, E., and Kumari, V. (2011). Coping styles predict responsiveness to cognitive behaviour therapy in psychosis. *Psychiatry Res.* 187, 354–362. doi: 10.1016/j.psychres.2010.12.029

Romme, M., and Escher, S. (1993). *Accepting Voices*. London: MIND Publications.

Segal, Z. V., Williams, J. M. G., and Teasdale, J. D. (2002). *Mindfulness-based Cognitive Therapy for Depression*. New York, NY: Guildford Press.

Shawyer, F., Farhall, J., Mackinnon, A., Trauer, T., Sims, E., Ratcliff, K., et al. (2012). A randomised controlled trial of acceptance-based cognitive behavioural therapy for command hallucinations in psychotic disorders. *Behav. Res. Ther.* 50, 110–121. doi: 10.1016/j.brat.2011.11.007

Shawyer, F., Ratcliff, K., Mackinnon, A., Farhall, J., Hayes, S. C., and Copolov, D. (2007). The voices acceptance and action scale (VAAS): pilot Data. *J. Clin. Psychol.* 63, 593–606. doi: 10.1002/jclp.20366

Slotema, C. W., Daalman, K., Blom, J. D., Diederen, K. M., Hoek, H. W., and Sommer, I. E. C. (2012). Auditory verbal hallucinations in patients with borderline personality disorder are similar to those in schizophrenia. *Psychol. Med.* 42, 1873–1878. doi: 10.1017/S0033291712000165

Strauss, C., Cavanagh, K., Oliver, A., and Pettman, D. (2014). Mindfulness-based interventions for people diagnosed with a current episode of an anxiety or depressive disorder: a meta-analysis of randomised controlled trials. *PLoS ONE* 9:e96110. doi: 10.1371/journal.pone.0096110

Strauss, C., and Hayward, M. (2013). "Group person-based cognitive therapy for distressin psychosis," in *Acceptance and Commitment Therapy and Mindfulness for Psychosis*, eds E. Morris, L. Johns, and J. Oliver (Chichester: Wiley-Blackwell), 240–254.

Strauss, C., Hayward, M., and Chadwick, P. (2012). Group person-based cognitive therapy for chronic depression: a pilot randomized controlled trial. *Br. J. Clin. Psychol.* 51, 345–350. doi: 10.1111/j.2044-8260.2012.02036.x

Strauss, C., Luke, G., Hayward, M., and Jones, F. (2015). Can brief mindfulness practice be of benefit? Evidence from an evaluation of group person-based cognitive therapy for depression. *Cogn. Behav. Ther.* 7, 1–18. doi: 10.1017/S1754470X14000312

Thomas, N. (2015a). "A model for the development of acceptance and mindfulness based therapies: preoccupation with psychotic experiences as a treatment target," in *Incorporating Acceptance and Mindfulness into the Treatment of Psychosis: Current Trends and Future Directions*, ed B. Gaudiano (New York, NY: Oxford University Press), 203–226.

Thomas, N. (2015b). "What have we learnt about how to capture and measure the outcomes of psychological therapies for voices?," in *Psychological Approaches to Understanding and Treating Auditory Hallucinations: From Theory to Therapy,* eds M. Hayward, C. Strauss, and S. McCarthy-Jones (Hove: Routledge), 100–128.

Thomas, N., Hayward, M., Peters, E., van der Gaag, M., Bentall, R. P., Jenner, J., et al. (2014a). Psychological therapies for auditory hallucinations (voices): current status and key directions for future research. *Schizophr. Bull.* 40(Suppl. 4), S202–S212. doi: 10.1093/schbul/sbu037

Thomas, N., Morris, E., Shawyer, F., and Farhall, J. (2013). "Acceptance and commitment therapy for voices acceptance and commitment therapy for psychosis," in *Acceptance and Commitment Therapy and Mindfulness for Psychosis,* eds E. Morris, L. Johns, and J. Oliver (Chichester: Wiley), 95–111.

Thomas, N., Ribaux, D., and Phillips, L. J. (2014b). Rumination, depressive symptoms and awareness of illness in schizophrenia. *Behav. Cogn. Psychother.* 42, 143–155. doi: 10.1017/S1352465812000884

Thomas, N., Shawyer, F., Castle, D. J., Copolov, D., Hayes, S. C., and Farhall, J. (2014c). A randomised controlled trial of acceptance and commitment therapy (ACT) for psychosis: study protocol. *BMC Psychiatry*14:198. doi: 10.1186/1471-244X-14-198

Trower, P., Birchwood, M., Meaden, A., Byrne, S., Nelson, A., and Ross, K. (2004). Cognitive therapy for command hallucinations: randomised controlled trial. *Br. J. Psychiatry* 184, 312–320. doi: 10.1192/bjp.184.4.312

van der Gaag, M., Valmaggia, L. R., and Smit, F. (2014). The effects of individually tailored formulation-based cognitive behavioural therapy in auditory hallucinations and delusions: a meta-analysis. *Schizophr. Res.* 156, 30–37. doi: 10.1016/j.schres.2014.03.016

Wykes, T., Steel, C., Everitt, B., and Tarrier, N. (2008). Cognitive behavior therapy for schizophrenia: effect sizes, clinical models, and methodological rigor. *Schizophr. Bull.* 34, 523–537. doi: 10.1093/schbul/sbm114

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Establishing the "Fit" between the Patient and the Therapy: The Role of Patient Gender in Selecting Psychological Therapy for Distressing Voices

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The experience of hearing distressing voices has recently attracted much attention in the literature on psychological therapies. A new "wave" of therapies is considering voice hearing experiences within a relational framework. However, such therapies may have limited impact if they do not precisely target key psychological variables within the voice hearing experience and/or ensure there is a "fit" between the profile of the hearer and the therapy (the so-called "What works for whom" debate). Gender is one aspect of both the voice and the hearer (and the interaction between the two) that may be influential when selecting an appropriate therapy, and is an issue that has thus far received little attention within the literature. The existing literature suggests that some differences in voice hearing experience are evident between the genders. Furthermore, studies exploring interpersonal relating in men and women more generally suggest differences within intimate relationships in terms of distancing and emotionality. The current study utilized data from four published studies to explore the extent to which these gender differences in social relating may extend to relating within the voice hearing experience. The findings suggest a role for gender as a variable that can be considered when identifying an appropriate psychological therapy for a given hearer.

Keywords: auditory hallucinations, distressing voices, psychological therapy, mindfulness, gender, emotional reaction, behavioral response

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INTRODUCTION

The experience of hearing distressing voices has recently attracted much attention in the literature on psychological therapies. This interest seems partly motivated by a desire to improve upon the moderate effects of Cognitive Behavior Therapy for Psychosis (CBTp; Jauhar et al., 2014; van der Gaag et al., 2014). The cognitive-behavioral model of voice hearing proposes that beliefs held about voices influence levels of distress and how people respond to them (e.g., Chadwick and Birchwood, 1994). Hence, CBTp for voices aims to work with these beliefs, in order to reduce distress and disturbance. However, there has recently been a shift from conceptualizing a voice

as a sensory stimulus that the hearer holds *beliefs about*, to a voice as a person-like stimulus which the hearer has a *relationship with* (Hayward et al., 2011). This conceptualization is consistent with personal accounts of hearing voices where the hearers typically personify voices and report having relationships with them as if they were real people (Escher and Romme, 2012; McCarthy-Jones et al., 2014a). Understanding voices within relational frameworks has resulted in a new "wave" of therapies for voices that focus upon the "experience" of relating to and with distressing voices. Many of these developments draw on the principles of CBTp, but also reflect additional influences.

Max Birchwood and colleagues have developed a treatment based on a relational approach (Social Rank Theory) to specifically target command hallucinations. Cognitive Therapy for Command Hallucinations (CTCH) is based on the finding that perceptions of voice power and superiority reflect appraisals of broader social status (Birchwood et al., 2004) and aims to reduce voice-related distress through altering the power balance between voice hearer and voice by increasing the power of the hearer. A recent large multicenter trial of CTCH reported reduced compliance and perceived voice power compared with treatment as usual (Birchwood et al., 2014). However, it remains to be determined whether these positive findings generalize to other types of voices and beliefs about voices.

Hayward and colleagues have extended the relational focus beyond power to include issues of proximity and intimacy. Drawing upon Birtchnell's (1996, 2002) Relating Theory, they have demonstrated similarities between voice and social relationships on the axes of both power and proximity (Hayward, 2003). Additionally, distant relating to the voice has consistently been associated with distress, suggesting that a safe distance from a voice cannot be achieved (Hayward et al., 2008; Sorrell et al., 2010). Relating Therapy (RT) has been developed to assist hearers to engage assertively with both their voices and other people within their social worlds. Whilst the effectiveness of RT needs to be addressed within randomized controlled trials, findings to date from case series analyses and qualitative research are encouraging and suggest that issues of *both* power *and* proximity can influence distress and may be amenable to therapeutic modification (Hayward et al., 2009; Hayward and Fuller, 2010).

A further way to change voice-hearers' maladaptive relationships with their voices may be to disengage from responding to voices interpersonally through either Mindfulness-based (e.g., Dannahy et al., 2011) or Acceptance and Commitment Therapy (ACT; Thomas et al., 2013) approaches (see Strauss et al., 2015, for a review of mindfulness-based interventions for voices). Evidence from small uncontrolled studies with voice-hearers show that mindfulness based approaches are associated with significant improvements in psychological well-being (Chadwick et al., 2009; Dannahy et al., 2011). ACT is a similar approach to mindfulness which has been applied to help people disengage from responding to voices automatically and to regard them simply as patterns of words (Thomas et al., 2013). Findings from randomized controlled trials of ACT for psychosis are thus far promising (Bach and Hayes, 2002; Gaudiano and Herbert, 2006) and further work is underway to develop the evidence base (Thomas et al., 2014).

Although the evidence base for relationally based therapies is thus far encouraging, such therapies may have limited impact if they do not ensure a "fit" between the profile of the hearer and the therapy (the so-called "What works for whom" debate). It is possible that theoretical models and therapeutic approaches informed by interpersonal perspectives may be relevant to only a sub-set of hearers, and indeed, that different interpersonal approaches may be more or less suited to different types of voice-hearers or voice-hearing experiences (Hayward et al., 2011).

CBT based approaches have evolved to be focused on individualized case conceptualization as the key means of determining therapeutic direction (Tarrier and Johnson, 2006). However, this process would benefit significantly from research-based principles to aid in conceptualizing individual differences related to voice experience and prioritizing therapy targets (van der Gaag et al., 2014). Gender is one aspect of both the voice and the hearer (and the interaction between the two) that may be influential when selecting an appropriate therapy. Consequently, it is surprising that so little attention has been paid to gender within the literature, especially the gender of the hearer. The existing literature on hearer gender suggests that differences are evident: voice hearing is more common in women (Rector and Seeman, 1992; Murphy et al., 2010), who have a higher frequency of voices (Sharma et al., 1999) and a more delusional interpretation of these experiences (Gonzalez et al., 2008); whereas voice hearing begins at an earlier age for men and is more persistent (Gonzalez et al., 2008). With respect to gender of the voice, the "dominance" of the male voice seems evident for both men and women (Legg and Gilbert, 2006). No differences have been reported across genders with respect to beliefs about voices (e.g., Thomas et al., 2015).

Accepting the similarities between relating to voices and social others described earlier, the fit between hearer and relationally based therapy is likely to be influenced by gender differences in interpersonal relating more generally. In terms of proximity of relating, there is evidence of gender differences in self-reported desire for closeness in intimate relationships, with men seeking greater distance and women greater closeness (Feeney, 1999; Birtchnell and Evans, 2004). There is also evidence of gender differences in emotional reactivity (increased in women, Skowron and Dendy, 2004), and in intensity (with women experiencing emotions more intensely than men, Searle and Meara, 1999). There is also good evidence from large cross-cultural reviews and meta-analyses that men report higher attachment avoidance than women whereas women report higher attachment anxiety than men in adult attachment relationships, providing further support for gender differences in interpersonal relating (Schmitt, 2003; Del Giudice, 2011).

In summary, the gender differences in relating outlined above suggest that females might be more inclined to engage with voices and exhibit strong emotional reactions when relating to them. By comparison, male hearers might seek to distance themselves from voices in order to limit exposure to associated emotions. We aimed to test hypothesized relationships between gender and ways of relating and responding to voices in a sample of voice hearers drawn from four independent studies, and tested three specific hypotheses:

Hypothesis 1—Female hearers will engage more with their predominant voice, when compared to male hearers—evidenced by significantly higher scores on the engagement scales of the Beliefs About Voices Questionnaire (BAVQ-R).

Hypothesis 2—Male hearers will respond to their predominant voice with greater resistance, when compared to female hearers—evidenced by significantly higher scores on the resistant scales of the Beliefs About Voices Questionnaire (BAVQ-R).

Hypothesis 3—Male hearers will relate to their dominant voice from a position of greater distance, when compared to female hearers—evidenced by significantly higher scores on the distance scale of the Voice and You (VAY).

METHODS

Participants

Data were drawn from the baseline data of four published studies: Dannahy et al. (2011), Hayward (2003), Hayward et al. (2008), and Sorrell et al. (2010). In total, data from 148 participants was included in this study, 75 of whom were women. Participants had a mean age of 39.56 years ($sd = 9.76$), had been hearing voices for ∼14.84 years ($sd = 10.43$), and were all prescribed antipsychotic medication. Diagnoses were obtained from either participants or case notes and were as follows: 117 schizophrenia, 8 schizoaffective disorder, 5 psychosis, 8 psychotic depression, 1 bipolar disorder, 4 personality disorder, 1 PTSD, and 4 were unknown.

Most participants contributed data concerning both emotional/behavioral responses to their voices, and relating to voices. Additionally, some participants (from Dannahy et al., 2011) contributed only data about their relational responding to voices, and some participants contributed only data on emotional/behavioral responses to voices (from Hayward, 2003). See **Table 1** for the profile of participants and their contributions to this study.

Ethics approval for the four published studies was granted by the National Research Ethics Service within the United Kingdom. Research Governance approval was granted by the appropriate Mental Health Trust within the National Health Service.

Measures

The Beliefs about Voices Questionnaire–Revised (BAVQ-R)

Emotional and behavioral responses to voices were measured using the BAVQ-R. The BAVQ-R is a 35-item questionnaire comprising five subscales: three assessing beliefs about the dominant voice in the form of malevolence (6 Items), benevolence (6 Items) and omnipotence (6 Items); and two assessing resistance (9 Items) and engagement (8 Items). The resistance and engagement subscales are each further divided into *emotional* and *behavioral* responses to the voice. All items are measured on a four-point scale (0–3). Internal reliability for the BAVQ-R has been shown to be good, with Cronbach's α scores for each of the primary subscales as follows: 0.84 malevolence, 0.88 benevolence, 0.74 omnipotence, 0.85 resistance, and 0.87 for engagement (Chadwick et al., 2000).

TABLE 1 | Participant demographics and contributions to BAVQ-R* and VAY analyses.

	Hayward, 2003	Hayward et al., 2008	Sorrell et al., 2010	Dannahy et al., 2011	Combined
Male (*N*)	16	16	19	22	73
Female (*N*)	11	11	13	40	75
Age – *M*(SD)	39.52 (10.73)	39.52 (10.54)	38.1 (9.3)	41.1 (9.2)	39.56 (9.76)
Diagnosis					
Schizophrenia	26	16	20	55	117
Schizoaffective disorder	0	4	4	0	8
Psychosis	0	0	0	5	5
Psychotic depression	1	3	4	0	8
Bipolar disorder	0	0	1	0	1
Personality disorder	0	3	0	1	4
PTSD	0	0	0	1	1
Unknown	0	1	3	0	4
Duration of voice hearing (years)	12.59 (8.30)	15.40 (13.27)	17.06 (10.70)	14.3 (9.7)	14.84 (10.43)
Participants contributing to total VAY	0	26	31	62	119
Participants contributing to total BAVQ-R	27	27	32	30	116

** BAVQ-R data taken from Dannahy et al. (2011) did not appear in the original publication.*

Voice and You (VAY)

The VAY is a 28-item measure of interrelating between the hearer and his/her predominant voice. Relating is measured across *four* scales: two concerning the hearer's perception of the relating of the voice in the form of dominance (7 Items) and intrusiveness (5 Items); and two concerning the relating of the hearer in the form of distance (7 Items) and dependence (9 Items). Each item is measured on a four-point Likert scale (0–3). The VAY has good internal consistency ($\alpha > 0.75$ for all scales) and test-retest reliability ($r > 0.7$ for all scales; Hayward et al., 2008).

Planned Data Analysis

All analyses were carried out using parametric analyses due to their increased power compared to non-parametric analyses and robustness to violations with relatively equal group sample sizes. When Levene's tests were significant the appropriate test statistics and alphas were reported. Prior to hypothesis testing we compared the sample characteristics of participants from each data set using chi square tests for categorical variables and ANOVAs for continuous variables. Independent-means *t*-tests were carried out in order to test each hypothesis individually, with participant gender as the grouping variable. The dependent variables of interest for each hypothesis and their respective measures were as follows: *Total Engagement, Emotional Engagement and Behavioral Engagement (BAVQ-R, Hypothesis 1); Total Resistance, Emotional Resistance, and Behavioral Resistance (BAVQ-R, Hypothesis 2); Voice Hearer Distance (VAY, Hypothesis 3)*. We then explored the potential confounding influence of age on these main analyses using ANCOVAs. Finally, we explored associations between gender and additional BAVQ-R and VAY subscales again using independent *t*-tests. Effect sizes were calculated using Cohen's *d* where $d = 0.2$ is considered a "small" effect size, 0.5 represents a "medium" effect size, and 0.8 a "large" effect size.

RESULTS

As data were drawn from previously published studies, it was assumed that all relevant data checks and cleaning had been administered by the respective authors. Analysis indicated no difference between samples in terms of sex [$\chi^2_{(1, n=147)} = 0.01$, $p = 0.934$], age [$F_{(3, 139)} = 0.34$, $p = 0.79$; see **Table 1** for mean scores], or the BAVQ-R and VAY dependent variables, except for the *behavioral engagement* subscale of the BAVQ-R [$F_{(78.35, 1076.84)} = 2.72$, $p = 0.048$]; however, Tukey's HSD and Scheffe's procedure *post-hoc* tests were unable to determine which groups differed, suggesting the study was underpowered to detect this effect (see **Table 2** for BAVQ-R means and standard deviations and **Table 3** for the VAY). Finally, no differences were detected between men and women with regards to age, years of voice hearing, diagnosis or type of medication taken (all $ps > 0.1$).

Hypothesis Testing

Independent-means *t*-tests were conducted to test each hypothesis (see **Table 3** for gender mean scores and standard deviations). Due to the exploratory nature of the study, a medium effect size (0.5) was deemed to be a suitable target when carrying out a power analysis. This analysis indicated the need for 102 participants (51 per condition) in order to attain 80% power, assuming an alpha of 0.05. A total sample of 620 (310 per condition) would be required to detect small effect sizes (0.2). Therefore, the study was adequately powered to detect medium and large effect sizes but not smaller effects.

TABLE 2 | Means and standard deviations of BAVQ-R subscales grouped by publication.

Dependent variable	Hayward, 2003	Hayward et al., 2008	Sorrell et al., 2010	Dannahy et al., 2011
Total resistance	18.41 (7.42)	20.52 (6.28)	18.23 (8.09)	21.33 (5.38)
Behavioral resistance	10.04 (4.26)	10.44 (4.16)	9.26 (5.04)	11.17 (3.90)
Emotional resistance	8.37 (3.91)	10.07 (3.37)	9.03 (3.93)	10.17 (2.35)
total engagement	5.96 (7.68)	3.7 (5.38)	5.97 (7.04)	5.96 (3.32)
Behavioral engagement	3.85 (4.07)	2.07 (2.69)	3.41 (3.32)	1.93 (2.00)
Emotional engagement	3.00 (4.49)	1.63 (2.91)	2.66 (4.51)	1.2 (2.09)
Omnipotence	11.78 (3.41)	12.52 (4.39)	11.03 (4.95)	13.57 (2.97)
Malevolence	10.96 (6.03)	11.59 (5.17)	11.22 (6.70)	12.60 (3.52)
Benevolence	5.04 (6.57)	3.70 (5.38)	4.34 (5.45)	2.03 (3.34)

TABLE 3 | Means and standard deviations of VAY subscales grouped by publication.

Dependent variable	Hayward, 2003	Hayward et al., 2008	Sorrell et al., 2010	Dannahy et al., 2011
Voice dominance	–	16.41 (6.42)	14.78 (6.85)	17.13 (4.74)
Voice intrusiveness	–	10.15 (4.82)	9.03 (4.56)	10.35 (3.87)
Hearer dependence	–	6.22 (5.97)	8.34 (6.78)	8.77 (5.18)
Hearer distance	–	16.33 (4.84)	13.48 (5.52)	14.13 (4.03)

Hypothesis 1—Female hearers will engage more with their predominant voice, when compared to male hearers—evidenced by significantly higher scores on the engagement scales of the Beliefs About Voices Questionnaire (BAVQ-R).

There were no gender differences in voice engagement, as measured by the BAVQ-R [$t_{(114)} = 1.23$, $p = 0.221$]. This finding would suggest that, contrary to the hypothesis, male and female voice hearers do not seem to engage differently with their voices. See **Table 4** for mean responding scores grouped by gender.

Hypothesis 2—Male hearers will respond to their predominant voice with greater resistance, when compared to female hearers—evidenced by significantly higher scores on the resistant scales of the Beliefs About Voices Questionnaire (BAVQ-R).

There was a significant difference in the extent to which participants resisted their voices. However, contrary to the hypothesis, the greatest resistance was demonstrated by female hearers [$t_{(106.18)} = -3.15$, $p = 0.002$]. Further analysis suggested that this difference was evident for both the behavioral [$t_{(109.36)} = -2.75$, $p = 0.007$] and emotional [$t_{(101.21)} = -2.77$, $p = 0.007$] aspects of resistance.

Hypothesis 3—Male hearers will relate to their dominant voice from a position of greater distance, when compared to female hearers—evidenced by significantly higher scores on the distance scale of the Voice and You (VAY).

There was a significant difference in the extent to which male and female hearers related distantly to their voices. However, contrary to the hypothesis, women related from a position of significantly greater distance [$t_{(117)} = -2.30$, $p = 0.023$].

Influence of Age

Due to the possible confounding influence of age on the analyses, associations were explored between age and responses to voices. An ANCOVA test with age entered as a covariate found this variable to have little effect on the above mentioned main effects. The relative significance (p) values with the effects of age removed were as follows: *Emotional Resistance (BAVQ-R)* = 0.005, *Behavioral Resistance (BAVQ-R)* = 0.017, *Total Resistance (BAVQ-R)* = 0.004, *Emotional Engagement (BAVQ-R)* = 0.091, *Behavioral Engagement (BAVQ-R)* = 0.238, *Total Engagement (BAVQ-R)* = 0.206, *Voice Hearer Distance* = 0.034.

Additional Analysis

Exploratory analysis of the remaining subscales of the BAVQ-R and VAY was carried out in order to identify gender-related differences not predicted by the hypotheses. As can be seen in **Table 5**, women were found to appraise their voice experience as being more omnipotent [$t_{(114)} = -2.93$, $p = 0.004$], more malevolent [$t_{(110.42)} = -2.61$, $p = 0.010$], and more dominant [$t_{(118)} = -3.03$, $p = 0.003$] than men. Further, the tendency for men to appraise their voice experience as more benevolent than women approached significance [$t_{(111.89)} = 1.96$, $p = 0.051$].

DISCUSSION

Voice hearing experiences are being considered within relational frameworks, and empirical studies suggest that "relationships"

TABLE 4 | Mean, standard deviations, and effect sizes for scores on the BAVQ-R and VAY grouped by gender.

Scale item	*N*	Male	Female	Sig.	*d*
Emotional resistance	116	8.58 (4.01)	10.30 (2.56)	0.007**	0.52
Behavioral resistance	115	9.18 (4.76)	11.35 (3.62)	0.007**	0.52
Total resistance	115	17.77 (7.67)	21.64 (5.40)	0.002**	0.59
Emotional engagement	116	2.67 (3.92)	1.54 (3.08)	0.086	0.32
Behavioral engagement	116	3.17 (3.33)	2.45 (2.98)	0.223	0.23
Total engagement	116	5.38 (6.49)	3.98 (5.71)	0.221	0.23
Voice hearer distance	119	13.46 (4.90)	15.42 (4.40)	0.023*	0.42

*$p < 0.05$; **$p < 0.01$.

TABLE 5 | Means, standard deviations, and effect sizes of additional subscales of the BAVQ-R and VAY grouped by gender.

Scale Item	*N*	Male	Female	*t*	Sig.	*d*
Omnipotence (BAVQ-R)	116	11.17 (4.32)	13.32 (3.54)	−2.93	0.004**	0.55
Malevolence (BAVQ-R)	116	10.37 (5.93)	12.93 (4.61)	−2.61	0.01*	0.49
Benevolence (BAVQ-R)	116	4.47 (5.61)	2.70 (4.56)	1.98	0.051	0.35
Voice Dominance (VAY)	120	14.68 (6.33)	17.79 (4.87)	−3.03	0.003**	0.56
Voice Intrusiveness (VAY)	120	9.23 (4.54)	10.54 (3.95)	−1.69	0.093	0.31
Hearer Dependence (VAY)	120	7.60 (5.81)	8.57 (5.94)	−0.91	0.366	0.17

*$p < 0.05$; **$p < 0.01$.

with voices share many similarities with social relationships. Given that differences exist in the ways that males and females relate socially (females seeking greater intimacy and closeness; males seeking greater distance), this study explored the possible influence of gender upon hearer responses within relationships with voices. It was hypothesized that female hearers would seek to engage with their voices and exhibit strong emotional reactions to them, whilst male hearers would seek to resist their voices and keep them at a distance. Data were drawn from four published studies involving clinical voice hearers and, contrary to expectations, female hearers did not engage with their voices more than male hearers. Instead, female hearers responded to their voices with significantly greater resistance and sought greater distance from them.

The findings from this study would therefore appear to contradict the gender differences reported in the literature on social relating. Rather than exhibiting a stronger emotional reaction and seeking to express greater intimacy with voices, female hearers exhibited greater resistance to their voices and attempted to withdraw from them. However, a review of the items within the "emotional resistance" scale of the BAVQ-R suggests that an alternative interpretation might be available. The scale contains items that require the respondent to rate how much voices make them feel frightened, down, angry, and anxious. Responding affirmatively to these items could be interpreted as emotional reactivity, rather than resistance. The resistance that is captured by the "behavioral resistance" scale (e.g., I try to stop my voice/I tell my voice to leave me alone) could then be considered as an attempt to push voices away in response to this strong emotional reaction, as the hearer seeks to distance themselves from the source of these strong and unpleasant emotions.

This interpretation of resistant behavior being triggered by an emotional reaction in female hearers is consistent with what is known about the negative and personally salient content of voice utterances. The content of voices often relates to past abuse and traumatic events (Hardy et al., 2005) and females who have been diagnosed with psychosis (e.g., Fisher et al., 2009; Shah et al., 2014) and hear voices (Daalman et al., 2012) more frequently report experiences of childhood abuse. If, by virtue of a hearer's gender, they are disposed toward a stronger emotional reaction (e.g., Searle and Meara, 1999), an appropriate behavioral response would be to try and eliminate the stimulus (voice utterances) that is generating the distressing emotion. If the stimulus cannot be eliminated, an alternative strategy might be to try and withdraw from the stimulus and create some distance between oneself and the voice. Both of these approaches have been utilized instinctively (Tsai and Ku, 2005) and therapeutically (Tarrier et al., 1990) with people who hear distressing voices with some effect, but may not generate positive outcomes in the longer term (Tarrier et al., 1993). Indeed, such "fight" and "flight" strategies have been associated with a range of negative outcomes (see Shawyer et al., 2013 for a review).

Conceptually, the interpretation of this study's findings both supports the central role of emotion in (at least) maintaining psychotic experiences (Garety et al., 2001), and also elaborates the cognitive model of voices. Appraisals of/beliefs about voices are the central tenet of the model, whereby the hearer's appraisal of their voice (as all powerful and having malevolent intent) has a significant influence upon their emotional and behavioral responses. The findings from this study suggest that the behavioral (resistant) response of the (female) hearer may (in part) be triggered, not wholly by the appraisal of the voice, but also by their emotional response—thereby elaborating the "consequences" (C) part of the ABC model by making explicit the association between emotional and behavioral responses. The findings may also have implications for the role of appraisal within the model, as emotional responses to voices could be stimulated by negative and personally salient content of voices, without appraisals exerting a mediating influence. This possibility is consistent with the findings of Close and Garety (1998) that voice content (As) and hearer responses (Cs) were consistent for all of the participants within their study. This direct relationship between As and Cs may also contribute to an understanding of the limited impact of CBT upon voice distress, despite successfully modifying beliefs about voices (e.g., Birchwood et al., 2014).

A further interpretation of this study's findings is offered by the additional exploratory analysis. Female hearers perceived their voices as significantly more powerful (omnipotent and dominant) and malevolent, compared to the perceptions of males. This might suggest that the emotional response of female hearers is influenced by their cognitive appraisals of the voices, corroborating the central tenet of the cognitive model (Chadwick and Birchwood, 1994). From an interpersonal perspective, the distribution of power across genders may be relevant here. Where power imbalances are evident in romantic relationships, males are perceived to be more powerful (Felmlee, 1994; Simpson et al., 2015). This imbalance may interact with the most common perception of voice gender (male—McCarthy-Jones et al., 2014a) and create a sense of disempowerment for female hearers which provokes a strong emotional reaction and resistant response.

Given the ability of the content and appraisals of voices to trigger an emotional response in hearers, and the possibility that female hearers might react more strongly to these emotions, what does this say about male hearers? Is it the case that voices trigger an emotional response of less intensity in males, or do they react less strongly to an emotional response of a similar intensity? Known gender differences in adult attachment might suggest that men, who are more likely to have avoidant attachment styles, might experience less negative affect in responses to voices. However, models of adult attachment also suggest that in the context of extreme stress, avoidant attachment strategies can "break down" and are no longer effective, resulting in overwhelming negative affect (Mikulincer and Shaver, 2010).

Clinical Implications

The clinical implications of the findings from this study seem both broad and narrow. From a broad perspective, there is a suggestion that closer attention should be paid to the links between emotional and behavioral responses to voices, and their association with the negative and personal salience of the content of voice utterances. Making these connections within an individual formulation will normalize and validate the responses of the hearer (Corstens and Longden, 2013), and identify targets

for intervention. These targets may include the behavioral responses of the hearer—and the possible evidence that different responses can generate to support the development of new (and less distressing) meaning.

If we know that passive/submissive and aggressive responses to voices, whilst understandable and instinctive, can maintain distress (Shawyer et al., 2013), what alternatives might exist? One option might be to do nothing—to merely notice the voice and locate one's attention elsewhere. Such a response is practiced and developed within mindfulness-based approaches, and can generate new meaning to support beliefs about the self as having some control, even when voices are around. Hallucination-proneness has been reported to be negatively correlated with mindfulness (Perona-Garcelán et al., 2014) and preliminary evidence has been generated for the potential of mindfulness-based approaches with voice hearers (Dannahy et al., 2011; Strauss et al., 2015). A further option might be to respond assertively—talking back to the voice in a manner that respects both the self and the voice; letting the voice know how it's making one feel, and offering evidence to support a more balanced (and less negative) view of self. A novel therapy is being developed by Hayward et al. (2009) to explore this way of responding and a pilot RCT is underway (Hayward et al., 2014). A final option for responding differently might involve responding in an "anti-complementary" way (Thomas et al., 2009), e.g., responding in a friendly manner to a derogatory voice.

A narrower implication of this study's findings concerns the fit of interventions to the gender of the hearer. Given their stronger emotional reaction to voices, and the greater extent to which they might be drawn into responding to the voice in a resistant manner, how might the alternative ways of responding suggested above be more or less effective for female hearers? Mindfulness-based interventions seem an obvious candidate as the invitation within this approach is not to react to voices. If a female hearer feels as if she is helplessly drawn into responding passively to her voice, what meaning might she give to her ability to bring her attention away from voices, and not get caught-up in listening to them, despite their insistence that she do so? What impact might this response have upon her sense of self? Future research might benefit from exploring the experience of hearers within mindfulness-based interventions, with a focus upon the effectiveness of the approach across genders.

LIMITATIONS

There are a several limitations to this study and analyses which pinpoint areas for further research. First, although this study benefits from a pooled data set, the total sample size is relatively small and possibly not powered to detect small between-group effects. Second, the multiple testing will have increased the likelihood of Type I errors. However, due to the exploratory nature of our study, we did not want to be too conservative and apply bonferroni corrections (Perneger, 1998). Third, the voice hearers who participated in the studies may not be representative of all voice hearers, for example, participants may be more willing or open to describing their voice hearing experiences than other voices hearers or by virtue of the studies' inclusion criteria participants are unlikely to have been in more acute phases of distress. Relatedly, there is growing recognition that there are different subgroups of voice hearers (McCarthy-Jones et al., 2014b) and gender and responses to voices may be more relevant in some groups compared to others. Fourth, although we explored and rejected the potentially confounding influence of age on our analyses, there may be other important but unmeasured confounds which better explain the association between gender and response to voices, including severity of voices and voice-related distress. Finally, our study did not investigate mechanisms which might account for associations between gender and ways of relating to voices. Attachment theory is a key interpersonal theory and may be an important variable to investigate in developing understanding of how males and females relate to their voices as well as other key people in their lives (Berry et al., 2012).

To overcome these limitations, we recommend that future studies should include large representative samples which enable subgroup analyses of different types of voice-hearing experiences. These studies should include multi-dimensional measures of voices which assess voice-related severity and distress as well as other important factors, including beliefs about, and ways of relating to, voices and adult attachment style.

AUTHOR CONTRIBUTIONS

All authors listed, have made substantial, direct and intellectual contribution to the work, and approved it for publication.

REFERENCES

Bach, P., and Hayes, S. C. (2002). The use of acceptance and commitment therapy to prevent the rehospitalization of psychotic patients: a randomized controlled trial. *J. Consult. Clin. Psychol.* 70:1129. doi: 10.1037/0022-006X.70.5.1129

Berry, K., Wearden, A., Barrowclough, C., Oakland, L., and Bradley, J. (2012). An investigation of adult attachment and the nature of relationships with voices. *Br. J. Clin. Psychol.* 51, 280–291. doi: 10.1111/j.2044-8260.2011.02027.x

Birchwood, M., Gilbert, P., Gilbert, J., Trower, P., Meaden, A., Hay, J., et al. (2004). Interpersonal and role-related schema influence the relationship with the dominant 'voice' in schizophrenia: a comparison of three models. *Psychol. Med.* 34, 1571–1580. doi: 10.1017/S0033291704002636

Birchwood, M., Michail, M., Meaden, A., Tarrier, N., Lewis, S., Wykes, T., et al. (2014). Cognitive behaviour therapy to prevent harmful compliance with command hallucinations (COMMAND): a randomised controlled trial. *Lancet Psychiatry* 1, 23–33. doi: 10.1016/S2215-0366(14)70247-0

Birtchnell, J., and Evans, C. (2004). The Person's relating to others questionnaire (PROQ2). *Pers. Individ. Dif.* 36, 125–140. doi: 10.1016/S0191-8869(03)00073-4

Birtchnell, (1996). *How Humans Relate: A New Interpersonal Theory*. Chichester: Psychology Press.

Birtchnell, J. (2002). Psychotherapy and the interpersonal octagon. *Psychol. Psychother.* 75, 349–363. doi: 10.1348/147608302320365235

Chadwick, P., and Birchwood, M. (1994). The omnipotence of voices. A cognitive approach to auditory hallucinations. *Br. J. Psychiatry* 164, 190–201. doi: 10.1192/bjp.164.2.190

Chadwick, P., Hughes, S., Russell, D., Russell, I., and Dagnan, D. (2009). Mindfulness groups for distressing voices and paranoia: a replication and randomized feasibility trial. *Behav. Cogn. Psychother.* 37, 403–412. doi: 10.1017/S1352465809990166

Chadwick, P., Lees, S., and Birchwood, M. (2000). The revised beliefs about voices questionnaire (BAVQ-R). *Br. J. Psychiatry* 177, 229–232. doi: 10.1192/bjp.177.3.229

Close, H., and Garety, P. (1998). Cognitive assessment of voices: further developments in understanding the emotional impact of voices. *Br. J. Clinical Psychol.* 37, 173–188. doi: 10.1111/j.2044-8260.1998.tb01292.x

Corstens, D., and Longden, E. (2013). The origins of voices: links between life history and voice hearing in a survey of 100 cases. *Psychosis* 5, 270–285. doi: 10.1080/17522439.2013.816337

Daalman, K., Diederen, K. M. J., Derks, E. M., van Lutterveld, R., Kahn, R. S., and Sommer, I. E. (2012). Childhood trauma and auditory verbal hallucinations. *Psychol. Med.* 42, 2475–2484. doi: 10.1017/S0033291712000761

Dannahy, L., Hayward, M., Strauss, C., Turton, W., Harding, E., and Chadwick, P. (2011). Group person-based cognitive therapy for distressing voices: pilot data from nine groups. *J. Behav. Ther. Exp. Psychiatry* 42, 111–116. doi: 10.1016/j.jbtep.2010.07.006

Del Giudice, M. (2011). Sex differences in romantic attachment: a meta-analysis. *Pers. Soc. Psychol. Bull.* 37, 193–214. doi: 10.1177/0146167210392789

Escher, S., and Romme, M. (2012). "The hearing voices movement," in *Hallucinations,* (New York, NY: Springer), 385–393.

Feeney, J. A. (1999). Issues of closeness and distance in dating relationships: effects of sex and attachment style. *J. Soc. Pers. Relat.* 16, 571–590. doi: 10.1177/0265407599165002

Felmlee, D. H. (1994). Who's on top? Power in romantic relationships. *Sex Roles* 31, 275–295. doi: 10.1007/BF01544589

Fisher, H., Morgan, C., Dazzan, P., Craig, T. K., Morgan, K., and Hutchinson, G., et al. (2009). Gender differences in the association between childhood abuse and psychosis. *Br. J. Psychiatry* 194, 319–325. doi: 10.1192/bjp.bp.107.047985

Garety, P. A., Kuipers, E., Fowler, D., Freeman, D., and Bebbington, P. E. (2001). A cognitive model of the positive symptoms of psychosis. *Psychol. Med.* 31, 189–195. doi: 10.1017/S0033291701003312

Gaudiano, B. A., and Herbert, J. D. (2006). Acute treatment of inpatients with psychotic symptoms using acceptance and commitment therapy: pilot results. *Behav. Res. Ther.* 44, 415–437. doi: 10.1016/j.brat.2005.02.007

Gonzalez, J. C., Herrero, N., Carrasco, B., Aguilar, J. A., Leal, C., and Sanjuan, J. (2008). Gender differences in auditory hallucinations in schizophrenia. *Schizophr. Res. 102 (Suppl.* 2), 1–230. doi: 10.1016/S0920-9964(08)70693-5

Hardy, A., Fowler, D., Freeman, D., Smith, B., Steel, C., and Evans, J., Garety, et al. (2005). Trauma and hallucinatory experience in psychosis. *J. Nerv. Ment. Dis.* 193, 501–507 doi: 10.1097/01.nmd.0000172480.56308.21

Hayward, M., Awenat, Y., McCarthy-Jones, S., Paulik, G., and Berry, K. (2014). Beyond beliefs: a qualitative study of people's opinions about their changing relations with their voices. *Psychosis.* doi: 10.1080/17522439.2014.926388

Hayward, M., Berry, K., and Ashton, A. (2011). Applying interpersonal theories to the understanding of and therapy for auditory hallucinations: a review of the literature and directions for further research. *Clin. Psychol. Rev.* 31, 1313–1323. doi: 10.1016/j.cpr.2011.09.001

Hayward, M., Denney, J., Vaughan, S., and Fowler, D. (2008). The voice and you: development and psychometric evaluation of a measure of relationships with voices. *Clin. Psychol. Psychother.* 15, 45–52. doi: 10.1002/cpp.561

Hayward, M., and Fuller, E. (2010). Relating therapy for people who hear voices: perspectives from clients, family members, referrers and therapists. *Clin. Psychol. Psychother.* 17, 363–373. doi: 10.1002/cpp.672

Hayward, M., Overton, J., Dorey, T., and Denney, J. (2009). Relating therapy for people who hear voices: a case series. *Clin. Psychol. Psychother.* 16, 216–227. doi: 10.1002/cpp.615

Hayward, M. (2003). Interpersonal relating and voice hearing: to what extent does relating to the voice reflect social relating? *Psychol. Psychother.* 76, 369–383. doi: 10.1348/147608303770584737

Jauhar, S., McKenna, P. J., Radua, J., Fung, E., Salvador, R., and Laws, K. (2014). Cognitive behavioural therapy for symptoms of schizophrenia: a systematic review and meta-analysis with examination of potential bias. *Br. J. Psychiatry* 204, 20–29. doi: 10.1192/bjp.bp.112.116285

Legg, L., and Gilbert, P. (2006). A pilot study of gender of voice and gender of voice hearer in psychotic voice hearers. *Psychol. Psychother.* 79, 517–527. doi: 10.1348/147608305X70955

McCarthy-Jones, S., Thomas, N., Strauss, C., Dodgson, G., Jones, N., Woods, A., et al. (2014b). Better than mermaids and stray dogs? Subtyping auditory verbal hallucinations and its implications for research and practice. *Schizophr. Bull.* 40, S275–S284. doi: 10.1093/schbul/sbu018

McCarthy-Jones, S., Trauer, T., Mackinnon, A., Sims, E., Thomas, N., and Copolov, D. L. (2014a). A new phenomenological survey of auditory hallucinations: evidence for subtypes and implications for theory and practice. *Schizophr. Bull.* 40, 231–235. doi: 10.1093/schbul/sbs156

Mikulincer, M., and Shaver, P. R. (2010). *Attachment in Adulthood: Structure, Dynamics, and Change*. New York, NY: Guilford Press.

Murphy, J., Shevlin, M., Adamson, G., and Houston, J. E. (2010). Positive psychosis symptom structure in the general population: assessing dimensional consistency and continuity from "pathology" to "normality." *Psychosis* 2, 199–209. doi: 10.1080/17522430903437087

Perneger, T. V. (1998). What's wrong with Bonferroni adjustments. *Br. Med. J.* 316, 1236–1238. doi: 10.1136/bmj.316.7139.1236

Perona-Garcelán, S., García-Montes, J. M., Rodríguez-Testal, J. F., López-Jiménez, A. M., Ruiz-Veguilla, M., Ductor-Recuerda, M. J., et al. (2014). Relationship between childhood trauma, mindfulness, and dissociation in subjects with and without hallucination proneness. *J. Trauma Dissociation* 15, 35–51. doi: 10.1080/15299732.2013.821433

Rector, N. A., and Seeman, M. V. (1992). Auditory hallucinations in women and men. *Schizophr. Res.* 7, 233–236. doi: 10.1016/0920-9964(92)90017-Y

Schmitt, D. P. (2003). Are men universally more dismissing than women? Gender differences in romantic attachment across 62 cultural regions. *Pers. Relat.* 10, 307–331. doi: 10.1111/1475-6811.00052

Searle, B., and Meara, N. M. (1999). Affective dimensions of attachment styles: exploring self-reported attachment style, gender, and emotional experience among college students. *J. Couns. Psychol.* 46:147. doi: 10.1037/0022-0167.46.2.147

Shah, S., Mackinnon, A., Galletly, C., Carr, V., McGrath, J. J., and Stain, H. J., et al. (2014). Prevalence and impact of childhood abuse in people with a psychotic illness. data from the second Australian national survey of psychosis. *Schizophr. Res.* 159, 20–26. doi: 10.1016/j.schres.2014.07.011

Sharma, R. P., Dowd, S. M., and Janicak, P. G. (1999). Hallucinations in the acute schizophrenic-type psychosis: effects of gender and age of illness onset. *Schizophr. Res.* 37, 91–95. doi: 10.1016/S0920-9964(98)00144-3

Shawyer, F., Thomas, N., Morris, E. M. J., and Farhall, J. (2013). "Theory on voices," in *Acceptance and Commitment Therapy and Mindfulness for Psychosis*, eds E. M. J. Morris, L. C. Johns and J. E. Oliver (Chichester: Wiley-Blackwell), 12–32.

Simpson, J. A., Farrell, A. K., Oriña, M. M., and Rothman, A. J. (2015). "Power and social influence in relationships," in *APA Handbook of Personality and Social Psychology: Vol. 3, Interpersonal Relations*, eds J. A. Simpson, J. F. Dovidio, M. Mikulincer, and P. R. Shaver (Washington, DC: APA), 668.

Skowron, E. A., and Dendy, A. K. (2004). Differentiation of self and attachment in adulthood: relational correlates of effortful control. *Contemp. Fam. Ther.* 26, 337–357. doi: 10.1023/B:COFT.0000037919.63750.9d

Sorrell, E., Hayward, M., and Meddings, S. (2010). Interpersonal processes and hearing voices: a study of the association between relating to voices and distress in clinical and non-clinical hearers. *Behav. Cogn. Psychother.* 38, 127–140. doi: 10.1017/S1352465809990506

Strauss, C., Thomas, N., and Hayward, M. (2015). Can we respond mindfully to distressing voices? A systematic review of the evidence. *Front. Psychol.* 6:1154. doi: 10.3389/fpsyg.2015.01154

Tarrier, N., Beckett, R., Harwood, S., Baker, A., Yusupoff, L., and Ugarteburu, I. (1993). A trial of two cognitive-behavioural methods of treating drug-resistant symptoms in schizophrenic outpatients. I: outcome. *Br. J. Psychiatry* 162, 524–532. doi: 10.1192/bjp.162.4.524

Tarrier, N., and Johnson, J. (Eds). (2006). *Case Formulation in Cognitive Behavioural Therapy*. Hove: Routledge.

Tarrier, N., Harwood, S., Yusopoff, L., Beckett, R., and Baker, A. (1990). Coping Strategy Enhancement (CSE): a method of treating residual schizophrenic symptoms. *Behav. Cogn. Psychother.* 18, 283–293. doi: 10.1017/S0141347300010387

Thomas, N., Farhall, J., and Shawyer, F. (2015). Beliefs about voices and schemas about the self and others in psychosis. *Behav. Cogn. Psychother.* 43, 209–223. doi: 10.1017/S1352465813000817

Thomas, N., McLeod, H. J., and Brewin, C. R. (2009). Interpersonal complementarity in responses to auditory hallucinations in psychosis. *Br. J. Clin. Psychol.* 48, 411–424. doi: 10.1348/014466509X411937

Thomas, N., Morris, E., Shawyer, F., and Farhall, J. (2013). "Acceptance and commitment therapy for voices," in *Acceptance and Commitment Therapy and Mindfulness for Psychosis*, eds E. M. J. Morris, L. C. Johns, and J. E. Oliver (Chichester: John Wiley & Sons, Ltd.), 95–111.

Thomas, N., Shawyer, F., Castle, D. J., Copolov, D., Hayes, S. C., and Farhall, J. (2014). A randomised controlled trial of acceptance and commitment therapy (ACT) for psychosis: study protocol. *BMC Psychiatry* 14:198. doi: 10.1186/1471-244X-14-198

Tsai, Y.-F., and Ku, Y.-C. (2005). Self-care symptom management strategies for auditory hallucinations amongst patients with schizophrenia in Taiwan. *Appl. Nurs. Res.* 19, 191–196. doi: 10.1016/j.apnr.2005.07.008

van der Gaag, M., Valmaggia, L. R., and Smit, F. (2014). The effects of individually tailored formulation-based cognitive behavioural therapy in auditory hallucinations and delusions: a meta-analysis. *Schizophr. Res.* 156, 30–37. doi: 10.1016/j.schres.2014.03.016

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Transcranial direct current stimulation as a treatment for auditory hallucinations

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Auditory hallucinations (AH) are a symptom of several psychiatric disorders, such as schizophrenia. In a significant minority of patients, AH are resistant to antipsychotic medication. Alternative treatment options for this medication resistant group are scarce and most of them focus on coping with the hallucinations. Finding an alternative treatment that can diminish AH is of great importance. Transcranial direct current stimulation (tDCS) is a safe and non-invasive technique that is able to directly influence cortical excitability through the application of very low electric currents. A 1–2 mA direct current is applied between two surface electrodes, one serving as the anode and the other as the cathode. Cortical excitability is increased in the vicinity of the anode and reduced near the cathode. The technique, which has only a few transient side effects and is cheap and portable, is increasingly explored as a treatment for neurological and psychiatric symptoms. It has shown efficacy on symptoms of depression, bipolar disorder, schizophrenia, Alzheimer's disease, Parkinson's disease, epilepsy, and stroke. However, the application of tDCS as a treatment for AH is relatively new. This article provides an overview of the current knowledge in this field and guidelines for future research.

Keywords: auditory hallucinations, focal stimulation, tDCS, psychosis, voices

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Hallucinations in Psychotic Disorders

Auditory hallucinations (AH) are a frequent symptom of schizophrenia which occurs in about 60–80% of patients (Andreasen and Flaum, 1991). The content of these hallucinations is mostly negative, often conveying anger (McCarthy-Jones et al., 2014), or terms of abuse (Nayani and David, 1996) and increasing the risk for suicidal behavior (Harkavy-Friedman et al., 2003). Furthermore, AH also occur in other diagnostic groups such as borderline personality disorder, anxiety disorders, affective disorders, posttraumatic stress disorder, autism, and significant hearing loss (Sommer et al., 2012b).

In approximately 70–75% of these cases, antipsychotic medication and/or cognitive behavioral therapy sufficiently suppress AH. However, the remaining 25–30% continues to suffer from AH despite optimal therapy (Shergill et al., 1998). Alternative treatment options are scarce for this group of patients, and often focus on coping with the hallucinations and accepting their presence instead of reducing them (Bentall et al., 1994). Due to the distressing impact AH have on the patients' quality of life, their ability to concentrate and their social and professional functioning, finding an effective treatment option to reduce AH in this treatment-resistant group would be of great value.

Transcranial Direct Current Stimulation

Transcranial direct current stimulation (tDCS) is a non-invasive focal neurostimulation technique that involves the application of a low intensity electric current between two surface electrodes, an anode and a cathode (Nitsche et al., 2008). A 1–2 mA direct current is applied between two electrodes, often with a size of 35 cm^2 (5 cm × 7 cm), which are placed on the scalp. The current flows between the anode and the cathode, some of it being diverted through the scalp and another part moving through the brain where brain activity is modulated. Although the exact mechanisms of action of tDCS have yet to be completely elucidated, there are two mechanisms by which tDCS modulates brain activity that are currently widely accepted in the field (Brunoni et al., 2012). The first proposes that the current that passes through the brain modulates levels of cortical excitability in a polarity dependent manner (Miranda et al., 2006). Cortical excitability is thought to be increased in the vicinity of the anode and reduced near the cathode. The anodal and cathodal effects of tDCS on cortical excitability are thought to be explained by shifts in the resting membrane potential (depolarization and hyperpolarization). The second proposes that prolonged effects of tDCS can be explained by modifications of *N*-methyl-D-aspartate (NMDA) receptor efficacy, changes in gamma-aminobutyric acid-ergic activity and modulation of interneurons, resulting in prolonged synaptic efficacy changes (Nitsche et al., 2008; Stagg and Nitsche, 2011). However, most of what we know about the effects of tDCS on a neural level is derived from studies of the primary motor cortex (Nitsche et al., 2008). Questions can be raised concerning the generalizability of these underlying mechanisms to other cortical areas (Horvath et al., 2015).

In the 1960s, tDCS was studied extensively, but never gained much popularity in clinical practice (Priori, 2003). Currently, this seems to be changing as tDCS is increasingly explored for the treatment of both neurologic and psychiatric symptoms (Boggio et al., 2008). It has shown efficacy on the clinical symptoms of depression, on both depressive and manic symptoms of bipolar disorder, cognitive functioning in schizophrenia, episodic memory in Alzheimer's disease, motor symptoms and working memory in Parkinson's disease, on the amount of insults in epilepsy, on rehabilitation of motor function, and language disorder after stroke and on tinnitus (Floel, 2014; Kuo et al., 2014). tDCS is a safe treatment with few, if any, side effects (Nitsche et al., 2008). Some mild side effects of a transient nature that have been mentioned in association with tDCS are a slight headache, an itching or tingling sensation at the location of the electrodes and redness of the skin at the location of the electrodes. However, such side effects are also reported after placebo (sham) treatment (Brunoni et al., 2014). Other advantages of this technique are that tDCS equipment is relatively cheap, the treatment can be given after a short training course, and it is easily portable.

Compared to transcranial magnetic stimulation (TMS), another form of focal stimulation that has often been used as an alternative treatment option for AH (Slotema et al., 2014), tDCS has some explicit benefits when using it for research. It is easier to apply an identical placebo treatment, as less physical sensations occur compared to TMS. The itching or tingling sensation that is sometimes mentioned by participants is often only present at the start of treatment and disappears quickly. To mimic this in a placebo treatment, it helps to start with a short period of active stimulation (30–40 s) after which stimulation slowly regresses. During the rest of the treatment period, no active stimulation takes place. This short active stimulation period does not have modulating effects on the brain, but it properly mimics the physical sensations of active treatment. Furthermore, it is possible to preprogram tDCS equipment to apply placebo treatment, which makes it easier to perform double blind sham-controlled trials (Nitsche et al., 2008).

Transcranial Direct Current Stimulation in AH

The use of tDCS as a treatment option for medication resistant AH is relatively new and has till now only been tested in patients with AH in the context of psychotic disorders. Homan et al. (2011) were the first to explore this in a case study. For 10 consecutive days, the patient received daily treatment of 15 min tDCS at an intensity of 1 mA. The cathode was placed on the left temporoparietal cortex (TPC), a location that has been linked to the experience of AH (Silbersweig et al., 1995; Shergill et al., 2000). The anode was placed on the right supraorbital area. Using this method, they were able to ameliorate medication resistant AH. Moreover, this effect was still present 6 weeks after treatment. A more recent case study reported a reduction of 90% in AH severity after 2 months of daily 20 min tDCS at an intensity of 1 mA (Andrade, 2013). After this, treatment was increased to twice daily and an intensity of 3 mA, which led to increased improvement in AH severity. This improvement was still present after 3 years of daily maintenance treatment, but when treatment frequency was reduced to once per 2 days the ameliorating effects disappeared. In this study, the cathode was also placed on the left TPC, but the anode was placed on the left dorsolateral prefrontal cortex (DLPFC). This is an area that is often used in studies investigating the effects of tDCS on cognitive functioning (Hoy et al., 2014). These two tDCS locations have been used in several other case studies reporting positive effects of tDCS on AH severity after multiple sessions of 20 min tDCS at an intensity of 2 mA (Rakesh et al., 2013; Shiozawa et al., 2013; Shivakumar et al., 2013; Nawani et al., 2014). However, all these studies were open-label without a control condition, meaning that non-specific effects (i.e., placebo-effects) may have been of large influence. Brunelin et al. (2012) were the first to publish a tDCS study in AH in which a control group was included. In this study, 15 patients received a 20 min tDCS treatment twice daily at an intensity of 2 mA, for 5 consecutive days and an equal number of patients received sham. In this study, the cathode was also placed on the left TPC and the anode on the left DLPFC. They found a robust decrease in AH severity of 30% compared to a placebo group of equal size. Furthermore, a significant decrease was found in other symptoms as measured by the Positive and Negative Syndrome Scale (PANSS), such as negative symptoms.

These positive effects were still present after 3 months. A more recent study by the same group, using a partially overlapping sample of 28 patients and identical methods, reported a decrease of 46% in AH frequency in medication resistant patients after active treatment, whereas no such effect occurred in the placebo group (Mondino et al., 2014). A recent open label study including 21 patients with schizophrenia and the same stimulation parameters and locations as Brunelin et al. (2012) found a similar improvement of 32% in AH severity. However, this study did not include a placebo condition (Bose et al., 2014). Up till now, one pilot study has been published that reports no beneficial effect of tDCS treatment on AH (Fitzgerald et al., 2014). This study tested the effects of both unilateral ($N = 13$) and bilateral ($N = 11$) tDCS on AH compared to placebo. In total, patients underwent 15 treatments in 3 weeks time. The AH did not respond to either treatment method. However, it is important to note that this study had a very small sample size and rated AH severity based on the PANSS only. This scale does not measure AH in much detail and the different severity scores of the hallucination item are found to be hard to differentiate (Santor et al., 2007). Other studies mostly use the Auditory Hallucination Rating Scale (AHRS) to measure AH severity. See **Table 1** for a summary of all included studies.

It is still unclear in what way tDCS might influence AH. As all studies that report positive results up till now have used the left TPC as the location for the cathode, it appears that the inhibiting action of tDCS on that specific location is important for the beneficial effects. It is unclear if excitation on the left DLPFC also influences AH severity. Brunelin et al. (2012) associated excitation on this location with a decrease of negative symptoms. However, Andrade (2013) found that using a more neutral position for the anode, namely the left mastoid, caused the beneficial effects on AH to vanish. This implicates that the excitatory effect of the anode on the DLPFC is important to induce a beneficial effect on AH. Possibly this can be explained by a positive effect from anodal stimulation of the left DLPFC on working memory. This hypotheses is mainly derived from literature on tinnitus, for which tDCS has also been reported to be effective. Like schizophrenia, tinnitus has been associated with reduced executive control (Heeren et al., 2014). Besides, tinnitus has been found to be alleviated by tDCS over the DLPFC (Frank et al., 2012). These authors hypothesized that improved executive control, as induced by tDCS over the DLPFC, acts as a mediator for the impact from tDCS on tinnitus (Heeren et al., 2014). It may be that a similar therapeutic mechanism is involved in the therapeutic effect of tDCS for AH. Reduced inhibition of irrelevant verbal information may be an important underlying mechanism of AH, speculatively AH could result from misattribution of self-generated information to an external source (Daalman et al., 2011). Application of anodal tDCS over de left DLPFC has been found to enhance working memory, which plays an important role in the executive control of information (Brunoni and Vanderhasselt, 2014). It could therefore be speculated that anodal tDCS over the left DLPFC induces the ameliorating effects on AH by improving the inhibition of irrelevant verbal information. Whether this excitation must take place at the left DLPFC is, however, yet unclear, as the first case study in this field used the right supraorbital area for the anode and still showed a positive result (Homan et al., 2011). Moreover, tDCS does not only produce focal effects but also indirect effects on surrounding brain areas and their connections (Keeser et al., 2011). The more distal effects of tDCS could also be of influence on the ameliorating effects on AH. Imaging studies combined with tDCS in AH could provide more insight in the exact neurological underpinnings of the effects of this treatment.

Taken together, the results of tDCS as an alternative treatment option for AH are preliminary and so far mostly positive. However, a note of caution may be in place here. When new treatment strategies are introduced, the initial reports tend to feature relatively small sample sizes and favorable results, whereas small studies with negative findings do not tend to be published (Emerson et al., 2010; Sommer et al., 2012a). With an increase of studies with larger sample sizes over time, negative findings tend to become published as well. Such trends have led effect sizes to decrease per year of publication (Munafo and Flint, 2010). This effect has also been visible in the application of TMS for AH (Slotema et al., 2012). As tDCS in the treatment of AH is a young treatment method, future studies may well show less favorable results. In the University Medical Center Utrecht, we have started a large randomized double blind trial to investigate the effects of tDCS on AH. We plan to include 62 patients and expect to be able to report results in autumn 2015. It is important to await such studies with large sample sizes before conclusions are drawn about the efficacy of tDCS. This also means that there is a large responsibility for scientific periodic journals to also publish negative findings of such treatments, to help reduce publication bias for positive results.

Moreover, it is of importance that placebo treatments in double blind trials are hard to distinguish from active tDCS treatment. At this point, all placebo-controlled trials in this field have used tDCS at an intensity of 2 mA (Brunelin et al., 2012; Fitzgerald et al., 2014; Mondino et al., 2014). For 1 mA tDCS, it has been reported that placebo treatment is highly identical to active treatment. Both participants and investigators were not able to distinguish between the two (Gandiga et al., 2006). This provides confidence that both participants and investigators will remain well blinded throughout the duration of a double blind trial. However, it is yet unsure if the same applies for tDCS stimulation at 2 mA, as the physical sensations at this intensity are more pronounced and redness of the skin may occur. Although the literature is still unclear if participants themselves are able to differentiate between 2 mA active stimulation and placebo treatment, it has been found that redness of the skin is a possible clue for researchers to differentiate between the two (O'Connell et al., 2012; Palm et al., 2013). However, it is important that these results stem from crossover studies, in which subtle differences between treatments and the effects on each individual participant attract more attention. Brunoni et al. (2014) investigated tDCS blinding of 2 mA stimulation in a large sample of patients with a depression disorder, using a parallel design. Each patient received either active or placebo treatment. They found that patients were able to identify 2 mA active treatment above chance level, but this appeared to be related to the occurrence of clinical response. Patients who did not show clinical response to treatment were

TABLE 1 | Studies using tDCS for the treatment of auditory hallucinations (AH).

Reference	Design	Patients	Position of electrodes	Current strength	Duration	Effects
Andrade (2013)	Case study	One subject with schizophrenia and clozapine resistant AH.	The cathode over the left temporoparietal cortex (TPC) and the anode over the left dorsolateral prefrontal cortex (DLPFC).	First 1 mA, later 3 mA	First 20 min (daily sessions for 2 consecutive months), later 30 min (twice daily sessions for 3 consecutive years).	A reduction of 90% in AH severity was reported after the first 2 months. After increasing treatment to twice daily and a current intensity of 3 mA, AH severity further improved. When electrode positioning was changed or treatment frequency was reduced to once per 2 days, the ameliorating effects disappeared.
Bose et al. (2014)	Open label study, without a placebo condition	21 subjects with schizophrenia and medication resistant AH.	The cathode over the left TPC and the anode over the left DLPFC.	2 mA	20 min (twice daily sessions on 5 consecutive days).	Improvement of 32% in AH severity.
Brunelin et al. (2012)	Randomized, placebo controlled, double-blind trial	30 subjects with schizophrenia and medication resistant AH.	The cathode over the left TPC and the anode over the left DLPFC.	2 mA	20 min (twice daily sessions on 5 consecutive days).	Improvement of 31% in AH severity which lasted for 3 months.
Fitzgerald et al. (2014)	Randomized, placebo controlled, double-blind trial	24 subjects with schizophrenia or schizoaffective disorder and medication resistant AH.	Unilateral and bilateral tDCS with the cathode over the (left) TPC and the anode over the (left) DLPFC.	2 mA	20 min (daily sessions on 15 days in 3 consecutive weeks)	AH did not respond to either treatment method, and no difference was found between the active and placebo treatment group.
Homan et al. (2011)	Case study	One subject with schizophrenia and medication resistant AH.	The cathode over the left TPC and the anode over the right supraorbital area.	1 mA	15 min (daily sessions on 10 consecutive days)	Amelioration of AH was reported, which was still present 6 weeks after treatment.
Mondino et al. (2014)	Randomized, placebo controlled, double-blind trial	28 subjects with schizophrenia and medication resistant AH.	The cathode over the left TPC and the anode over the left DLPFC.	2 mA	20 min (twice daily sessions on 5 consecutive days).	Improvement of 46% in AH severity in the active treatment group, with no such effect in the placebo group.
Nawani et al. (2014)	Case study	One subject with schizophrenia and medication resistant AH.	The cathode over the left TPC and the anode over the left DLPFC.	2 mA	20 min (twice daily sessions on 5 consecutive days).	Improvement of AH.
Rakesh et al. (2013)	Case study	One subject with schizophrenia and medication resistant AH.	The cathode over the left TPC and the anode over the left DLPFC.	2 mA	20 min (twice daily sessions on 5 consecutive days).	Complete cessation of AH.
Shiozawa et al. (2013)	Case study	One subject with schizophrenia and medication resistant AH.	The cathode over the left TPC and the anode over the left DLPFC.	2 mA	20 min (twice daily sessions on 5 consecutive days).	Improvement of AH, which was sustained after a 2-month follow-up.
Shivakumar et al. (2013)	Case study	One subject with schizophrenia and medication resistant AH.	The cathode over the left TPC and the anode over the left DLPFC.	2 mA	20 min (twice daily sessions on 5 consecutive days).	Complete cessation of AH, which was sustained after a 4-week follow-up.

not able to identify active treatment. However, this study did not mention results about the accuracy of blinding in tDCS operators, which were different investigators than the assessors of the clinical effect of the treatment. Knowing if a parallel design has advantages for the accuracy of blinding in tDCS operators is important to assess the reliability of results from double blind studies using placebo-controlled tDCS in parallel designs.

At this time, studies using tDCS in AH have highly similar methods, using 15–20 min of treatment at 1–2 mA and mostly placing the electrodes over the left TPC and left DLPFC. Future research could further investigate if these are indeed the most optimal parameters and locations for tDCS in AH. In TMS, the left TPC is also the most used brain area for inhibitory stimulation as a treatment for AH. Multiple attempts at other locations for TMS did not lead to positive results compared to placebo (Slotema et al., 2014). Considering that, the choice for the left TPC as a location for the cathode in tDCS seems logical. However, it may be worth the effort to test the efficacy of both cathodal and anodal tDCS on other brain areas that have been associated with AH.

Furthermore, the precision of the treatment in influencing the targeted brain areas could possibly be optimized. In most studies, relatively large electrodes are used with a surface size of 35 cm^2. However, it is also possible to use smaller electrodes with a surface size of 25 cm^2 or even so called 'high definition' tDCS in which electrodes are used with a diameter of 12 mm or less (Minhas et al., 2010). Such a method may increase the precision of treatment by decreasing the amount of electricity that is lost due to distribution over the scalp. But using smaller electrodes should be investigated thoroughly, as the neuromodulating effects of small electrodes can strongly differ from those of big electrodes (Nitsche et al., 2008). It is possible that the desired effects are eliminated instead of increased using small electrodes, as they are designed for more focal effects and will have less effect on surrounding brain areas and their connections. The use of small electrodes also increases the need for more precision in placing the electrodes on the scalp. Currently, electrode placement is mostly done using the international 10–20 system for EEG electrode placement (Jasper, 1958), but it is unclear whether this offers enough precision when using smaller electrodes. A stereotactic neuronavigation technique based on an individual's structural MRI image may be a suitable option to offer more reliability that the focus of tDCS treatment is targeted at the right brain area (Neggers et al., 2004; Fitzgerald et al., 2009; Sack et al., 2009).

Conclusion

At this moment, tDCS appears to be a possible new treatment option to help reduce treatment-resistant AH. However, as currently only three randomized controlled trials have been published with relatively small sample sizes, two of which reporting positive results and one with non-significant results, insufficient data is available to determine if tDCS treatment is indeed effective in AH. Future placebo-controlled trials in large samples will have to assess if the mainly positive results up till now can be replicated. Furthermore, different methods and parameters for stimulation, localization, and precision of tDCS should be investigated in more detail to further optimize this treatment.

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References

Andrade, C. (2013). Once- to twice-daily, 3-year domiciliary maintenance transcranial direct current stimulation for severe, disabling, clozapine-refractory continuous auditory hallucinations in schizophrenia. *J. ECT.* 29, 239–242. doi: 10.1097/YCT.0b013e3182843866

Andreasen, N. C., and Flaum, M. (1991). Schizophrenia: the characteristic symptoms. *Schizophr. Bull.* 17, 27–49. doi: 10.1093/schbul/17.1.27

Bentall, R. P., Haddock, G., and Slade, P. D. (1994). Cognitive-behavior therapy for persistent auditory hallucinations – from theory to therapy. *Behav. Ther.* 25, 51–66. doi: 10.1016/S0005-7894(05)80145-5

Boggio, P. S., Rigonatti, S. P., Ribeiro, R. B., Myczkowski, M. L., Nitsche, M. A., Pascual-Leone, A., et al. (2008). A randomized, double-blind clinical trial on the efficacy of cortical direct current stimulation for the treatment of major depression. *Int. J. Neuropsychopharmacol.* 11, 249–254. doi: 10.1017/S1461145707007833

Bose, A., Shivakumar, V., Narayanaswamy, J. C., Nawani, H., Subramaniam, A., Agarwal, S. M., et al. (2014). Insight facilitation with add-on tDCS in schizophrenia. *Schizophr. Res.* 156, 63–65. doi: 10.1016/j.schres.2014.03.029

Brunelin, J., Mondino, M., Gassab, L., Haesebaert, F., Gaha, L., Suaud-Chagny, M. F., et al. (2012). Examining transcranial direct-current stimulation (tDCS) as a treatment for hallucinations in schizophrenia. *Am. J. Psychiatry* 169, 719–724. doi: 10.1176/appi.ajp.2012.11071091

Brunoni, A. R., Nitsche, M. A., Bolognini, N., Bikson, M., Wagner, T., Merabet, L., et al. (2012). Clinical research with transcranial direct current stimulation (tDCS): challenges and future directions. *Brain Stimul.* 5, 175–195. doi: 10.1016/j.brs.2011.03.002

Brunoni, A. R., Schestatsky, P., Lotufo, P. A., Bensenor, I. M., and Fregni, F. (2014). Comparison of blinding effectiveness between sham tDCS and placebo sertraline in a 6-week major depression randomized clinical trial. *Clin. Neurophysiol.* 125, 298–305. doi: 10.1016/j.clinph.2013.07.020

Brunoni, A. R., and Vanderhasselt, M. (2014). Working memory improvement with non-invasive brain stimulation of the dorsolateral prefrontal cortex: a systematic review and meta-analysis. *Brain Cogn.* 86, 1–9. doi: 10.1016/j.bandc.2014.01.008

Daalman, K., Van Zandvoort, M., Bootsman, F., Boks, M., Kahn, R., and Sommer, I. (2011). Auditory verbal hallucinations and cognitive functioning in healthy individuals. *Schizophr. Res.* 132, 203–207. doi: 10.1016/j.schres.2011.07.013

Emerson, G. B., Warme, W. J., Wolf, F. M., Heckman, J. D., Brand, R. A., and Leopold, S. S. (2010). Testing for the presence of positive-outcome bias in peer review: a randomized controlled trial. *Arch. Intern. Med.* 170, 1934–1939. doi: 10.1001/archinternmed.2010.406

Fitzgerald, P. B., Hoy, K., Mcqueen, S., Maller, J. J., Herring, S., Segrave, R., et al. (2009). A randomized trial of rTMS targeted with MRI based neuro-navigation in treatment-resistant depression. *Neuropsychopharmacology* 34, 1255–1262. doi: 10.1038/npp.2008.233

Fitzgerald, P. B., Mcqueen, S., Daskalakis, Z. J., and Hoy, K. E. (2014). A negative pilot study of daily bimodal transcranial direct current stimulation in schizophrenia. *Brain Stimul.* 7, 813–816. doi: 10.1016/j.brs.2014.08.002

Floel, A. (2014). tDCS-enhanced motor and cognitive function in neurological diseases. *Neuroimage* 85(Pt 3), 934–947. doi: 10.1016/j.neuroimage.2013.05.098

Frank, E., Schecklman, M., Landgrebe, M., Burger, J., Kreuzer, P., Poeppl, T. B., et al. (2012). Treatment of chronic tinnitus with repeated sessions of prefrontal transcranial direct current stimulation: outcomes from an open-label pilot study. *J. Neurol.* 259, 327–333. doi: 10.1007/s00415-011-6189-4

Gandiga, P. C., Hummel, F. C., and Cohen, L. G. (2006). Transcranial DC stimulation (tDCS): a tool for double-blind sham-controlled clinical studies in brain stimulation. *Clin. Neurophysiol.* 117, 845–850. doi: 10.1016/j.clinph.2005.12.003

Harkavy-Friedman, J. M., Kimhy, D., Nelson, E. A., Venarde, D. F., Malaspina, D., and Mann, J. J. (2003). Suicide attempts in schizophrenia: the role of command auditory hallucinations for suicide. *J. Clin. Psychiatry* 64, 871–874. doi: 10.4088/JCP.v64n0803

Heeren, A., Maurage, P., Perrot, H., De Volder, A., Renier, L., Araneda, R., et al. (2014). Tinnitus specifically alters the top-down executive control subcomponent of attention: evidence from the attention network task. *Behav. Brain Res.* 269, 147–154. doi: 10.1016/j.bbr.2014.04.043

Homan, P., Kindler, J., Federspiel, A., Flury, R., Hubl, D., Hauf, M., et al. (2011). Muting the voice: a case of arterial spin labeling-monitored transcranial direct current stimulation treatment of auditory verbal hallucinations. *Am. J. Psychiatry* 168, 853–854. doi: 10.1176/appi.ajp.2011.11030496

Horvath, J. C., Forte, J. D., and Carter, O. (2015). Evidence that transcranial direct current stimulation (tDCS) generates little-to-no reliable neurophysiologic effect beyond MEP amplitude modulation in healthy human subjects: a systematic review. *Neuropsychologia* 66, 213–236. doi: 10.1016/j.neuropsychologia.2014.11.021

Hoy, K. E., Arnold, S. L., Emonson, M. R., Daskalakis, Z. J., and Fitzgerald, P. B. (2014). An investigation into the effects of tDCS dose on cognitive performance over time in patients with schizophrenia. *Schizophr. Res.* 155, 96–100. doi: 10.1016/j.schres.2014.03.006

Jasper, H. H. (1958). Report of the committee on methods of clinical examination in electroencephalography. *Electroencephalogr. Clin. Neurophysiol.* 10, 370–375. doi: 10.1016/0013-4694(58)90053-1

Keeser, D., Meindl, T., Bor, J., Palm, U., Pogarell, O., Mulert, C., et al. (2011). Prefrontal transcranial direct current stimulation changes connectivity of resting-state networks during fMRI. *J. Neurosci.* 31, 15284–15293. doi: 10.1523/JNEUROSCI.0542-11.2011

Kuo, M. F., Paulus, W., and Nitsche, M. A. (2014). Therapeutic effects of non-invasive brain stimulation with direct currents (tDCS) in neuropsychiatric diseases. *Neuroimage* 85(Pt 3), 948–960. doi: 10.1016/j.neuroimage.2013.05.117

McCarthy-Jones, S., Trauer, T., Mackinnon, A., Sims, E., Thomas, N., and Copolov, D. L. (2014). A new phenomenological survey of auditory hallucinations: evidence for subtypes and implications for theory and practice. *Schizophr. Bull.* 40, 225–235. doi: 10.1093/schbul/sbs156

Minhas, P., Bansal, V., Patel, J., Ho, J. S., Diaz, J., Datta, A., et al. (2010). Electrodes for high-definition transcutaneous DC stimulation for applications in drug delivery and electrotherapy, including tDCS. *J. Neurosci. Methods* 190, 188–197. doi: 10.1016/j.jneumeth.2010.05.007

Miranda, P. C., Lomarev, M., and Hallett, M. (2006). Modeling the current distribution during transcranial direct current stimulation. *Clin. Neurophysiol.* 117, 1623–1629. doi: 10.1016/j.clinph.2006.04.009

Mondino, M., Haesebaert, F., Poulet, E., Suaud-Chagny, M. F., and Brunelin, J. (2014). Fronto-temporal transcranial direct current stimulation (tDCS) reduces source-monitoring deficits and auditory hallucinations in patients with schizophrenia. *Schizophr. Res.* 161, 515–516 doi: 10.1016/j.schres.2014.10.054

Munafo, M. R., and Flint, J. (2010). How reliable are scientific studies? *Br. J. Psychiatry* 197, 257–258. doi: 10.1192/bjp.bp.109.069849

Nawani, H., Kalmady, S. V., Bose, A., Shivakumar, V., Rakesh, G., Subramaniam, A., et al. (2014). Neural basis of tDCS effects on auditory verbal hallucinations in schizophrenia: a case report evidence for cortical neuroplasticity modulation. *J. ECT.* 30, e2–e4. doi: 10.1097/YCT.0b013e3182a35492

Nayani, T. H., and David, A. S. (1996). The auditory hallucination: a phenomenological survey. *Psychol. Med.* 26, 177–189. doi: 10.1017/S003329170003381X

Neggers, S. F., Langerak, T. R., Schutter, D. J., Mandl, R. C., Ramsey, N. F., Lemmens, P. J., et al. (2004). A stereotactic method for image-guided transcranial magnetic stimulation validated with fMRI and motor-evoked potentials. *Neuroimage* 21, 1805–1817. doi: 10.1016/j.neuroimage.2003.12.006

Nitsche, M. A., Cohen, L. G., Wassermann, E. M., Priori, A., Lang, N., Antal, A., et al. (2008). Transcranial direct current stimulation: state of the art 2008. *Brain Stimul.* 1, 206–223. doi: 10.1016/j.brs.2008.06.004

O'Connell, N. E., Cossar, J., Marston, L., Wand, B. M., Bunce, D., Moseley, G. L., et al. (2012). Rethinking clinical trials of transcranial direct current stimulation: participant and assessor blinding is inadequate at intensities of 2mA. *PLoS ONE* 7:e47514. doi: 10.1371/journal.pone.0047514

Palm, U., Reisinger, E., Keeser, D., Kuo, M. F., Pogarell, O., Leicht, G., et al. (2013). Evaluation of sham transcranial direct current stimulation for randomized, placebo-controlled clinical trials. *Brain Stimul.* 6, 690–695. doi: 10.1016/j.brs.2013.01.005

Priori, A. (2003). Brain polarization in humans: a reappraisal of an old tool for prolonged non-invasive modulation of brain excitability. *Clin. Neurophysiol.* 114, 589–595. doi: 10.1016/S1388-2457(02)00437-6

Rakesh, G., Shivakumar, V., Subramaniam, A., Nawani, H., Amaresha, A. C., et al. (2013). Monotherapy with tDCS for schizophrenia: a case report. *Brain Stimul.* 6, 708–709. doi: 10.1016/j.brs.2013.01.007

Sack, A. T., Cohen, K. R., Schuhmann, T., Moerel, M., Walsh, V., and Goebel, R. (2009). Optimizing functional accuracy of TMS in cognitive studies: a comparison of methods. *J. Cogn. Neurosci.* 21, 207–221. doi: 10.1162/jocn.2009.21126

Santor, D. A., Ascher-Svanum, H., Lindenmayer, J. P., and Obenchain, R. L. (2007). Item response analysis of the positive and negative syndrome scale. *BMC Psychiatry* 7:66. doi: 10.1186/1471-244X-7-66

Shergill, S. S., Brammer, M. J., Williams, S. C., Murray, R. M., and Mcguire, P. K. (2000). Mapping auditory hallucinations in schizophrenia using functional magnetic resonance imaging. *Arch. Gen. Psychiatry* 57, 1033–1038. doi: 10.1001/archpsyc.57.11.1033

Shergill, S. S., Murray, R. M., and Mcguire, P. K. (1998). Auditory hallucinations: a review of psychological treatments. *Schizophr. Res.* 32, 137–150. doi: 10.1016/S0920-9964(98)00052-8

Shiozawa, P., Da Silva, M. E., Cordeiro, Q., Fregni, F., and Brunoni, A. R. (2013). Transcranial direct current stimulation (tDCS) for the treatment of persistent visual and auditory hallucinations in schizophrenia: a case study. *Brain Stimul.* 6, 831–833. doi: 10.1016/j.brs.2013.03.003

Shivakumar, V., Bose, A., Rakesh, G., Nawani, H., Subramaniam, A., Agarwal, S. M., et al. (2013). Rapid improvement of auditory verbal hallucinations in schizophrenia after add-on treatment with transcranial direct-current stimulation. *J. ECT.* 29, e43–e44. doi: 10.1097/YCT.0b013e318290fa4d

Silbersweig, D. A., Stern, E., Frith, C., Cahill, C., Holmes, A., Grootoonk, S., et al. (1995). A functional neuroanatomy of hallucinations in schizophrenia. *Nature* 378, 176–179. doi: 10.1038/378176a0

Slotema, C. W., Aleman, A., Daskalakis, Z. J., and Sommer, I. E. (2012). Meta-analysis of repetitive transcranial magnetic stimulation in the treatment of auditory verbal hallucinations: update and effects after one month. *Schizophr. Res.* 142, 40–45. doi: 10.1016/j.schres.2012.08.025

Slotema, C. W., Blom, J. D., Van, L. R., Hoek, H. W., and Sommer, I. E. (2014). Review of the efficacy of transcranial magnetic stimulation for auditory verbal hallucinations. *Biol. Psychiatry* 76, 101–110. doi: 10.1016/j.biopsych.2013.09.038

Sommer, I. E., Aleman, A., Slotema, C. W., and Schutter, D. J. (2012a). Transcranial stimulation for psychosis: the relationship between effect size and published findings. *Am. J. Psychiatry* 169, 1211. doi: 10.1176/appi.ajp.2012.12060741

Sommer, I. E. C., Koops, S., and Blom, J. D. (2012b). Comparison of auditory hallucinations across different disorders and syndromes. *Neuropsychiatry* 2, 57–68. doi: 10.2217/npy.12.2

Stagg, C. J., and Nitsche, M. A. (2011). Physiological basis of transcranial direct current stimulation. *Neuroscientist* 17, 37–53. doi: 10.1177/1073858410386614

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Preferences for different insomnia treatment options in people with schizophrenia and related psychoses: a qualitative study

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Symptoms of psychosis such as hallucinations and delusions can be intrusive and unwanted and often remain treatment-resistant. Due to recent progress in basic and clinical sciences, novel approaches such as sleep-based interventions are increasingly becoming offered to address the physical and mental health issues of people with severe mental illness. While the primary outcome is to improve sleep, studies have demonstrated that interventions that target symptoms of insomnia can also produce improvements in the severity of psychotic symptoms, quality of life, and functional outcomes. This study presents qualitative data on the attitudes and preferences of people with schizophrenia and schizo-affective disorders to three different types of therapies for insomnia (standard pharmacological, melatonin-based, and cognitive and/or behavior therapy). Interviews included discussions regarding the perceived advantages and limitations of different therapies, enablers to taking up the preferred option, as well as personal strategies that have helped respondents with sleep problems in the past. Results showed that, when given the choice, these individuals prefer psychological and behavioral-type therapy to other sleep interventions because of its potential to support and empower them in taking responsibility for their own recovery. Pharmacological therapies, by contrast, are viewed as useful in managing acute sleep problems, but only as a short-term solution. Overall, the findings underscore the need for patients' active engagement when making decisions about treatment options.

Keywords: sleep disorders, sleep, insomnia, psychological treatment, CBT, melatonin, antipsychotics, neuroleptic

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Introduction

The term 'psychosis' refers to a set of experiences which include hearing voices and seeing images that other people do not ('hallucinations') and unusual beliefs that others do not share ('delusions'). These symptoms often attract a psychiatric diagnosis such as schizophrenia, schizoaffective disorder, bipolar disorder, or other psychotic disorders. Symptoms related to psychosis can be particularly distressing and burdensome, and can persist despite intensive and prolonged treatment, prompting the need to explore alternative interventions.

Sleep has been an area of increasing interest in the treatment of mental illness such as depression (Hickie et al., 2013) and more recently in the treatment of psychotic disorders (National Institute of Mental Health [NIMH], 2015). Insomnia is a particularly common condition with heterogeneous origin and which affects almost all individuals with psychosis at some point during their illness (Donlon and Blacker, 1975; Benca et al., 1992; Chemerinksi et al., 2002; Chouinard et al., 2004). Symptoms include highly irregular timing of sleep–wake patterns, difficulties getting to sleep or staying asleep, and being active at night and excessively tired during the day. Studies have demonstrated that these sleep problems are intrinsically linked to the cause and maintenance of psychotic symptoms (Zarcone and Benson, 1997; Yang and Winkelman, 2006; Waters et al., 2011) and to psychotic relapse (Heinrichs and Carpenter, 1985; Falloon, 1992). Individuals with psychosis and co-occurring sleep–wake problems are also more likely to have cognitive impairments, negative mood, reduced perceived ability to cope, daytime dysfunctions (Zarcone and Benson, 1997; Chemerinksi et al., 2002; Hofstetter et al., 2003; Chouinard et al., 2004) and an increased risk of suicide (Pompili et al., 2009).

In response to these findings, specific strategies which target poor sleep in psychosis are increasingly being developed with a view to improve sleep, but also to treat psychotic symptoms (e.g., Edinger et al., 2009; Myers et al., 2011; Wagley et al., 2013) and ameliorate clinical outcomes and functional disability (e.g., Suresh Kumar et al., 2007). The evidence-base, however, only so far includes small pilot studies, and there are no clear recommendations regarding the most effective treatment approach for insomnia in psychosis. In addition, questions remain regarding the extent to which these individuals are likely to take up sleep therapies.

Recovery-oriented practices advocate for individuals to be actively involved in decision-making about available intervention options, yet people living with schizophrenia and psychosis may not be given many choices or may find themselves unheard by mental health professionals in treatment planning and care (González-Torres et al., 2007). If interventions for insomnia are to be a viable treatment option, a key first stage must be to seek the personal perspectives of people with psychotic disorders regarding their preferences for different types of sleep interventions.

In this study, we sought to understand the preferences of a sample of individuals with psychosis regarding different types of therapies for insomnia. Qualitative interview methodology was used in the current study to identify preferred choices amongst different alternatives ('testing alternatives' analytic framework), and to identify issues of personal importance with regards to taking up these therapies ('key concepts' framework). Qualitative methods are often utilized to conduct in-depth inquiries into a specific issue and have considerable explanatory power when seeking to understand personal perspectives that cannot be comprehensively addressed using quantitative measures. New knowledge is generated through the analytical examination of narratives in response to semi-structured interviews. Typically, interviews and focus groups are conducted until the same themes keep re-emerging (a state of 'saturation'). Thus, sample sizes in qualitative studies are typically much smaller than cross-sectional studies (and can be as small as $n = 1$). The lived experience of people with psychosis has previously been examined using such qualitative methodologies and studies show that these individuals are highly capable of engaging in this style of interviewing and providing informed opinions (Holmes et al., 1995).

This paper presents a report on the views and preferences of a sample of individuals with a diagnosis of schizophrenia and schizoaffective disorders regarding three different types of evidence-based therapies for insomnia: standard pharmacological, melatonin-based, and psychological and behavioral-type (talking) therapies. The interviews included discussions of (i) the perceived advantages and limitations of each therapy, (ii) preferred approaches, (iii) enablers to taking up the preferred therapy, and (iv) personal strategies that have helped these individuals with sleep problems in the past. Before the results are presented, an overview of the different treatments available, their evidence-base and their mechanisms of action, are presented.

Insomnia Treatments Available for Psychosis

Different types of interventions are available to treat sleep dysfunction in psychosis. Some are based on techniques known to be effective in community samples and others are informed by an analysis of sleep–wake behaviors. The most commonly used interventions to regulate sleep–wake patterns and improve symptoms of insomnia include (1) standard pharmacotherapy, (2) melatonin, and (3) psychological and/or behavioral interventions. Other interventions exist (e.g., bright light therapy, stand-alone sleep restriction therapy) but insufficient evidence exists for their use in psychosis or they are not recommended due to a possible association with psychotic relapse (e.g., Sit et al., 2007; based on case study in bipolar disorder).

Pharmacotherapy

A common clinical approach for managing insomnia in psychosis uses pharmacotherapy, with options including antipsychotics and hypnotics. The appeal of pharmacotherapy is its relatively rapid onset of action (Hickie et al., 2013) and sedatives and hypnotics are frequently prescribed for acute sleep problems (Falloon et al., 1996).

With regards to antipsychotics, the inhibitory effects of these drugs on dopamine (DA) transmission are thought to represent a likely mechanism for producing sedation. While antipsychotics are not recommended as a direct treatment for sleep disturbance in clinical guidelines, a common perception amongst mental health staff is that antipsychotics can satisfactory addresses both symptoms of psychosis and chronic insomnia. Indeed, many patients report immediate symptom relief, but empirical evidence regarding the sleep-promoting effects of antipsychotics remains mixed. For example, improvements in total sleep time, sleep efficiencies and stage 2 sleep have been

reported (Monti and Monti, 2004) but sleep problems persist (e.g., Keshavan et al., 1996; Lieberman et al., 2005), with antipsychotic medication accounting for less than 10% of the total variance in sleep quality (Waters et al., 2012). Another factor of central importance includes the undesirable physical and somatic side effects of antipsychotic medications such as grogginess, next day tiredness, as well as difficulties getting to sleep or sleeping too much (e.g., Morrison et al., 2000; Ritsner et al., 2002).

Melatonin

Melatonin (ingested as daily capsules) is commonly offered for the treatment of insomnia and other disturbances of the sleep–wake cycles in the general community. Melatonin is a natural hormone secreted by the pineal gland which acts to stabilize circadian rhythms. The sedative and chronobiologic effects of melatonin have led to its popular use as a treatment for insomnia, jet lag, circadian rhythm sleep disorders as well as in mood disorders. Melatonin produces fewer side-effects than antipsychotics, although it can be linked to headaches and drowsiness in higher dosages.

Given alterations in circadian chronobiologic rhythms of melatonin (phase advance, and low output) in individuals with schizophrenia-spectrum disorders (Van Cauter et al., 1991; Rao et al., 1994), melatonin appears to be a promising treatment option for insomnia. In support, studies provide some evidence for the beneficial effects of melatonin in this clinical group. Suresh Kumar et al. (2007), for example, conducted a randomized trial of melatonin versus placebo with 40 individuals with schizophrenia using flexible dose 3–12 mg of melatonin for 2 weeks as an adjunct to regular medication. Relative to placebo, melatonin had some benefits on night-time awakenings and sleep duration as assessed by questionnaires (small effect size), and was also linked to improvements in mood and daytime functioning. Using a smaller dose of 2 mg of melatonin and a sample of 19 individuals with schizophrenia in a randomized, double-blind, and cross-over design, Shamir et al. (2000) demonstrated that melatonin treatment for 3 weeks was linked to improved sleep efficiency and sleep duration, as well as reduced duration to sleep onset, although these improvements were mostly observed in people whose sleep quality was low at baseline.

Psychological and Behavioral Interventions (Including CBT)

Neurobiological changes can explain many of the sleep problems in psychosis (e.g., Van Cauter et al., 1991; Rao et al., 1994), although sleep habits and psychological problems also contribute significantly to the onset and maintenance of insomnia. For instance, precipitating factors for insomnia often include stressful life events, and there is a wealth of evidence demonstrating that psychological issues such as worry and rumination, and cognitive factors such as dysfunctional beliefs and thought control strategies, perpetuate symptoms of insomnia in the general community (Harvey, 2002). Therefore, management strategies which target psychological, cognitive, and behavioral factors that prevent sufferers from re-establishing a normal sleep pattern have recently been the subject of much attention.

Components of cognitive interventions target cognitive hyperarousal, maladaptive thought control strategies, dysfunctional beliefs and attitudes such as the perceived need to control sleep, and relaxation elements. By contrast, behavioral interventions focus on the formation of good sleep habits (a regular wake time, not clock watching, managing caffeine, and alcohol intake), breaking negative associations of the bed as a place of frustration, and awareness of sleep-promoting activities such as regular exercise. The benefits of such approaches to insomnia in the general population are well documented (e.g., Harvey et al., 2014).

Some therapeutic approaches include behavioral interventions alone (e.g., sleep restrictions), although studies in the (non-psychiatric) community show that therapies that address both behavioral and cognitive elements ('Cognitive–Behavioral Therapy for Insomnia, CBT-I') have the most potential in producing reliable and durable changes (Spielman et al., 1987; Perlis et al., 2005; Schmidt et al., 2011).

Individuals with psychosis often have a sedentary lifestyle and a lack of daytime structure (Hofstetter et al., 2003), suggesting that behavioral approaches promoting good sleep, regular sleep routine, and contributors to daytime sleepiness can therefore increase awareness about the need for behavioral changes. We recently demonstrated evidence of knowledge gaps about sleep hygiene in inpatients with psychosis, specifically regarding the importance of regular sleep–wake timings and the wake-promoting effects of nicotine (Chiu et al., 2015a, in 55 inpatients with psychotic disorders). In addition, these psychiatric individuals demonstrated levels of thought control strategies (rumination and aggressive suppression) and dysfunctional beliefs about sleep (preoccupation about the consequence of poor sleep) that were similar to non-psychiatric controls insomnia, suggesting that interventions combining cognitive and behavioral strategies (such as CBT-I) are likely to be most efficacious for treating insomnia in psychosis.

While CBT-I is recommended by the American Academy of Sleep Medicine as a first-line treatment for insomnia (Espie, 2009), few studies has been published in people with psychosis. Myers et al. (2011) provided four individual CBT-I sessions to 15 patients with persisting persecutory delusions and insomnia. It was reported that participants reported significant improvements in self-reported sleep quality as well as reductions in delusions and psychological distress at post-intervention and one month follow-up, providing 'proof of concept' for CBT-I in psychosis. Other studies have reported on the effectiveness of cognitive and behavioral interventions, although these other studies included mixed diagnostic groups with primarily affective or anxiety disorders (Edinger et al., 2009; Wagley et al., 2013) or abbreviated treatment components (one session Lyne et al., 2011; two sessions Wagley et al., 2013).

Overall, a number of interventions may be used to improve sleep and symptoms for people with schizophrenia and related psychoses. The current paper now presents a study of their preferences regarding these interventions.

Qualitative Study into the Views and Preferences of Respondents Regarding Three Different Types of Insomnia Treatments

In this section, the views and preferences of a sample of individuals with schizophrenia and related psychoses with regards different types of evidence-based therapies for insomnia are presented. The interviews included discussions of (i) the perceived advantages and limitations of these therapies, (ii) preferred approaches, (iii) enablers to taking up the preferred therapy, and (iv) personal strategies that have helped them with sleep problems in the past.

Participants

Participants were recruited from Graylands Psychiatric Hospital (inpatient wards) and a local mental health drop-in centre (The Lorikeet Centre). Recruitment occurred using advertising and a snow-ball technique. A total of 14 respondents completed this study (aged 28–64; 50% males). In keeping with previous research conducted with this population (Carey et al., 1999), the aim was for focus group with sizes of three to four people. Three focus groups (comprising up to four people), and six individual interviews for individuals who preferred not to engage in groups were conducted between November 2013 and January 2014.

All individuals had been given a diagnosis of schizophrenia or schizoaffective disorder by a mental health physician, and all participants had substantial past or current sleep problems accompanied with daytime dysfunction. Length of illness since first hospitalization ranged from three to 33 years (mean = 16 years). All participants were taking one or more antipsychotic drug; three were also taking benzodiazepines, and five antidepressants. All had a prior experience of sedative and/or benzodiazepine. One participant had received sleep hygiene information in the past (delivered informally by a mental health professional). Two had tried melatonin, and one (ID4.1) was still taking melatonin, but none had received CBT-I. Ethical approval was granted by the University of Western Australia and North Metropolitan Health Service – Mental Health Human Research Ethics Committees.

Methods

Focus groups followed standard procedures (Morgan et al., 1998). Focus groups and individual interviews were conducted by psychologist VC at the drop-in centre or at Graylands Hospital. Oversight was provided by a senior team member (FW or MR) to ensure that the procedures were applied consistently, that participants had sufficient time and opportunities to give their views and that in-depth discussions were pursued. Groups began with an introduction, including conditions of confidentiality and respect for one another, followed by the methods and rationale of the project. Topics were addressed in a flexible way using a semi-structured interview schedule developed by the investigators. In Part 1, personal experiences of sleep problems, help seeking behavior, therapies that had been tried (including standard pharmacologic), and personal strategies that helped in the past were addressed. In Part 2, a handout was provided with information about melatonin and cognitive/behavior therapies drawn from the literature and consumer medicine information. No handouts were provided for pharmacological therapies since all participants had prior experience of antipsychotics and sedatives. Discussions focused on the perceived benefits of different therapies ('what do you like most?') and limitations ('what do you like least?'), preferred approaches for addressing sleep problems in the short term and in the longer term, and what would help them to take up the preferred interventions. Prompts were used to aid discussion and encourage participants to follow on from previous comments. After the consent and introduction, discussions lasted 45–60 min.

Analysis of Transcripts

Sessions were recorded on audio tape, and then transcribed using Krueger and Casey's (2000) approach to sorting transcript data. Two researchers (VC and FW) made themselves familiar with the content of transcripts. VC then coded the transcripts, and sorted the coded data into categories and subcategories in excel document spreadsheets (descriptions of sleep problems, impact, coping, treatment types, enablers, personal strategies) which were verified by the other researchers (FW and MR). Next, the research team analyzed the spreadsheets independently and then met to compare and discuss the coded data and whether some categories should be combined or separated until a consensus was reached. No difficulties in coding were met and interrater agreement was high with no disagreements arising on the main findings. The joint discussions also allowed team members to reflect on their views of the research, and the representation of multiple specialists in the team allowed an analysis and interpretation of the data without any systematic biases. Credibility checks were conducted with additional consultation with a study participant and with the input of person with a lived experience.

Results of the Qualitative Study Interviews

Attitudes Toward, and Preferences for, Different Types of Insomnia Therapies

Using the systematic analysis described above, reports were pooled separately for the different interventions. Overall, the respondents had firm opinions about the different sleep treatments (see **Table 1** for summary).

Table 1 shows seven elements which participants identified as valuable in a sleep therapy and which address not only sleep issues (routine, long-term solution), but also physical health (drug-free), psychological health (worry, stress, intrusive thoughts, and social contact) and principles sustaining recovery (regaining control, and learning something new). Cognitive and behavioral therapies met all seven criteria and was rated as acceptable by 71% of participants, melatonin met one criterion (acceptable in 57.2% of the sample), and pharmacotherapy none (acceptable by only 22.5% of participants).

Six elements were then identified as unwanted in therapy: lack of confidence in its evidence base; risks associated with

TABLE 1 | Perceived benefits and limitations of different types of sleep interventions.

	Pharmacotherapy	Melatonin	Cognitive and/or behavioral therapies
Acceptability	22.5%	57.2%	71.5%
Benefits			
Improves sleep routine		√	√
Long term solution to sleep problems			√
Drug free			√
Helps with worries, stress, racing thoughts			√
Human contact in therapy			√
Regaining control			√
Learn something new			√
Limitations			
Limited perceived efficacy for treating sleep			√
Interaction between drugs	√	√	
Tiredness as a side-effect	√	√	
Poor concentration as side-effect	√		
Lack of control over the process	√	√	
Lack of motivation as possible barrier			√

polypharmacy; side effects from medications (cognitive and functional effects); and lack of choice and control over the process. Lack of motivation was also perceived as a barrier to engaging in therapy. Pharmacotherapy met 4/6 (66%) of these unwanted elements, melatonin 3/6 (50%), and cognitive and behavioral therapies 2/6 (33%).

Pharmacotherapy

Respondents reported mixed feelings about their medications, and had both positive and negative opinions about pharmacological approaches to sleep treatment. Six respondents (42.8%) felt that medications had helped with their sleep problems:

(ID7.1) Well I went to the psychiatrist and she prescribed me antipsychotics and I went to sleep after that.
(ID4.1) I'd like to have been on something else, like temaz just for a little while to cover the time so I can have a decent night's sleep.

A majority (n = 11, 78.5%) however, did not view pharmacotherapy as an acceptable intervention. Reasons included unwanted side effects and possible interactions between drugs (n = 7, 50%):

(ID8.2) I was just about to say, sometimes it takes about 11 or 12 hours I've noticed with some medications to wear off enough to be alert you know what I mean?

Other reasons were that the medications didn't always help with sleep problems (42.8%), or that their physicians were often changing the type, dosage or scheduling of medications, which impacted on their sleep:

(ID6.1) I couldn't sleep for weeks . . . the doctor in her wisdom decided to change my medication; They're always juggling with it in the clinics, and I've had to put my foot down – no more juggling unless there's a really good reason for it, I don't wanna be a guinea pig.

Melatonin

Respondents' views of melatonin were largely favorable. Six respondents (42.8%) were drawn by its novelty and had not heard of other people using it:

(ID1.2) Probably it's just something new. You wanna try something new, see if it will help me go to sleep.

More than a quarter of the sample (n = 4; 28.5%) viewed melatonin as a more natural and safer option than pharmacotherapy:

(ID9.1) If you're giving melatonin works better than a sleeping tablet, it'd be a more natural option.
(ID6.1) Well I know that melatonin's natural and it is something natural.

While melatonin was perceived to be 'more natural' than pharmacotherapy, it was still viewed by many as another drug option, and thus potentially harmful. Six participants (42.8%) did not want to take more medications than they needed to:

(ID2.1) Aw the thing is I don't. . .I take plenty of medications and I wouldn't want to take any more than I have to. . .
(ID3.2) Yeah that's the thing, like you know, for years with me like I'd take tablets, a side effect pill to counteract that, and injections too. . . and now I'm down to just a couple of tablets at night and I don't want to go back to scoffing down pills and getting jabs you know

A sizeable minority also worried about possible side effects (n = 6, 42.8%), particularly relating to headaches and tiredness, and the interaction melatonin might have with other drugs:

(ID4.1) I'd rather not be on melatonin if it can cause headaches or drowsiness.
(ID1.3) What if it clashed with the other medication that we're taking?

Cognitive and/or Behavioral Interventions

Discussion of non-pharmacologic interventions brought up a greater number of positive than negative points, and a quarter of respondents did not raise any negatives views toward cognitive and behavioral interventions (29%).

Half of all respondents (50%) agreed that a benefit of such treatment was that it was a drug-free option:

(ID3.1) Because it doesn't include much of the things with medications. I get some pretty bad things with side-effects.
(ID5.1) Learn to know yourself better, because spend time to think about what affects you or not, something good for you, natural way.

However, a quarter of respondents ($n = 4$; 28.5%) were skeptical regarding whether it could offer something new that they had not tried before, or stated that 'talking' had limited efficacy on sleep problems:

(ID5.2) yeah cause I've tried a lot of like CBT kind of stuff, and what else. . . yeah I've tried heaps of stuff. I got into Buddhism like full on, and I was meditating every day, and guided visualizations. . . all that sort of stuff, and it doesn't seem to do anything.

Being actively engaged in the treatment process was a benefit of cognitive/behavior therapy for 50% of respondents, who felt that being involved in the treatment process would give them a sense of control and autonomy:

(ID1.3) Like working at it and doing.. you know. . .what we've been told. . .working at it. Like trying to help yourself.
(ID3.2) But if you said, like it's a test and you make that decision and that's what you want to do, then that's your decision, your control. . .so it's a bit of a plus there. Yeah I think that's pretty much a human element isn't it?

The majority of respondents (57.1%, $n = 8$) understood that the aims were to establish a good sleep routine and to promote long-lasting changes in sleep behavior.

(ID6.1) Yeah. I'd give it all I had you know, because I've grown to understand what it. . .I'm looking to break the bad sleeping habits really. It probably works better in the long term, I think, because what you learn stays with you. . . well that might be my experience.

Sleep problems in psychosis are often related to worries, stress, and anxiety. Respondents stated they would value therapist advice on how to deal with stress and racing thoughts (28.5%, $n = 4$). Learning to relax was also perceived to be a valuable skill by four participants (28.5%):

(ID1.2) They've got a progressive one which relaxes your muscles from there down to your feet which is very, very good

Conversely, two participants (14.3%) worried those psychological therapies for sleep may bring up traumatic issues;

(ID1.2) Well it might be a bit unsettling too. . .Well it might stir up too much stuff that you can't deal with. Yeah, there's people who may be sensitive to it.

Finally, face to face interaction, and the sharing of personal experiences, was seen to be of therapeutic benefit for four respondents (28.5%):

(ID8.2) I used to ring helplines and things like that. I've had friends too who have rung me at odd times of the night. I think sometimes all you need is some confirmation you're human, you're alive.
(ID4.1) About life issues, about problems, you can keep people calm, not be frightened of sharing your thoughts, to have understanding of one another.

Challenges for 42.8% of participants ($n = 6$) included the discipline, time and hard work that is required for the psychological therapy. The motivation needed to repeatedly attend the sessions and actively engage in treatment was also voiced as a limitation by five (35.7%) of the respondents:

(ID5.2) You see my biggest problem is my motivation, I'm not very motivated. I'm told that that's part of something to do with the frontal lobe or something like that where it affects my motivation, but I'm not sure if that's sleep-related or not

Participants' Views Regarding How to Best Support their Sleep

Preferred Approach

Participants were asked to reflect back on their journey with mental illness and to describe the type of insomnia treatment they would chose if they had been given the choice.

One dominant opinion (57.1%, $n = 8$) was that one approach might not fit everyone, all of the time. Specifically, a treatment might work for one person but not another, and also that some interventions work better at some stages of the illness or recovery than others. Particularly, during the acute phase of the illness, pharmacological approaches might work best:

(ID6.1) In those days, I was just hopelessly entwined in my illness and I thought I was alright, but looking back like. . .
(ID5.1) Sometimes I can't work by myself, don't know why and only the medicine can keep me in routine.

Respondents also suggested that psychological and behavioral interventions should be the first line treatment, with a focus on sleep education, relaxation techniques and having someone to speak to, and with pharmacological options available if cognitive and behavioral sessions do not seem to be improving their sleep.

*(ID2.1) When that person starts getting aggravated and saying "this isn't working" And then they start getting aggro "I can't sleep, f** off, and I can't do this anymore", that's maybe when the medication should come in. But it should be kept at a bare minimum, you know, only like you know if they use it once every 5 days that would be really good you know.*

Enablers of Psychological and Behavioral Therapies for Sleep Problems

With cognitive and behavioral therapies as the preferred option, we asked participants about factors that might enable and support them in taking up such therapies. **Table 2** shows that participants provided a wide range of solutions.

Solutions were broken down into five main themes. The first theme relates to access to information in a language that is easy to understand, and which addresses sleep issues that

are directly relevant for people with symptoms of psychosis. Therefore, studies which seek to understand the perspective and personal experiences of people with lived experience, in their own words, are better able to identify gaps in knowledge and define clinical targets. For instance, our recent work with groups of people with psychosis suggests that night-time rumination, worries, hallucinated voices, external locus of control (Chiu et al., 2015a), as well as frequent nightmares, night terrors (Chiu et al., 2015b) are key experiences which prevent good sleep from happening. In other words, while better sleep is an objective, targets for treatment should first address factors that get in the way of achieving this objective.

Themes 2 and 3 address some of the benefits of therapies from a personal perspective, and using the group format as a productive conduit. First, sleep improvements are linked to broader psychological improvements which include feeling better, reduced tiredness and increased energy, all of which provide motivation to persevere with the therapy. Second, group interventions are perceived as advantageous by providing opportunities to contribute and learn as a valued member of their community. The opportunity to talk to and learn from others was important for many participants, who reflected that each individual has a personal and unique journey which can be meaningfully shared with others facing similar issues.

Theme 4 relates to overcoming personal challenges and the hard work necessary to make changes in sleep habits and cognitions that support good sleep. The ideas raised were drawn from each individual's experience in finding their own personal strengths – some learnt to 'let go,' others to 'self-talk,' or 'conduct rituals.' These self-reflections make psychological therapies particularly suitable for addressing sleep problems (as opposed to the use of melatonin or pharmacological therapies alone) given that they provide a space for the person to find their strengths and personal strategies as guided by an experienced therapist.

Finally, theme 5 relate to practical issues about attending the sessions. One participant raised the need for transport assistance to attend the session. Financial hardships experienced by people with psychosis on a pension are a common problem, and can get in the way of these individuals receiving the right treatment and at the right time.

Strategies that have Helped with Sleep Problems or for Going Back to Bed

Finally, participants' strategies that had been found to support their sleep were solicited (**Table 3**). Sleep tips are now widely available on the internet and popular media (for example the Sleephealthfoundation.org.au) and from general and sleep practitioners. Yet few are written for people with psychotic disorders, and by people who themselves experience psychosis. Although the current participant group had not received any coaching or formal sleep education, their strategies closely followed those recommended for community populations such as the importance of winding down, relaxation, and regular bedtimes.

Negative thoughts at bedtime were commonly brought up as needing coping strategies. Worries and intrusive and ruminative thoughts are a common feature of psychotic disorders (Morrison and Baker, 2000) and are particularly elevated in those with symptoms of insomnia (Chiu et al., 2015a). It is thus particularly

TABLE 2 | Enablers to psychological sleep therapies.

Main themes	Enablers
(1) Information that is relevant to people with psychosis	• *Knowing that it would improve sleep* • *I think hearing about the success rates. Hearing. . . the outcomes would make people wanna go more* • *Make the sessions and the instruction content easy to understand* • *I think it should be worded in such a way that I would understand*
(2) Sleeping better is linked to feeling better	• *The biggest motivation is the intrinsic improvement* • *Yeah, if you see improvement it will help you stick to it* • *It's good to have things to look forward to. . .you know, like once you get your rest either way, you'll start feeling better, you'll think better, you'll have more energy, and yeah umm...*
(3) Empowerment and teaching others	• *If one person's motivated, maybe someone else will get motivated and, if you're lucky, half the people get into it* • *Just adding to my general knowledge base you know, and being able to help other people* • *Being able to talk about the experience of doing it and what worked for me, and maybe consider if they make the judgment of what might work for them*
(4) Overcoming personal challenges	• *Learn how to let go so that I can sleep; you know, let go mentally and physically so I can sleep, that would be the overriding thing.* • *Yeah well probably self-talk would come into it, because I know if I can talk myself into getting out of bed early, it's a big hurdle to overcome – that's one of my bad habits. . .* • *Like take your medication at a set time, do some sort of ritual* • *There are lots of stumbling blocks, but I'm just learning how to use my brain now. I have... was in and out of hospital for at least 5 years with no drugs, no crime. . . and uh that helped a lot with everything*
(5) Practical issues	• *Well little things like catching a taxi motivated me to come today. Um so just, just um... just making things easier*

TABLE 3 | Personal strategies that have helped with sleep problems and for getting back to sleep.

Routine
• *A routine before bed like a ritual that is repeated every night*
• *Drinking milk before going to bed*
• *Reading a book*
• *Take a bath*
Sleep hygiene
• *More exercise during the day*
• *Quitting smoking and drugs*
Relaxation
• *Relaxation methods like meditation*
• *Relaxing music*
Addressing negative thoughts
• *Write in a book what you are thinking before you go to bed*
• *Do some art before going to bed to resolve an issue*
• *Doing an activity that breaks the train of thoughts that is going through your mind which is stopping you getting to sleep*
Feeling supported emotionally
• *Ring the Samaritans so that I can tell someone what is on my mind, and I feel validated*
• *Talking to someone*

important that these individuals find strategies that address these psychological issues. Since CBT-I is the only type of therapy which specifically addresses negative thoughts at bedtime, this particular sleep intervention appears particularly well suited to address the needs of this population.

Finally, social and psychological support ('feeling supported') is often taken for granted by people in the community. One participant suggested ringing helplines as a way to meeting one's psychological needs and reassurance, and achieving better sleep.

Summary and Discussion

This paper examined the views and attitudes of people with psychosis about different treatments for insomnia. This study demonstrated, yet again, that people with severe and persistent mental illness are perceptive and insightful and must to be consulted about their treatment and care.

Respondents expressed mixed feelings about pharmacotherapy. Many felt that antipsychotic and sedative medications had benefited their sleep, although concerns remained about side effects, particularly next-day drowsiness, poor attention, and concentration. This supports recent findings reporting on the side effects of antipsychotics on concentration, memory, tiredness, and restlessness (Morrison et al., 2000) and of the distress caused by these reactions (Finn et al., 1990).

A majority of participants responded positively to melatonin as a sleep treatment option, and a majority said they might try it if given the opportunity. Its unfamiliarity, however, led to concerns about how it might interact with their other medications and other side effects.

In the decisional balance, psychological and behavioral-type therapies were perceived as more attractive and with the potential to have greater sleep, psychological, physical, and recovery benefits than any other type of intervention, and the majority of respondents favored this approach over the others. The dominant view was that such therapies have the potential to support and empower these individuals to take responsibility for their own lives and their recovery. Participants noted that the learning process regarding how to manage sleep, and how to cope with sleep problems, provides the only approach to a long-term solution to their sleep problems. This acknowledges that these individuals are experts in their own lives, and that they should be given ownership and responsibility for their choices with appropriate support.

While some respondents were skeptical regarding the potential of such therapies to help with their sleep, many were drawn to psychological support as a way of addressing stress, worries, and racing thoughts. Ambivalence regarding the value of CBT by clients with psychosis has been described previously. In Messari and Hallam (2003), clients expressed skepticism regarding the benefits of the therapies for improving symptoms but, at the same time, they valued the educational components of the program and their relationship with the therapist. This suggests that doubts should not be perceived as a barrier for engaging in treatment as multiple benefits might arise, including psychological improvements with downstream effects on sleep (Franzen and Buysse, 2008). In further support for 'talking' therapies, opportunities for human contact and emotional support were also high on the list of enablers for taking up therapy. It is often forgotten that many people with psychosis live alone and experience substantial loneliness. Two participants in this study, for instance, reported telephoning helplines in the middle of the night to achieve this basic human need. Psychological therapies are therefore highly suited to address these concerns which can act as a barrier to good sleep.

Lack of motivation was recognized as a possible barrier to engaging in psychological and behavioral therapies. Lack of motivation is a well-known symptom of psychosis (e.g., Bentall et al., 2010) which likely impacts on cognition and take-up of therapies (Gard et al., 2009). This suggests that therapies that include motivational methods to engage clients maintain treatment adherence and maximize outcomes are most likely to succeed (Gard et al., 2009). Interestingly, the current participants recognized that personal efforts and hard work are instrumental in regaining a sense of control, autonomy, and independence, placing value in intrinsic motivation with the identification of personal goals that have real-world relevance and which underlie recovery principles.

One possible motivation strategy makes use of group therapy with its opportunity for sharing lessons from one's journey and to learn from each other. In support, in this study, the group format as a methodological approach led to the exploration of a broader range of issues relative to single interviews. Of note, however, a subgroup of participants chose to have individual interviews rather than a group session. While no key differences in sleep themes emerged, personal contents were more frequently brought up, with participants reporting a greater number of adverse experiences (effects of trauma, grief, and loss on sleep, and detailed descriptions of nightmares). It is

possible that these experiences were also common in the other participants given that trauma is a common feature of psychosis (Tarrier et al., 2007), but that the group format was not conducive of such personal discussions. The current data does not provide answers to this question, but our findings suggest that the opportunity to have choices is important and that group therapy may not suit everyone.

When asked their opinion regarding which treatment might work best, participants explained that everyone is different, and that people need different things at different times. Cognitive and behavioral approaches were perceived as more likely to yield benefits in the longer term, but they may not suit all individuals especially if the person is experiencing lack of insight, uncontrollable tiredness, or an acute episode of illness. Eight participants thought that concurrent pharmacological and psychological/behavioral interventions might be the optimal approach during an episode of acute illness.

With regards limitations, the objective of the study was to sample the views of people with psychosis in different environments, and participants included both psychiatric inpatients and individuals in remission from psychotic disorders. One consequence, therefore, is a small sample size in each of the two groups, although this approach may arguably provide greater methodological triangulation. The primary difference between inpatients and outpatients was in the discussions by inpatients about their sleep experiences in the hospital environment (e.g., help from nurses, sleeping walking amongst patients in the wards). Another limitation is that individuals volunteered to take part in this study possibly introducing a participant bias. Finally, no participants had received CBT-I but all had used pharmacological approaches and two had tried melatonin. Participants had, therefore, informed views about antipsychotic medications and sedatives, and were more likely to be aware of their side effects. By contrast, participants made 'educated guesses' about the other treatments which may not reflect the views of a personal experience of these interventions.

Conclusion

In light of evidence showing that poor sleep is intrinsically linked to symptoms of psychosis and that it may act as a barrier to recovery, it is becoming a clinical priority to fully address sleep problems in people with psychotic disorders. In this study, psychological and behavioral-type interventions and melatonin were viewed as valid adjuncts to pharmacotherapy and there was a strong desire for participants to make their own choices regarding the type, and timing, of their therapies. This suggests that psychological and behavioral treatments, including CBT-I, should be more systematically offered to people with psychosis with co-occurring insomnia. In services without clinical expertise in CBT-I, allied health professionals should offer behavioral interventions and education with an emphasis on good sleep habits (a regular wake time, not clock watching, managing caffeine and alcohol intake), awareness of sleep-promoting activities such as regular exercise, association of the bedroom for sleep only (removing TV, phones, etc, and not sleeping in living areas), as well as relaxation and stress-management techniques (Morin et al., 2006).

Overall, this study showed that clients seeking clinical care for sleep problems must be consulted about their preferences and views, and that engagement with others who share similar experiences and an understanding of advantages and limitation of different interventions may be key elements to successful change.

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References

Benca, R. M., Obermeyer, W. H., Thisted, R. A., and Gillin, J. (1992). Sleep and psychiatric disorders: a meta-analysis. *Arch. Gen. Psychiatry* 49, 651–668. doi: 10.1001/archpsyc.1992.01820080059010

Bentall, R., Simpson, P. W., and Lee, D. A. (2010). Motivation and avolition in schizophrenia patients: the role of self-efficacy. *Psychosis Psychol. Soc. Integr. Appr.* 2, 12–22. doi: 10.1080/17522430903505966

Carey, K. B., Purnine, D. M., Maisto, S. A., Carey, M. P., and Barnes, K. L. (1999). Decisional balance regarding substance use among persons with schizophrenia. *Community Ment. Health J.* 35, 289–299. doi: 10.1023/A:1018705722246

Chemerinksi, E., Ho, B.-C., Flaum, M., Arndt, S., Fleming, F., and Andreasen, N. C. (2002). Insomnia as a predictor for symptom worsening following antipsychotic withdrawal in schizophrenia. *Compr. Psychiatry* 43, 393–396. doi: 10.1053/comp.2002.34627

Chiu, V., Harvey, R., Sloan, N., Ree, M. J., Janca, A., Lin, A., et al. (2015a). Cognitive and behavioural factors associated with insomnia in people with schizophrenia and psychosis. *J. Nerv. Ment. Dis.* (in press).

Chiu, V., Ree, M. J., and Waters, F. (2015b). What is it like for people with psychosis to sleep poorly? (in press).

Chouinard, S., Poulin, J., Stip, E., and Godbout, R. (2004). Sleep in untreated patients with schizophrenia: a meta-analysis. *Schizophr. Bull.* 30, 957–967. doi: 10.1093/oxfordjournals.schbul.a007145

Donlon, P. T., and Blacker, K. H. (1975). Clinical recognition of early schizophrenic decompensation. *Dis. Nerv. Syst.* 36, 323–327.

Edinger, J. D., Olsen, M. K., Stechuchak, K. M., Means, M. K., Lineberger, M. D., Kirby, A., et al. (2009). Cognitive behavioral therapy for patients with primary insomnia or insomnia associated predominantly with mixed psychiatric disorders: a randomized clinical trial. *Sleep* 32, 499–510.

Espie, C. A. (2009). "Stepped care": a health technology solution for delivering cognitive behavioural therapy as a first line insomnia treatment. *Sleep* 32, 1549–1558.

Falloon, I. (1992). Early intervention for first episodes of schizophrenia: a preliminary exploration. *Psychiatry* 55, 4–15. doi: 10.1521/00332747.1992.11024572

Falloon, I., Kydd, R., Coverdale, J., and Laidlaw, T. (1996). Early detection and intervention for initial episodes of schizophrenia. *Schizophr. Bull.* 22, 271–282. doi: 10.1093/schbul/22.2.271

Finn, S. E., Bailey, J. M., Schultz, R. T., and Faber, R. (1990). Subjective utility ratings of neuroleptics in treating schizophrenia. *Psychol. Med.* 20, 843–848. doi: 10.1017/S0033291700036539

Franzen, P., and Buysse, D. (2008). Sleep disturbances and depression: risk relationships for subsequent depression and therapeutic implications. *Dialog. Clin. Neurosci.* 10, 473–481.

Gard, D. E., Fisher, M., Garrett, C., Genevsky, A., and Vinogradov, S. (2009). Motivation and its relationship to neurocognition, social cognition and functional outcome in schizophrenia. *Schizophr. Res.* 115, 74–81. doi: 10.1016/j.schres.2009.08.015

González-Torres, M., Oraa, R., Arístegui, M., Fernández-Rivas, A., and Guimon, J. (2007). Stigma and discrimination towards people with schizophrenia and their family members. *Soc. Psychiatry Psychiatr. Epidemiol.* 42, 14–23. doi: 10.1007/s00127-006-0126-3

Harvey, A. (2002). A cognitive model of insomnia. *Behav. Res. Ther.* 40, 869–893. doi: 10.1016/S0005-7967(01)00061-4

Harvey, A. G., Bélanger, L., Talbot, L., Eidelman, P., Beaulieu-Bonneau, S., Fortier-Brochu, É., et al. (2014). Comparative efficacy of behavior therapy, cognitive therapy, and cognitive behavior therapy for chronic insomnia: a randomized controlled trial. *J. Consult. Clin. Psychol.* 82, 670–83. doi: 10.1037/a0036606

Heinrichs, D. W., and Carpenter, W. T. (1985). Prospective study of prodromal symptoms in schizophrenic relapse. *Am. J. Psychiatry* 142, 371–373. doi: 10.1176/ajp.142.3.371

Hickie, I., Naismith, S., Robillard, R., Scott, E., and Hermens, D. (2013). Manipulating the sleep-wake cycle and circadian rhythms to improve clinical management of major depression. *BMC Med.* 11:79. doi: 10.1186/1741-7015-11-79

Hofstetter, J. R., Mayeda, A. R., Happel, C. G., and Lysaker, P. H. (2003). Sleep and daily activity preferences in schizophrenia: associations with neurocognition and symptoms. *J. Nerv. Ment. Dis.* 191, 408–410. doi: 10.1097/01.NMD.0000071591.91247.67

Holmes, E. P., Corrigan, P. W., Knight, S., and Flaxman, J. (1995). Development of a sleep management program for people with severe mental illness. *Psychiatr. Rehabil. J.* 19, 9–15. doi: 10.1037/h0095445

Keshavan, M. S., Reynolds Iii, C. F., Miewald, J. M., and Montrose, D. M. (1996). A longitudinal study of EEG sleep in schizophrenia. *Psychiatry Res.* 59, 203–211. doi: 10.1016/0165-1781(95)02810-2

Krueger, R. A., and Casey, M. A. (2000). *Focus Groups: A Practical Guide for Applied Research*, 3rd Edn. Thousand Oaks, CA: Sage Publications, Inc. doi: 10.1037/10518-189

Lieberman, J. A., Stroup, T. S., McEvoy, J. P., Swartz, M. S., Rosenheck, R. A., Perkins, D. O., et al. (2005). Effectiveness of antipsychotic drugs in patients with chronic schizophrenia. *N. Engl. J. Med.* 353, 1209–1223. doi: 10.1056/NEJMoa051688

Lyne, J., Quinlivan, L., Byrne, C. A., Malone, K., and Walsh, C. (2011). Sleep hygiene use in a psychiatry outpatient setting. *Ir. Med. J.* 104, 49–50.

Messari, S., and Hallam, R. (2003). CBT for psychosis: a qualitative analysis of clients experiences. *Br. J. Clin. Psychol.* 432, 171–188. doi: 10.1348/014466503321903580

Monti, J. M., and Monti, D. (2004). Sleep in schizophrenia patients and the effects of antipsychotic drugs. *Sleep Med. Rev.* 8, 133–148. doi: 10.1016/S1087-0792(02)00158-2

Morgan, D. L., Krueger, R. A., and King, J. (1998). *The Focus Group Kit*. Thousand Oaks, CA: Sage, 1–6.

Morin, C., Bootzin, R., Buysse, D., Edinger, J., Espie, C., and Lichstein, K. L. (2006). Psychological and behavioral treatment of insomnia: update of the recent evidence (1998-2004). *Sleep* 29, 1398–1414.

Morrison, A. P., and Baker, C. A. (2000). Intrusive thoughts and auditory hallucinations: a comparative study of intrusions in psychosis. *Behav. Res. Ther.* 38, 1097–1106. doi: 10.1016/S0005-7967(99)00143-6

Morrison, A. P., Gaskill, D., Meehan, T., Lunney, P., Lawrence, G., and Collings, P. (2000). The use of the liverpool university neuroleptic side-effect rating scale (LUNSERS) in clinical practice. *Aust. N. Z. J. Mental Health Nurs.* 9, 166–178. doi: 10.1046/j.1440-0979.2000.00181.x

Myers, E., Startup, H., and Freeman, D. (2011). Cognitive behavioural treatment of insomnia in individuals with persistent persecutory delusions: a pilot trial. *J. Behav. Ther. Exp. Psychiatry* 42, 330–336. doi: 10.1016/j.jbtep.2011.02.004

National Institute of Mental Health [NIMH]. (2015). *National Institute of Mental Health*. Available at: http://www.nimh.nih.gov/research-priorities/rdoc/arousal-and-regulatory-systems-workshop-proceedings.shtml

Perlis, M. L., Smith, M. T., and Pigeon, W. R. (2005). "Etiology and pathophysiology of insomnia," in *Principles and Practice of Sleep Medicine*, eds M. H. Kryger, T. Roth, and W. C. Dement (Philadelphia, PA: Elsevier Saunders), 714–725. doi: 10.1016/B0-72-160797-7/50067-7

Pompili, M., Lester, D., Grispini, A., Innamorati, M., Calandro, F., Iliceto, P., et al. (2009). Completed suicide in schizophrenia: evidence from a case-control study. *Psychiatry Res.* 167, 251–257. doi: 10.1016/j.psychres.2008.03.018

Rao, M. L., Gross, G., Strebel, B., Halaris, A., Huber, G., Bräunig, P., et al. (1994). Circadian rhythm of tryptophan, serotonin, melatonin, and pituitary hormones in schizophrenia. *Biol. Psychiatry* 35, 151–163. doi: 10.1016/0006-3223(94)91147-9

Ritsner, M., Ponizovsky, A., Endocott, J., Nechamkin, Y., Rauchverger, B., Silver, H., et al. (2002). The impact of side-effects of antipsychotic agents on life satisfaction of schizophrenia patients: a naturalistic study. *Eur. Neuropsychopharmacol.* 12, 31–38. doi: 10.1016/S0924-977X(01)00128-6

Schmidt, R. E., Harvey, A. G., and Van der Linden, M. (2011). Cognitive, and affective control in insomnia. *Front. Psychol.* 2:349. doi: 10.3389/fpsyg.2011.00349

Shamir, E., Laudon, M., Barak, Y., Anis, Y., Rotenberg, V., Elizur, A., et al. (2000). Melatonin improves sleep quality of patients with chronic schizophrenia. *J. Clin. Psychiatry* 61, 373–377. doi: 10.4088/JCP.v61n0509

Sit, D., Wisner, K. L., Hanusa, B. H., Stull, S., and Terman, M. (2007). Light therapy for bipolar disorder: a case series in women. *Bipolar Disord.* 9, 918–927. doi: 10.1111/j.1399-5618.2007.00451.x

Spielman, A. J., Caruso, L. S., and Glovinsky, P. B. (1987). A behavioral perspective on insomnia treatment. *Psychiatr. Clin. North Am.* 10, 541–553.

Suresh Kumar, P. N., Andrade, C., Bhakta, S. G., and Singh, N. M. (2007). Melatonin in schizophrenic outpatients with insomnia: a double-blind, placebo-controlled study. *J. Clin. Psychiatry* 68, 237–241. doi: 10.4088/JCP.v68n0208

Tarrier, N., Khan, S., Cater, J., and Picken, A. (2007). The subjective consequence of suffering a first episode psychosis: trauma and suicide behaviour. *Soc. Psychiatry Psychiatr. Epidemiol.* 42, 29–35. doi: 10.1007/s00127-006-0127-2

Van Cauter, E., Linkowski, P., Kerkhofs, M., Hubain, P., L'Hermite-Balériaux, M., Leclercq, R., et al. (1991). Circadian and sleep-related endocrine rhythms in schizo- phrenia. *Arch. Gen. Psychiatry* 48, 348–356. doi: 10.1001/archpsyc.1991.01810280064009

Wagley, J. N., Rybarczyk, B., Nay, W. T., Danish, S., and Lund, H. G. (2013). Effectiveness of abbreviated CBT for insomnia in psychiatric outpatients: sleep and depression outcomes. *J. Clin. Psychol.* 69, 1043–1055. doi: 10.1002/jclp.21927

Waters, F., Faulkner, D., Naik, N., and Rock, D. (2012). Effects of polypharmacy on sleep in psychiatric inpatients. *Schizophr. Res.* 139, 225–228. doi: 10.1016/j.schres.2012.05.013

Waters, F., Sinclair, C., Rock, D., Jablensky, A., Foster, R. G., and Wulff, K. (2011). Daily variations in sleep–wake patterns and severity of psychopathology: a pilot study in community-dwelling individuals with chronic schizophrenia. *Psychiatry Res.* 187, 304–306. doi: 10.1016/j.psychres.2011.01.006

Yang, C., and Winkelman, J. W. (2006). Clinical significance of sleep EEG abnormalities in chronic schizophrenia. *Schizophr. Res.* 82, 251–260. doi: 10.1016/j.schres.2005.10.021

Zarcone, V. P., and Benson, K. L. (1997). BPRS symptom factors and sleep variables in schizophrenia. *Psychiatry Res.* 66, 111–120. doi: 10.1016/S0165-1781(96)02857-0

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