MEASURING AND UNDERSTANDING THE PHENOMENOLOGY AND CONTENT OF HALLUCINATIONS

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Thesis Abstract

Historically regarded as a symptom of psychosis, more recent research has indicated that hallucinations may be transdiagnostic, phenomenologically diverse, and associated with traumatic and adverse life experiences. Psychological models have struggled to account for this range of hallucinatory experience. A better understanding of how traumatic experiences relate to hallucinations, and of the diversity of this phenomenon could have valuable implications for psychological theories and therapies for hallucinations.

A systematic literature review (Paper 1) examined the relationship between trauma and the content and characteristics of hallucinations. A large majority of included studies identified a relationship, including direct relationships, such as parallels in terms of perpetrator and voice identity, and thematic relationships, such common themes of threat. The findings were explored in the context of psychological theories of hallucinations, including drawing on the existing literature on re-experiencing symptoms as found in post-traumatic stress disorder. Various methodological limitations of the literature are discussed.

An empirical study (Paper 2) sought to develop the Dimensions of Voices Questionnaire. An exploratory factor analysis revealed different dimensions which were termed memory-related hallucinations, threat-related hallucinations and linguistic complexity hallucinations. Certain demographic characteristics of the sample limit generalisability, perhaps due to the study being online. Further research is needed to ascertain replication of the factor structure in an independent sample.

A critical evaluation (Paper 3) is presented, which describes in more detail some of the decisions made in the above papers, and further explores the strengths and limitations of this work.

Declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Acknowledgements

Paper 1

Relationship between Trauma and the Content and Characteristics of Hallucinations across Clinical and Non-Clinical Populations: A Systematic Review

Word Count: 9150 (excluding figures, tables, and references)

Abstract

There is now a substantial research literature examining the relationship between exposure to traumatic life events and the content and characteristics of psychotic symptoms, in particular hallucinatory experiences. This study aimed to systematically review the findings from this research area. A literature search was performed on Embase, PsychInfo and Medline to identify eligible quantitative, qualitative and mixed methods studies. Of the 37 studies retained for inclusion, data extraction and narrative synthesis revealed that 36 (97.2%) reported an association between trauma and hallucination content or characteristics. 35 studies identified an association in terms of content (including in terms of identity, resembling the nature of the trauma, thematic links and persecutory content). 8 studies identified a relationship between trauma and characteristics of hallucinations (such as commenting, commanding and conversing voices). These findings have implications for psychological theories and models of hallucinations as well as for development and implementation of psychological therapies for distressing hallucinations, such as indicating the importance of assessing the nature of the particular trauma-hallucination relationship in trauma-focused interventions. It suggests that models and therapies of hallucinations need to capture and address trauma-hallucination links which are similar to but perhaps distinctive from re-experiencing symptoms, as well as hallucinations which are indirectly or thematically linked to traumatic experiences.

Introduction

Hallucinations are perceptions which are experienced in the absence of an objective, external source responsible for the "generation" of that percept (Aleman & Larøi, 2008) and can occur across all sensory modalities. Although frequently associated with schizophrenia spectrum disorders (Slade & Bentall, 1988), hallucinations are observed in other clinical populations, such as in individuals diagnosed with borderline personality disorder (Kingdon et al., 2010), post-traumatic stress disorder (PTSD) (Anketell et al., 2010), bipolar disorder (Upthegrove et al., 2015) and dissociative identity disorder (Dorahy et al., 2009; Ross et al., 1990). Additionally, hallucinations can arise in 'at risk' individuals (sometimes referred to as 'Attenuated Psychosis Syndrome' (APS), or 'Ultra High Risk' (UHR)), and in nonclinical populations (Laroi et al., 2012; Pierre, 2010; Van Os & Reininghaus, 2016). Phenomenological characteristics of hallucinatory experiences have been found to be comparable across various clinical and nonclinical groups (Honig et al., 1998; Serper, Dill, Chang, Kot, & Elliot, 2005; Waters & Fernyhough, 2017). Consequently, psychosis-like experiences have been proposed to lie along a continuum, as a trans-diagnostic experience (Van Os, Hanssen, Bijl, & Ravelli, 2000).

A substantial literature now exists illustrating an association between traumatic life events and the experience of hallucinations. Meta-analyses have found that childhood adversities increase the risk of hallucinations in the context of psychosis (Varese et al., 2012) and are associated with hallucination severity (Bailey et al., 2018). The probability of experiencing hallucinations in individuals who have been sexually abused was around 15 times higher than those with no such experience in an epidemiological study (Bebbington et al., 2004). While there has been a large body of research focusing on links between childhood abuse and psychosis/schizophrenia, relationships have also been identified with adulthood trauma; and chronic but less 'severe' childhood adversities have

been found to be equally associated with psychosis (Read, Fink, Rudegeair, Felitti, & Whitfield, 2008). For example, one meta-analysis reported that emotional abuse and bullying were associated with psychosis, in addition to sexual and physical abuse and neglect (Varese et al., 2012).

Several mechanisms through which trauma may confer risk of hallucinations have been proposed. A number of theories purport that this association may be related to traumatic memory intrusions, which are characteristic of the re-experiencing symptoms in PTSD. In this respect, higher rates of PTSD have been identified in individuals with psychosis compared to the general population (de Bont et al., 2016), and one large-scale population survey reported an association between post-traumatic intrusions and hallucinations (Alsawy, Wood, Taylor, & Morrison, 2015). Additionally, trauma-memory re-experiencing was found to partly account for the association between childhood sexual abuse and hallucinations in a nonclinical sample (Gracie et al., 2007). This has led researchers to propose that the aetiology of some hallucinations may be related to re-experiencing of trauma memories (McCarthy-Jones & Longden, 2015; Steel, Fowler, & Holmes, 2005). However, this has presented the challenge of explaining why such symptoms may be experienced, described and diagnosed as hallucinations rather than purely as memory intrusions.

Multiple psychological models of hallucinatory experiences have been proposed, the most explored and agreed upon being the so called "misattribution models". These models propose that people who experience auditory verbal hallucinations (AVH) misattribute inner speech (or other internally generated cognitive events) as non-self, and have an externalising bias leading them to readily ascribe cognitive events as external rather than internal in origin (Bentall, 1990; Frith, 1992; Laroi & Woodward, 2007). Consistent with this, neural correlates of inner speech have been identified in people experiencing AVH (Jones & Fernyhough, 2007), and a bias towards attributing stimuli to

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an external source has also been identified in this population (Brookwell, Bentall, & Varese, 2013; Ditman & Kuperberg, 2005). In a meta-analysis, self-monitoring deficits were consistently identified across various paradigms and sensory modalities in participants experiencing AVH (Waters, Woodward, Allen, Aleman, & Sommer, 2012).

A number of theoretical accounts have been proposed to explain how the observed relationship between trauma and hallucinations may fit with these misattribution models. Allen, Coyne and Console (1997) suggest that trauma-induced dissociation could make individuals vulnerable to experiencing hallucinations by impairing reality testing and destabilizing the individual's internal anchors or sense of self (see also, Moskowitz & Corstens, 2007). This could then increase the risk of source monitoring errors. Morrison, Frame and Larkin (2003) argue that both hallucinations and re-experiencing symptoms in PTSD may be trauma-related memory intrusions with similar underlying mechanisms. They proposed that intrusions experienced as hallucinations, and interpretations of these intrusions, may be less culturally acceptable compared to those in PTSD, potentially due to the tendency for them to be attributed to an external source (Bentall, 1990; Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001). Bentall and Fernyhough (2008) propose that, given that deficits in source monitoring may be more likely with a low cognitive load (Johnson, Hashtroudi, & Lindsay, 1993), individuals who have difficulties with source monitoring, may misattribute intrusive memories (which are considered non-effortful and spontaneous; Brewin, 2003) to an external source, ultimately emerging as hallucinations. However, whilst these theories are successful at drawing together an otherwise disparate literature on trauma and psychosis and misattribution models, they do not fully explain the diverse phenomenology of hallucinations, nor the fact that individuals diagnosed with both PTSD and psychosis can report both trauma memory intrusions and hallucinations.

In a recent review, Hardy (2017) presented a multifactorial model to explain the diverse phenomenology of hallucinations in the context of theories about traumatic

intrusions. Cognitive models of PTSD construe trauma-related intrusions as the result of improperly consolidated and contextualised memories in the presence of increased emotion (Brewin, Gregory, Lipton, & Burgess, 2010; Ehlers & Clark, 2000) and heightened encoding of perceptual memory (Brewin et al., 2010; Ehlers & Clark, 2000; Hackmann & Holmes, 2004). This is believed to lead to fragmented memories which are easily triggered and experienced as especially vivid and intense, lending to a sense of them occurring in the present. Hardy (2017) argues that intrusions in psychosis may appear to differ from those in PTSD (and not necessarily be appraised as relating to trauma memories) because they are especially decontextualized and are disassimilated in episodic memory to the extent that the person cannot recognise them as part of the trauma. This theory requires the possibility that trauma-memory intrusions may occur along a continuum - from more contextualised to less contextualized - a currently speculative, although perhaps intuitive, hypothesis. This would explain the extent to which some intrusions are more developed than others: for example, from hearing a scream to a multisensory flashback. It is proposed that the high levels of trauma and adversity reported in populations who experience hallucinations may mean that this group have particular difficulties in the contextualisation and consolidation of memories due to heightened stress sensitivity (Fowler et al., 2006; Steel et al., 2005). Dissociation may be an additional possible cause of decontextualised memories, as it has been suggested to interfere with the integration of sensory-perceptual processes, which could increase the likelihood of intrusive memories (Brown, 2006).

Additionally, trauma-related beliefs, appraisals and schemas stored through semantic memory have been proposed to impact upon the person's self-perceptions (their 'working self') (Hardy, 2017). As a result, it would be likely that the individual retrieves episodic and personal representations consistent with both these experiences and the 'working self' and interpret new events in accordance with this. This could lead to

intrusions experienced as hallucinations which are thematically linked to the person's post-traumatic appraisals and beliefs.

Based on these theories, it would be plausible that, in addition to conferring vulnerability to hallucinations in general, trauma would be associated with the specific content and characteristics of hallucinations. Hallucination characteristics (e.g. location, Schneiderian features, insight) have tended to be privileged as clinically relevant rather than content (e.g., American Psychiatric Association, 2013). A number of studies have investigated how trauma may be associated with particular characteristics or features of hallucinations, such as whether AVH are commenting or conversing (e.g., Berg et al., 2017; Rosen et al., 2017) or commanding (e.g., Longden, Sampson, & Read, 2016). The comparatively recent research interest in content has particularly focused on AVH or 'voice hearing'. Voice content has been found to predict distress and psychiatric need over and above other variables such as Schneiderian symptoms (Beavan & Read, 2010). It has been argued that AVH content is related to trauma in both individuals with diagnoses of schizophrenia and PTSD (McCarthy-Jones & Longden, 2015). Furthermore, researchers have suggested that the particular content of hallucinations is meaningful in the context of the person's life experiences and, in particular, in relation to their experiences of adversity (Corstens & Longden, 2013). In this regard, AVH have been conceptualised as 'dissociated or disowned components of the self (or self-other relationships) that result from trauma, loss, or other interpersonal stressors' (Longden, Madill, & Waterman, 2012, p. 28).

The question of the relationship between trauma and the specific content and characteristics of hallucinations has been approached using various methodologies and study designs, including through qualitative and quantitative analysis and case-control, cross-sectional and case series studies. However, a systematic review of this literature has not yet been undertaken. Such a review could be important in terms of advancing theoretical models of hallucinations, understanding the trauma-hallucination relationship,

and informing clinical practices when working therapeutically with distressing

hallucinatory experiences in trauma survivors.

Research Aims

This review aims to synthesise findings across different clinical and non-clinical

populations as to how traumatic life experiences may impact upon the content and

characteristics of hallucinations, together with identifying the strengths and weaknesses of

the literature through a systematic quality (risk of bias) assessment.

Method

Search Procedure

The systematic review followed the standards and conventions outlined in the PRISMA

statement. Details of the protocol for this systematic review were registered on

PROSPERO and can be accessed at:

http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018087970.

Systematic searches were completed in August 2017 on PsycINFO, Embase and Medline.

A broad range of search terms was decided upon in order to maximise the identification of

studies on hallucinations. The following three search strings (combined with the Boolean

operator "AND", with truncated search terms where relevant) were used:

1. Hallucination-related search terms (hallucination* OR voice* OR psychosis OR

    psychotic OR schizo* OR severe mental OR serious psychiatric OR serious mental

    OR positive symptom* OR delusion* paranoi* OR thought disorder* OR

    grandios*)

2. Trauma-related search terms (advers* OR trauma* OR abuse* OR bully* OR

    bullied OR maltreat* OR life event* OR neglect OR victim* OR loss OR life

    experience*)

3. Content/characteristics (dimension* OR feature* OR content OR characteristic*)

No date restrictions were placed for these searches, but they were limited to articles involving humans and written in English. Reference lists of eligible studies and citing articles were also checked in order to identify additional literature not identified through the database searches. Unpublished articles (e.g. dissertations) were included in addition to published literature in an effort to reduce the impact of publication bias on the review findings. Key authors in the field and corresponding authors of all papers included were contacted to request any additional relevant papers (including unpublished work).

Inclusion and Exclusion Criteria

Studies were included if they met all of the following criteria:

1) *Assessed hallucinations*: Studies were included if hallucinations were assessed, whether in a clinical or nonclinical group. Due to the limited volume of this literature, no particular criterion was used for measurement instruments. However, this was evaluated as part of the quality assessment. Hallucinations could be auditory, visual, tactile, gustatory or olfactory or a combination of modalities. Studies could meet this inclusion criteria if all or some of the sample experienced hallucinations.

2) *Assessed content or characteristics of hallucinations:* Studies were deemed to assess 'content' if they included some assessment of the specific subject, valence or identity of hallucinations. To be considered to assess 'characteristics', studies needed to assess the particular features of hallucinations (e.g., their frequency, volume, location, or whether they conversed or not). Studies which only assessed the modality of hallucinations (e.g. auditory / visual hallucinations) were not included; modality was not considered a characteristic as it does not provide any additional information about the particular subject or features of the experience (i.e. they refer to how it is experienced rather than what is experienced). Similarly, the dichotomous differentiation between simple versus complex hallucinations (e.g., Lu et al., 2017) was considered insufficiently specific for inclusion as

a characteristic. Beliefs about voices (e.g. beliefs that voices were malevolent) were not included as these were not considered an aspect of hallucination content, referring to an interpretation that the person has made about their hallucinatory experience.

3) *Assessed trauma exposure:* Studies were deemed eligible if they measured trauma exposure, or if participants had been recruited because of their exposure to trauma (e.g. combat veterans, refugees, or people with a PTSD diagnosis). No particular requirements were placed in terms of the trauma assessment tools, although this was appraised as part of the quality assessment process. Studies could meet this criterion if some or all of the sample had experienced a trauma (i.e. studies investigating how content/characteristics of positive symptoms vary depending on trauma exposure were included). No specific restrictions were placed on the types of trauma considered in this study, including events in both childhood and adulthood, various forms of abuse, bullying, neglect, bereavement and combat trauma. However, events that might be considered stressful rather than traumatic were not included, such as job loss, the breakdown of a relationship, or general aspects of the child-parent relationship (e.g. measured using the Parental Bonding Instrument; Parker, Tupling, & Brown, 1979).

4) *Assessed the relationship between trauma and symptoms:* Eligible studies had to report an evaluation of the relationship between trauma and the content/characteristic of hallucinatory experiences. For quantitative studies, a descriptive or inferential statistical analysis of the associations between traumatic experiences and content/characteristics of symptoms was required. For qualitative studies, papers needed to examine potential associations between trauma and content or characteristics of symptoms using qualitative analysis or narrative description in order to be included. For case series, authors needed to descriptively highlight and discuss the presence or absence of associations between trauma and symptom content or characteristics.

Studies were excluded for the following reasons:

- Samples with participants for whom an organic, neurological or pharmacological origin for hallucinations was implicated (e.g. dementia, traumatic brain injury or medication side-effects).

- Books, posters or conference abstracts.

- Solely review articles.

- Single case studies.

- Written in a language other than English.

Selection

Eligibility was determined through three screening stages: article titles, abstracts and full papers. Twenty percent of titles and abstracts were screened by a second researcher external to the research team to assess interrater reliability. For title screening, Cohen's Kappa was good at .709 (p < .001), therefore level of agreement was statistically significant. Sensitivity was 71.4% whilst specificity was 99.4%. Kappa for abstract screening was also good at .701 (p < .001), therefore level of agreement was statistically significant. Sensitivity was 94.1% whilst specificity was 86.2%. Sixty percent of the papers that reached the full paper stage underwent a consensus rating by two of the authors (PC and FV), with the authors agreeing on 98.3%. Discrepancies were discussed and an agreement reached. The full systematic search and eligibility screening procedure is depicted in Figure 1.
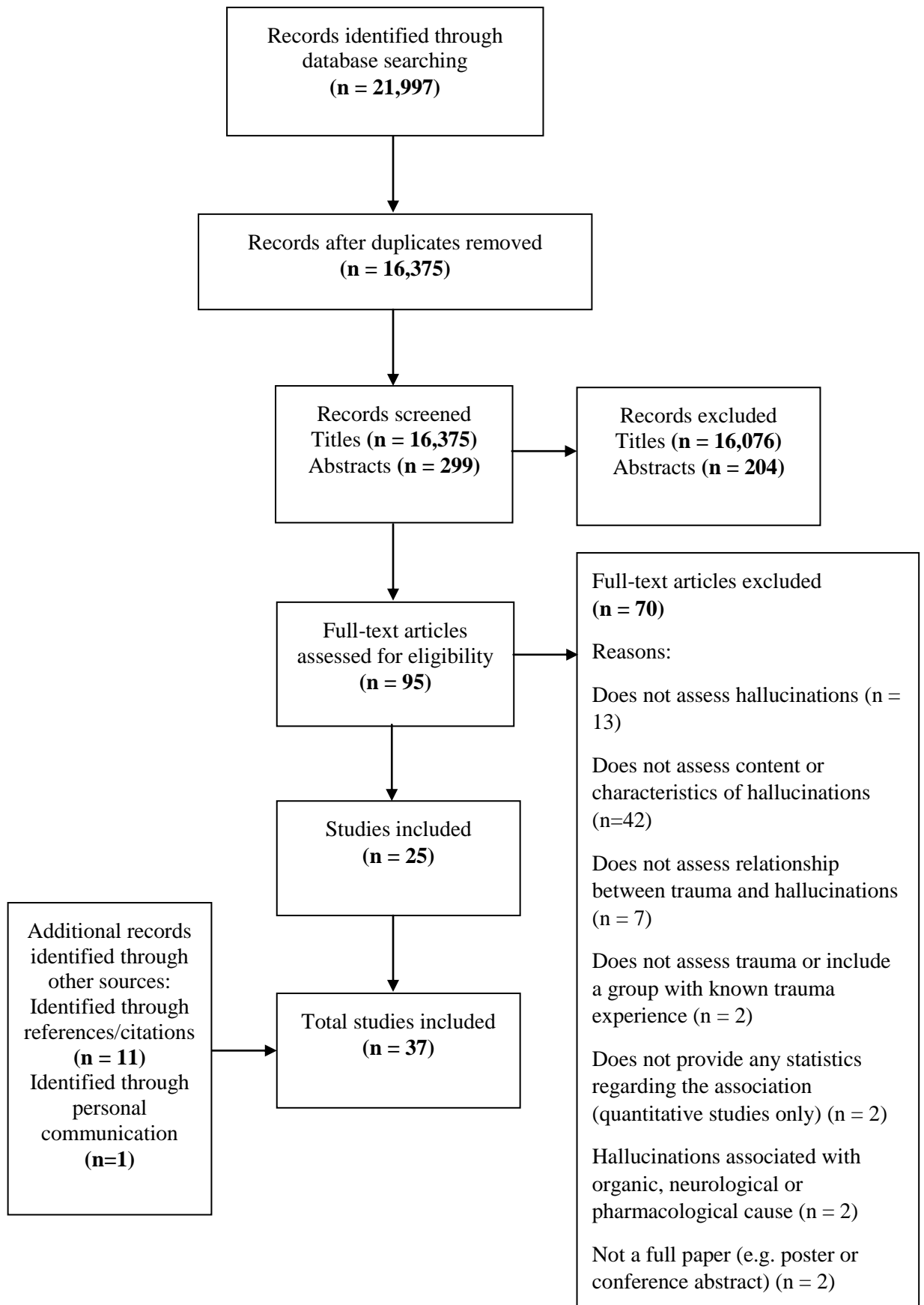
Fig. 1. *A PRISMA diagram of the screening process.*

Quality Assessment

The quality of eligible studies was assessed using the Quality Assessment Tool for Studies with Diverse Designs (QATSDD: Sirriyeh, Lawton, Gardner, & Armitage, 2012) which allows for evaluation of qualitative, quantitative and mixed-methods studies. It was developed through combining previously validated tools to create 16 items (14 for quantitative studies, 14 for qualitative studies and 16 for mixed methods studies) deemed to ascertain research quality. It includes the assessment of explicit study aims, sampling, data collection, measures, and analysis. Total scores range from 0-42. A four-point Likert scale (0-3) was used to rate papers on each item, from 'no mention at all' to 'criteria completely met'. The first author and an independent rater completed the assessment, with any discrepancies being discussed between them and resolved by PC.

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Results

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Overall Summary of Studies

Thirty-seven studies were retained for review. Table 1 provides a summary of relevant study characteristics and research findings. Thirty-six out of 37 (97.2%) studies observed some association between trauma and hallucination content or characteristics.

Participant Characteristics

A total of 5194 individuals participated in the included studies, of which 2106 were male, 3031 female, 2 transgender, and 55 did not report gender. The mean age was 34.76 years. Thirty five out of 37 studies included clinical populations, 3 studies recruited an UHR sample (O' Connor, Nelson, Cannon, Yung, & Thompson, 2017; Thompson et al., 2010; Velthorst et al., 2013), and 1 study deliberately recruited a non-clinical group who experienced AVH (Daalman, Diederen, Derks, Van Lutterveld, & Sommer, 2012). Within studies including a clinical sample, the most common diagnoses were schizophrenia spectrum conditions (n = 633), PTSD (n = 451), bipolar disorder (n = 2193), psychotic

disorders (recorded as psychosis, psychosis not otherwise specified, or psychotic disorders) (n = 328). Bipolar was an especially common diagnosis due to one study having an unusually large sample size (Upthegrove et al., 2015). Participants were recruited through a range of services, predominantly inpatient and outpatient services.

Measures

Details regarding the measures used to assess trauma and hallucinations are shown in Table 1. Sixteen different measures were used to assess trauma, the most common of which was the Childhood Trauma Questionnaire (Bernstein et al., 2003). Sixteen studies did not report the use of or results from any measurement instrument for the assessment of trauma. This included all six case studies, together with all studies that were conducted with a sample selected based on trauma exposure (e.g. combat veterans or individuals with PTSD). Five studies retrieved information about trauma exposure from medical records and did not report the use of a specific measurement tool (Longden et al., 2016; Nygaard & Sonne, 2017; O' Connor et al., 2017; Read & Argyle, 1999; Read et al., 2003; Velthorst et al., 2013).

There were 18 different measures of hallucination content or characteristics, including the Structured Clinical Interview for DSM-IV-TR (SCID; First, Spitzer, Gibbon, & Williams, 2002), the Positive and Negative Syndrome Scale (PANSS: Kay, Fiszbein, & Opfer, 1987), and the Psychotic Symptom Rating Scale for Hallucinations (PSYRATS-AH: Haddock, McCarron, Tarrier, & Faragher, 1999).

Additionally, four studies gathered information on hallucination content and characteristics solely through medical records (Longden et al., 2016; Nygaard & Sonne, 2017; Read & Argyle, 1999; Read et al., 2003). This approach was limited by its dependence upon the assumption that consistent assessment and reporting on trauma and hallucination content and characteristics was conducted within the medical setting.

A number of quantitative studies gathered information about trauma and hallucination content through developing their own questionnaire (Thompson et al., 2010) or interview (Corstens & Longden, 2013; Gauntlett-Gilbert & Kuipers, 2003; Hardy et al., 2005). Two studies used a measure that was specifically designed to assess and code hallucination content or characteristics and associations with trauma (Hardy et al., 2005; Peach, 2016). Additionally, two qualitative studies developed their own interview in order to assess phenomenology (Rhodes, Parrett, & Mason, 2016; Rosen et al., 2017).

Design Characteristics

The 37 included studies used quantitative (n=27), qualitative methodology (n=9, including 7 case series), or mixed methodology (n=1). Quantitative papers used either a cross-sectional (n=21) or case-control (n=7) research design. Qualitative studies used a grounded theory (n=2), Interpretative Phenomenological Analysis (IPA: n=2) or case series approach. Studies approached the research question either by investigating associations between trauma and hallucination content, or by associations between scores on measures of hallucination characteristics.

Regarding hallucination characteristics, eleven studies, all using quantitative methodology, used a combination of self-report measures and semi-structured interviews to investigate how hallucination characteristics associated with trauma scores. These studies all focused on AVH, including on whether they were conversing, commanding, commenting, controlling and other phenomenological aspects such as frequency, duration and location (e.g. Daalman et al., 2012) Some studies additionally considered relationships with specific subscales on trauma measures, such as childhood sexual abuse (e.g., Read et al., 2003).

Table 1: Characteristics and findings of all studies included in the review.

Study	Sample (reported for sample experiencing hallucinations only)	Diagnosis	Data type[1], study design[2]	Analytic method	Assessment of trauma exposure[1] and hallucinations[2]	Hallucination modality[1] Hallucination content or characteristics[2]	Main findings	QATSDD Total Score
Studies investigating associations between scores on measures of trauma and hallucination characteristics								
Berg et al. (2017) *Norway*	N = 454 Age: M = 29.34 Gender: Male (n = 249)	Non-affective or affective psychotic disorder (N = 454)	1) Quantitative 2) Case Control study?	Spearman's rho d; Mann-Whitney U, and regression	1) Norwegian version of the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994). 2) Structured Clinical Interview for DSM-IV Axis I Disorders (SCID; First & Gibbon, 2004) Positive and Negative Syndrome Scale (PANSS; Kay, Fiszbein, & Opler, 1987) and the Global Assessment of Functioning Scale (GAF; (Pedersen, Hagtved, & Karterud, 2007)	1) Auditory verbal 2) Characteristics (conversing and commenting)	Childhood trauma (total score) correlated with and predicted conversing AVH, which also correlated with all subscales. Commenting AVH associated with physical and sexual abuse and physical neglect, not total CTQ, emotional abuse or neglect.	33
Daalman et al. (2012) *The Netherlands*	N=227 Age: M = 40.22 Gender: Male (N = 85)	Non-affective psychotic disorder (N = 86), schizoaffective disorder (n=14)	1) Quantitative 2) Case-control	Spearman correlations, logistic regression	1) CTQ short form (Bernstein et al., 2003) 2) The Psychotic Symptom Rating Scales (PSYRATS) Auditory Hallucinations Scale (Haddock et al., 1999)	1) Auditory verbal 2) Content (emotional valence) Characteristics (duration, location, loudness, controllability)	No type of childhood trauma distinguished between positive or negative emotional valence of AVH. No significant relationships were found between sexual and emotional abuse and AVH characteristics such as frequency, duration, location, loudness, beliefs about their origin, controllability, and emotional valence of content and total associated distress.	28
Dorahy et al. (2009) *New Zealand*	N=65 Age: M=41.61 Gender: Male (n=27), Not Recorded (n=2)	Schizophrenia (n=34), DID (n=29)	1) Quantitative 2) Case-control?	Backwards likelihood-ratio logistic regression and descriptive statistics	1) CTQ 2) Mental Health Research Institute Unusual Perceptions Scale (MUPS; Carter, Mackinnon, Howard, Zeegers, & Copolov, 1995)	1) Auditory verbal 2) Content (identity) and characteristics (commanding and controlling)	1.96-2.49 estimated increased odds that maltreatment group (compared to no maltreatment) heard more than 2 AVH, felt commanded or controlled by AVH, heard AVH content relating to someone influential, and heard AVH replaying past memories.	26
Hammersley et al. (2003) *UK*	N=96 Age: M=40.5 Gender: Male (n=32)	Bipolar affective disorder	1) Quantitative 2) Cross-sectional	Chi-squared statistic	1) 8 item questionnaire to be completed by therapists 2) SCID	1) Auditory verbal 2) Content (mood-incongruent) and characteristics (commenting)	Reports of sexual abuse associated with history of commenting AVH. No significant relationship between mood-incongruent psychotic symptom content and childhood sexual abuse.	21
Longden et al. (2016) *New Zealand*	N=251 Age: M=35.7 Gender: Male (n=129)	Primary disorder: mood disorder (45.4%), psychotic disorder (23.1%), anxiety disorder (7.6%), other (13.9%), none (9.9%)	1) Quantitative 2) Cross-sectional	Mann-Whitney U-Tests, Phi-coefficient, unadjusted odds ratios	1) From medical records 2) From medical records	1) Auditory verbal 2) Characteristics (commanding)	Number of adversities significantly higher in patients reporting command AVH. Childhood physical abuse, fostering/adoption, and poverty were all associated with increased probability of reporting command AVH.	26
Misiak et al. (2016)	N= 94 Age: M=26.71	Schizophrenia (n=94)	1) Quantitative 2) Case-	Mann-Whitney U test	1) Early Trauma Inventory self-report-short form (ETISR-SF; Bremner, Bolus, & Mayer, 2007)	1) Auditory verbal 2) Content (abusive)	Third person AVH (abusive, accusatory, or persecutory AVH) and first rank AVH hallucinations (thought echo, third person auditory hallucinations and running commentary AVH) were	24

Poland	Gender: Male (n = 54)		control?		2) The Operational Criteria Checklist for Psychotic Illness and Affective Illness (OPCRIT; McGuffin, Farmer, & Harvey, 1991) and PANSS	and characteristics (commenting)	significantly more frequent in patients with a childhood trauma history compared to those without.	
O'Connor et al. (2017) *Australia*	N = 118 (with perceptual abnormalities, n=77) Age: M=18.3 Gender: Male (n=49)	Ultra-high risk (not transitioned to psychosis, n=59)	1) Quantitative 2) Cross-sectional	Logistic regression	1) From clinical records 2) OPCRIT and the Comprehensive Assessment of At-Risk Mental States (CAARMS; Yung et al., 2005)	1) Auditory verbal 2) Content (abusive) and characteristics (commanding)	No association between childhood trauma or bullying and abusive, second person, third person, or commanding AVH content. No association between a psychosocial stressor in the 3 months prior to the onset of attenuated symptoms and AH content.	27
Read et al. (2003) *New Zealand*	N=200 Age: M=36.6 Gender: Male (n=86)	Psychotic disorder (n=37), schizoaffective disorder (n=5), affective disorder (n=100), PTSD (n=7), other (n=46).	1) Quantitative 2) Cross-sectional?	Pearson Chi-squared, Stepwise linear regression	1) Review of medical records 2) Review of medical records	1) Auditory verbal 2) Content (sexual content, direct relationships) and characteristics (commenting and commanding)	AVH commenting and command hallucinations to harm or kill oneself were significantly related to all abuse types. Child and adult abuse combined was the only significant predictor of command AVH. Commenting AVH were predicted by child abuse, adult abuse and child and adult abuse combined. Sexual symptom content was 7 times more likely in childhood sexual and physical abuse than in the non-abused group. References to evil or the devil were more common in the childhood sexual abuse and childhood and adulthood sexual abuse combined groups than in the non-abused group. For sexual and evil content, the only significant predictor was combined child and adult abuse. The authors additionally described a number of examples in which content seemed directly related to the documented abuse.	27
Sahin et al. (2013) *Turkey*	N= 124 Age: M=21.8 Gender: Male (n=88)	First episode psychosis (n=83), ultra-high risk (n=41)	1) Quantitative 2) Case-control	Pearson Correlation	1) CTQ 2) Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1984) and The Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962)	1) Auditory verbal 2) Characteristics (commenting)	In UHR group, severity of sexual abuse correlated with SAPS scores for AVH commenting. Severity of physical neglect correlated with AVH commenting.	24
Studies investigating associations between trauma and hallucination content (including hallucination identity, negative or abusive content, direct and thematic associations)								
Corstens & Longden (2013) *The Netherlands*	N=100 Age: M = 35.94 Gender: Male (n = 43)	Psychotic disorder (80%), BPD), (8%), affective disorder (5%), diagnosis not disclosed (7%).	1) Quantitative 2) Cross-sectional	Descriptive statistics (percentages)	1) Childhood History Questionnaire 2) Semi-structured interview	1) Auditory verbal 2) Content (identity)	78% heard AVH whose identity could be formulated in terms of lived experience. AVH were commonly recognised as representations of aspects of the self, or of significant others (e.g. abusive (45%) or non-abusive (30%) family members). 94% heard AVH that could be formulated as specific representations of social emotional conflicts.	26
Falukozi & Addington (2012)	N= 45 Age: M = 19	Clinical high risk for psychosis	1) Quantitative 2) Cross-sectional	Spearman-rank correlations	1) The Abuse/ Trauma Questionnaire (Janssen et al., 2004) 2) The Scale of Prodromal	1) Auditory verbal and visual 2) Content	There was no correlation between trauma and hearing negative AVH, feeling numbness, vibrations, pain, burning, or someone's touch. The only significant association with trauma was hearing positive AVH.	28

Canada	Gender: Male (n = 25)				Symptoms (SOPS; (Addington, 2007); Content of Attenuated Positive Symptoms (CAPS; Marshall et al., 2014)	(emotional valence)		
Gauntlett-Gilbert & Kuipers. (2003) *UK*	N=20 Age: M=41 Gender: Male (n=10)	Schizophrenia or Schizoaffective Disorder (60%), Bipolar affective disorder (15%), Depression or Psychotic depression (25%), borderline personality disorder (15%)	1) Quantitative 2) Cross-sectional	No statistical analysis (percentages provided for visual hallucinations)	1) No measure used 2) Structured interview that evaluated the phenomenology of visual hallucinations	1) Visual 2) Content (direct associations)	55% experienced VH of traumatic events.	13
Hardy et al. (2005) *UK*	N=75 Age: M=39.1 Gender: Male (n=52)	Schizophrenia (n=62), Schizoaffective disorder (n=13), Comorbid PTSD (n=27)	1) Quantitative 2) Cross-sectional	Chi-squared tests/Fisher tests	1) Trauma History Questionnaire (THQ; Green, 1996) 2) Schedules for Clinical Assessment in Neuropsychiatry version 10 (SCAN; Wing et al., 1990) and PSYRATS	1) None 2) Content (direct and indirect associations)	5/40 with history of trauma had direct associations between traumas and hallucinations. 23/40 had hallucinations with indirect (thematic) associations with traumas. All 5 with direct associations also had indirect associations. 17/40 had no associations. Participants who had experienced a guilt-inducing event or humiliating event were more likely to experience hallucinations of the same theme. There was a non-significant association between threatening events and hallucinations, and a significant association for intrusive events and hallucinations. Hallucinations were slightly more threatening in the trauma group compared to no trauma (non-significant).	31
Jessop et al. (2008) *Australia*	N=26 Age: M=15.7 Gender: Male (n=9)	Primary PTSD (n=13), primary schizophrenia (n=5)	1) Quantitative 2) Case-control?	Percentages calculated	1) None 2) Items used from PANSS and the SADS for School-Aged Children (K-SADS; (Kaufman, Birmaher, & Brent, 1997)	1) Auditory verbal 2) Content (identity, abusive and thematic associations); characteristics (commanding)	6/13 subjects with PTSD had trauma-related AVH (including thematic relationship to trauma and derogatory comments heard which were previously said to them). For 2, AVH sounded like familiar people. 4 reported neutral or helpful AVH, 3 reported religious themes of AVH. Both (2/5) subjects with schizophrenia and trauma had derogatory, commanding AVH.	21
Nygaard & Sonne (2017) *Denmark*	N = 74 Age: PTSD-SP (M = 44.8) Gender: PTSD-SP: male (n = 48)	PTSD-SP (n=74)	1) Quantitative 2) Cross-sectional	Descriptive statistics	1) From medical records 2) From medical records	1) Auditory verbal, auditory, visual, olfactory and tactile 2) Content (identity, nature of trauma)	Of PTSD-SP patients: 49 experienced AH. 30/49 had AVH. 8/30 described hearing known AVH, sometimes related to flashbacks. 11/22 with VH, saw family members/traumatic events. 7 described trauma-related VH but limited details provided. 3/5 with OH were possibly trauma-related. 2 had OH but limited details provided. 2/6 with TH were trauma-related. 5/74 described hallucinations as being directly connected to flashbacks.	25
Peach (2016) *Australia*	N=66 Age: M=20.18 Gender: Male (n=28), female-to-male transgender	Psychotic disorder (83%) PTSD (26%).	1) Quantitative 2) Cross-sectional	Correlational analyses and post-hoc regression analyses	1) CTQ 2) SCID; PANSS	1) None 2) Content (direct and indirect associations)	28/36 had trauma-related hallucinations (9/36 directly, 3/36 indirectly or 24/36 thematically). 29/36 had no relationship. 64% had more than one type of relationship. 22/36 had post-traumatic intrusions, with 16/22 being related to hallucinations (3/22 directly, 3/22 indirectly or 12/22 thematically). 11/22 had hallucinations with no relationship to intrusions. Threat was the most common theme present in	31

	(n=2)						traumas (31.1%), hallucinations (33.3%), and post-traumatic intrusions (31.3%).	
Raune et al. (2006) *UK*	N=41 Age: M=29.6 Gender: Male (n=24)	Schizophrenia / Schizoaffective (61%), Bipolar (19.5%), Other Psychoses (19.5%)	1) Quantitative 2) Cross-Sectional	Correlations and principle components analysis	1) Life Events and Difficulties Schedule (LEDS; A Bifulco et al., 1989) 2) SCAN	1) Auditory 2) Content (persecutory, depressive and grandiose)	Persecutory content, but not depressive or grandiose content, was significantly correlated with humiliating, intrusive and self-esteem impairing events. Persecutory content was not significantly correlated with danger or loss events.	30
Read & Argyle (1999) *USA*	N=100 Age: M = 35.5 Gender: Male (n = 10)	Affective disorder (n = 12), schizophrenia (n = 4)	1) Quantitative 2) Cross-sectional	Descriptive statistics	1) Medical records 2) Medical records	1) Auditory verbal and visual 2) Content (identity, nature of trauma)	Hallucination content related to abuse in 3/ 7 instances assessed, with 1/7 additional possible relationship. This included AVH resembling perpetrators, child voices, and AVH related to sexual abuse.	22
Reiff et al. (2012) *USA*	N=30 Age: M=37.3 Gender: Male (56.7%)	Schizophrenia (31%), Schizoaffective Disorder (35%), depression (12%), Bipolar Disorder (23%)	1) Qualitative 2) Grounded theory	Thematic content and grounded theory techniques. Core Conflictual Relationship Theme Method (CCRT)	1) Histories of Physical and Sexual Abuse Questionnaire, (HPSAQ; Muenzenmaier, Struening, Ferber, & Meyer, 1993) 2) Psychiatric Research Interview for Substance and Mental Disorders (PRISM; Hasin et al., 1996)	1) Auditory 2) Content (direct and indirect associations)	14/21 reported correspondence between early trauma and content of hallucinations/delusions. 2/21 had direct hallucination-trauma links. Others had more subtle associations: 5/21 had "being hurt" or "threatened" and 6/21 had "threatening" or "forceful" in relation to both trauma and hallucinations.	29
Rosen et al. (2017) *USA*	A) N=97 B) N=34 Age: A) M=42.33 B) M=46.6 Gender: A) Male (n=42) B) Male (n=20)	A) Schizophrenia (n=35), bipolar disorder (n=16). B) Psychotic disorder (n=34)	A.1) Quantitative B. 1) Qualitative A.2) Cross-sectional B.2) Grounded theory	A Binary logistic regression, independent sample t-test, bivariate spearman correlations B. Grounded theory	A. 1) Life events checklist (LEC; Blake et al., 1995) B. 1) Background information on trauma collected with demographic information A. 2) SCID; PANSS B. 2) Interview (no further information provided)	1) Auditory verbal 2) Content (identity, direct and indirect associations, protective) and characteristics (commenting and conversing)	Childhood onset AVH that emerged at the time of trauma were more likely to mirror an abusive figure. AVH that emerged in older adolescence or adulthood following a series of adversities had less direct links with trauma and were more likely to have thematic links to adverse experiences. Trauma was often directly or indirectly linked to religious AVH (e.g. demonic). Positive AVH that protected or reassured participants in the face of or following adversity were also reported. Direct links between non-verbal perceptual/somatic experiences and trauma were unclear. Trauma was associated with commenting and conversing AVH.	36
Rosen et al. (2018) *USA*	N=61 Age: M=47.98 Gender: Male (n=28)	Schizophrenia (n=48), Bipolar disorder (n=13)	1) Quantitative 2) Cross-sectional	Bivariate Pearson's Correlations, PROCESS computational tool	1) ACE 2) PSYRATS	1) Auditory verbal 2) Content (emotional valence)	Childhood trauma scores were significantly correlated with the composite negative content score. Negative content fully mediated the relationship between childhood trauma and AVH related distress.	26
Scott et al. (2007) *Australia*	N=37 Age: M=15.5 Gender: Male (n = 19)	Psychotic disorder (n= 18), PTSD (n= 20).	1) Quantitative 2) Case-control	Descriptive statistics	1) K-SADS 2) K-SADS	1) Auditory 2) Content (identity)	5/20 with PTSD (related to sexual abuse) reported trauma-related AH (hearing voice of perpetrator). There were no trauma-related hallucinations in psychosis group. No subject reported hallucinations related to traumas other than sexual abuse.	20
Thompson et al. (2010)	N=92 Age: M=18.0	Attenuated psychotic symptoms (66.3%) Trait group criteria (17.4%)	1) Quantitative 2) Cross-sectional	Logistic Regression	1) Questionnaire based on items from surveys 2) Questionnaire developed to	1) Auditory 2) Content (direct associations with the	15.2% reported psychotic symptoms with directly sexual content. 6.5% experienced AH of a sexual content/nature. Patients who reported sexual trauma experienced significantly more symptoms with sexual content than patients with no	30

Australia	Gender: Male (n=32)				assess symptoms for sexual content using the wording from the SCID stems; CAARMS	nature of the trauma)	history of sexual trauma (an average of 0.73 symptoms compared 0.10). There was a similar association between physical trauma and sexual content, but for all other traumas including physical trauma the relationship was statistically non-significant when other types of trauma were controlled for.	
Upthegrove et al. (2015) *UK*	N = 2019 Age: (M=47) Gender: Male (n=604),	Bipolar disorder type I	1) Quantitative 2) Cross-sectional?	Chi-square test of association	1) Childhood life events questionnaire (R. Upthegrove et al., 2015) 2) SCAN	1) Auditory and visual 2) Content (abusive, mood-congruent) and characteristics (commenting)	Significant association between mood congruent AH and childhood, sexual, physical and emotional abuse; death of a loved one; and experiencing a victimising event. This was replicated for VH in relation to childhood physical, sexual and emotional abuse. Childhood abuse (especially sexual abuse, but also emotional abuse) and experiencing a victimising event were significantly associated with experiencing abusive/accusatory AH content. No associations were found between trauma measures and commenting AH. Greater numbers of adverse events experienced was associated with abusive/accusatory and mood-congruent content.	25
Velthorst et al. (2013) *The Netherlands*	N = 127 Age: M = 18.2 Gender: Male (n=53)	Ultra-high risk (n=127)	1) Quantitative 2) Cross-sectional	Hierarchical multiple regression and logistic regression	1) Auditing of clinical file 2) CAARMS; Auditing of clinical file	1) Perceptual 2) Content (abusive) and characteristics (commanding)	Participants who had experienced sexual trauma reported significantly more perceptual distortions with abusive content compared to those who had not experienced sexual trauma. This remained significant after adjustment for other types of trauma. No significant association was identified for perceptual disturbances that involve commands.	31
Studies assessing the relationship between trauma and hallucination content in traumatized populations (e.g. with PTSD/refugees)								
Anketell et al. (2010) *Northern Ireland*	N=20 Age: M = 46.2 Gender: Male (n = 19)	Chronic PTSD (N=20)	1) Quantitative 2) Cross-sectional	Descriptive statistics only	1) Post-Traumatic Diagnostic Scale (PDS; Foa, 1995) 2) PANSS	1) Auditory verbal 2) Content (identity, protective)	10/20 recognized the identity of their AVH. 3 identified AVH as people involved directly in their trauma or their loved ones. 8 directly related AVH to past trauma. 2 reported their AVH were of the dead. 3 had indirect links between trauma and AVH. 3 heard protective AVH.	24
Baethge (2002) *Germany*	N=2 Age: M=44 Gender: Male (n=0)	Claustrophobia (n=1)	1) Qualitative 2) Case series	None	1) None reported 2) None reported	1) Multi-sensory 2) Content (identity)	Bereaved individuals who had multi-sensory hallucinations of their lost loved one which were experienced as unpleasant. The hallucinations were not replaying events from the past, but were of the loved one appearing and conversing in the present	3
Bleich & Moskowits (2000) *Croatia*	N=5 Age: M=31.8 Gender: All male	PTSD with psychotic symptoms	1) Qualitative 2) Case series	None	1) None reported 2) None reported	1) Auditory verbal 2) Content (identity, direct and indirect associations); characteristics (commanding)	5/5 experienced trauma-related hallucinations and heard enemy AVH, or those of dead comrades. The content of what the AVH said was indirectly related to the trauma (e.g. threatening or criticising their decisions). 2/6 heard AVH of comrades commanding them to kill themselves.	11
Bowers (2010) *USA*	N=4 Age: M=40.25 Gender: Male(n=0)	PTSD, psychotic disorder not otherwise specified, alcohol or cannabis dependence (n=4), depression (n=3)	1) Qualitative 2) Case series	None	1) PTSD Life Chart Method (PTSD-LCM; Osuch et al., 2001) 2) SCID	1) Auditory verbal, visual, olfactory and tactile 2) Content (identity, indirect associations and protective)	All participants reported trauma-related hallucinations. 2/4 had direct associations (e.g. smell or touch of dead loved one), 3/4 had indirect associations (e.g. light touch from abusive mother on skin), 1/4 heard supportive AVH of loved ones.	24

Chan & Silove (2000) *UK*	N=3 Age: M=40 Gender: Male (n=2)	PTSD with psychotic symptoms	1) Qualitative 2) Case series	None	1) Clinical interview 2) Clinical interview	1) Auditory verbal 2) Content (abusive)	2/3 had direct trauma-hallucination links, for the third case the links were less easily defined as direct/indirect (hearing threatening AVH, hallucinating assault with no reported previous experience of assault).	9
David et al. (1999) *USA*	N=53 Age: M=46.9 Gender: Male (n = 53)	PTSD	1) Quantitative 2) Cross-sectional	Chi-squared and independent t tests	1) SCID 2) SCID	1) Auditory and visual 2) Content (thematic associations	All of the patients with psychotic symptoms had hallucinations that reflected combat themes, guilt and were non-bizarre (e.g. AH/VH of dead people). 29% additionally had non-combat-related visions.	20
Hamner (1997) *USA*	N=9 Age: M=48 years Gender: Male (n=25)	PTSD (100%), depression (88.89%) alcohol or substance dependence in remission (77.78%)	1) Quantitative 2) Cross-sectional	Descriptive statistics (percentages)	1) CTQ 2) SCID	1) None 2) Content (direct associations)	7/9 had at least some delusions or hallucinations that were not referable to the traumatic stressors. 2 had hallucinations that were strictly referable to the trauma.	14
Heins et al. (1990) *Australia*	N=3 Age: M=30.67 Gender: Male (n=1)	Schizophrenia (n=2), depression (n=1), no diagnosis (n=1)	1) Qualitative 2) Case series	None	1) Clinical interview 2) Clinical interview	1) Auditory verbal 2) Content (indirect associations)	All heard AVH which were not recognised as known individuals, but the content of what they said could be linked indirectly to their trauma (e.g. "slut" related to sexual abuse).	5
Ivezic (1999) *USA*	N = 2 Age: M=39.5 Gender: Male (n=1)	PTSD with psychotic symptoms	1) Qualitative 2) Case series	None	1) None reported 2) None reported	1) Auditory verbal 2) Content (indirect associations and identity)	Both heard AVH indirectly related to trauma (e.g. talking about what should have been done differently, sometimes resembling dead friends).	7
Ivezic et al. (2000) *Croatia*	N = 41 Age: M = 33 Gender: Male (n = 40)	PTSD (N=41)	1) Quantitative 2) Cross-sectional	Descriptive statistics	1) Structured clinical interview 2) Schedule for Affective Disorders and Schizophrenia Lifetime Version (SADS-L; Spitzer & Endicott, 1979)	1) Auditory verbal and visual 2) Content (direct and indirect associations)	2/8 heard AVH accusing them of being guilty for the death of soldiers. 1/8 experienced VH of grotesque faces, or faces of dead people. All patients experienced psychotic symptoms directly or symbolically related to their trauma. The authors found these symptoms to be related to the trauma and associated emotions, but did not qualify as re-experiencing symptoms.	24
Norredam et al. (2011) *Denmark*	N=6 Age: M=41.33 Gender: Male (n = 4)	PTSD, unspecified paranoid psychosis, unspecified episode of depression (n=6).	1) Qualitative 2) Case series	None	1) Clinical interview 2) Clinical interview	1) Auditory verbal 2) Content (direct and indirect associations) and characteristics (commenting)	All 6 had some trauma-hallucination links. 3/6 had direct links (e.g. saw perpetrators), 4/6 had indirect links (e.g. hearing AVH in the same dialect as perpetrators), 1/6 had non-trauma-related hallucinations (e.g. commenting on activities).	15
Rhodes et al. (2016) *UK*	N=7 Age: M=34.71 Gender: Male (6)	Depression with psychotic features (1), paranoid schizophrenia (2), PTSD and psychosis symptoms or diagnosis (4)	1) Qualitative 2) Phenomenology	IPA	1) Clinical interview 2) Clinical interview	1) Auditory verbal and visual 2) Content (identity, direct associations with nature of trauma)	Two main themes of AVH and VH were of attackers or lost loved ones. 6/7 reported trauma-related AVH (3 directly representative of attack, 3 indirect). 1/7 had non-trauma-related AVH only. 4/7 had trauma-related VH (loved ones and perpetrators). 1/7 had non-trauma-related VH only.	28

Content

Thirty-four studies investigated the relationship between trauma and hallucination content. This included 25 quantitative studies and two qualitative studies, as well as all seven case series. Four studies explicitly assessed direct and indirect links between trauma and the content of hallucinations in their clinical samples, such as using a coding framework (Hardy et al., 2005; Peach, 2016; Reiff, Castille, Muenzenmaier, & Link, 2012; Rosen et al., 2017). A direct relationship was generally defined as a literal correspondence between the content of the hallucination and the traumatic event; for example, a person who was threatened with a gun later seeing a vision of a gun. Indirect relationships were considered present if the hallucination bared some resemblance to the trauma but did not literally correspond to what happened; for example, hearing the voice of an abuser commenting on everyday activities unrelated to the trauma. Thematic relationships were those in which trauma and hallucinations shared a common broader theme (e.g. a theme of guilt). It was common for participants to have more than one type of relationship (direct, indirect, thematic, or no relationship), sometimes having different types of relationships between different life events and different hallucinations (Peach, 2016).

Direct associations between trauma and hallucination content. Direct relationships between hallucinations and traumatic events were observed for 10-25% of participants (Hardy et al., 2005; Peach, 2016; Reiff et al., 2012). Rosen et al. (2017) found that direct links were more common in voices that emerged in childhood at the time of abuse. Trauma was found to directly relate to hallucination content in terms of the perceived identity of the hallucination (e.g. a perpetrator or deceased loved one), and also in terms of the nature of the traumatic experience (e.g. the weapons used, what was said, the sensory experience).

Direct associations in terms of hallucination identity. Fourteen studies (including all seven case series) found that a significant subset of participants either recognised the

identity of their hallucinations or experienced hallucinations that could be formulated within the context of the person's life experience (e.g., 50%, Anketell et al., 2010; 78% Corstens & Longden, 2013). Personified hallucinations directly related to trauma were those identified as perpetrators and dead friends or relatives.

Studies of clinical populations who experienced AVH (predominantly individuals with PTSD or schizophrenia) found that 15-57% individuals experienced hallucinations that resembled or were similar to a real-life perpetrator (Anketell et al., 2010; Corstens & Longden, 2013; Nygaard & Sonne, 2017; Read & Argyle, 1999). Voices perceived as a perpetrator were found to often use abusive language (e.g. 'whore' in sexual abuse survivors; Rosen et al., 2017) or criticise the individual. In combat veterans, hallucinations of the enemy were often reported (e.g. AVH of Arabic voices; Bleich & Moskowits, 2000). Interestingly, Rosen et al. (2017) found AVH were more likely to mirror abusive figures when they emerged at the time of childhood abuse, compared to those which began later.

Many studies reported hallucinations of dead relatives and friends. This included multisensory hallucinations of lost loved ones as if they were appearing in the present, and even interacting with the person (Baethge, 2002). Conversely, other such hallucinations were images of the person when they died (e.g. seeing a dead brother in a pool of blood (Norredam, Jensen, & Ekstrom, 2011). Hallucinations of comrades were also common in studies that recruited combat veterans (Bleich & Moskowits, 2000; David, Kutcher, & Jackson, 1999).

Corstens and Longden (2013) found that 48% of individuals experienced hallucinations that resembled aspects of themselves, with these hallucinations often being precipitated by an event such as abuse. Also, Read and Argyle (1999) found that one person heard the voices of screaming children as well as their abuser.

Direct associations related to the context and nature of the trauma. Other direct associations included seeing the scene of the trauma (e.g. a visual hallucination (VH) of the

location of an assault, Chan, 2000) as well as hallucinations related to what happened during the trauma (most commonly between sexual abuse and sexual symptom content; Read & Argyle, 1999; Read et al., 2003; Thompson et al., 2010). Specifically, Thompson et al (2010) found 33.3% of their UHR participants with a history of sexual abuse had psychotic symptoms of sexual content. In addition, Read et al. (2003) found that sexual symptom content was seven times more likely in a group reporting childhood sexual and physical abuse compared to non-abused participants. Read and Argyle (1999) similarly found that amongst participants whose hallucination content was documented in medical records, half of these had content associated with features of abuse. Other hallucinations found to directly relate to what happened during the trauma included hearing a 'voice' which was perceived to be that of the torture they had endured (Rhodes et al., 2016) and experiencing tactile hallucinations (TH) of electricity which the person related to their experiences at a concentration camp (Nygaard & Sonne, 2017).

Comparing direct associations and re-experiencing symptoms. Thirteen studies looked at hallucination content in a selected traumatised population (e.g. those with PTSD). These included six quantitative studies and seven case series. Traumatised populations researched in quantitative studies predominantly had a diagnosis of PTSD and were combat veterans (David et al., 1999; Hamner, 1997; Ivezic, Bagaric, Oruc, Mimica, & Ljubin, 2000) refugees (Nygaard & Sonne, 2017) conflict-related trauma victims (Anketell et al., 2010) and psychiatric inpatients with a trauma history (Read & Argyle, 1999). Case series included individuals who had experienced bereavement (Baethge, 2002), combat (Bleich & Moskowits, 2000; Ivezic, 1999), persecution (Norredam et al., 2011) and childhood sexual abuse (Heins, Gray, & Tennant, 1990).

In addition to assessing associations between trauma and hallucination content, a number of studies with PTSD samples compared trauma-related hallucinations to re-experiencing symptoms or flashbacks. Although direct associations between trauma and

hallucination content were often identified, authors did not consider such experiences to be equivalent to re-experiencing symptoms. Peach (2016) found that 73% of individuals who had both hallucinations and post-traumatic intrusions described some relationship between the two, but only 14% described a direct relationship between their hallucinations and intrusions. Similarly, Nygaard and Sonne (2017) found that 10% of participants with PTSD and psychosis experienced hallucinations that were directly connected to their flashbacks (e.g. angry voices, the sound of aeroplanes). Additionally, a number of other papers did not consider the observed trauma-related hallucinations formally re-experiencing symptoms (Ivezic et al., 2000). For example, Anketell et al. (2010) concluded that voice hearing remained distinct from re-experiencing symptoms in their sample of individuals with PTSD, as the relationship between hallucinations and trauma tended to be a symbolic one.

Indirect and thematic associations between trauma and hallucination content.
Four studies explicitly assessed indirect and thematic links between trauma and the content of hallucinations amongst clinical populations (Hardy et al., 2005; Peach, 2016; Reiff et al., 2012; Rosen et al., 2017). Indirect, thematic links were present for 57.5-67% of participants (Hardy et al., 2005; Peach, 2016; Reiff et al., 2012). Indirect or thematic associations were not equally common for all themes. For example, Hardy et al. (2005) found that traumas involving guilt and humiliation were not associated with hallucination themes involving guilt or humiliation. Threatening traumas were non-significantly associated with threatening hallucination themes, and intrusive traumas were significantly associated with intrusive hallucination themes. Reiff et al. (2012) found that five of their 12 participants reported thematic associations for 'being hurt' or 'threatened' in both their trauma and hallucination content, whereas six had experienced a 'threatening' or 'forceful' other for both trauma and hallucination content. Indirect associations were frequently identified in case series (e.g. critical voices; Heins et al., 1990).

Supportive and protective hallucinations. Although in most cases trauma exposure was associated with negative or distressing content of AVH, a sizeable minority of studies conversely reported that individuals experienced hallucinations that were positive or protective. One study found that non-abusive family members were the subject of hallucinations in 30% of individuals (Corstens & Longden, 2013), whilst others found that 14-15% of voices were of loved or supportive family members, including acting as an 'inner guide' (Anketell et al., 2010; Rhodes et al., 2016). Rosen et al. (2017) found that participants often reported experiencing AVH perceived to protect them in the face of adversity or reassure them regarding their morality following traumatic events. In a case series, hallucinations of family members were reported by one participant, including offering companionship and reassuring her that she did not need to be scared (Bowers, 2009).

Abusive, negative or persecutory content. Quantitative studies also looked at trauma-hallucination content associations, but did so with regard to specifically selected aspects of content. Abusive, persecutory or threatening AVH content were associated with a trauma history in individuals diagnosed with psychosis (Hardy et al., 2005; Misiak, Moustafa, Kiejna, & Frydecka, 2016; Raune, Bebbington, Dunn, & Kuipers, 2006), and were specifically associated with sexual or emotional abuse or a victimising event in childhood, and greater numbers of adverse experiences in a sample with bipolar affective disorder (Upthegrove et al., 2015). Sexual trauma was also found to be associated with abusive content of perceptual disturbances in Velthorst et al.'s (2013) UHR population, although another study with an at-risk group did not find an association between a history of childhood adversity and abusive hallucinations (O' Connor et al., 2017). Read et al. (2003) found in their sample of psychiatric inpatients that hallucinations involving reference to evil or the devil were more common in victims of childhood sexual abuse

alone and childhood and adult sexual abuse combined, compared to those who had not experienced abuse.

Daalman et al. (2012) found that no type of childhood trauma was associated with AVH valence (positive or negative) in their sample of psychiatric and non-psychiatric voice hearers. Similarly, Falukozi and Addington (2012) found in their high-risk for psychosis sample, childhood trauma was associated with the experience of voices generally, but not negative voices specifically. However, in their recent study, Rosen, McCarthy-Jones, Jones, Chase and Sharma (2018) found that childhood trauma was significantly correlated with negative AVH content, and negative content fully mediated the relationship between childhood trauma and AVH-related distress.

Mood congruent and incongruent content. Two studies of individuals with bipolar affective disorder assessed the relationship between mood-congruent/incongruent hallucinations and trauma. Upthegrove et al. (2015) found childhood trauma to be significantly associated with mood-congruent verbal and auditory hallucinations. Additionally, they found that mood-congruent hallucinations were associated with greater numbers of adverse experiences. Comparatively, Hammersley et al. (2003) found that the relationship between mood incongruent hallucinations and childhood sexual abuse was not significant.

Characteristics of Hallucinations

Voices commenting were associated with childhood sexual abuse (Berg et al., 2017; Hammersley et al., 2003; Sahin et al., 2013), physical abuse (Berg et al., 2017), and physical neglect (Berg et al., 2017; Sahin et al., 2013), together with trauma scores generally (Misiak et al., 2016; Read et al., 2003; Rosen et al., 2017) but not emotional abuse or neglect (Berg et al., 2017). An exception to these findings was in a sample of individuals with bipolar disorder, when no associations were found between commenting

AVH and any of the trauma variables (Upthegrove et al., 2015). Conversing voices were associated with total trauma score (Berg et al., 2017; Rosen et al., 2017) and all types of child abuse and neglect (Berg et al., 2017).

Commanding hallucinations were associated with number of adversities in psychiatric inpatients: fostering/adoption and poverty in one study (Longden et al., 2016) and childhood and adulthood abuse in another (Read et al., 2003). However, this finding of a relationship with trauma was not replicated in an ultra-high risk group (Velthorst et al., 2013). Dorahy et al. (2009) found that command hallucinations were present in 81% of individuals with schizophrenia with a history of maltreatment, compared to 44% with no maltreatment. They also found that the maltreated group were more likely to feel controlled by their voices.

Daalman et al. (2012) found that there was no relationship between sexual and emotional abuse and features of AVH like frequency, duration, location, loudness and the extent to which the person feels in control of their voices.

Results of Quality Assessment

Total scores for the quality assessment are shown in Table 1, and the full assessment results can be found in Appendix 2. This assessment revealed that a majority of the studies introduced reasonable theoretical frameworks and rationales for their research, clearly stated their research aims, and chose appropriate (although not always optimal) methodology to answer the research question. Many studies had a different rationale and aim to the focus of this review, but still reported relevant findings.

There were some limitations in terms of the diversity of samples, such as recruiting participants from only one site (e.g. from one inpatient unit; Jessop, Scott, & Nurcombe, 2008; Read & Argyle, 1999; Scott, Nurcombe, Sheridan, & McFarland, 2007). Also, many

studies did not fully and consistently report the demographics of their sample, e.g. neglecting to report ethnicity (Daalman et al., 2012; Dorahy et al., 2009; Hammersley et al., 2003; Jessop et al., 2008; Misiak et al., 2016; O' Connor et al., 2017; Sahin et al., 2013; Scott et al., 2007; Thompson et al., 2010). Such limitations could impact upon generalisability and be indicative of a degree of selection bias. Case series in particular provided insufficient methodological information for selection bias to be ruled out, and often were not well justified in terms of theoretical underpinning or methodological strategy.

It was also noteworthy that many of the studies included a subset of the sample of interest for the purpose of this review (e.g. only individuals with PTSD who hear voices, rather than a trans-diagnostic group). Consequently, the individual conclusions drawn by each paper were not necessarily generalisable across different clinical and nonclinical populations. Taking these studies in combination, the complete sample of interest for this review is accounted for, but the use of different measurement tools across different studies limits the capacity to draw comparisons between populations.

Many of the measures used to assess hallucination content and characteristics were not necessarily designed to provide such specific and detailed information, instead being designed as measures of severity or to inform a diagnostic assessment. Consequently, authors tended to report information on content and characteristics by deriving it from individual items rather than global scores. In a number of studies, details were not provided about where the information about content or characteristics was retrieved from during the assessment process. For example, studies using the SCID and PANSS, often did not clarify exactly how information on characteristics like commenting voices was gathered and coded. Consequently, it is possible that the information gathered in these studies may be biased by the interview process (e.g., if an interviewer tends to ask certain additional probing questions for some participants but not others). Additionally, studies that

developed their own measure for the purpose of the study were often limited by the absence of assessment of the reliability and validity of the measure used (e.g., Thompson et al., 2010).

Some studies assessing hallucination content used a structured approach to clearly describe how they made such links (e.g., Hardy et al., 2005; Peach, 2016). However, in many of the studies that made links in terms of content an association was described but the authors did not explain their decision process in replicable detail. The conclusions of such studies are therefore limited by the possibility that they may be biased towards the particular raters' interpretations. In order to circumvent or minimize this methodological issue, some studies used multiple raters and an assessment of reliability (Hardy et al., 2005; Peach, 2016; Rosen et al., 2017), multiple raters and a consensus rating (Reiff et al., 2012), or kept their rater blind to the study aims and hypotheses (Thompson et al., 2010).

This review prioritised inclusivity, and therefore included case series and unpublished dissertations (Bowers, 2009; Peach, 2016) in order to reduce the likelihood of publication bias. This did mean that a number of included papers, particularly case series, had a range of methodological limitations. However, the authors decided not to exclude any papers based on the outcomes of the quality assessment.

Discussion

This systematic review aimed to provide a narrative synthesis of the findings of 37 eligible studies to clarify the relationship between trauma and various aspects of hallucination content and characteristics. The included studies were heterogeneous in terms of study design and methodology (quantitative, qualitative, mixed methodology), together with their chosen sample (various clinical populations, such as those with schizophrenia, PTSD and bipolar disorder, together with non-clinical groups).

Thirty-six of the 37 studies identified an association between hallucination content or characteristics and traumatic life experiences. Hallucination identity was one prominent way in which a proportion of participants' hallucinations tended to relate to their trauma (as a perpetrator, dead friend or relative, a loved one supporting them through adversity, or themselves as a vulnerable child). Both direct, indirect and thematic associations were identified in various studies, although indirect and thematic links were reported to be more common (Peach, 2016), including those that might reflect post-traumatic appraisals rather than necessarily post-traumatic intrusive memories (e.g. 'you are worthless', or 'slut' in relation to sexual abuse). When shared themes between trauma and hallucinations were investigated, the findings were specific to particular themes (e.g. themes of threat and hurt were shared between trauma and hallucination content but themes of humiliation or guilt were not). A number of studies reported cases of mixed associations, wherein AVH and trauma were related in terms of identity whilst the content of what they said was not necessarily directly related to the content of the trauma (e.g. voice of a perpetrator commanding suicide, Read & Argyle, 1999). An association was also found between trauma and mood-congruent hallucination content, but not mood-incongruent hallucinations (Hammersley et al., 2003; Upthegrove et al., 2015). Relationships were also identified between trauma and hallucination features like voices commenting, commanding, conversing and controlling (although there were mixed findings for controlling voices and commanding voices). Phenomenological characteristics like frequency, duration, loudness and vividness did not appear to be associated with traumatic experiences.

Subscale analyses of trauma measures revealed that associations were sometimes specific to particular types of trauma. For example, commenting AVH were found to be associated with childhood physical and sexual abuse but not emotional abuse or neglect (Berg et al., 2017). However, these investigations were sparser and further corroborative

evidence is required before any conclusions about associations with specific traumas can be formulated. Although a large proportion of the research into trauma and psychosis has historically focused on childhood abuse, many of the identified associations applied both to traumatic events in childhood and adulthood. One interesting point of difference was the finding that hallucinations emerging after childhood trauma were more likely to directly resemble someone involved in the trauma, whereas those that emerged later on or following adversity in adulthood tended to have broader thematic links (Rosen et al., 2017).

In terms of inconsistencies between studies, findings regarding the relationship between trauma and negative AVH content were varied. This could also be related to the use of different measures of childhood trauma and the different analytic methods used. For example, Daalman et al. (2012) used a composite score based on items from the PSYRATS that included voice-related distress along with negative content, then dichotomised the score using a median split followed by regression analysis to test whether specific types of childhood trauma predicted negative or positive voice content. Contrastingly, Rosen et al. (2018) used a continuous variable for voice content and total childhood trauma score, using correlations to assess the relationship.

Consistent with a continuum model of psychosis-like experiences, and despite the heterogeneity of study samples, the findings did not tend to significantly differ between diagnostic groups with regard to associations with trauma. For example, Daalman et al. (2012) found that psychiatric status did not impact upon the relationship between trauma and AVH emotional valence. However, two discrepancies between diagnostic groups were identified between UHR and psychiatric populations. Firstly, the relationship between trauma and abusive hallucination content that was apparent in many studies of psychiatric groups was not replicated in an UHR population (O' Connor et al., 2017). Secondly, the association between command hallucinations and trauma observed in psychiatric inpatients

with schizophrenia and other diagnoses (Read et al., 2003) was not found in individuals at risk of psychosis (Velthorst et al., 2013). This is likely because to meet criteria for UHR regarding hallucinatory experiences, hallucinations must not be fully distinct voices, unless infrequent (American Psychiatric Association, 2013). Therefore, it would be expected that participants in UHR samples would not often report commanding or abusive AVH. Indeed, there was a sizable contrast in the proportion of participants experiencing command hallucinations between the studies amongst UHR groups (10-15%: Velthorst et al., 2013), and psychiatric inpatients (29%: Read et al., 2003). A further possibility is that abusive and commanding hallucinations emerge more with hallucination duration. Research has previously found that certain phenomenological aspects of hallucinations tend to emerge over time for individuals who hear voices, although this was not found to include command hallucinations or abusive content (Nayani & David, 1996).

Another possible point of difference between diagnostic groups is that studies amongst individuals diagnosed with PTSD tended to report higher percentages of participants with trauma-hallucination content associations, especially direct associations, compared to mixed psychiatric samples or samples of individuals with schizophrenia. In fact, in two studies of individuals with PTSD, the whole sample had direct or indirect trauma-hallucination content associations (David et al., 1999; Ivezic et al., 2000). Given that many of the studies of individuals with PTSD included predominantly male combat-veterans, it is difficult to distinguish whether this difference is related to the diagnosis of PTSD (e.g. due to shared aetiology between re-experiencing symptoms and direct trauma-hallucination associations), the type of trauma experienced, or the demographic of the sample. The former possibility would be consistent with some proposed theories of hallucinations, such as the hypothesis that psychological mechanisms behind re-experiencing symptoms, like incomplete consolidation of trauma memories, may additionally underlie direct trauma-hallucination associations (Bentall & Fernyhough,

2008; Hardy, 2017; McCarthy-Jones & Longden, 2015; Steel et al., 2005). A number of papers concluded that observed trauma-hallucination associations were phenomenologically distinct from re-experiencing symptoms, but given that they did not provide much explanation or justification for this conclusion, or detail how they determined this, their conclusion must be interpreted with caution. Hardy's (2017) theory of trauma-memory intrusions and hallucinations would suggest that re-experiencing symptoms in PTSD may be distinct from trauma-related hallucinations in that the hallucinations would be even less contextualised and more fragmented. Future research could build on this literature, comparing re-experiencing symptoms in PTSD to hallucinations in terms of phenomenology using more reliable and transparent methods.

Theoretical Implications

The findings of this review are broadly consistent with existing narrative reviews which discuss trauma and hallucination content (e.g., Hardy, 2017; McCarthy-Jones & Longden, 2015), and build on these by lending clarification about the type of association and how this varies across studies and populations. Many of these findings are also consistent with the continuum model of trauma-memory fragmentation proposed as a theory of hallucinations by Hardy (2017). The reported finding that participants can experience different types of trauma-hallucination links, including both direct associations and more thematic ones, is consistent with the suggestion that hallucinations may be related to both trauma memory intrusions and trauma-related appraisals or self-schemas (Hardy, 2017). The fact that they often co-occur, could reflect the evidence that indicates certain post-traumatic appraisals and cognitions may increase the likelihood of trauma-memory intrusions through maintaining a sense of current threat and triggering dysfunctional responses (Ehlers & Steil, 1995; Ehlers & Clark, 2000) It would be interesting for future research to investigate whether trauma-related appraisals and

schemas, including those that might emerge as hallucinations, may predict or be associated with higher levels of trauma memory intrusions.

Other findings, such as the identified association between trauma and mood-congruent hallucinations, can be interpreted in the context of Hardy's (2017) theory. Based on cognitive psychology literature on mood-congruent memory recall, it would be hypothesised that individuals are more likely to recall a memory with emotional valence consistent with their current mood. If hallucinations are understood as a form of trauma memory re-experiencing, such hallucinations could be predicted to be most likely experienced at times when the person's mood is congruent with the emotional valence of their content. Consistent with this, depression has been found to be associated with negative voice-content (Rosen et al., 2018). The contrasting findings of positive and protective voices experienced as reassuring in the face of adversity are difficult to account for within this theory, but could perhaps be a mood-incongruent self-regulating process.

Inner-speech models of hallucinations (Jones & Fernyhough, 2007) may provide an additional explanation for some of the thematic associations with trauma, or direct links which do not resemble re-experiencing symptoms. This model proposes that the internalisation of interactions with a caregiver leads to the formation of inner speech. Therefore, critical, derogatory or persecutory themes of voices may relate to the internalisation of such interactions.

Clinical Implications and Future Directions

The findings of this review have a number of implications in terms of psychological therapies for distressing hallucinations. They indicate that an emphasis should be placed on hallucination content, and that therapies need to offer flexibility in order to work with a variety of trauma-hallucination links, including direct and indirect associations.

One approach that especially values the meaning behind hallucination content is Voice Dialoguing (Corstens, Longden & May, 2012). This involves the therapist directly interacting with the person's voices in order to gain a better understanding of their purpose and intent and, ultimately, facilitate a more peaceful, positive relationship between hearer and voice(s) through addressing factors like unresolved trauma representations. Based on this review we might hypothesise that hallucinations which are indirectly related to trauma, particularly those related to post-traumatic appraisals or self-schemas, internalised inner-speech, or dissociated aspects of the self, may be especially suitable for a Voice Dialoguing approach.

A possible common aetiology between re-experiencing symptoms and trauma-related hallucinations also has therapeutic implications. For example, it may be that if individuals have direct associations, or indirect associations which seem to be especially decontextualised intrusions, a trauma-focused therapy with an evidence-base for working with re-experiencing symptoms may be appropriate, such as Trauma-Focused Cognitive Behavioural Therapy (TF-CBT; Ehlers & Clark, 2000) or Eye Movement Desensitisation and Preprocessing (EMDR; Shapiro, 1989). Some studies have tentatively explored the use of these approaches with individuals with psychosis. For example, Keen, Hunter and Peters (2017) explored the use of TF-CBT through a case series of 9 individuals with symptoms of PTSD and psychosis. They found that all individuals had an improvement on at least one outcome measure (25% on AVH measures and 63% on PTSD measures). Prolonged exposure and EMDR have been found to be effective in reducing PTSD symptoms in individuals with both psychosis and PTSD (van den Berg et al., 2015) and a reanalysis of the data suggested that psychotic symptoms also decreased, although this effect was particularly pronounced for paranoia rather than hallucinations (de Bont et al., 2016). Given that the treatment protocol used did not specifically target memories associated with trauma-related hallucinations, there is a need for future studies that apply trauma-focused

interventions that specifically target trauma-related hallucinations and which record outcomes in terms of hallucinations and re-experiencing symptoms.

The finding that trauma-hallucination associations are often thematic or indirect, as well as suggestions that these may be related to post-traumatic appraisals, indicates that exposure techniques may not be best suited to individuals experiencing this type of hallucinations. Within TF-CBT, cognitive restructuring is used to change trauma-related cognitions and appraisals and so may be applicable to this population. Although one study found that using cognitive restructuring alone in individuals with PTSD and psychosis was no better than treatment as usual (Steel et al., 2017), it is possible that this approach would be more effective in individuals who do not have direct trauma-hallucination associations or re-experiencing symptoms. Another technique that could be applicable for this purpose is imagery-rescripting, which has been used with various clinical populations and seeks to alter negative schematic beliefs related to a traumatic experience and form new adaptive meanings (Arntz & Weertman, 1999). Imagery-rescripting has the additional advantage for working with people experiencing hallucinations (who may be experiencing hallucinations in various sensory modalities) that it is multisensory rather than purely verbal. When used as an adjunct to imaginal exposure, imagery-rescripting has been associated with improved outcomes in terms of reducing feelings of anger, shame and guilt in individuals with PTSD (Arntz, Kindt, & Tiesema, 2007). A small study has tentatively found that a single session of imagery-rescripting decreased distress in some individuals with psychosis, although very limited effects were found on psychotic symptoms (Ison, Medoro, Keen, & Kuipers, 2014). Additionally, approaches like compassion focused therapy which target shame and self-criticism may be of value for derogatory hallucinations associated with appraisals or self-schemas (Gilbert, 2009).

Limitations

The findings of the review must be interpreted with caution in light of the aforementioned limitations in methodological quality. In particular, studies often used relatively small and restricted samples of individuals experiencing hallucinations (e.g. in terms of ethnicity, recruitment from one service, all having one diagnosis). Whilst the integration of the findings of these various studies means that it is possible to evaluate the extent to which findings are replicated in different groups, these conclusions should be interpreted with caution given the different methodologies used. Few studies included non-clinical populations; consequently, many of the findings of this review require replication in non-clinical groups.

A number of limitations that emerged through the quality assessment seemed likely to be associated with reporting bias (e.g. due to journal word limits), rather than necessarily reflecting the methodological quality of studies. For example, few papers provided a detailed discussion of the rationale for their chosen measures, sample size, or approach to analysis. This was interpreted to not necessarily be a reflection on the actual quality of the study, and was not necessarily associated with inappropriate measures, sample size or analytic methodology. However, it was noteworthy that a number of studies had relatively small sample sizes and only provided descriptive statistics rather than employing any additional analytic methods which could have been more informative.

Additional methodological issues relate to the assessment of trauma. Many studies used either a self-report measure or a semi-structured interview, retrieved information from case records, or did not report using any assessment measure. Therefore, it is possible that trauma has been underreported, and the use of a combination of self-report and semi-structured interview would have been preferable. Another methodological issue worth acknowledging, although unavoidable, is the retrospective nature of reporting of trauma.

However, retrospective accounts of trauma provided by individuals with psychosis have generally been found to be reliable (Fisher et al., 2011).

Many studies used measures of hallucinations that were not specifically designed to assess content and characteristics. This means that when information relevant to this review was reported, it tended to be derived from a single item (e.g. on voices commenting) on a scale. Because papers do not generally explain exactly where in the measure such information was derived from, this potentially increases the risk of bias and means that many studies could have missed additional details on content or characteristics due to the nature of their measures.

The methods used to assess associations between hallucination and trauma in terms of content were often not described in detail and sometimes seemed to rely on the subjective judgements of the investigator. Hardy et al. (2005) and Peach (2016) used a more structured and standardised approach to assessing content compared to other studies, additionally using second raters. This literature would also benefit from drawing on methodology from other disciplines in order to analyse overlap in content. For example, if studies involved collecting a detailed trauma narrative, together with asking participants in detail about the nature of their hallucinatory experiences (potentially drawing on Voice Dialoguing techniques), corpus linguistics (Kennedy, 2014) could be used to analyse the semantic overlap between trauma narratives and description of hallucination content, thereby minimising the reliance on subjective judgements.

Findings of case series in particular must be regarded with caution. These studies were exceptional in that all participants displayed a number of trauma-hallucination content associations and this is likely a reflection of the deliberate selection of these particular individuals for the purposes of the studies. Additionally, given that case studies did not undergo any formal analysis or methods of interpretation, the authors were required

to apply their own interpretations to a certain extent in order to summarize the trauma-hallucination links.

There were a number of limitations of the chosen methodology of this review. The inclusion of participants across clinical and nonclinical groups allowed a broader exploration of literature on hallucinations, and fitted with the literature given that few studies only recruited participants with a specific diagnosis, but limits the conclusions that can be drawn about specific groups. This may have been especially problematic regarding the inclusion of UHR populations, for whom hallucinations were assessed along a continuum of perceptual disturbances. The absence of criteria regarding particular measures of trauma and hallucination content/characteristics means that many of the included studies did not use a reliable or validated assessment of these constructs. However, a more strict criterion would have resulted in the inclusion of only a very limited proportion of the available literature.

Conclusions

The findings of this review highlight the importance of investigating the content and characteristics of hallucinations and how these may relate to adverse life experiences in both research and clinical settings. The identified methodological issues in this literature has implications for future research on hallucination content. Additionally, the findings of this review could inform psychological therapies for people experiencing distressing hallucinations.

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Paper 2

Developing a Measure of Different Dimensions of Auditory

Verbal Hallucinations

Word Count: 7264 (excluding key practitioner message, tables and references)

Abstract

Background: Auditory verbal hallucinations (AVH) have been shown to be a phenomenologically diverse experience which occurs across various clinical and nonclinical groups. Theoretical and empirical studies have indicated the presence of a number of possible subtypes of AVH characterised by specific and distinguishable features, most notably hypervigilance, inner speech and memory-related AVH

Method: The current study involved the development and psychometric evaluation of the Dimensions of Voices Questionnaire, a measure designed to assess phenomenological features of AVH consistent with the above subtypes. A sample of 127 voice hearers completed a battery of online measures comprising the DOV-Q and measures of threat anticipation, persecution, re-experiencing symptoms, dissociation and inner speech.

Results: Exploratory factor analysis yielded three factors each with 6 items: memory-related, linguistic complexity and threat-related. The loading of some items onto multiple factors indicated that subscales were not entirely distinct, with certain shared aspects of phenomenology. Identified dimensions were differentially associated with the other psychological constructs measured, such as re-experiencing symptoms, persecution and aspects of inner speech.

Conclusions: These results suggest that it is possible to measure different features of AVH using a self-report questionnaire. The dimensions identified were consistent in a number of ways with previously proposed subtypes of AVH. Further research to ascertain replication of the factor structure in an independent sample is needed. The relationship between these results and previous findings, together with the clinical and research implications, are discussed.

Key words: auditory hallucinations, psychosis, phenomenology, dimensions, subtypes

Key practitioner message:

- In this article we present a novel measure of different dimensions of auditory verbal hallucinations.

- Previous studies have suggested that auditory verbal hallucinations are characterised by diverse phenomenology, rather than being a unitary construct.

- Measuring dimensions of voices could enable tailoring or differential selection of psychological interventions depending on the particular dimension experienced.

Introduction

Auditory verbal hallucinations (AVH) are the experience of hearing a voice with a compelling sense of reality in the absence of an appropriate external stimulus (McCarthy-Jones et al., 2012). Although these experiences are often considered a central feature of psychosis (including schizophrenia spectrum disorders), they have also been reported in other clinical and nonclinical groups (Laroi et al., 2012; Van Os et al., 2000; Van Os & Reininghaus, 2016). A substantial literature has indicated that the experience of hallucinations is associated with adverse or traumatic life experiences (e.g. Read, Agar, Argyle, & Aderhold, 2003; Read, Van Os, Morrison, & Ross, 2005; Shevlin, Dorahy, & Adamson, 2007) with adverse experiences being more common in both psychotic and non-psychotic individuals who experience AVH compared to non-patient controls (Daalman, Diederen, Derks, van Lutterveld, et al., 2012).

Research into the causes of AVH, and possible treatments for distressing AVH, has predominantly conceptualised these experiences as a unitary phenomenon rather than considering their phenomenological heterogeneity (Jones, 2010; Laroi et al., 2012). Theoretical models of AVH therefore only explain a subset of these experiences (Jones, 2010). In this regard, both quantitative and qualitative studies have indicated considerable phenomenological variability, including in frequency, duration, linguistic complexity, personification and associated distress (Nayani & David, 1996); characterful qualities, emotional valence and accompanying bodily sensations (Woods, Jones, Alderson-Day, Callard, & Fernyhough, 2015); and whether AVH are demanding, make comments, and are located internally or externally (Upthegrove et al., 2016). In turn, AVH qualities are not necessarily stable: Nayani and David (1996), for example, found that the likelihood of internal localisation and AVH complexity increased over time, and features such as reality testing and clarity are not reliably reported (Junginger & Frame, 1985).

There have been various attempts to group and define subsets of hallucinatory experiences in light of their apparent phenomenological diversity. Consensus has not been

reached regarding the number and type of possible AVH categories. However, more recent research has indicated the presence of at least three possible types of AVH: hypervigilance, inner-speech and memory-related (McCarthy-Jones et al., 2012, 2014). These subtypes may differ in terms of dimensional characteristics such as voice repetitiveness, emotional valence and localization (i.e. in or outside the head), complexity of the utterance (i.e. words or sentences), voice content (e.g. commenting or commanding) and similarity of the utterances to the person's previous conversations (McCarthy-Jones et al., 2012). Consonant with any scientific theory of hallucinations (Bentall, 1990), possible underlying cognitive mechanisms have additionally been discussed for these subtypes.

Hypervigilance hallucinations (HV-AH) were proposed by Dodgson and Gordon (2009) as hallucinations occurring in noisy environments with lots of people when attention is focused externally. They are thought to arise from an exaggerated perceptual bias towards threat leading to auditory false-positives (detecting a sound or noise when it is not present), in which the person hears voices or sounds in their environment which confirm their pre-existing beliefs. For example, an individual on a noisy bus who is anxious about being bullied may mistake background noises or other conversations for derogatory words like 'loser'. Such perceptual biases can be linked to signal detection theory (Green & Swets, 1966) and have been identified in people experiencing hallucinations (Bentall & Slade, 1985; Brébion, Smith, Amador, Malaspina, & Gorman, 1998). These biases are proposed to be a self-protective mechanism developed in an attempt to avoid false negatives (i.e. missing threatening stimuli) (Haselton & Nettle, 2006), possibly as a result of adverse life experiences. HV-AH would be most likely to arise in noisy environments in which data-driven processing directed by contextual information is impeded and conceptually-driven processing, which is easily biased, attempts to fill in the gaps; increasing the likelihood of false positives.

Hallucinations related to inner-speech (IS-AH) have also been suggested, the evidence for which has been reviewed elsewhere (Jones, 2010; Jones & Fernyhough,

2007). IS-AH are hypothesised to be characterised by longer utterances, conversing with the voice hearer, commenting on their thoughts and activities, and providing commands. These hallucinations have been related to models of inner speech acquisition through the internalisation of interpersonal verbal exchanges, initially proposed by Vygotsky (1987; 1997), and expanded upon by Fernyhough (2004), in a four-stage model of the development of inner speech. The latter suggests that inner speech develops from external dialogue with caregivers, to private speech (internalised dialogue), to expanded dialogic inner speech (linguistic activity increasingly internalised), and finally to condensed dialogic inner speech (abbreviated in terms of syntactic and semantic qualities).

Jones and Fernyhough (2007) suggest that AVH may be explained as expanded inner speech in which multiple internalised voices play out. This can explain findings that the content of AVH may reflect the thoughts and ideas of the voice hearer (Leudar & Thomas, 2005), and the paradoxical 'alien-yet-self' quality of AVH (Fernyhough, 2004) (i.e., voices being heard inside the head but identified as coming from someone else). Different aspects of inner speech have been found to correlate with hallucination proneness (Alderson-Day et al., 2014; McCarthy-Jones & Fernyhough, 2011), and were associated with psychosis in a clinical population (De Sousa, Sellwood, Spray, Fernyhough & Bentall, 2016), although these findings were not entirely consistent regarding the types of inner speech associated. Neurological research further indicates the involvement of inner speech processes in AVH, with identified unusual connectivity between Broca's and Wernicke's area proposed to result in misattribution of inner-speech to an external source (De Weijer et al., 2013).

Another suggested subtype is memory-related auditory hallucinations (MR-AH; McCarthy-Jones et al., 2014).These have been proposed to represent reactivated memories, potentially associated with identified deficits in intentional inhibition and contextual memory in people who experience AVH (Waters, Badcock, Michie, & Maybery, 2006). Findings of unusual hippocampal activation and connectivity in people experiencing AVH

supports the involvement of memory-related processes (Amad et al., 2014; Tamminga, Stan, & Wagner, 2010).

This can be related to cognitive theories of post-traumatic stress disorder (PTSD), which relate memory intrusions to fragmented and decontextualised trauma memories (Ehlers & Clark, 2000b). Although MR-AH are not necessarily specific to trauma memories, a number of papers have discussed a possible relationship between AVH and trauma-memory intrusions (Hardy, 2017; McCarthy-Jones & Longden, 2015; Steel et al., 2005). Furthermore, a dose-dependent relationship has been identified between trauma and AVH (Bentall, Wickham, Shevlin, & Varese, 2012) which can be explained by the suggestion that consecutive traumas are increasingly less likely to successfully integrate as autobiographical memories, increasing vulnerability to intrusions (Ehlers & Clark, 2000). Hardy (2017) has additionally proposed that if memories are especially decontextualised amongst individuals experiencing AVH, this could explain why they are considered a hallucination rather than identified as a memory flashback or re-experiencing symptom.

In addition to studies which have proposed and tested specific aspects of possible AVH subtypes, a number of studies have also administered phenomenological interviews and then conducted cluster analyses in an attempt to explore the presence of different AVH. Stephane, Thuras, Nasrallah and Georgopoulos (2003) identified two main AVH clusters using such methodology. The first was characterised by low linguistic complexity, repetitive content, attributed to the self and external localisation of the AVH; potentially resembling features of an HV-AH subtype. The second cluster included AVH with high linguistic complexity, systematised content, attributed to others, internal localisation, and with multiple voices, which in turn is potentially similar to the proposed IS-AH. However, this study was limited by low power, and the authors did not include any questions about AVH related to memories.

McCarthy-Jones et al. (2012) used 13 items selected from the Mental Health Research Institute Unusual Perceptions Schedule (MUPS; Carter, Mackinnon, Howard,

Zeegers & Copolov, 1995) and identified four clusters: own thought AVH (first person, not addressing the person, possibly being one's own voice or thoughts, similar to memories); replay AVH (identical to a memory); commanding and commenting AVH (repetitive, first or third person, constant, commands and running commentaries); and non-verbal AH (sounds, voices that sound like nonsense). Interestingly, participants often endorsed more than one subtype, indicating that the categories are not entirely distinct and stable. McCarthy-Jones et al. (2012) noted that the study was limited by the restricted range of variables included and the lack of items tailored to assess certain subtypes of AVH proposed in recent literature, such as HV-AH. Additionally, some of the participants were not currently hearing AVH, relying on retrospective reporting of their experiences.

Another cluster analysis of AVH phenomenology measured through semi-structured interview supported the existence of a HV-AH subtype that involved hearing threatening voices from outside of the head when attention is focused externally (Garwood, Dodgson, Bruce, & McCarthy-Jones, 2013). The authors additionally identified three other clusters characterised by features such as internal localisation and internally focused attention. However, the sample size of this study was small and the examples of AVH described by participants sometimes dated back many years, limiting their reliability. In addition, only a very limited range of AVH features were explored in terms of these different clusters.

These studies relied on lengthy interviews and complex statistical analyses to categorise AVH according to their defining characteristics, which is time-consuming and impractical for routine implementation in clinical practice. Their reliability was also limited in some instances due to the use of retrospective reporting. In addition, none of them assessed aspects of phenomenology in sufficient detail to enable the identification of HV-AH, IS-AH and MR-AH and predominantly recruited samples with a diagnosis of schizophrenia, thereby only representing a subset of individuals who experience AVH (Laroi et al., 2012; Van Os & Reininghaus, 2016). Given that no significant

phenomenological differences in AVH have been identified between different diagnostic groups (Waters & Fernyhough, 2017), the use of a more heterogeneous sample would not be expected to impact upon the features identified, and would in turn improve the trans-diagnostic validity of the findings. Taken together, an empirically-derived comprehensive self-report measure of different phenomenological features of voices, validated with a diverse group of individuals in terms of diagnosis who currently experience AVH, could therefore be valuable. Since previous findings indicate that voice hearer's experiences cannot be separated into discrete independent subtypes (McCarthy-Jones et al., 2012), a measure seeking to identify AVH dimensions that are consisted with the proposed subtypes but do not preclude the possibility of experiencing multiple types, would likely be most useful. Given that different psychological mechanisms have been proposed to underlie different types of AVH, assessing the dimensions of AVH could enable clinicians to formulate their clients' difficulties and tailor their therapeutic interventions to the particular type of voices experienced (Smailes, Alderson-Day, Fernyhough, McCarthy-Jones, & Dodgson, 2015).

Research Aims

The main aims of this study were: 1) to develop and validate a self-report measure of phenomenological characteristics of AVH that may be used to assess different subtypes, 2) to determine whether participants' responses indicate the presence of three purported dimensions: inner speech, hypervigilance and memory-related hallucinations, and 3) to identify whether hypothesized associations are identified between putative AVH dimensions and other variables, specifically: paranoia, threat anticipation and HV-AH; expanded inner speech and IS-AH; intrusive memories, and responses to intrusive memories like rumination, thought suppression and dissociation and MR-AH.

Method

Participants

One hundred and forty five participants consented to take part in the study, of which 127 completed the DOV-Q at time point 1 (T1) and 67 at time point 2 (T2). A majority of the participants ($n = 141$) completed the study online, whilst paper-versions were provided to participants who did not have access to the Internet ($n = 4$).

Participants were invited to take part if they met the following eligibility criteria: had heard voices in the last three months, were fluent in English, and were aged 16 years or above. Seven participants were excluded after completing an initial demographics measure because they reported that they had not heard voices in the last three months. Consistent with evidence that voice hearing is a trans-diagnostic phenomenon, no restrictions were applied regarding psychiatric diagnoses.

Sample characteristics are displayed in Table 1. Participants were predominantly female (73.8%), white (80.6%) and had achieved degree-level education (42.8%). Clinical information is displayed in Table 2, with participants predominantly having a psychiatric diagnosis (91%), most commonly of a schizophrenia spectrum disorder (52.4%).

Table 2: Summary of sample characteristics identified through demographics measure.

Sample demographics		Percentage (%)	N
Age (M,SD)		36.68 (13.67)	
Gender	Female	73.8	107
	Male	23.4	34
	Other	2.8	4
Ethnicity	White	80.6	117
	Mixed	4.9	7
	Asian	2.1	3
	Black (African or Caribbean)	1.4	2
	Other	11	16
Education	Degree level	42.8	62
	A Level or equivalent	14.5	21
	GCSE or equivalent	8.3	14
	Other	25.5	37
	No qualifications	4.1	7
Employment	Employed/self-employed	35.9	59
	Unemployed	11	16
	Full-time education	14.5	21
	Looking after family/home	4.8	7
	Retired	3.4	5
	Other	3.4	5
English first language		86.2	125

Table 3: Clinical information identified through demographics measure.

Background psychiatric information	Percentage (%)	N
Self-reported lifetime diagnosis		
No psychiatric diagnoses	9	13
Schizophrenia spectrum disorders	52.4	76
Depression (with psychotic features)	29.7	43
Brief psychotic disorder	3.4	5
Bipolar disorder	19.3	28
Delusional disorder	2.8	4
Borderline personality disorder	7.6	11
Dissociative identity disorder	3.4	5
Post-traumatic stress disorder	4.1	6
Other diagnosis	11.03	16
Duration of voice hearing		
<10 years	35	51
10-20 years	25.6	37
20 years or more	30.3	43
Not stated	9.7	14
Lifetime self-reported use of antipsychotic medication	78.6	114
Lifetime use of psychological therapies		
CBT	51	74
Psychodynamic	18.6	27
Family Therapy	13.8	20
Other	33.8	49
Previous hospital admission for mental health	67.6	98

Measures

All measures used can be found in Appendix 4.

  Demographics questionnaire. This measure had been developed and used by the research team in previous unpublished studies and informed by demographic information collected in studies such as the Adult Psychiatric Morbidity Survey (McManus, Meltzer, Brugha, Bebbington, & Jenkins, 2009). It included 18 questions on demographic variables such as age, gender, ethnicity and education level achieved, together with background questions about participants' mental health including (self-reported) lifetime diagnoses, medication and therapeutic interventions. Participants were asked to select their answer from a number of options, including 'other'.

  Hamilton Programme for Schizophrenia Voices Questionnaire (HPSVQ; Lieshout & Goldberg, 2007). This 13-item self-report measure was used to obtain information on AVH characteristics, content, subjective impact and severity. The first nine items are rated on a 5-point Likert scale from 0-4 in terms of how impairing these experiences are (negative content, frequency, loudness, length, clarity, obeying commands, associated distress, feelings of worthlessness and interference). The final four items assess the part of day and social situations that AVH tend to occur in, where they come from, and how typical this is. The HPSVQ has shown good agreement with established interview measures of AVH such as the Positive and Negative Symptoms Scale for Schizophrenia (PANSS: Kay, Fiszbein, & Opler, 1987) and Psychotic Symptoms Rating Scales-Auditory Hallucinations Subscale (PSYRATS-AH: Haddock, McCarron, Tarrier, & Faragher, 1999), and good internal consistency and test-retest reliability (Kim et al., 2010). In this study, internal consistency measured using Cronbach's alpha (CA; Cronbach, 1951) was $\alpha=0.88$. Items associated with severity and distress were specifically used in the analyses.

Development of the Dimensions of Voices Questionnaire

The Dimensions of Voices Questionnaire (DOV-Q) was developed by the authors to assess the hypothesised types of voices (inner speech, memory-based, hypervigilance). Item generation drew on psychological theory about features of voices associated with each purported subtype (McCarthy-Jones et al., 2014; Smailes et al., 2015). The items were also informed by existing measures that have previously been used in quantitative studies investigating subtypes of AVH (e.g. Mental Health Research Institute Unusual Perceptions Schedule, MUPS, Carter et al., 1995; semi-structured interview schedule, Garwood et al., 2013) and the findings of qualitative studies on AVH phenomenology (Upthegrove et al., 2016). Given that items loading onto multiple factors can be problematic for factor analysis interpretation and scale scoring (Tabachnick & Fidell, 2013), the initial pool of items generated by the research team were then edited and reduced so that only items hypothesised to be specific to one of the three subtypes were retained.

Cognitive interviewing with five people with lived experience of psychosis was used to both refine the measure and to assess face validity. Cognitive interviewing is used to understand the processes an individual goes through when completing a questionnaire, such as comprehension of it, decision processes, memory retrieval, and their response process (Tourangeau, 1984; Willis, 1994). Interviewees were recruited through a local Hearing Voices Network group and were compensated £10 for their time. Interviews involved administering the DOV-Q and using techniques such as think-allowed probing (the interviewee discusses their thought process as they read, interpret and decide on an answer for each question) and concurrent and retrospective probing (the interviewer asks specific questions about the process of interpreting and answering items, either after each item or at the end of the questionnaire) (Willis, 1994). Interviewees were provided with multiple options for individual items, including original and revised versions. They were asked whether or not they agreed with revisions suggested by previous interviewees. Revisions to language (predominantly simplification), format, the Likert scale, and steps to

reduce content overlap were all made following the cognitive interviews. This process indicated that items had high face and content validity. Thirteen items were revised, one item was removed and one item was added based on consensus (see Appendix 5 for specific revisions). This process was completed in five interviews, as after this number all participants had reached an agreement on the revisions. The Cognitive Interviewing Schedule that was developed and used can be found in Appendix 6. Items were checked by all members of the research team before the measure was finalised.

The final version of the DOV-Q used in this study was a 20-item questionnaire requiring participants to rate the extent to which statements correspond with their experience of voice hearing as either: not at all, occasionally, sometimes, often, or constantly. Items 1-8 were designed to tap the inner speech subtype, items 9-14 the hypervigilance subtype, and items 15-20 the memory-related subtype.

Additional Measures

Additional measures, presented in randomised order, were used to assess psychological constructs hypothesised to be associated with the different purported subtypes.

Availability Test (AVT, threatening subscale; Bentall et al., 2009). This was used to measure threat anticipation and biases in heuristic reasoning. Participants were asked to predict the likelihood of each of seven threatening events happening to them in the subsequent week using a 7-point Likert scale (1 not at all - 7 very likely). It has shown acceptable internal reliability in previous studies (Corcoran et al., 2006). In this study, the internal consistency of the threatening subscale was good ($\alpha=0.83$).

Persecution and Deservedness Scale (PADS, persecution subscale only; Melo, Corcoran, Shryane, & Bentall, 2009). This 10-item scale was used to measure the severity of paranoid thinking. Participants were asked to rate statements on a scale from 0 (certainly

false) to 4 (certainly true). Items were designed to assess the belief that the individual is at risk due to the negative attitudes and intentions of others (persecutory paranoid ideation). The PADS has been shown to be a reliable and valid measure for the measurement of paranoia in clinical and non-clinical populations, with concurrent validity compared to other measures of paranoid thinking and acceptable internal reliability demonstrated for each subscale (Melo et al., 2009). In this study, Cronbach's Alpha for the persecution subscale was $\alpha=0.92$.

Post-traumatic Diagnostic Scale DSM 5 (PDS 5, re-experiencing subscale; Foa et al., 2016). This scale was devised to measure PTSD symptomatology. The re-experiencing subscale used in this study consists of five items that participants were asked to rate on a scale from 0 (not at all) to 4 (6 or more times a week/severe) depending on how much the re-experiencing symptom has affected them in the last month. Participants were asked to complete the scale with respect to a specific traumatic event. Before completing this subscale, participants were asked if they had experienced a traumatic event (using a definition informed by the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013) and, if not, to complete the questionnaire in regards to a stressful life event instead. This scale has shown excellent internal consistency, test-retest reliability, and good convergent and discriminant validity in relation to other measures (Foa et al., 2016). However, it has not been validated in a sample of voice hearers, or for completion with regards to a stressful but not traumatic event. In this sample $\alpha=0.93$.

Responses to Intrusions Questionnaire (RIQ). This questionnaire was developed in a series of studies (Clohessy & Ehlers, 1999; Halligan, Clark, & Ehlers, 2002; Murray, Ehlers, & Mayou, 2002; Steil & Ehlers, 2000) in which it showed good reliability and predictive validity for PTSD. It was used to assess responses to intrusive memories of stressful events which are hypothesised to increase the likelihood of further re-experiencing of memories (e.g. rumination, dissociation, thought suppression). Participants

were asked to rate 17 statements according to how often they have responded to memories of a stressful life event in a particular way over the past week on a four-point Likert scale (Never - Always). This scale has not previously been validated in a sample of people who hear voices although it has been used with non-clinical populations and populations with high levels of trauma (Clohessy & Ehlers, 1999; Starr & Moulds, 2006). In this study, internal consistency was α=0.93.

Brief Dissociative Experiences Scale (DES-B; Dalenberg & Carlson, 2010). This 8-item version of the original DES (Bernstein & Putnam, 1986), assesses severity of dissociative experiences on a 5-point scale from 0 (not at all) to 4 (more than once a day). In this study, internal consistency was α=0.79.

Varieties of Inner Speech Questionnaire (VISQ; Mccarthy-Jones & Fernyhough, 2011). This 18-item measure assesses different types of inner speech: dialogic (i.e. talking to oneself), condensed (i.e. brief phrases or single words), evaluative or motivational content, and inner speech including other people's voices. Participants were asked to rate the extent to which statements resemble their experience of inner speech on a scale from 1 (Certainly does not apply to me) to 6 (Certainly applies to me). Internal consistency and test-retest reliability were found to be acceptable or good. This measure has additionally been used in clinical populations (De Sousa et al., 2016). For this study, CA was: condensed α=0.04, dialogic α=0.80, other people α=0.84, evaluative α=0.86.

Procedure

All procedures were approved by the University of Manchester Research Ethics Committee. The rationale and procedure for the study was also discussed with a service user liaison committee to provisionally ascertain the acceptability of the study and methodology., and a supervisor with lived experience of AVH provided extensive input.

Participants were recruited online through social media, charities, support groups and the international voice hearing network Intervoice, as well as through communication

with Hearing Voices Network peer-support groups in England. The study was advertised from August 2017 until February 2018. Participants who did not have access to the Internet and were recruited through hearing voices groups or the charitable sector were provided with a paper version of all questionnaires and forms from the online study, together with a stamped addressed envelope to return these to the researchers. After reading the participant information sheet, participants were able to provide informed consent to take part in the study. They were then shown a demographics questionnaire, the DOV-Q and the battery of additional questionnaires, followed by a debriefing section. Participants were given the option to provide their contact details if they chose to be entered into a prize draw and/or if they consented to being contacted after two weeks to participate in the second part of the study. With the exception of this, participants completed the study anonymously. Contact details were stored separately from the participants' anonymized research data, and destroyed following the prize draw and second part of the study. An automated email was sent after two weeks, to those who consented, with a link to the second part of the study. Participants were asked to complete the DOV-Q again, to provide their contact details if they wished to be entered into another prize draw, and shown the study debrief for a second time.

Data Analysis

Exploring the factor structure of the DOV-Q. An exploratory factor analysis (EFA) was performed, with extraction through principal components. Bartlett's test of sphericity was measured and the Kaiser-Meyer-Olkin (KMO) (Kaiser, 1974) was calculated in order to assess whether EFA was appropriate. Items with inter-item correlations > 0.30 and < 0.90 were retained for the factor analysis (Tabachnick & Fidell, 2013).

Parallel analysis (PA; Horn, 1965) was used to determine the number of factors to be extracted, as this is considered to be the most accurate method with samples <200

(Velicer & Jackson, 1990) and alternatives like Kaiser's criterion and the scree test have been found to retain too many factors (Hubbard & Allen, 1987; Zwick & Velicer, 1986). In PA, observed eigenvalues are compared to the eigenvalues arising in a random dataset with equivalent sample size and variable numbers. Eigenvalues that are greater than corresponding values in the random dataset are retained.

On the basis of previous studies which found that it was common for people to hear more than one type of voice (McCarthy-Jones et al., 2012), it was hypothesised that factors would be correlated. Oblique factor rotation was therefore initially explored, whilst correlations between factors were ascertained in order to confirm whether oblique or orthogonal factor rotation were more appropriate. As the items of the DOV-Q are all on the same scale, the covariance matrix was extracted (Field, 2009). Items with factor loadings <0.32 were then removed from the factors (Hair, Black, Anderson, & Tatham, 1995; Tabachnick & Fidell, 2013).

Exploring the psychometric properties of the DOV-Q. Internal consistency was measured using CA for each subscale of the DOV-Q. To assess test-retest reliability, correlational analyses using Spearman's Rho (due to non-normally distributed data) were carried out between participants' factor scores on the DOV-Q at the first and second time point.

Exploring associations between dimensions and secondary outcome measures. Associations between factors and secondary outcome measures (including individual items of the HPSVQ which could be indicative of distress or severity of AVH) were assessed through correlational analyses for continuous data using Spearman's Rho (r_s) due to non-normally distributed data. For the same reason, non-parametric Mann-Whitney and Kruskal-Wallis tests were used for categorical data. To take into account correlations between factors, partial correlations were undertaken that controlled for scores on other factors.

Of the 127 participants who completed the DOV-Q, two participants had one item of data missing and one participant completed the whole measure using only the response "2". These participants were retained for the analyses, with mean substitution across participants applied for missing data. Sensitivity analyses was then conducted with these participants removed. One participant had one item of missing data for the PADS and two participants had one item missing for the VISQ, which were both dealt with by mean substitution within participants within the relevant subscale. One participant had one item missing on the HPSVQ which was dealt with by mean substitution across participants, as these items were not considered to be measuring the same construct. Four outliers were identified for the VISQ condensed subscale (two for dialogic and five for evaluative) and one for the AVT. Outliers were retained for the following analyses and sensitivity analyses were conducted with outliers removed.

Exploratory Factor Analysis

The overall KMO was good at 0.743 (Hutcheson & Sofroniou, 1999), and individual KMO ranged from 0.561 to 0.880, indicating adequate sample size (Hutcheson & Sofroniou, 1999). Bartlett's test of sphericity was highly significant ($p<0.001$), indicating EFA was appropriate. Inter-item correlations were > 0.30 and < 0.90, and so all 20 items were retained for the EFA. For all 20 items, participants used the whole range of the five-point response scale, suggesting that the scale was suitable for the target sample.

PA indicated that three factors occurred above chance based on the 95th percentile criteria from the parallel analysis Monte Carlo simulation. Consequently, three factors were extracted using Principal Components Extraction. With three factors extracted, a cumulative percentage of 42.59% of the total variance was explained (Factor 1, 22.03%; Factor 2, 11.5%; Factor 3, 8.06%).

Determining the factor structure. Oblique rotation revealed that factors were not correlated (all $r<.22$), so orthogonal rotation (varimax) was used. The factors extracted and items that loaded on those factors were the same for both types of rotations, as is expected if factors are not correlated (Tinsley & Tinsley, 1987). Other forms of rotation were tried, but varimax and direct oblimin produced the best solution in terms of the numbers of cross-loadings on different factors and the number of items that were retained.

Items 1 and 6, which did not load on any factor above .32, were removed. Items loading on more than one factor above .32 were retained in the factor on which they loaded highest, which applied to five items that loaded on to two factors. This resulted in six items being associated with each factor. The results of the rotated, rescaled factor matrix are shown in Table 3, and the results of the EFA with all factor loadings are shown in Appendix 7.

Once this factor structure was decided, correlations between total scores on each subscale were calculated, indicating significant correlations between Factors 1 and 2 ($r=.473$, $p<.001$) and a small correlation between factors 2 and 3 ($r=.220$, $p=.014$). No significant correlation was found between factor 1 and 3 ($r=.063$, $p=.48$).

Table 4: Extracted factors together with the items associated with each factor and their loadings.

Factor 1		Factor 2		Factor 3	
Do the things your voice(s) say remind you of conversations or events from the past?	0.795	Do you find that the voice(s) often repeat the same thing over and over again?	0.684	Are most of the voice(s) you hear very clear?	0.791
Do you hear the voice(s) of someone you know or knew in the past?	0.785	Do your voices try to tell you what to do?	0.672	Are the voice(s) hard to hear (e.g. quiet or muffled, or sound as if they are coming from far away)?	-0.627
Do your voices replay memories of past conversations in your mind (like a tape recorder)?	0.651	Do you tend to hear voices when you are in places with lots of people, e.g. in town?	0.629	Do the voices say long sentences?	0.620
Do your voice(s) replay memories of events which you usually try to forget and push out of your mind?	0.630	Do your voice(s) talk about what you are thinking or doing at that moment (like a running commentary)?	0.605	Do the words spoken by the voice(s) make no sense (e.g. gibberish)?	-0.599
Do you hear voice(s) that remind you of your younger self?	0.605	Do you tend to hear voices when you are afraid of something bad happening?	0.492	Do you ever have a conversation with your voice(s) in which they respond to you?	0.539
Do you ever feel like your voices are speaking your own thoughts?	0.601	When you hear your voices are you focusing on what is going on around you (e.g. what other people are saying)?	0.316	Do the voice(s) say just one or two words?	-0.518

Interpreting factors. Although the three factor model was consistent with the predicted three subscales, these extracted factors differed in a number of ways from those predicted. Factor 1 contained all items predicted to be associated with MR-AH, with the exception of repetitive voices, and with the addition of an item about voices speaking the person's own thoughts. This additional item was not considered incompatible with MR-AH, and so this factor retained the label 'memory-related auditory hallucinations'. Factor 2 included aspects of the purported HV-AH, such as hearing voices when 'in places with lots of people', 'focusing on what is going on around you', and when 'afraid of something bad happening'. It also included commenting, commanding and repetitive voices. Consequently, this factor was termed 'threat-related auditory hallucinations' (TR-AH). The third factor included several items that have been hypothesised to associate with IS-AH, such as distinct voices conversing with long sentences. It also included a number of reverse coded items which had been hypothesised to be associated with the HV-AH (voices say one or two words, are muffled and speak gibberish). It seemed that this factor reflected linguistic complexity, and it was therefore termed 'linguistic complexity auditory hallucinations' (LC-AH).

Reliability

Sixty-seven participants (52.76%) completed the DOV-Q at T2. The average duration between T1 and T2 was 22.88 days (range 14-66). Test-retest reliability calculated using Spearman's Rho showed that all items and imposed factor scores correlated between T1 and T2 at a 0.01 level (2-tailed) with all p values being less than .001 and $rs > .40$ and $< .86$ (See Appendix 8).

CA for the DOV-Q at T1 for each subscale was 0.818 (MR-AH), 0.682 (TR-AH), and 0.690 (LC-AH).

Associations with Additional Measures

Mann-Whitney tests revealed no significant difference in terms of diagnosis for MR-AH ($U = 510.5$, $Z = .15$, $p = 0.88$), for TR-AH ($U = 360.0$, $Z = -.54$, $p = 0.60$), and for LC-AH ($U = 518.0$, $Z = .18$, $p = 0.94$). Kruskal-Wallis tests also revealed no significant difference in terms of duration of voice hearing for MR-AH ($H(15) = 19.32$, $p = 0.20$), TR-AH ($H(15) = 16.38$, $p = 0.36$), or LC-AH ($H(15) = 13.55$, $p = 0.56$).

Due to correlations between factors, nonparametric partial correlations were explored between the DOV-Q subscales and the secondary outcome measures (see Table 4). The size of correlations are described based on the guidelines provided by Cohen (1988). Due to the number of tests, a Bonferroni correction was applied, which resulted in the requirement of $p = 0.001$ for significance.

Once the Bonferroni correction was applied, MR-AH were moderately positively correlated with other-people inner speech (measured using the VISQ), and AVH that make the person feel worthless (as measured using the HPSVQ) (see Table 6 for correlations with the HPSVQ). TR-AH were moderately correlated with re-experiencing and persecution (measured using the PDS and PADS). This dimension was correlated with AVH with negative content, which are interfering, and which are associated with a feeling of worthlessness as well as the total score on the HPSVQ. LC-AH did not correlate significantly with any of the secondary outcome measures or with the HPSVQ.

Table 5: Associations identified through partial correlations between each dimension of the DOV-Q and scores on additional measures.

	Factor 1 (Memory related)	Factor 2 (Threat related)	Factor 3 (Linguistic complexity)
DES-B (n=119)	$r_s = 0.190$ p = 0.059	$r_s = 0.251$ p = 0.012	$r_s = -0.068$ p = 0.504
PADS (persecution) (n= 116)	$r_s = 0.162$ p = 0.107	**$r_s = 0.329$** **p = 0.001**	$r_s = 0.001$ p = 0.992
VISQ (condensed) (n= 115)	$r_s = 0.067$ p = 0.511	$r_s = 0.041$ p = 0.688	$r_s = -0.082$ p = 0.418
VISQ (dialogic)	$r_s = 0.157$ p = 0.118	$r_s = 0.299$ p = 0.003	$r_s = -0.066$ p = 0.515
VISQ (other people)	**$r_s = 0.330$** **p = 0.001**	$r_s = 0.299$ p = 0.003	$r_s = -0.006$ p = 0.954
VISQ (evaluative)	$r_s = 0.107$ p = 0.289	$r_s = 0.213$ p = 0.034	$r_s = -0.015$ p = 0.886
PDS (re-experiencing) (n= 111)	$r_s = 0.253$ p = 0.011	**$r_s = 0.341$** **p = 0.001**	$r_s = -0.004$ p = 0.965
RIQ (n=111)	$r_s = 0.153$ p = 0.129	$r_s = 0.292$ p = 0.003	$r_s = -0.015$ p = 0.882
AVT (Threatening)	$r_s = 0.137$ p = 0.174	$r_s = 0.256$ p = 0.010	$r_s = -0.068$ p = 0.504

Statistics denoted in bold are significant after the Bonferroni correction

Table 6: Associations identified through partial correlations between each dimension of the DOV-Q and characteristics of hallucinations identified using the HPSVQ.

HPSVQ Items	Factor 1 (Memory related)	Factor 2 (Threat related)	Factor 3 (Linguistic complexity)
Total score (n=124)	$r_s = 0.229$ p = 0.022	**$r_s = 0.474$** **p < 0.001**	$r_s = 0.293$ p = 0.003
AVH Bad content	$r_s = 0.139$ p = 0.166	**$r_s = 0.371$** **p < 0.001**	$r_s = 0.089$ p = 0.380
AVH Interference	$r_s = 0.209$ p = 0.037	**$r_s = 0.353$** **p < 0.001**	$r_s = 0.154$ p = 0.126
AVH Distressing	$r_s = 0.313$ p = 0.002	$r_s = 0.297$ p = 0.003	$r_s = 0.016$ p = 0.874
AVH Worthlessness	**$r_s = 0.317$** **p = 0.001**	**$r_s = 0.431$** **p < 0.001**	$r_s = 0.021$ p = 0.834

Statistics denoted in bold are significant after the Bonferroni correction

Sensitivity Analyses

   The factor analysis was additionally completed with the two cases who had one missing item excluded listwise rather than using mean substitution, together with the exclusion of the participant with a problematic response pattern. PA similarly indicated the extraction of three factors and there were no differences in the factor structure except that item 9 no longer loaded above the 0.3 level. When the outliers and participants with missing data for the threat-related factor of the DOV-Q, the VISQ, PADS and the AVT were removed, all partial correlations were the same except that the association between MR-AH and distressing voices on the HPSVQ now reached significance [$r(95) = 0.314$, $p=0.001$); as did TR-AH and other people inner speech [$r(95) = 0.321$, $p=0.001$]. However, TR-AH and persecution (measured using the PADS) no longer achieved significance with the Bonferroni correction [$r(104) = 0.276$, $p = 0.004$]. Internal consistency for the VISQ was also unchanged.

Discussion

   The aim of this study was to develop and validate a self-report measure of aspects of AVH phenomenology amongst a sample of clinical and nonclinical voice hearers in order to identify and measure different dimensions of AVH. A 20-item scale was developed including items hypothesised to associate with memory-related, hypervigilance and inner speech hallucinations. EFA revealed three factors: hallucinations associated with memories, threat and linguistic complexity. Whilst aspects of these scales were consistent with the predicted subtypes, there were also a number of differences. The internal consistency and test-retest reliability for the scale were good. Certain partial correlations with other measures were consistent with predictions.

   The predicted MR-AH subtype emerged as the first factor, comprising all hypothesised items except for repetitive content. Both AVH that were similar and identical to memories loaded on this subtype, consistent with predictions but contrasting with the

findings of McCarthy-Jones et al. (2012). Unexpectedly, an item related to voices speaking the person's own thoughts loaded on this factor. Similarly, McCarthy-Jones et al. (2012) found that AVH similar to memories clustered with AVH that were possibly the persons own voice or thoughts. Consistent with this, we found that MR-AH correlated with hearing the voices of other people in inner speech. The inclusion of aspects of inner-speech in a memory-related subtype may be interpreted in light of theories of the development of inner-speech (Vygotsky, 1997). Early experiences may be internalised and influence the content of inner speech, so that MR-AH resemble both memories and inner speech. Also, traumatic events impact upon the individual's self-perceptions, so that MR-AH could resemble both reactivated memories and post-traumatic self-beliefs (Hardy, 2017). Items which comprised this factor were not specific to traumatic memories, but could also include positive or benign memories. This may account for the lack of hypothesised associations with re-experiencing symptoms and maladaptive responses to intrusions.

TR-AH included items hypothesised to associate with hypervigilance hallucinations, such as hearing AVH when afraid of something bad happening, when attention is focused externally, and when in places with lots of people. However, this factor was also characterised by repetitive, commenting and commanding AVH content. These later items fell into a cluster identified by McCarthy-Jones et al. (2012) which they called 'constant commanding and commenting AVH.' Since the authors did not assess dimensions that could be associated with hypervigilance voices, our results extend these findings by indicating that such AVH may additionally be associated with fear, focusing on surroundings, and being in places with lots of people. Unexpectedly, items related to short, unclear and nonsensical utterances did not load highly on this factor, which has implications for signal detection theories of HV-AH as false positives would be more likely to resemble single words or short phrases with low clarity. Hypothesised associations with persecution were identified, but associations with threat-anticipation did not reach significance after the Bonferroni correction.

Unexpectedly, this dimension correlated with re-experiencing symptoms and maladaptive responses to re-experiencing symptoms. Also, items relating to replays of memories and memories that the person tries to forget significantly loaded on TR-AH, with the latter item being especially indicative of stressful or traumatic memories. Correlations were also identified between this dimension and MR-AH, indicating that they likely do not represent entirely distinct constructs. Given that TR-AH showed higher correlations with re-experiencing symptoms and maladaptive responses to intrusions, as well as with items on the HPSVQ thought to measure severity, it may be that this factor is especially characterised by voices which are negative, distressing, and associated with traumatic memories, whilst the MR-AH is associated with both distressing and non-distressing memories, or even potentially the voices of known people being protective. A further assessment of the specific AVH content of individuals who endorsed the MR-AH dimension could clarify this.

Loadings on the threat-related factor were also significant for items related to conversing voices and long utterances, although these items were not retained in this factor as they loaded more highly on the linguistic complexity dimension. This combination, together with the commenting and commanding items, is similar to the hypothesised IS-AH subtype. Tentatively, an explanation for these associations may be that threat-related voices are associated with trauma memories which potentially lead the person to be afraid of something bad happening and focus on their surroundings when in places with lots of people. Inner speech processes may accompany this as a means of threat-monitoring. For example, commenting hallucinations could include threat-related comments on the surroundings (e.g. 'he is looking at you, he is going to come and get you') and could be repetitive (e.g. repeatedly saying things like 'look out'). In-depth assessment of AVH content could help clarify this.

The identification of LC-AH, characterised by long and conversing AVH replicates some findings of previous cluster analyses (Stephane et al., 2003). However, this factor did

not correlate with types of inner speech measured on the VISQ as might be predicted. Nayani and David (1996) found that linguistic complexity increased with the length of time that a person had experienced AVH, but this finding was not replicated in our study. Loadings were very low on this factor for items related to memories, and it did not correlate with re-experiencing symptoms, indicating that this particular subtype may not have such direct relationships with traumatic life events. This dimension did not have any associations with aspects of severity measured using the HPSVQ, potentially indicating that this dimension is less disturbing. Future research could investigate this further, such as whether psychiatric voice hearers differ from nonclinical voice hearing populations, like spiritualists, in terms of the dimensions reported.

Strengths and Limitations

This study benefited from an adequate sample size for the purposes of the analyses and a diverse sample in terms of various demographic variables, although it was disproportionately female with high levels of education and relatively low age for a voice hearing population (likely resulting from predominantly online recruitment). Therefore, it is possible that the current sample represents a younger group. The diagnostic heterogeneity of the sample together with the reliance on self-reported diagnosis, limits the conclusions that can be drawn about specific diagnostic groups. Further research is needed to determine the generalisability of the findings and how they apply to more homogenous samples with confirmed diagnoses.

The DOV-Q has been shown to have good test-retest reliability and internal consistency, and face validity was evidenced through cognitive interviews. There are many different approaches to assessing test-retest reliability and correlations were chosen. Alternative approaches could have been preferable, but were not possible within the scope of this study (Vaz, Falkmer, Passmore, Parsons, & Andreou, 2013). The DOV-Q represents a succinct and usable measure for the purposes of clinical practice and research. However,

there is only limited assessment of the measures' validity and the stability of the factor structure.

Items significantly loading onto multiple factors were dealt with by retention on the factor with the highest loading. Alternatively, these items could have been removed, potentially allowing factors to represent more distinct, separable entities. However, the researchers decided it made more theoretical sense to retain these items, given they loaded highly on certain factors and the measure was already relatively short. They therefore instead sought to understand and interpret such overlaps. However, this does create challenges in interpreting the findings and could be problematic for the use of the measure.

Participants were asked to complete the DOV-Q with regards to their typical voice-hearing experience. Instead, they could have been asked to focus on a particular voice, with the opportunity to complete it multiple times for different voices (the approach taken by Garwood et al., 2013). Given that McCarthy-Jones et al. (2012) found that participants tended to hear multiple types of voices, this may have resulted in a more precise result, with less overlap between factors. Future studies could try to use the DOV-Q in this way, and assess through factor analysis whether it impacts upon the factor structure.

Regarding other measures, findings using the VISQ must be interpreted with caution given the low recorded internal consistency (although this was specific to the condensed subscale). Furthermore, a number of the assessment instruments had not previously been validated in voice hearing populations (PDS and RIQ), and the delivery of individual subscales of certain measures in an effort to reduce participant burden limits the generalisability of previous findings which used the whole scale to assess validity.

Research and Clinical Implications

The study supports hypotheses that AVH are not a unitary construct. Consequently, future research on AVH should clarify the specificity of findings to different dimensions. This could include investigating how AVH dimensions evolve overtime from first episode

of psychosis, and how they relate to help-seeking and respond to different psychological and pharmacological treatments. The neurobiological signature associated with different dimensions could also be explored.

Certain therapeutic approaches may be preferentially suited to specific AVH dimensions, requiring therapies to be tailored to types of voices, as suggested by Smailes et al. (2015). Trauma-focused therapeutic approaches (e.g. Ehlers & Clark, 2000) may be particularly useful for the memory-related dimensions, and potentially threat-related AVH. An intervention for AVH drawing on the cognitive model for panic disorder (Clark, 1986), as proposed by Morrison (1998), could be applicable to threat-related AVH, focusing on selective attention or hypervigilance processes together with safety behaviours. Voice Dialoguing methods (Corstens, Longden, & May, 2012) could be appropriate for linguistic complexity AVH, involving the therapist interacting with conversing AVH to ascertain the intent of the voices and enable the person to make changes in terms of their behaviour and how they relate to their voices and themselves. Future studies could assess whether outcomes for different types of therapy are superior for different dimensions.

Conclusion

The findings of this study emphasise the importance of considering different types of voice hearing experiences in approaches to understanding aetiology and treatment and investigating their phenomenology. The study provides the initial stage in the development of a reliable, valid and concise self-report measure of different types of AVH, although further developments are needed.

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Paper 3

Critical Evaluation

Word Count: 5766 (excluding references)

Paper Overview

This paper provides a critical and reflective discussion of the researcher's experience of conducting the research presented in this thesis, including the particular decisions made and challenges encountered. Firstly, there will be a discussion of the chosen subject area of the review, and decisions made and issues encountered through refinement of the inclusion criteria, screening, extraction, quality assessment, and synthesis. The rationale and methodology of the empirical paper will then be described, including a more detailed explanation of the development of the DOV-Q than was possible in the constraints of Paper 2. The particular challenges that arose as part of this paper will also be outlined. Limitations and future directions will be discussed throughout.

Rationale for Chosen Topic

The researcher had previously worked in a trauma clinic researching Post-traumatic stress disorder (PTSD) and psychological therapies for this population. In subsequent work with individuals with a diagnosis of schizophrenia, the researcher was then interested to observe how symptoms, which could have been described as flashbacks or dissociative experiences in a PTSD population, were considered hallucinations in individuals with this diagnosis. The area chosen for this thesis therefore arose from the researcher's hypotheses based on observations of commonalities between re-experiencing symptoms in PTSD and hallucinations. The researcher wondered whether a subset of hallucinations represent re-experiencing of trauma memories (as explored through the development of the Dimensions of Voices Questionnaire, DOV-Q). They were also interested in the extent to which trauma memories were associated with the specific content of hallucinations (investigated through the systematic review).

<div align="center">**Systematic Review**</div>

Deciding on the Research Question

Due to the topic of the empirical paper, the researcher initially considered a systematic review of studies that have attempted to categorise and find types of hallucinations. However, after scoping this literature, it became clear that it is currently too limited to warrant such a review. An existing systematic review has included a subsection on this literature (Upthegrove et al., 2016). Consequently, a review on the phenomenological diversity of AVH was considered, although scoping contrastingly revealed this was an exceedingly broad and heterogeneous literature to lend itself to a systematic review within the timeframe at disposal for this ClinPsyD research. In light of the researcher's original interest in the relationship between trauma and hallucinations and similarities to re-experiencing symptoms of PTSD, a review was consequently explored regarding the relationship between trauma and the content and characteristics of positive symptoms. Searches therefore included studies of hallucinations, delusions or thought disorder.

Searching and Screening Process

The search strategy was devised based on that of previous systematic reviews and meta-analyses regarding psychosis and trauma (e.g. Pilton, Varese, Berry, & Bucci, 2015). The researcher generated a content/characteristics string, and then incorporated words identified through an initial scope of the literature. The research team were consulted for any additions or revisions to the search strategy.

Searches retrieved a very large number of papers, most likely due to the relatively broad terms necessitated to investigate trauma and life events, together with the large literature on positive symptoms and psychosis. Consequently, the researcher decided to separate the title and abstract stage as it was possible to quickly determine from the title of many of the obtained papers that they were not relevant to the review.

At the full paper stage, it became apparent that studies of delusions were especially difficult to analyse in terms of content or characteristics. Delusions were commonly investigated in terms of particular predefined types (e.g. grandiose, delusions of reference, paranoid). Although such broad subcategories are somewhat informative about content, the research team decided that the studies provided insufficient detail about specific content for much meaning to be derived in terms of the relationship between trauma and symptom content. This highlights future scope for research into the specific content of delusions, without such content being absorbed into broader categories. For many of the studies that investigated delusions, it was difficult to reach a consensus or find a consistent way to determine whether or not they were eligible for inclusion. Additionally, no research was able to assess the relationship between the content of thought disorder and trauma. Sufficient papers had been obtained for the review to focus only on hallucinations, and so the research team decided that papers would be excluded at the full paper stage if they referred only to delusions or thought disorder, rather than hallucinations. Although the researcher considered doing the searches a second time without terms for delusions and thought disorder, it was decided that this was not necessary, since no relevant literature would have been missed through retaining a broad search. It is possible that, had the researcher spent more time initially scoping this literature and discussing the inclusion criteria at an earlier stage, searches could have originally been specific to hallucinations. Alternatively, these difficulties with integrating and interpreting the delusions literature could have been identified earlier, allowing the employment of a more targeted search strategy.

Also regarding the inclusion criteria, the research team were uncertain as to whether beliefs about voices (such as those measured using the Beliefs About Voices Questionnaire; (Chadwick, Lees, & Birchwood, 2000) could be construed as an aspect of content. For example, associations between trauma and beliefs that voices are malevolent could be taken to suggest that trauma may be associated with malevolent content.

However, it was eventually decided that beliefs would not be included as these reflect how a person interprets their voices, which may or may not be associated with the voice content.

Quality Assessment

A number of quality assessment tools were considered, although few tools were able to accommodate the combination of qualitative, quantitative and mixed methods studies in this review. The Quality Assessment Tool for Studies with Diverse Designs (QATSDD, Sirriyeh, Lawton, Gardner, & Armitage, 2012) was eventually chosen because the items were thought to be relatively broad assessments of aspects of research generally considered important to study quality. It therefore was deemed a useful assessment that could be flexibly applied to the different study designs included. In addition, it can be used to calculate a total score for each paper allowing the results to be succinctly summarised in a table.

However, the researcher did encounter a number of issues in using this tool, particularly with regards to apparent ambiguity of some of the items. This issue was resolved by discussing the interpretation of each item with the research team, developing a consensus on the interpretation of each item (see Appendix 9), and coding studies according to this interpretation. For item 5 of the quality assessment (Representative sample of target group of a reasonable size), the researcher felt the item was biased towards quantitative studies in terms of the importance of sample size and representativeness. However, in qualitative studies, the importance is placed more on the meaningfulness and richness of the data, rather than sample size and generalisability. This is consistent with the criticisms of the quality assessment measure highlighted by Fenton, Lauckner and Gilbert (2015). Consequently, this item was split into two, with a qualitative question which simply focused on selection bias.

The second rater was similarly advised to assess studies using the interpretations decided upon by the research team. In spite of this, a degree of subjectivity seemed to result from using this assessment tool, as highlighted in the critical appraisal of this measure (Fenton et al., 2015). The researcher, and also the second rater, generally found that marking whether a paper scored 0 or 3 for an item was relatively straightforward as the criteria were either not met at all or met completely. However, when this was not the case, it often seemed ambiguous as to whether a paper should achieve a 1 or 2. Therefore, as per the guidance of this critical appraisal, the tool was used to aid assessment of the general strengths and weaknesses of the included papers, whilst importance was not placed on specific scores. Moreover, given this subjectivity at an individual item level, the second rater was used to obtain a consensus agreement, rather than to calculate inter-rater reliability was not calculated.

Another limitation that the researcher encountered when using this tool, was that papers often lost points through the use of this tool for not including certain information which likely reflected reporting bias resulting from the constraints imposed by word limits for publication, rather than necessarily reflecting the absence of these procedures being undertaken. For example, not fully explaining why they chose their particular analytic methods, measurement tools, or sample size. This therefore seemed a limitation of the quality assessment tool. However, the tool was useful in determining the representativeness of the sample for quantitative studies, the reliability of the findings, and in discussing some of the limitations of many of the chosen measures of hallucination content and characteristics.

Data Extraction and Synthesis

The researcher found that producing a succinct table as part of the data extraction process was challenging, especially with qualitative studies and case series. Case series in particular often described individual cases but did not attempt to summarise or analyse the

findings, thereby leaving the researcher to summarise the findings for the purpose of the data extraction process. Doing so required the researcher to make some assumptions about the specific findings of the studies, e.g. classifying direct and thematic associations between hallucinations and trauma based on definitions of such associations, but without using a formal coding framework.

Empirical Paper

The original research topic proposed was investigating whether particular phenomenological aspects of auditory verbal hallucinations (AVH) are especially associated with trauma and dissociation. After an initial scope of the literature, it became apparent that although a number of studies had investigated phenomenology (e.g. Upthegrove et al., 2016; Woods, Jones, Alderson-Day, Callard, & Fernyhough, 2015), and a few studies had attempted to categorise experiences of AVH according to their specific phenomenological characteristics (Garwood et al., 2013; McCarthy-Jones et al., 2012; Stephane et al., 2003), no validated self-report measurement tool has been developed that assesses all the phenomenological characteristics that might distinguish between different types of AVH. Consequently, the researcher decided to develop a questionnaire that would assess these characteristics and that might be predicted to be associated with proposed different subtypes of voices.

Development of the DOV-Q

Due to the fact that there was already a literature on phenomenology of AVH, including qualitative and mixed method studies (e.g. Upthegrove et al., 2016; Woods et al., 2015), it was not considered necessary to initially do qualitative interviews prior to measure development. However, on reflection, the researcher appreciates that a richer understanding of the particular content of AVH that fall into the identified dimensions could have been useful for factor interpretation. Further research using in-depth interviews

about the content of the three dimensions of AVH identified could consequently be a useful future direction.

Items were initially generated by consulting questionnaires and interviews used in previous studies that investigated subtypes or phenomenology of AVH. These included the selected items of the Mental Health Research Institute Unusual Perceptions Schedule (MUPS, (Carter et al., 1995) used by (McCarthy-Jones et al., 2012), the semi-structured interview devised and used to assess hypervigilance AVH (Garwood et al., 2013), a series of questions used in a study on phenomenology of AVH in the hypnagogic and hypnopompic state (Jones, Fernyhough, & Larøi, 2010), and the findings of mixed methods and qualitative studies which looked at phenomenological characteristics of AVH (Upthegrove et al., 2016; Woods et al., 2015). These studies indicated the inclusion of items assessing the following: commanding, commenting and repetitive voices, voices replaying memories of previous conversations; voices that do not make sense (gibberish); first second or third person voices (McCarthy-Jones et al., 2012); focus of attention (internal/external) and context (quiet/noisy) whilst hearing voices; level of voice threat; location of voice (inside or outside of the head) (Garwood et al., 2013); and conversing qualities of voices (Jones et al., 2010).

After an initial item pool of 22 items was generated, the researcher coded each item according to which purported subtype they were predicted to tap. They were informed by previous descriptions of the proposed subtypes (McCarthy-Jones et al., 2012, 2014; Smailes et al., 2015). Expanding beyond this, whilst it was previously argued that the memory-based subtype only contains AVH which are exact replays of memories (McCarthy-Jones et al., 2012), the authors hypothesised that AVH that resemble memories or previous conversations may be conceptualised as part of the memory-based subtype. This was based on the wealth of cognitive psychology literature that has established the fallible, reconstructive nature of memory, with memories changing over time and not being an exact replica of events (e.g., Bartlett, 1932).

Efforts were made to adapt items so that they only applied to one particular subtype. For example, 'Do you ever speak back to your voices?' was not considered specific to any one subtype. However only inner speech type voices would be considered to be dialogical in nature, and so the item was amended to 'Do you ever engage in a dialogue with your voices in which they respond?' Two items which were not specific to a particular subtype were removed entirely. For example, 'Do the voice(s) address you (e.g. saying your name or 'you')' was thought to potentially apply to any of the three purported subtypes and so was removed from the measure. An alternative approach would have been to retain a larger range of items and then reduce these following factor analysis based on loadings, so that only items that correlated highly with each factor remained. This approach would have been more truly exploratory and less empirically driven, but was not adopted because more items would require a larger sample size in order to obtain sufficient power for factor analysis (based on the suggested 5-10 participants per item (Kass & Tinsley, 1979). It would therefore have meant that the recruitment target would not have been met within the timeframe of this project.

In the DOV-Q, the researcher decided to ask questions about each person's voice or voices generally. An alternative option that was considered was asking about the person's most dominant voice. Another possibility would have been for participants to complete the DOV-Q multiple times, each time focusing on a specific voice. Both of these options could potentially have led to a more 'clean' result from the factor analysis. After all, if participants have multiple types of voices, as previously indicated (McCarthy-Jones et al., 2012), completing the questionnaire about voice hearing experiences generally could have increased the correlations between different factors and made it more likely that items load highly on multiple factors. Consistent with this, in their study, Garwood et al. (2013) asked participants about a discrete AVH experience. For participants who hear many types of voices, completing the questionnaire multiple times for different voices would have been very time-consuming, or meant that they could only complete the questionnaire

regarding a subset of the voices, neglecting aspects of their voice hearing experience. It may have been difficult for participants to select a 'dominant voice'. Moreover, it could be that voices that are perceived as being dominant are those which are more threatening or intrusive, which could have led to participants mainly endorsing the threat-related hallucinations dimension.

Cognitive Interviewing

The researcher decided to use cognitive interviewing to allow the expertise and preferences of individuals with lived experience of hearing voices to be integral to the development of the DOV-Q. It was hoped that in doing so this measure would be useful, meaningful and acceptable both from a theoretical perspective and that of the individuals who would complete it in the future. Cognitive interviewing was conducted with five individuals who heard voices. Revisions to the questionnaire made through cognitive interviewing can be found in Appendix 5. The researcher devised and followed a cognitive interviewing schedule (Appendix 6) based on probing techniques described by (Willis, 1994). They also developed vignettes to describe the three purported different types of voices (Appendix 10). Volunteers were asked to read the vignettes and identify any aspects of these or of their voice hearing experience that the DOV-Q had not captured. The responses of each volunteer were integrated into the cognitive interviewing plan. For example, one volunteer said that that they would find it clearer to say 'When you hear your voice(s), are you focusing on what is going on around you?' as oppose to 'When you hear your voice(s), is your attention on your surroundings?'. Consequently, this was integrated into the interview, so that the other volunteers were asked which of these two options they preferred.

All volunteers agreed with the suggestions proposed by previous volunteers. Five interviews were considered sufficient as there were no disagreements. Willis (1994) suggests that 5-10 interviews are acceptable for measure development. However, recent

literature has indicated that additional problems continue to be identified with larger sample sizes for cognitive interviewing (Blair & Conrad, 2011). Therefore, it is possible that, had more interviews been conducted, there would have been more revisions to the questionnaire. Volunteers thought that it was possible to complete the measure with regards to their voice hearing experience in general, and were positive about the rationale for a measure of different types of voices.

The researcher found cognitive interviewing to be a valuable research process. It enabled the expertise of people who hear voices to be integral to the development of the questionnaire, hopefully increasing its acceptability. Whilst the researcher had been mindful when originally drafting the questionnaire of reading age and the acceptability of the language, it was very useful hearing first hand and in detail how particular words and items were experienced and interpreted. However, it is important to acknowledge that the voice hearing population is diverse, and the individuals interviewed were recruited from a local hearing voices group, thereby potentially representing those with less 'severe' and complex presentations. The additional recruitment of individuals through inpatient units and community mental health teams could have better insured the acceptability of the measure. All of the individuals interviewed had been involved in services in the past, or were under services currently, due to distressing voices. Consequently, it may also have been beneficial to have conducted cognitive interviews with individuals who are not distressed by their voices. For example, people from a spiritualist community may have been able to offer an alternative perspective on the acceptability of the questionnaire.

Selection of Additional Measures

The researchers decided to administer a selection of additional measures in order to look for associations between different constructs and specific subscales of the DOV-Q. Due to the researcher's particular interest in trauma and dissociation, it was initially planned that a trauma measure (e.g., Brief Betrayal Trauma Survey; Goldberg & Freyd,

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2006) and dissociation measure (Dissociative Experiences Scale; Carlson & Putnam, 1993) would be used as additional measures. However, following the research subcommittee, the researcher decided to select measures based on hypothesised associations with each specific predicted subtype.

For the memory-related subtype, a measure of trauma-memory re-experiencing symptoms was chosen (the re-experiencing subscale of the Post-Traumatic Diagnostic Scale; Foa et al., 2016), a measure of psychological responses to intrusive memories that are associated with re-experiencing symptoms (Responses to Intrusions Questionnaire; Clohessy & Ehlers, 1999; Halligan, Clark, & Ehlers, 2002; Murray, Ehlers, & Mayou, 2002; Steil & Ehlers, 2000), together with a brief measure of dissociation (Brief Dissociative Experiences Scale; Dalenberg & Carlson, 2010). The researcher decided not to include a trauma measure, as the experience of trauma was not considered to be specific to the memory-based subtype. For example, the hypervigilance subtype was thought to be a state of threat anticipation likely associated with prior trauma exposure. Additionally, the inner-speech subtype was thought to represent internalised communication from early caregivers, which could include communication associated with abuse. The researcher was limited by the constraints of possible participant burden, aware that more questionnaires would likely reduce participant retention. However, given that a relatively high proportion of participants continued to complete the additional measures, it may have been possible to have included a trauma measure. This could have been desirable in hindsight as it may have allowed the memory-related and threat-related hallucinations to be further distinguished from one another (given overlap in terms of memory items). It would have been interesting to see whether a trauma measure was, like re-experiencing symptoms, correlated with threat-related hallucinations but not memory-related hallucinations. Given that the linguistic-complexity dimension seemed to be associated with less severity and distress, it would have been interesting to see whether this dimension was associated with lower levels of trauma.

In the absence of a trauma measure, to enable participants to complete the PDS and RIQ, a definition of trauma was provided (see Appendix 4). However, this brings the issues and constraints of other definitions of trauma. Research has indicated that the relationship between trauma and hallucinations is not restricted to Criterion A events defined in the Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5; American Psychiatric Association, 2013) (i.e., events in which the person is exposed to death, threatened death, actual or threatened serious injury or sexual violence). Indeed, there is a literature critiquing the rigidity and restrictiveness of this trauma criteria, which argues that 'small t' traumas or adversities are also important and relevant to mental health problems (e.g., Shapiro, 2018). Therefore, it is possible that an event could be sufficiently traumatic to cause re-experiencing symptoms and memory-related hallucinations without a participant having experienced a Criterion A event. Consequently, the researcher decided that all participants should be allowed to fill out the PDS and RIQ, even if they responded 'no' to the trauma definition. These participants were therefore asked to complete these questionnaires with regards to a stressful life event. This does however mean that these questionnaires were used, with a small number of participants (n=12), in a way which differs from how they were used when validated.

Another issue with these measures was that they have not been validated in voice hearing populations, having predominantly been used in individuals with PTSD. They were regarded as appropriate as people with PTSD also experience hallucinations, and the hypothesised aetiology underlying re-experiencing symptoms in PTSD and certain types of hallucinations are thought to be similar (e.g., Hardy, 2017). The PDS has been used previously in studies that include individuals who experience hallucinations (e.g., Wade et al., 2015). However, if, as predicted by Hardy (2017), trauma-memory intrusions which are considered hallucinations are especially fragmented and decontextualised, the PDS may not be sufficiently sensitive to pick up on this form of re-experiencing symptoms. After all, the PDS assumes that the person has been able to relate their re-experiencing symptoms to

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the trauma memory. Consequently, it is possible that re-experiencing symptoms will be under-detected using this measure in a voice hearing population. Therefore, a future direction may be to develop a measure or more likely a semi-structured interview to assess re-experiencing symptoms which may be more fragmented and decontextualised and therefore less explicitly trauma related, as may be the case in individuals who hear voices. This could be similar to the measure developed by Hardy et al. (2005) to assess associations between trauma and hallucinations regarding content.

Although a number of measures of inner speech were considered, the Varieties of Inner Speech Questionnaire (VISQ; McCarthy-Jones & Fernyhough, 2011) was chosen as it has previously been used in clinical populations (De Sousa et al., 2016). Also, unlike other measures of inner speech, it captures dialogicality and condensation, as well as expanded inner speech, allowing hypotheses to be tested regarding associations between inner-speech type hallucinations and these specific aspects of inner speech (Jones & Fernyhough, 2007). Given that dissociation has been found to mediate the relationship between aspects of inner speech and hallucinations (Alderson-Day et al., 2014), it was predicted that scores on the DES-B may also correlate with an inner-speech subtype of voices, meaning that dissociation was not predicted to be specific to the memory-based subtype.

To tap the hypervigilance subtype, the persecution subscale of the Persecution and Deservedness Scale (Melo et al., 2009) was chosen. This was thought to be preferable to the other measures considered as it was a shorter length and the items seem more threat - related as opposed to measuring a paranoid type of social anxiety. As an additional measure of threat-anticipation, the threat -related subscale of the Availability Test (Bentall et al., 2009) was used. However, as with the PDS, selecting only one subscale of these measures is problematic as they were originally validated using the full measure.

Sample Selection and Recruitment

The research team debated whether or not to specifically select participants with a diagnosis of a psychotic disorder, or whether to recruit individuals who hear voices regardless of diagnosis. Given the literature referred to in Paper 1 and Paper 2 indicates that voice hearing may be a trans-diagnostic experience, occurring in various clinical and also nonclinical populations, the researcher wanted to recruit a mixed clinical and nonclinical sample. However, they had concerns that any findings regarding subtypes of voices could be criticised if a heterogeneous sample was used. For example, it would be possible to question whether the presence of a memory-based subtype was because the sample included individuals with PTSD. The researcher decided to recruit a heterogeneous sample, but record diagnoses as part of the demographics questionnaire, so that findings could be interpreted in relation to diagnostic status. It was hoped that this would have increased the diversity of the sample and therefore made it more representative of the voice hearing population. However, the predominantly online nature of this study likely means that certain groups were less represented, such as those with very low levels of literacy, older individuals who do not use the Internet, and people with especially complex and chaotic presentations. The researcher tried to minimise this methodological issue by also recruiting through the charitable sector, Hearing Voices Network groups, and offering paper copies of questionnaires. However, individuals who do not access Hearing Voices Network groups or charities could have been missed. The high level of education of the sample and relatively low mean age does indeed indicate that the sample does not fully represent the voice hearing population more generally.

Reflecting on the recruitment process, the researcher found that with proactive, regular and consistent sharing of the study online it was possible to meet recruitment targets of 5-10 participants per item (a minimum of N=100). Having only minimal previous use of social media personally or professionally, this was initially a challenge. Recruiting through Hearing Voices Network groups across England, the researcher found

that there is a huge amount of variability, with some groups seeming saturated and frustrated by the number of research requests, whilst more rural groups in particular seemed excited and grateful for some research opportunities. It therefore became apparent that both online and face-to-face recruitment and testing can lead to certain populations being more difficult to reach and the voices of people from certain demographics or locations being particularly heard. This further emphasised the advantage of using a combination of both these methods in research.

Data Analysis

Undertaking the Exploratory Factor Analysis, the researcher initially encountered challenges in terms of determining how many factors to extract. The curve produced by eigen values as a scree plot was relatively smooth, with no clear 'elbow', and the extraction of factors based on eigen values resulted in six factors, which was a large number for a 20 item scale. Parallel analysis is now considered preferable means of extracting factors (Velicer & Jackson, 1990) and so the researcher decided to adhere to this method, resulting in the identification of three factors. Another challenge was deciding whether to extract a correlation or covariance matrix. This was either not mentioned at all or not discussed in depth in the statistical books consulted (Field, 2009; Tabachnick & Fidell, 2013) although it was stated that where items are commensurable (i.e. on the same scale), the covariance matrix could be used (Field, 2009) and that there were statistical reasons to prefer the covariance matrix as it can produce better defined factor structures (Tinsley & Tinsley, 1987). Given that the items of the DOV-Q were commensurable, all on a five-point Likert scale, and in light of the very limited available information about extracting a covariance matrix, the researcher consulted a statistician (Dr Leslie-Anne Carter, Lecturer in Biomedical statistics), who advised the extraction of the covariance matrix and how to interpret the output.

The researcher was aware of preferable approaches to managing a number of aspects of the data analysis, but which were not possible in the scope of this thesis due to the requirement of additional statistical programs. Missing data was dealt with through mean substitution either across or within participants depending on the extent to which participants responses were predicted to be consistent between items. In sensitivity analyses, missing data was dealt with through listwise deletion so that the researcher could ascertain whether the method of managing missing data impacted upon the findings. However, preferable approaches to managing missing data for factor analysis have been identified (predictive mean matching and 2-stage estimation; McNeish, 2017). Additionally, test-retest reliability was calculated using Spearman's rho correlation coefficients, although measurement error indices, coefficient of repeatability, and the smallest real difference have been shown to be better approaches (Vaz et al., 2013). Future evaluations of this scale could explore the use of these alternative analytic techniques.

Another challenge encountered through the process of data analysis was managing items which cross- loaded above the 0.32 level onto multiple factors. The researcher consulted the literature and found there to be no agreed upon method to deal with this issue, with the most common responses being to remove all items which load on more than one factor; to increase the 0.32 to threshold so that any items which load above a higher level on each factor are retained; to retain items on all factors on which they load; or to retain items in factors on which they load the highest. Given that it had been previously found that this population may experience multiple types of voices (McCarthy-Jones et al., 2012), that scores on factors were correlated indicating that they were not entirely independent, that the measure was relatively short with only 20 items, and that this was likely to be the beginning of the measure development process (with the need for future replication), the research decided to retain all items with cross loadings above the 0.32 level. Following replication of the factor structure in an independent population (e.g. recruited through NHS services), and further refinement of the measure, it may be that

these cross loadings will eventually need to be managed differently for the measure to be easily usable and interpretable.

Due to the number of items which loaded onto multiple factors, the researchers decided that it was better to consider the questionnaire as a measure of voice hearing dimensions, rather than discrete subtypes. This is consistent with the general approach of research into phenomenology that seeks to describe rather than categorise. It also may be more acceptable to people who hear voices. Indeed, one participant commented in response to the study advertisement that they felt that the 'subtypes' approach was putting people into boxes. Instead, referring to voice hearing dimensions accommodates the possibility that people may hear different voices at different times and that their experiences are changeable rather than static. This alternative perspective was also advocated by the researcher's supervisor, drawing on her lived experience of hearing voices.

Interpretation of Findings

The factors that emerged were similar but not identical to the subtypes of voices predicted. The researcher was mindful of the risk of over-interpreting the findings by introducing interpretations based on previous studies and theory. Consequently, a very structured approach was taken to deriving the factors (all items above 0.32 were retained, and where items loaded onto multiple factors were kept in the factor on which they have the highest loading).

Defining and describing the identified factors required the researcher to assess the extent to which factors reflected the hypothesised subtypes. Where unexpected items loaded onto factors, it was necessary for the researcher to decide whether it was possible to explain the presence of these items in the context of the previously hypothesised subscales, or whether it would be more suitable to redefine the factor. For the memory-related factor, it seemed clear that this was almost identical to the previously hypothesised memory-related dimension. Conversely, for the linguistic complexity factor it was apparent that this

was sufficiently different from the hypothesised inner speech dimension to necessitate a new definition. This decision was more challenging for the threat-related dimension, which in certain respects resembles the hypervigilance-subtype, but differed from this in a number of ways, and included a relatively diverse selection of items. Consequently, the researcher consulted the research team, who agreed upon this being considered a threat-related dimension, with the label "intrusive" also being considered. Experts by experience were additionally consulted in an attempt to obtain an independent assessment of what this factor reflected. However, the individuals contacted found it challenging to define this factor because of the level of diversity of the items. It is therefore important to acknowledge that, in the absence of further research about the content of voices in this dimension, the label 'threat-related' hallucination, is slightly presumptuous. It may be that, following further research, this label will be revised.

Conclusions, Implications and Future Directions

Both of these papers highlight the diversity of the experience of hearing voices, the importance that should be placed on the specific content and variable qualities of hallucinations and how these may fit with the person's life history. This has implications for working therapeutically with people who hear voices, indicating that investing time in thinking about the specific content and characteristics of someone's voices in relation to their life experiences could help people make sense of experiences which might otherwise be confusing for them. They also both suggest the need and potential value of identifying and tailoring different treatment approaches depending on the particular voice phenomenology. Given the wealth of meaning that can clearly be derived from attending to voice content, and the substantial minority of studies that used a reliable and validated measure to assess content in the review, the development of new methodological avenues for exploring hallucination content seems an important future direction. Also, given the association between hallucinations and re-experiencing symptoms identified in both

papers, further research to investigate the hypothesis proposed by Hardy (2017) that

hallucinations may be especially decontextualised re-experiencing symptoms would be a

hugely valuable direction for this field. This may also require the development of a

measure of re-experiencing symptoms in the form of hallucinations.

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Manuscripts should ordinarily not exceed 50 pages, *including* references and tabular material. Exceptions may be made with prior approval of the Editor in Chief. Manuscript length can often be managed through the judicious use of appendices. In general the References section should be limited to citations actually discussed in the text. References to articles solely included in meta-analyses should be included in an appendix, which will appear in the on line version of the paper but not in the print copy. Similarly, extensive Tables describing study characteristics, containing material published elsewhere, or presenting formulas and other technical material should also be included in an appendix. Authors can direct readers to the appendices in appropriate places in the text.

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If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

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Title. Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible. **Note: The title page should be the first page of the manuscript document indicating the author's names and affiliations and the corresponding author's complete contact information.**

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Appendix 2. Results of Quality Assessment

	1	2	3	4	5A	5B	6	7	8	9	10	11	12	13	14	15	16	Total
Anketell et al. (2010)	3	3	3	0	1	N/A	2	2	2	1	3	N/A	2	0	N/A	0	2	24
Baethge (2002)	3	0	0	0	N/A	0	0	0	0	N/A	N/A	0	N/A	0	0	0	0	3
Berg et al. (2017)	3	3	3	0	3	N/A	3	2	3	1	3	N/A	3	3	N/A	0	3	33
Bleich & Moskowits (2000)	2	2	3	0	N/A	1	1	0	0	N/A	N/A	2	N/A	0	0	0	0	11
Bowers (2010)	3	2	2	1	N/A	1	2	3	2	1	2	2	N/A	0	0	0	3	24
Chan & Silove (2000)	2	3	2	0	N/A	1	0	0	0	N/A	N/A	1	N/A	0	0	0	0	9
Corstens & Longden (2013)	3	3	3	0	2	N/A	3	2	1	0	3	N/A	3	0	N/A	0	3	26
Daalman et al. (2012)	3	3	3	0	2	N/A	2	2	2	1	2	N/A	3	3	N/A	0	2	28
David et al. (1999)	2	3	3	0	2	N/A	2	0	2	0	3	N/A	2	0	N/A	0	1	20
Dorahy et al. (2009)	3	3	3	0	2	N/A	2	2	1	1	3	N/A	3	1	N/A	0	2	26
Falukozi & Addington (2012)	3	3	3	0	2	N/A	3	2	1	2	3	N/A	2	1	N/A	0	3	28
Gauntlett-Gilbert & Kuipers (2003)	2	2	1	0	2	N/A	1	0	1	0	1	N/A	2	0	N/A	0	1	13

Hammersley et al. (2003)	1	3	3	0	2	N/A	3	1	2	0	2	N/A	2	0	N/A	0	2	21
Hamner (1997)	1	1	2	0	2	N/A	2	0	1	0	2	N/A	2	0	N/A	0	1	14
Hardy et al. (2005)	3	3	2	3	2	N/A	2	2	1	3	3	N/A	3	1	N/A	0	3	31
Heins et al. (1990)	1	2	1	0	N/A	1	0	0	0	N/A	N/A	0	N/A	0	0	0	0	5
Ivezic (1999)	1	1	3	0	N/A	1	0	0	0	N/A	N/A	1	0	0	0	0	0	7
Ivezic et al. (2000)	2	3	3	0	2	N/A	3	2	2	0	3	N/A	2	0	N/A	0	2	24
Jessop et al. (2008)	3	3	3	0	1	N/A	1	3	3	0	2	N/A	1	0	N/A	0	1	21
Longden et al. (2016)	3	3	1	0	3	N/A	2	1	2	1	2	N/A	3	2	N/A	0	3	26
Misiak et al. (2016)	3	3	2	0	2	N/A	2	1	1	1	3	N/A	3	1	N/A	0	2	24
Norredam et al. (2011)	3	3	3	0	N/A	2	0	0	1	N/A	N/A	1	1	0	0	0	1	15
Nygaard et al. (2017)	3	3	3	0	2	N/A	3	0	3	0	2	N/A	3	0	N/A	0	3	25
O'Connor (2017)	3	3	3	0	3	N/A	3	1	3	0	2	N/A	3	1	N/A	0	2	27
Peach (2016)	3	3	3	1	1	N/A	3	2	3	1	3	N/A	3	2	N/A	0	3	31
Raune et al. (2006)	3	2	2	0	2	N/A	2	3	2	2	3	N/A	3	3	N/A	0	3	30
Read et al. (2003)	3	3	3	0	2	N/A	3	0	3	0	2	N/A	3	2	N/A	0	3	27
Read & Argyle (1999)	3	3	3	0	3	N/A	1	0	3	0	1	N/A	2	1	N/A	0	2	22

Study	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
Reiff (2012)	3	3	2	0	N/A	2	3	3	3	2	N/A	3	N/A	2	0	0	3	29
Rhodes et al. (2016)	3	3	3	0	N/A	2	2	2	2	N/A	N/A	3	N/A	3	3	0	2	28
Rosen et al. (2017)	3	3	3	0	2	3	3	0	2	2	3	3	3	2	2	0	2	36
Rosen et al. (2018)	3	2	3	0	2	N/A	2	1	1	2	2	N/A	3	2	N/A	0	3	26
Sahin et al. (2013)	3	2	2	0	1	N/A	2	1	3	1	3	N/A	3	0	N/A	0	3	24
Scott et al. (2007)	2	2	3	0	1	N/A	2	1	3	0	2	N/A	2	0	N/A	0	2	20
Thompson et al. (2010)	3	3	3	0	3	N/A	3	2	2	1	2	N/A	3	2	N/A	0	3	30
Upthegrove et al. (2015)	3	3	3	0	1	N/A	2	1	1	2	3	N/A	3	1	N/A	0	2	25
Velthorst et al. (2013)	3	3	3	0	3	N/A	3	3	3	1	2	N/A	3	1	N/A	0	3	31

Items are as follows: 1) Explicit Theoretical Framework, 2) Statement of aims/objectives in main body of report, 3) Clear description of research setting, 4) Evidence of sample size considered in terms of analysis, 5) Representative sample, 6) Description of procedure for data collection, 7) Rationale for choice of data collection tool(s), 8) Detailed recruitment data, 9) Statistical assessment of reliability and validity of measurement tools (Quantitative only), 10) Fit between stated research question and method of data collection (Quantitative only), 11) Fit between stated research question and format and content of data collection tool (Qualitative only), 12) Fit between research question and method of analysis (Quantitative only), 13) Good justification for analytic method selected, 14) Assessment of reliability and analytic process (Qualitative only), 15) Evidence of user involvement in study design, 16) Strengths and limitations critically discussed.

Appendix 3: Authors guidelines for Clinical Psychology and Psychotherapy

Research articles: Substantial articles making a significant theoretical or empirical contribution.

Reviews: Articles providing comprehensive reviews or meta-analyses with an emphasis on clinically relevant studies.

Assessments: Articles reporting useful information and data about new or existing measures.

Practitioner Reports: Shorter articles (a maximum of 1200 words) that typically contain interesting clinical material. These should use (validated) quantitative measures and add substantially to the literature (i.e. be innovative).

PREPARING THE SUBMISSION

Parts of the Manuscript
The manuscript should be submitted in separate files: title page; main text file; figures.

File types

Preferred formats for the text and tables of your manuscript are .doc, .docx, .rtf, .ppt, .xls. LaTeX files may be submitted provided that an .eps or .pdf file is provided in addition to the source files. Figures may be provided in .tiff or .eps format.

New Manuscript
Non-LaTeX users: Upload your manuscript files. At this stage, further source files do not need to be uploaded.
LaTeX users: For reviewing purposes you should upload a single .pdf that you have generated from your source files. You must use the File Designation "Main Document" from the dropdown box.

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3. The full names of the authors;
4. The author's institutional affiliations where the work was conducted, with a footnote for the author's present address if different from where the work was conducted;
5. Conflict of Interest statement;
6. Acknowledgments;
7. Abstract, Key Practitioner Message and keywords;
8. Main text;
9. References;
10. Tables (each table complete with title and footnotes);
11. Figure legends;

Figures and appendices and other supporting information should be supplied as separate files.

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Please refer to the journal's Authorship policy in the Editorial Policies and Ethical Considerations section below for details on author listing eligibility.

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Contributions from anyone who does not meet the criteria for authorship should be listed, with permission from the contributor, in an Acknowledgments section. Financial and material support should also be mentioned, including the name(s) of any sponsor(s) of the research contained in the paper, along with grant number(s). Thanks to anonymous reviewers are not appropriate.

Conflict of Interest Statement
Authors will be asked to provide a conflict of interest statement during the submission process. For details on what to include in this section, see the Conflict of Interest section in the Editorial Policies and Ethical Considerations section below. Submitting authors should ensure they liaise with all co-authors to confirm agreement with the final statement.

Abstract
Enter an abstract of no more than 250 words containing the major keywords. An abstract is a concise summary of the whole paper, not just the conclusions, and is understandable without reference to the rest of the paper. It should contain no citation to other published work.

Key Practitioner Message
All articles should include a Key Practitioner Message of 3-5 bullet points summarizing the relevance of the article to practice.

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2. Footnotes to the text are not allowed and any such material should be incorporated into the text as parenthetical matter.

References
References should be prepared according to the *Publication Manual of the American Psychological Association* (6th edition). This means in-text citations should follow the author-date method whereby the author's last name and the year of publication for the source should appear in the text, for example, (Jones, 1998). The complete reference list should appear alphabetically by name at the end of the paper. Please note that for journal articles, issue numbers are not included unless each issue in the volume begins with page 1, and a DOI should be provided for all references where available.

For more information about APA referencing style, please refer to the APA FAQ.

Reference examples follow:

Journal article
Beers, S. R. , & De Bellis, M. D. (2002). Neuropsychological function in children with maltreatment-related posttraumatic stress disorder. *The American Journal of Psychiatry, 159,* 483–486. doi: 10.1176/appi.ajp.159.3.483

Book
Bradley-Johnson, S. (1994). *Psychoeducational assessment of students who are visually impaired or blind: Infancy through high school* (2nd ed.). Austin, TX: Pro-ed.

Internet Document
Norton, R. (2006, November 4). How to train a cat to operate a light switch [Video file]. Retrieved from *http://www.youtube.com/watch?v=Vja83KLQXZs*

Endnotes
Endnotes should be placed as a list at the end of the paper only, not at the foot of each page. They should be numbered in the list and referred to in the text with consecutive, superscript Arabic numerals. Keep endnotes brief; they should contain only short comments tangential to the main argument of the paper.

Tables
Tables should be self-contained and complement, not duplicate, information contained in the

text. They should be supplied as editable files, not pasted as images. Legends should be concise but comprehensive – the table, legend, and footnotes must be understandable without reference to the text. All abbreviations must be defined in footnotes. Footnote symbols: †, ‡, §, ¶, should be used (in that order) and *, **, *** should be reserved for P-values. Statistical measures such as SD or SEM should be identified in the headings.

Figure Legends

Legends should be concise but comprehensive – the figure and its legend must be understandable without reference to the text. Include definitions of any symbols used and define/explain all abbreviations and units of measurement.

Figures

Although authors are encouraged to send the highest-quality figures possible, for peer-review purposes, a wide variety of formats, sizes, and resolutions are accepted. Click here for the basic figure requirements for figures submitted with manuscripts for initial peer review, as well as the more detailed post-acceptance figure requirements.

Figures submitted in color may be reproduced in color online free of charge. Please note, however, that it is preferable that line figures (e.g. graphs and charts) are supplied in black and white so that they are legible if printed by a reader in black and white. The cost of printing color illustrations in the journal will be charged to the author. The cost is £150 for the first figure and £50 for each figure thereafter. If color illustrations are supplied electronically in either TIFF or EPS format, they may be used in the PDF of the article at no cost to the author, even if this illustration was printed in black and white in the journal. The PDF will appear on the Wiley Online Library site.

Additional Files

Appendices

Appendices will be published after the references. For submission they should be supplied as separate files but referred to in the text.

General Style Points

The following points provide general advice on formatting and style.

1. **Abbreviations:** In general, terms should not be abbreviated unless they are used repeatedly and the abbreviation is helpful to the reader. Initially, use the word in full, followed by the abbreviation in parentheses. Thereafter use the abbreviation only.
2. **Units of measurement:** Measurements should be given in SI or SI-derived units. Visit the Bureau International des Poids et Mesures (BIPM) website for more information about SI units.
3. **Numbers:** numbers under 10 are spelled out, except for: measurements with a unit (8mmol/l); age (6 weeks old), or lists with other numbers (11 dogs, 9 cats, 4 gerbils).
4. **Trade Names:** Chemical substances should be referred to by the generic name only. Trade names should not be used. Drugs should be referred to by their generic names. If proprietary drugs have been used in the study, refer to these by their generic name, mentioning the proprietary name and the name and location of the manufacturer in parentheses.

Appendix 4. Questionnaires used in the empirical study
Demographics questionnaire

Gender	Male Female Other
Age	
Nationality	
Ethnicity:	White 1. White – British 2. White – Irish 3. Any other white background Mixed: 4. Mixed - White and Black Caribbean 5. Mixed - White and Black African 6. Mixed - White and Asian 7. Any other mixed background Asian or Asian British: 8. Asian or Asian British – Indian 9. Asian or Asian British – Pakistani 10. Asian or Asian British – Bangladeshi 11. Any other Asian/Asian British background Black or Black British: 12. Black or Black British – Caribbean 13. Black or Black British – African 14. Any other Black/Black British background Chinese or other ethnic group: 15. Chinese 16. Any other (please describe) (APMS, 2007)
Sexual orientation	Which of the options best describes how you think of yourself?: 1.Heterosexual or Straight, 2. Gay or Lesbian, 3. Bisexual, 4. Other 5. Prefer not to say (Office for National Statistics, 2009)
First Language: Do you consider yourself to be fluent in reading and speaking English?	English Other: Yes No
	1. Never married and never registered a same-sex civil

What is your legal marital or same-sex civil partnership status?	partnership 2. Married 3. Separated, but still legally married 4. Divorced 5. Widowed 6. In a registered same-sex civil partnership 7. Separated, but still legally in a same-sex civil partnership 8. Formerly in a same-sex civil partnership which is now legally dissolved 9. Surviving partner from a same-sex civil partnership (Office for National Statistics, 2011)
How far did you get in school? (select highest only)	1. Degree level qualification 2. Teaching qualification or HNC/HND, BEC/TEC Higher, BTEC Higher or NVQ level 4 3. 'A'Levels/SCE Higher or ONC/OND/BEC/TEC not higher or City & Guilds Advanced Final Level NVQ level 3 4. 'O'Level passes (Grade A-C if after 1975) or City & Guilds Craft/Ord level or GCSE (Grades A-C) or NVQ level 2 5. CSE Grades 2-5 GCE 'O'level (Grades D & E if after 1975) GCSE (Grades D, E, F, G) or NVQ level 1 6. CSE ungraded 7. Other qualifications (specify) 8. No qualifications (APMS, 2007)
Which of these activities best describes what you are doing at present? (please select one only)	1. Employee 2. Self Employed 3. Unemployed 4. Full-time education at school, college or university 5. Looking after family/home 6. Receipt of sickness or disability benefits 7. Retired 8. Other Inactive (Office for National Statistics, 2015)
Have you ever received a psychiatric diagnosis?	1. Yes 2. No
Have you ever received any of the following diagnosis [select as many as apply]?	• No • Schizophrenia (or "Paranoid Schizophrenia") • Schizoaffective Disorder • Schizophreniform • Depression with psychotic features (depression with unusual experiences like hallucinations and delusions) • Delusional Disorder • Bipolar Disorder with psychotic experiences

	• Brief Psychotic Disorder • Any other disorder which included psychotic experiences • Other Please state………
Have you ever received antipsychotic medication for any of the following? [Select as many as apply]	• No • Hallucinations (hearing voices, visions) • Delusions (unusual and sometimes bizarre beliefs) • Paranoia (excessive or irrational suspiciousness and distrustfulness of others) • Unusual beliefs
Have you ever received mental health support or treatment for any of the following [select as many as apply]?	• No • Hallucinations (hearing voices, visions) • Delusions (unusual and sometimes bizarre beliefs) • Paranoia (excessive or irrational suspiciousness and distrustfulness of others) • Unusual beliefs
Have you ever been a patient in hospital for mental health difficulties? IF YES: How many times? Are you currently in hospital for mental health difficulties?	1 Yes 2 No 1.Yes 2.No
Have you received input from a community mental health team or early intervention service? Are you currently receiving input from a community mental health team or early intervention service?	1 Yes 2 No 1.Yes 2.No
Do you hear voices other people cannot hear?	1.Yes 2.No
How long have you been hearing voices for?	
Have you ever received the following types of psychological therapy?	1. Cognitive Behavioural Therapy (CBT) 2. Psychodynamic Therapy 3. Family Therapy 4. Other please state ……………………

Hamilton Programme for Schizophrenia Voices Questionnaire

Please tick the **ONE** box that best describes your experience of voices **DURING THE PAST WEEK**, including today.

1. How *frequently* did you hear a voice or voices?

No voices	Less than once a day	Once or twice a day	Several times a day	All of the time/Constantly

2. How *bad* are the things the voices say to you?

No voices saying bad things	Not that bad	Fairly bad	Very bad	Horrible

3. How *loud* are the voices?

Voices not present	Very quiet (like whispering)	Average (same as my own voice)	Fairly loud	Very loud (yelling or shouting)

4. How *long* do the voices usually last?

Voices not present	A few seconds to 1 minute	A few minutes	More than 10 minutes but less than an hour	Longer than 1 hour/they just seem to persist

5. How much do the voices *interfere* with your daily activities?

No interference	A little bit	Moderately	Quite a bit	Extremely interfering

6. How *distressing* are the voices that you hear?

No voices are distressing me	A little bit	Moderately	Quite a bit	Extremely distressing

7. How *bad* (worthless/useless) do the voices make you *feel about yourself*?

No voices make me feel bad	A little bit	Fairly bad	Very bad	Extremely bad (as bad as I can feel)

8. How *clearly* do you hear the voices?

Voices not present	Very mumbled	Fairly mumbled	Fairly clear	Very clear voices

9. How often do you **DO** what the voices say?

No voices telling me what to do	Rarely	Sometimes	Often	Always

10. In what *part of the day* do you hear the voices most often?[a]

Right when I wake up	Morning	Afternoon	Evening	Just before bed	The voices are equally as likely at

					all times of the day

11. What kind of *social situations* are you in most often when your voices start?

When I am alone	When I am with a few people (like in 'group')	When I am around a lot of people (like in a mall or on a busy street)	No situation in particular/they occur equally in all social situations

12. **Where** do the voices come from?

From Inside my head	From Outside my head	From both Inside and Outside

13. Would you say the last week is like a *typical* week of your hearing voices?

Yes	No (Please explain below)

Dimensions of Voices Questionnaire

Please answer the following questions about what your voice(s) are typically like. We understand that your experience of hearing voices may have changed over time, so please complete this questionnaire for how your voices have been over the past few months. We know that 'voices' is not everyone's preferred word and that there are other ways to refer to these experiences. We have used this term for the purpose of this questionnaire. We hope that this term does not cause any offence.

1. When you hear your voice(s), are you focused on your own thoughts?

Not at all   Rarely   Sometimes   Often   Constantly

2. Do your voice(s) talk about what you're thinking or doing at that moment (like a running commentary)

Not at all   Rarely   Sometimes   Often   Constantly

3. Do you ever feel like your voice(s) are speaking your own thoughts?

Not at all   Rarely   Sometimes   Often   Constantly

4. Do you ever have a conversation with your voice(s) in which they respond to you?

Not at all   Rarely   Sometimes   Often   Constantly

5. Do the voice(s) say long sentences?

Not at all   Rarely   Sometimes   Often   Constantly

6. Do you tend to hear voice(s) more when your thoughts are wandering or when you are not concentrating on any particular thing?

Not at all   Rarely   Sometimes   Often   Constantly

7. Are most of the voice(s) you hear very clear?

Not at all   Rarely   Sometimes   Often   Constantly

8. Do your voices try to tell you what to do?

Not at all   Rarely   Sometimes   Often   Constantly

9. When you hear your voice(s), are you focusing on what is going on around you (e.g. what other people are saying)?

Not at all   Rarely   Sometimes   Often   Constantly

10 . Do you tend to hear voices when you are in places with lots of people (e.g. in town)?

Not at all   Rarely   Sometimes   Often   Constantly

11. Do the voice(s) say just one or two words?

Not at all   Rarely   Sometimes   Often   Constantly

12. Are the voice(s) hard to hear (e.g. quiet or muffled, or sound as if they are coming from far away)?

Not at all   Rarely   Sometimes   Often   Constantly

13. Do the words spoken by the voice(s) make no sense (e.g. gibberish)?

Not at all   Rarely   Sometimes   Often   Constantly

14. Do you tend to hear voices when you are afraid of something bad happening?

Not at all   Rarely   Sometimes   Often   Constantly

15. Do you hear the voice(s) of someone you know or knew in the past?

Not at all   Rarely   Sometimes   Often   Constantly

16. Do you hear voice(s) that remind you of your younger self?

Not at all   Rarely   Sometimes   Often   Constantly

17. Do you find that the voice(s) often repeat the same thing over and over again?
Not at all   Rarely   Sometimes   Often   Constantly

18.Do the things your voice(s) say remind you of conversations or events from the past?
Not at all   Rarely   Sometimes   Often   Constantly

19. Do your voice(s) replay memories of past conversations in your mind (like a tape recorder)?
Not at all   Rarely   Sometimes   Often   Constantly

20. Do your voice(s) replay memories of events which you usually try to forget about and push out of your mind?
Not at all   Rarely   Sometimes   Often   Constantly

Availability Test (Threatening subscale)

You will be presented with a list of different events. You have to decide how likely it is that each event will happen to you at some time over the next week.

Here is an example:

You become the world's strongest person.

How likely is it that this will happen to you at some time over the next week? Please tell me your answer using the scale below.

Not At All						Very Likely
1	2	3	4	5	6	7

It is probably not very likely that this will happen over the next week. Most people click "1."

You touch your nose.

How likely is it that this will happen to you at some time over the next week? Please tell me your answer using the scale below.

Not At All						Very Likely
1	2	3	4	5	6	7

It is probably very likely that this will happen over the next week. Most people click "7." Next you will see some other activities for you to rate how likely it is they will happen in the next week.

Your mail is read without your permission.

Not At All						Very Likely
1	2	3	4	5	6	7

Someone stares at you menacingly.

Not At All						Very Likely
1	2	3	4	5	6	7

You are followed by someone.

Not At All						Very Likely
1	2	3	4	5	6	7

You are hit by somebody.

Not At All						Very Likely
1	2	3	4	5	6	7

Someone says that you are boring company.

Not At All						Very Likely
1	2	3	4	5	6	7

Someone tells you a lie.

Not At All						Very Likely
1	2	3	4	5	6	7

Someone tells you to shut up.

Not At All						Very Likely
1	2	3	4	5	6	7

Persecution and Deservedness Scale (Persecution subscale)
Please read each of the following statements carefully and indicate the extent to which they are true or false by circling a number on the scale.

	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
1. There are times when I worry that others might be plotting against me.	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
	0	1	2	3	4
2. I often find it hard to think of anything other than the negative ideas others have about me.	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
	0	1	2	3	4
3. My friends often tell me to relax and stop worrying about being deceived or harmed.	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
	0	1	2	3	4
4. Every time I meet someone for the first time, I'm afraid they've already heard bad things about me.	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
	0	1	2	3	4
5. I'm often suspicious of other people's intentions towards me.	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
	0	1	2	3	4
6. Sometimes, I just know that people are talking critically about me.	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
	0	1	2	3	4
7. There are people who think of me as a bad person.	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
	0	1	2	3	4
8. People will almost certainly lie to me.	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
	0	1	2	3	4
9. I believe that some people want to hurt me deliberately.	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
	0	1	2	3	4
10. You should only trust yourself.	Certainly false	Possibly false	Unsure	Possibly true	Certainly true
	0	1	2	3	4

Post-traumatic Diagnostic Scale DSM 5 (Re-experiencing subscale with trauma question)

Some people have experienced traumatic events. For example, occasions during which they felt that their, or somebody else's, life or safety were in danger. Examples of traumatic events are physical attack, sexual assault, or being neglected. Do you think that you have experienced such an event during your life, *not including the last month*?

Yes/No

If Yes:

Below is a list of problems that people sometimes have after experiencing a very traumatic event. Please read each statement carefully and choose the number that best describes how often that problem has been happening and how much it has upset you over THE LAST MONTH. Rate each statement with respect to the traumatic event that bothers you most (NOT including any events which have occurred in the past month).

If No:

Please complete the following statements with regards to a very stressful event that you have experienced (not including the last month)

Below is a list of problems that people sometimes have after experiencing a very stressful event. Please read each statement carefully and choose the number that best describes how often that problem has been happening and how much it has upset you over THE LAST MONTH. Rate each statement with respect to the traumatic event that bothers you most (NOT including any events which have occurred in the past month).

1. Having upsetting thoughts or images about the trauma

0	1	2	3	4
Not at all	Once a week or less/a little	2 to 3 times a week/somewhat	4 to 5 times a weak/very much	6 or more times a weak/severe

2. Having a bad dream or nightmares about the trauma

0	1	2	3	4
Not at all	Once a week or less/a little	2 to 3 times a week/somewhat	4 to 5 times a weak/very much	6 or more times a weak/severe

3. Reliving the trauma, acting or feeling as if it were happening again

0	1	2	3	4
Not at all	Once a week or less/a little	2 to 3 times a week/somewhat	4 to 5 times a weak/very much	6 or more times a weak/severe

4. Feeling emotionally upset when you were reminded of the trauma (for example, feeling scared, angry, sad, guilty, etc.)

0	1	2	3	4
Not at all	Once a week or less/a little	2 to 3 times a week/somewhat	4 to 5 times a weak/very much	6 or more times a weak/severe

5. Experiencing physical reactions when you were reminded of the trauma (for example, break into a sweat, heart beating fast)

0	1	2	3	4
Not at all	Once a week or less/a little	2 to 3 times a week/somewhat	4 to 5 times a weak/very much	6 or more times a weak/severe

Responses to Intrusions Questionnaire

What do you do when memories of the event pop into your mind? Please select the answer that applied best to you DURING THE PAST WEEK.

1.	I try to push them out of my mind.	Never	Sometimes	Often	Always
2.	I try to erase the memory of the event.	Never	Sometimes	Often	Always
3.	I try hard to control my emotions.	Never	Sometimes	Often	Always
4.	I distract myself with something else.	Never	Sometimes	Often	Always
5.	I think of something else.	Never	Sometimes	Often	Always
6.	I work hard at keeping busy with other things.	Never	Sometimes	Often	Always
7.	I think about how life would have been different if the event had not occurred.	Never	Sometimes	Often	Always
8.	I dwell on how the event could have been prevented.	Never	Sometimes	Often	Always
9.	I think about why the event happened to me.	Never	Sometimes	Often	Always
10.	I dwell on how I used to be before the event.	Never	Sometimes	Often	Always
11.	I dwell on what other people have done to me.	Never	Sometimes	Often	Always
12.	I dwell on what I should have done differently.	Never	Sometimes	Often	Always
13.	I go over what happened again and again.	Never	Sometimes	Often	Always
14.	I worry that something similar will happen to me or my family.	Never	Sometimes	Often	Always
15.	I detach myself from the memories.	Never	Sometimes	Often	Always
16.	I drift off into a world of my own.	Never	Sometimes	Often	Always
17.	I numb my feelings.	Never	Sometimes	Often	Always

150

Brief Dissociative Experiences Scale
Instructions: For each statement below, please tick the box that best answers each question to show how much each thing has happened to you in the past seven (7) days.

		Not at all	Once or twice	Almost every day	About once a day	More than once a day
1.	I find myself staring into space and thinking of nothing	0	1	2	3	4
2.	People, objects, or the world around me seem strange or unreal	0	1	2	3	4
3.	I find that I did things that I do not remember doing	0	1	2	3	4
4.	When I am alone, I talk out loud to myself	0	1	2	3	4
5.	I feel as though I were looking at the world through a fog so that people and things seem far away or unclear	0	1	2	3	4
6.	I am able to ignore pain	0	1	2	3	4
7.	I act so differently from one situation to another that it is almost as if I were two different people	0	1	2	3	4
8.	I can do things very easily that would usually be hard for me	0	1	2	3	4

Varieties of Inner Speech Questionnaire

This questionnaire aims to explore your experiences of thinking in words and talking to yourself silently in your mind. Such experiences are what researchers are refer to as "Inner Speech" or "Verbal Thought". We are going to refer to this as either "thinking to yourself in words" or "Inner Speech".

Use the scale to indicate whether the following statements apply to you or not.

1. I think to myself in words using brief phrases and single words rather than full sentences

Certainly applies to me					Certainly does not apply to me
6	5	4	3	2	1

2. When I am talking to myself about things in mind, it is like I am going back and forward asking myself questions and then answering them

Certainly applies to me					Certainly does not apply to me
6	5	4	3	2	1

3. I hear the voice of another person in my head. For example, when I have done something foolish I hear my mother's voice criticizing me in my head

Certainly applies to me					Certainly does not apply to me
6	5	4	3	2	1

4. I experience the voices of other people asking me questions in my head

Certainly applies to me					Certainly does not apply to me
6	5	4	3	2	1

5. I hear other people's voices nagging me in my head

Certainly applies to me					Certainly does not apply to me
6	5	4	3	2	1

6. My thinking in words is more like a dialog with myself, rather than my own thoughts in a monolog

Certainly applies to me					Certainly does not apply to me
6	5	4	3	2	1

7. I think to myself in words using full sentences

Certainly applies to me					Certainly does not apply to me
6	5	4	3	2	1

8. My thinking to myself in words is like shorthand notes, rather than full, proper, grammatical English

Certainly applies to me					Certainly does not apply to me
6	5	4	3	2	1

9. I think in inner speech about what I have done, and whether it was right or not

Certainly applies to me					Certainly does not apply to me
6	5	4	3	2	1

10. When I am talking to myself about things in my mind, it is like I am having a conversation with myself

Certainly applies to me					Certainly does not apply to me
6	5	4	3	2	1

11. I talk silently to myself telling myself to do things

Certainly applies to me				Certainly does not apply to me	
6	5	4	3	2	1

12. I hear other people's actual voices in my head, saying things that they have never said to me before

Certainly applies to me				Certainly does not apply to me	
6	5	4	3	2	1

13.I talk back and forward to myself in my mind about things

Certainly applies to me				Certainly does not apply to me	
6	5	4	3	2	1

14. My thinking in words is shortened compared to my normal out-loud speech. For example, rather than saying to myself things like 'I need to go to the shops', I will just say 'shops' to myself in my head

Certainly applies to me				Certainly does not apply to me	
6	5	4	3	2	1

15. If I were to write down my thoughts on paper, they would read like a normal grammatical sentence

Certainly applies to me				Certainly does not apply to me	
6	5	4	3	2	1

16.I hear other people's actual voices in my head, saying things that they actually once said to me

Certainly applies to me				Certainly does not apply to me	
6	5	4	3	2	1

17. I talk silently to myself telling myself not to do things

Certainly applies to me				Certainly does not apply to me	
6	5	4	3	2	1

18. I evaluate my behaviour using my inner speech. For example I say to myself, "that was good" or "that was stupid"

Certainly applies to me				Certainly does not apply to me	
6	5	4	3	2	1

Appendix 5. Development and revisions of items of the Dimensions of Voices Questionnaire through cognitive interviewing

Item	Sub-type (IS, MB, HV)	Items revised and refined by a research team	Items following revision through cognitive interviewing
1	IS	When you hear your voice(s), is your attention on your own thoughts and what is going on inside your head?	*When you hear your voice(s), are you focused on your own thoughts?*
2	IS	Have the voice(s) taken the form of a running commentary (e.g., a description of what you are thinking or doing)?	*Do your voice(s) talk about what you're thinking or doing at that moment (like a running commentary)*
3	IS	Do you ever feel like your voice(s) are speaking your own thoughts?	Do you ever feel like your voice(s) are speaking your own thoughts?
4	IS	Do you ever engage in a conversation with your voice(s) in which they respond?	*Do you ever have a conversation with your voice(s) in which they respond to you?*
5	IS	Do the voice(s) say long sentences?	Do the voice(s) say long sentences?
6	IS	Do you tend to hear voice(s) more when your mind is drifting?	*Do you tend to hear voice(s) more when your thoughts are wandering or when you are not concentrating on any particular thing?*
7	IS	Are the voice(s) you hear very clear?	*Are most of the voice(s) you hear very clear?*
8	IS		*Do your voice(s) try to tell you what to do?*
9	HV	When you hear your voice(s), is your attention on your surroundings?	*When you hear your voice(s), are you focusing on what is going on around you (e.g. what other people are saying)?*
10	HV	Do you tend to hear voices when you are in places with lots of people?	*Do you tend to hear voices when you are in places with lots of people (e.g. in town)?*
11	HV	Do the voice(s) say just one or two words?	Do the voice(s) say just one or two words?
12	HV	Are the voice(s) hard to hear (e.g., are they quiet or muffled, or sound as if they are coming from far away)?	*Are the voice(s) hard to hear (e.g., quiet or muffled, or sound as if they are coming from far away)?*
12	HV	Do you tend to hear your voices when you are somewhere noisy?	
13	HV	Do the words spoken by the voice(s) make no sense (e.g., gibberish)?	Do the words spoken by the voice(s) make no sense (e.g., gibberish)?
14	HV	Do you tend to hear voices	*Do you tend to hear voices*

		when you are actively listening out for danger?	*when you are afraid of something bad happening?*
15	MB	Do you recognise the voice(s) as someone you have met before?	*Do you hear the voice(s) of someone you know or knew in the past?*
16	MB	Do you hear voice(s) that remind you of your younger self?	Do you hear voice(s) that remind you of your younger self?
17	MB	Do you find that the voice(s) often say the same thing over and over again?	*Do you find that the voice(s) often repeat the same thing over and over again?*
18	MB	Are the things your voice(s) say similar to conversations that you remember having, or overhearing, in the past (like replays of memories)?	*Do the things your voice(s) say remind you of conversations or events from the past?*
19	MB	Are the things your voice(s) say identical to conversations that you remember having, or overhearing, in the past?	*Do your voice(s) replay memories of past conversations in your mind (like a tape recorder)?*
20	MB	Do your voice(s) replay memories of events which you usually try to forget about and push out of your mind?	Do your voice(s) replay memories of events which you usually try to forget about and push out of your mind?

Items in italics have been edited through the cognitive interviewing process.
Items not which were added after cognitive interviewing or removed following this process are only shown in one of the columns.

Appendix 6. Cognitive interviewing schedule

- Thank you for agreeing to help us with the development of our new questionnaire. We are particularly interested in how you arrive at your answers and any problems you encounter with answering questions, rather than your particular answers. Do not worry about hurting my feelings if you criticise the questions, my job is to find out what is wrong with them so that we can improve them.
- Please could you complete the following questionnaire. As you go through the questionnaire could you let me know if any items are particularly difficult to complete, confusing, or if you have suggestions about how they could be improved.
- Thank you for completing the questionnaire.

A few general questions:
- How easy was it to put your answers on the 10-point scale?
   Would you prefer if it said 0 (not at all), 5 (sometimes), 10 (very much)
   Would you prefer options instead of a scale e.g. ticking boxes not at all/a little bit/some of the time/quite a bit/very much
   Would you prefer a scale from 0-7?
   Too many choices or not enough?

- Do you think the scale captures your experience of hearing voices? If not, what you think is missing?
- Are there any elements of the questionnaire that you change?

I would now like to go through the questionnaire again with you and ask you a few specific questions.
- Introduction section - what do you think the wording? Were there any bits that were unclear or that you would change?

Inner speech

1. When you hear your voice(s), is your attention on your own thoughts and what is going on inside your head?

   0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much
 - What do you think this is asking?
 - How hard with this to answer?

 *- Would it be better to say: '*When you hear voice (s), are you wrapped up in thinking?'

2. Have the voice(s) taken the form of a running commentary (e.g., a description of what you are thinking or doing)?

   0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much
- Can you repeat the question in your own words?
- How hard was this to answer?
- Do you find the word 'commentary' confusing? Would there be a clearer and simpler way of asking this? E.g. 'have your voices ever described what you are doing'

3. Do you ever feel like your voice(s) are speaking your own thoughts?

   0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much
-How sure are you of this answer?
- How hard with this to answer?

4. Do you ever engage in a conversation with your voice(s) in which they respond?
        0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
Not at all   Very much
- How did you decide on that particular number?

5. Do the voice(s) say long sentences?
        0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
Not at all   Very much
- How did you decide on that particular number?
- How hard was this to answer?

6. Do you tend to hear voice(s) more when your mind is drifting?
        0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
Not at all   Very much
- What do you think this question is asking?

- Any other word that we could use instead of drifting? E.g. wondering/daydreaming.

7. Are the voice(s) you hear very clear?
        0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
Not at all   Very much
-What to you does the word 'clear' mean here?
- How did you decide on that particular number?
- What do you think of adding the item: 'Do your voices (try to) tell you what to do?'

Hypervigilance
8. When you hear your voice(s), is your attention on your surroundings?
        0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
Not at all   Very much
- Can you repeat this question in your own words?

- How did you get to this answer?

- Would it be better to say 'when you hear your voices, are you noticing/focusing on what is going on around you?'

- Would be more clear if we added an example (e.g. on what other people around you are saying)?

9. Do you tend to hear voices when you are in places with lots of people?
        0   – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much
- What sort of places where you thinking of when it says 'lots of people'?

- Add example? (E.g. when you are in the pub or in town).

10. Do the voice(s) say just one or two words?

     0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much

- How did you decide on that number?

11. Are the voice(s) hard to hear (e.g., are they quiet or muffled, or sound as if they are coming from far away)?

     0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much

- How hard was this to answer?

12. Do you tend to hear your voices when you are somewhere noisy?

     0   – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much

- What sort of places are you thinking about?

- Does this add anything beyond or different to question nine?

- Would it be helpful to add 'e.g. in the pub or in a supermarket'

13. Do the words spoken by the voice(s) make no sense (e.g., gibberish)?

     0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much

- How hard was this to answer?

- How did you get to this answer?

14. Do you tend to hear voices when you are actively listening out for danger?

     0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

N$ot at all   Very much

- How sure are you of your answer?

- What sort of situation where you thinking of here?

- Alternative question: 'Do you tend to hear voices when you are fearful of something bad happening?

- OR 'Do you hear your voices when you are listening out for people and what they might be saying'

Memory-based

15. Do you recognise the voice(s) as someone you have met before?

     0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much

- How sure are you of your answer?

- Would it be helpful to have an example (e.g. family, someone who has died)?

- Would it be better to ask 'Do you hear voices of someone you know?'

16 Do you hear voice(s) that remind you of your younger self?

     0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much

- *How hard was this to answer?*

17. Do you find that the voice(s) often say the same thing over and over again?

      0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much

- Can you repeat the question in your own words?

18. Are the things your voice(s) say similar to conversations that you remember having, or overhearing, in the past (like replays of memories)?

      0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much

- How did you decide on that number?
- Better to ask: 'Do your voices replay memories of conversations in your mind?'?

19. Are the things your voice(s) say identical to conversations that you remember having, or overhearing, in the past?

      0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much

- How sure are you of this answer?
- What you think about having both 18 and 19? All

20. Do your voice(s) replay memories of events which you usually try to forget about and push out of your mind?

      0 – 1 – 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Not at all   Very much

- If 'yes', is there anything else that you do in response to these voices?
- How difficult was this to answer?

Appendix 7. Results of exploratory factor analysis of the DOV-Q including all individual item loadings

DOV-Q Items	1	2	3
1 When you hear your voice(s), are you focused on your own thoughts?	.274	-.041	.031
2 Do your voice(s) talk about what you are thinking or doing at that moment (like a running commentary)	.168	**.605**	-.025
3 Do you ever feel like your voices are speaking your own thoughts?	**.601**	.211	.091
4 Do you ever have a conversation with your voice(s) in which they respond to you?	-.023	.362	**.539**
5 Do the voices say long sentences	-.008	.331	**.620**
6 Do you tend to hear voice(s) more when your thoughts are wandering or when you are not concentrating on any particular thing	.300	.012	.018
7 Are most of the voice(s) you hear very clear?	.066	.142	**.791**
8 Do your voices try to tell you what to do?	.042	**.672**	.276
9 When you hear your voices are you focusing on what is going on around you (eg what other people are saying)?	-.051	**.316**	.041
10 Do you tend to hear voices when you are in places with lots of places, eg in town?	.020	**.629**	-.065
11 Do the voice(s) say just one or two words?	-.109	.016	**-.518**
12 Are the voice(s) hard to hear (eg quiet or muffled, or sound as if they are coming from far away)?	-.021	.123	**-.627**
13 Do the words spoken by the voice(s) make no sense (eg gibberish)?	.065	.095	**-.599**
14 Do you tend to hear voices when you are afraid of something bad happening?	.219	**.492**	.081
15 Do you hear the voice(s) of someone you know or knew in the past?	**.785**	-.115	-.025
16 Do you hear voice(s) that remind you of your younger self?	**.605**	.147	-.128
17 Do you find that the voice(s) often repeat the same thing over and over again?	.351	**.684**	-.050
18 Do the things your voice(s) say remind you of conversations or events from the past?	**.795**	.215	.146
19 Do your voices replay memories of past conversations in your mind? (like a tape recorder)	**.651**	.433	-.034
20 Do your voice(s) replay memories of events which you usually try to forget and push out of your mind?	**.630**	.496	.005

Appendix 8. Correlations between time point 1 and time point 2 on individual items and sub-scale scores of the DOV-Q

Items and Sub-scales of the DOV-Q	Correlations and Significance
Memory-related auditory hallucinations sub-scale	$r_s = .791$ $p < .001$
Linguistic complexity auditory hallucinations sub-scale	$r_s = .922$ $p < .001$
Threat-related auditory hallucinations sub-scale	$r_s = .757$ $p < .001$
Do your voice(s) talk about what you're thinking or doing at that moment (like a running commentary)	$r_s = .565$ $p < .001$
Do you ever feel like your voice(s) are speaking your own thoughts?	$r_s = .455$ $p < .001$
Do you ever have a conversation with your voice(s) in which they respond to you?	$r_s = .779$ $p < .001$
Do the voice(s) say long sentences?	$r_s = .768$ $p < .001$
Are most of the voice(s) you hear very clear?	$r_s = .680$ $p < .001$
Do your voice(s) try to tell you what to do?	$r_s = .795$ $p < .001$
When you hear your voice(s), are you focusing on what is going on around you (e.g. what other people are saying)?	$r_s = .599$ $p < .001$
Do you tend to hear voices when you are in places with lots of people (e.g. in town)?	$r_s = .460$ $p < .001$
Do the voice(s) say just one or two words?	$r_s = .619$ $p < .001$
Are the voice(s) hard to hear (e.g., quiet or muffled, or sound as if they are coming from far away)?	$r_s = .556$ $p < .001$
Do the words spoken by the voice(s) make no sense (e.g., gibberish)?	$r_s = .538$ $p < .001$
Do you tend to hear voices when you are afraid of something bad happening?	$r_s = .440$ $p < .001$
Do you hear the voice(s) of someone you know or knew in the	$r_s = .860$

past?	*p* < .001
Do you hear voice(s) that remind you of your younger self?	*r*$_s$ = .681
	p < .001
Do you find that the voice(s) often repeat the same thing over and over again?	*r*$_s$ = .685
	p < .001
Do the things your voice(s) say remind you of conversations or events from the past?	*r*$_s$ = .735
	p < .001
Do your voice(s) replay memories of past conversations in your mind (like a tape recorder)?	*r*$_s$ = .662
	p < .001
Do your voice(s) replay memories of events which you usually try to forget about and push out of your mind?	*r*$_s$ = .725
	p < .001

Appendix 9. Items of the Quality Assessment Tool for Diverse Designs (QATSSD) and the interpretations of these items by the research team.

	QATSDD Original Items	Researcher's interpretations of items
1	Explicit Theoretical Framework	In the introduction, does it refer to previous research and gaps in research knowledge, therefore providing a theoretical rationale for the research?
2	Statement of aims/objectives in main body of report	Are the aims of the research stated in the main body of the report (not just the abstract)?
3	Clear description of research setting	Is there a clear description of the target population and setting (eg. Psychosis/refugees/inpatient)?
4	Evidence of sample size considered in terms of analysis	Do the authors explain their choice of sample size (e.g. depending on the type of analysis that they are doing, a power calculation)?
5a	Sampling sufficiently representative to avoid selection bias (Quantitative only)	Is the sample representative of the group targetted by the authors (as defined in Q3)? Is the sample sufficiently representative to allow the generalisability of the findings and minimise selection bias? (e.g. looking at ethnicity, gender, diagnoses, education, how the sample was recruited such as only inpatients)
5b	Qualitative only	Did the study use appropriate sampling (i.e. without evidence of selection bias)?
6	Description of procedure for data collection	Did the authors describe, in detail, the different stages of the data collection? (when, where and how data were gathered)
7	Rationale for choice of data collection tool(s)	Did the authors explain and justify their choice of data collection tools (e.g. in terms of relevance, reliability and validity)?
8	Detailed recruitment data	Do the authors report recruitment information such as number approached, number recruited, method of recruitment, numbers excluded, attrition data if relevant)?
9	Statistical assessment of reliability and validity of measurement tool(s) (Quantitative only)	Do the authors statistically measure the reliability and validity of the tools that they have used (e.g. Cronbach's Alpha and internal consistency)?
10	Fit between stated research question and method of data collection (Quantitative only)	Does the choice of data collection tool optimally enable the assessment of the research question?
11	Fit between stated research question and format and content of data collection tool e.g. interview schedule (Qualitative only)	Does the data collection tool allow for detailed relevant data to be gathered to enable the stated research question to be addressed?
12	Fit between research question and	Is the method of analysis the most fitting

	method of analysis (Quantitative only)	approach for the research question? Could the authors have considered alternative or additional analyses?
13	Good justification for analytic method selected	Did the authors provide an explanation for why they chose their particular analytic method (e.g. based on the research question or data)?
14	Assessment of reliability of analytic process (Qualitative only)	Did the authors assess the reliability of their analysis (e.g. with different raters)?
15	Evidence of user involvement in design	Do the authors describe how service users were involved in the planning of the study?
16	Strengths and limitations critically discussed	Do the authors discuss all of the strengths and weaknesses of the study (including; design, measures, procedure, sample and analysis)?

Appendix 10. Vignettes for different subtypes of voices

Inner speech subtype

When I hear voices, I am normally on my own or in a fairly quiet place. I hear my voices more when I am not focusing on anything in particular. My voices sometimes say what I am thinking, speaking my worries, plans or what I am noticing. Sometimes they say things which I dare not think or say. My voices sometimes say full sentences, they might speak a running commentary of what I'm doing, or have full conversations with me or each other. I usually hear the same few voices and I may think of them as people, each with their own identity. More often than not I hear the voices coming from inside, rather than outside, of my head.

Totally disagree 0----1----2----3----4----5----6----7----8----9----10 Totally agree

Memory-based subtype

My voices are people that I know or have met before, such as my family members, my younger self, or people that have hurt me in the past. The things they say are similar or identical to things which I have heard in the past. Sometimes when I hear my voices it is like hearing memories being played back to me. The voices replay memories which I normally try to push out of my mind and forget. My voices tend to say the same things over and over again. They do not tend to say very much, normally a few words rather than a whole conversation.

Totally disagree 0----1----2----3----4----5----6----7----8----9----10 Totally agree

Hypervigilance subtype

I normally hear my voices when I am somewhere noisy with lots of people. I am often listening out for danger when I hear my voices, and they often say what I'm scared that people might say. I may be feeling fearful or anxious when I hear the voices. I hear the voices coming from outside of my head, and sometimes I think they are coming from people around me. The voices don't tend to say very much, often just a few words. I hear the voices of many different people.

Totally disagree 0----1----2----3----4----5----6----7----8----9----10 Totally agree

Appendix 11. Participant information sheet

MANCHESTER 1824

Measuring and understanding different types of voice hearing

Participant Information Sheet

You are being invited to take part in a research study as part of a Clinical Psychology research project. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Feel free to email the researchers if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Who will conduct the research?

Investigators:

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What is the purpose of the research?
The current study aims to test out a new questionnaire which has been designed to measure different types of voice hearing. Research has indicated that people who hear voices experience this in different ways. Different types of voices might have different causes, and it could be that different approaches (e.g. in psychological therapy) could be more useful for certain types of voices than others. Developing a questionnaire that measures different types of voice hearing could allow more research to be conducted into this, and might be helpful if someone who hears voices is distressed and seeking help.

What will I be asked to do if I take part?
If you agree to take part in the study, you will be asked to complete a series of questionnaires. The first questionnaire will ask some general information about you (your age, gender, ethnicity etc). The next two questionnaires will ask you about the types of voices that you hear, for example 'When you hear your voice(s) are you somewhere with lots of people?'.
There will then be four questionnaires asking about a range of experiences, including questions about how you deal with stressful memories (e.g. 'I detach myself from the memories'), feeling unreal, your thoughts (e.g. 'I think to myself in words using full

sentences') and how you see the world (e.g. 'I'm often suspicious of other peoples' intentions towards me').

We will ask you if you wish to provide an email address so that we can enter you a prize draw, invite you to take part in a short second part of the study, let you know the findings of this study, and send you details regarding further research. We will only use this email address for these purposes, and you are able to make a decision as to whether to opt in to each of these if you choose.

The second part of the study, if you choose to additionally participate in this, will involve re-doing one of the questionnaires, so that we can see if people's responses change over time. This should only take about five minutes.

What happens if I find this study distressing?
Although the questionnaires that you will complete do not usually create distress, if you do feel upset as a result of the questions asked in this study please see below for the contact details of sources of advice and support. Please also contact Petrina Cox (Trainee Clinical Psychologist) to let her know that you are feeling distressed so that any necessary adaptations can be made to the study for future participants. Please note that the latter is not to be used for contact in emergencies as the researcher may not always have frequent and regular access to emails.

Will I be paid for participating in the research?
If you complete this study, you will be given the opportunity to be included in a prize draw for a £50 Amazon voucher.

What happens to the data collected?
The information collected from the study will be entered into a database and analysed once the study is completed. The study will be written up in a report (doctoral) and will be submitted to a scientific journal for publication. However, the personal details of any person who has participated in the research will not be given. All information included in the database and the report will be anonymised, this means that other people will not be able to link the data (and your answers) to you. The anonymised data will be stored on University of Manchester computers for 10 years. The researchers may want to re-analyse this data as part of a future study. On occasions we might want to share the anonymised data collected as part of this study with other researchers at the University of Manchester or other Universities. In all cases, only the anonymised answers from your questionnaires will be shared, not your personal details. You will be able to opt out from this on the following Consent Form.

How is confidentiality maintained?
All information which is collected from the questionnaires will be kept strictly confidential and will conform to the Data Protection Act of 1998 with respect to data collection, storage and destruction. Any personal details provided will be stored separately from your responses to the questionnaires.

What happens if I do not want to take part or if I change my mind?

It is up to you to decide whether or not to take part. If you decide to take part and then change your mind you can withdraw without giving reasons. Because we will not be asking for your name, and the data is anonymized, we regret that you will not be able to ask for your data to be destroyed once you begin to take part. However, you will be able to click "quit" at any time. If you click "quit" or close your browser, you will not be able to continue with the study. After you have taken part, if you have provided us with your contact details, it may be possible for you to contact us and request that we destroy your data if your data has not yet been downloaded. Once it is downloaded, it will not be stored with your contact details to keep it anonymous, and so we would not be able to identify your data in order to destroy it on your request.

What is the duration of the research?
Taking part should take around 30 minutes.

What if something goes wrong?
If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions.

What if I want to make a complaint?
If you have a complaint, please contact the project supervisor, Prof. Tony Morrison (anthony.p.morrison@manchester.ac.uk)

If there are any issues regarding this research that you would prefer not to discuss with members of the research team, or you wish to make a formal complaint, or if you are not satisfied with the response you have gained from the project supervisor in the first instance, then please contact the Research Governance and Integrity Team by either writing to 'The Research Governance and Integrity Manager, Research Office, Christie Building, The University of Manchester, Oxford Road, Manchester, M13 9PL', by emailing: research.complaints@manchester.ac.uk, or by telephoning 01613757583 or 2758093

Who has reviewed the research project?
The project has been reviewed and approved by the University of Manchester Research Ethics. The Ethics Committee number is 2017-0661-3706.

Where can I obtain further information if I need it?
Please feel free to contact:

Main Researcher:
Petrina Cox (petrina.cox@postgrad.manchester.ac.uk)

Project Supervisor:
Dr Filippo Varese (filippo.varese@manchester.ac.uk)
Prof. Tony Morrison (anthony.p.morrison@manchester.ac.uk)
Dr. Eleanor Longden (eleanor.longden@gmw.nhs.uk)

If I feel distressed, who should I contact?

In case of distress, or if you feel you need support because of your experiences, see the useful contacts below:

- Your General Practitioner (GP)

- In an emergency, go to your nearest Accident and Emergency department.

- Samaritans on **08457 90 90 90** or www.samaritans.org.

- Hearing Voices Network (www.hearing-voices.org)

- Intervoice (www.intervoiceonline.org)

This Project Has Been Approved by the University of Manchester's Research Ethics Committee [Ethics Committee number is 2017-0661-3706.]

Appendix 12. Consent form

MANCHESTER
1824

The University of Manchester

Measuring and understanding different types of voice hearing

Consent form

1. Have you read the Participant Information Sheet?	**YES/NO**
2. Have you received enough information about the study?	**YES/NO**
3. Do you understand that you do not need to take part in the study and if you do enter you are free to withdraw:- * at any time * without having to give a reason for withdrawing * and without detriment to you	**YES/NO**
4. Do you agree for your anonymous data to be stored and analysed?	**YES/NO**
5. Are you happy for your anonymous data to possibly be used in future studies?	**YES/NO**
6. Do you agree for your anonymous data to be shared with researchers who collaborate with our research team? [click No if you prefer to opt out]	**YES/NO**
7. Are you 16 years old or older?	**YES/NO**

Appendix 13. Debrief sheet

Measuring and understanding different types of voice hearing

Thank you for your participation. The aim of this study is to investigate the development of a new questionnaire for measuring different types of voice hearing.

Evidence has shown that many people have the experience of hearing voices which other people cannot hear. Hearing voices is often talked about as one type of experience. However, people who hear voices often have very different experiences of this. For example, some people find that they are not bothered by their voices whilst other people find their voices extremely distressing. Some people find that their voices are a replay of memories from their past, whilst others think their voices are those of people around them. Some people find that their voices say just one word or a brief phrase, whereas other people hear voices which speak entire conversations with the voice hearer and each other. So far, research has suggested that there may be three types of voices: those that are related to memories, voices which are related to worries about threat in one's environment, and voices which are a type of thought being spoken out in one's head. These different types of voices differ in various ways, for example in terms of where and when they are heard and what they say.

For this study, we have developed a questionnaire measuring different types of voices, based on feedback from people who hear voices. This could be useful for future research, so that voice hearing is not always considered as being the same experience for everyone. It could also help inform the development of psychological therapies that can be tailored to individuals' particular experience of hearing voices.

If you feel distressed as a result of reading this or taking part in the study, please see the following useful contacts:

- Your General Practitioner (GP)

- In an emergency, go to your nearest Accident and Emergency department.

- Samaritans on **08457 90 90 90** or www.samaritans.org.

Please also contact Petrina Cox (Trainee Clinical Psychologist) to let her know so that any necessary adaptations can be made to the study for future participants. Please note that the latter is not to be used for contact in emergencies as the researcher may not always have frequent and regular access to emails.

Appendix 14. Approval letter from University Research Ethics Committee

Research Governance, Ethics and Integrity

2nd Floor Christie Building

The University of Manchester

Oxford Road

Manchester

M13 9PL

Tel: 0161 275 2206/2674

Email: research.ethics@manchester.ac.uk

Ref: 2017-0661-3329

21/06/2017

Dear Miss Petrina Cox, Dr Eleanor Longden, Dr Filippo Varese

Study Title: Measuring and understanding different types of voice hearing

University Research Ethics Committee 1

I write to thank you for submitting the final version of your documents for your project to the Committee on 19/06/2017 16:33 . I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form and supporting documentation as submitted and approved by the Committee.

Please see below for a table of the title, version numbers and dates of all the final approved documents for your project:

Document Type	File Name	Date	Version
Additional docs	Debrief Sheet	21/12/2016	1
Additional docs	Contact details	21/12/2016	1
Questionnaire	PADS-10 questionnaire	21/12/2016	1
Questionnaire	Responses to Intrusions Questionnaire	21/12/2016	1
Questionnaire	Schizophrenia Voices Questionnaire (HPSVQ)	21/12/2016	1
Questionnaire	Demographics Questionnaire	21/12/2016	1
Questionnaire	Vignettes for subtypes	21/12/2016	1
Lone Worker Policy/Procedure	Lone working policy	27/01/2017	1
Distress Protocol/Debrief Sheet	Distress protocol	03/03/2017	1
Questionnaire	Varieties of Inner Speech questionnaire	18/03/2017	1
Questionnaire	PDS (re-experiencing subscale)	22/03/2017	1
Questionnaire	The Availability Test (amended)	02/06/2017	2
Advertisement	Invitation Email and Online Advert (amended)	02/06/2017	2
Advertisement	Poster (amended)	02/06/2017	2
Advertisement	Contact details (amended)	02/06/2017	2
Participant Information Sheet	Participant Information Sheet (amended)	06/06/2017	3
Consent Form	Consent form (amended)	06/06/2017	2
Questionnaire	SOV-Q amended (track changes)	18/06/2017	2

This approval is effective for a period of five years however please note that it is only valid for the specifications of the research project as outlined in the approved documentation set. If the project continues beyond the 5 year period or if you wish to propose any changes to the methodology or any other specifics within the project, an application to seek an amendment must be submitted for review. Failure to do so could invalidate the insurance and constitute research misconduct.

You are reminded that, in accordance with University policy, any data carrying personal identifiers must be encrypted when not held on a secure university computer or kept securely as a hard copy in a location which is accessible only to those involved with the research.

Reporting Requirements:

You are required to report to us the following:

1. Amendments
2. Breaches and adverse events
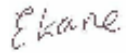3. Notification of progress/end of the study

Feedback

It is our aim to provide a timely and efficient service that ensures transparent, professional and proportionate ethical review of research with consistent outcomes, which

is supported by clear, accessible guidance and training for applicants and committees. In order to assist us with our aim, we would be grateful if you would give your view of the service that you have received from us by completing a **UREC Feedback Form**. Instructions for completing this can be found in your approval email.

We wish you every success with the research.

Yours sincerely,

Ms Emma Kane

Secretary to University Research Ethics Committee 1