Chapter 2
Hallucinatory Experiences in Non-clinical Populations

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Abstract It is now widely recognised that some people hear voices in the absence of distress or a need for psychiatric care. Although there have been reports of such individuals throughout history, until relatively recently there was little empirical research on this population. The consensus from interview and questionnaire-based research is that non-clinical voice-hearers hear voices that are more positive in content, less frequent, less disruptive, and less distressing. Influenced by cognitive models of psychosis, the literature has focused on the appraisals that voice-hearers make of their voices, to the exclusion of other variables such as content. There is growing evidence that clinical voice-hearers have more negative beliefs about their voices and that these are influenced by their more negative beliefs about people in general, formed in the context of negative life experiences. Initial fMRI data suggests that non-clinical voices are underpinned by similar neural mechanisms as clinical voices but as yet it is unclear from these studies why they are experienced so differently. The current chapter reviews these findings and suggest avenues for future research.

Abbreviations

AVH	Auditory verbal hallucinations
fMRI	Functional magnetic resonance imaging
IFG	Inferior frontal gyrus
IPA	Interpretative phenomenological analysis
MTG	Middle temporal gyrus

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SMA Supplementary motor area
STS Superior temporal sulcus

2.1 Introduction

Auditory verbal hallucinations (AVH) have traditionally been considered pathognomic of schizophrenia by the medical profession (Sartorius et al. 1974). There is even widespread popular belief, fuelled by parts of the media, that they are precursors to violent offending (Leudar and Thomas 2000). However, AVH can result from a range of brain pathologies, for example dementia (Wilson et al. 2000) or epilepsy (Winawer et al. 2000). It is moreover increasingly recognised that many individuals in the general population hear voices in the absence of distress or psychiatric disorder. Hallucinations may consist in simple sensory experiences (for example, simple tones), combinations of simple phenomena (Brasic 1998), or attain the complexity of fully formed language (AVH). They differ from mere imagery in the intensity and the subjective reality of the sensory experience. Depending on the accompanying psychopathology, the capacity to distinguish between hallucinations and physically present stimuli varies and can be completely missing as in many cases of psychosis (Bentall et al. 1991). People diagnosed with schizophrenia, in particular, suffer from defects in source monitoring (Brebion et al. 2000) and are prone to misattributing internal events to an external source (Baker and Morrison 1998). Yet today only AVH in the form of running commentary or interlocuting voices, proposed as first-rank symptoms by Kurt Schneider, are regarded as truly pathognomonic of schizophrenia by the main diagnostic systems (Linden 2012), although their specificity has not been formally quantified. All other forms of verbal and non-verbal auditory hallucinations can thus be produced by a wide range of other pathologies, or none at all. This chapter focuses on the latter scenario, AVH in the absence of other perceptual and cognitive changes and with no identifiable psychiatric or neuropathological correlate. We will refer to people with these experiences as non-clinical voice-hearers.

This is not a new phenomenon or area of interest; throughout history there have been accounts of respected voice-hearers who were not universally dismissed as insane (e.g. Socrates, Galileo, Joan of Arc; Leudar and Thomas 2000). Voice-hearing appears to be a human experience that is viewed more favourably and as something unrelated to mental illness in non-Western cultures (e.g. Prince 1992; Sodi 1995; Bhugra 1996) or when it occurs temporarily in circumstances involving extreme stress and isolation (e.g. Brugger et al. 1999; Simpson 2004).

The first large scale survey of hallucinations in the general population was carried out over a 100 years ago (Sidgwick et al. 1894) and again several times since, producing estimates of the prevalence of voices between 4 and 15% (e.g. Romme and Escher 1989; Tien 1991; Johns et al. 2002a, b). However, empirical research on non-clinical voices has been limited. It has been demonstrated that hallucination-like experiences can be induced in ambiguous sensory situations under laboratory

conditions (Mintz and Alpert 1972; Young et al. 1987; Feelgood and Rantzen 1994), possibly more so in people who score high on measures of schizotypy (van de Ven and Merckelbach 2003). Other researchers have attempted to examine non-clinical hallucinations by conducting analogue studies using individuals from the general population (most often university students) that score highly on self-report measures of predisposition to hallucinations such as the Launay–Slade Hallucination Scale (Launay and Slade 1981). However, whilst hallucination-like experiences may look phenomenologically similar to actual hallucinations, they are unlikely to tell us much about the reality of living with voices in the absence of distress or need for care and are no substitute for interviews with people who regularly hear voices.

Unfortunately, it is very difficult to identify and recruit non-clinical voice-hearers to research projects. People in the general population who hear voices do not openly share the experience, unless they belong to a cultural group where hearing voices is a valued experience, such as Spiritualism, for example. Understandably, due to prevailing medical and cultural attitudes, non-clinical voice-hearers are cautious about discussing their voices with other people for fear of being labelled mentally ill and encountering stigma or even unsolicited treatment. Perhaps as a consequence, there have only been nine published studies which have recruited non-clinical voice-hearers and directly compared their voices to those of clinical voice-hearers (see Table 2.1: Romme and Escher 1989; Leudar et al. 1997; Honig et al. 1998; Davies et al. 2001; Johns et al. 2002a, b; Jones et al. 2003; Andrew et al. 2008; Sorrell et al. 2010; Daalman et al. 2011). Moreover, the majority of these studies have employed small sample sizes; seven of the nine studies recruited between four and twenty-one non-clinical voice-hearers.

The current chapter reviews the literature comparing clinical and non-clinical voice-hearers, from initial studies which focused on comparing the levels of distress in these two groups to later work which has begun to examine the mechanisms that explain the differing distress levels reported by these two groups. In addition, exciting advances in neuroimaging now mean that it is possible to examine voices beyond psychological self-report measures and investigate their biological basis. Other chapters provide an overview of the current literature on neuroimaging of clinical hallucinations (see Part IV, this volume) and here we describe our recent functional magnetic resonance imaging (fMRI) study of non-clinical voice-hearers.

2.2 What Are Non-clinical AVH and How Many People Experience Them?

The most recent systematic review of studies of the rates of sub-clinical psychotic experiences in the general population reported an average prevalence rate of 5% and an average incidence rate of 3% (van Os et al. 2009). Thus of all the people who hear voices, only a minority are diagnosed with a psychiatric disorder. Such epidemiological studies provide an estimate of the frequency of AVH in the general population but they neither give any indication of the quality of these experiences nor do

Table 2.1 Summary of the main studies on non-clinical hallucinations

Study	Participants	Method	Main findings
Romme and Escher (1989)	173 voice-hearers self-classified as copers or non-copers	Postal survey sent to 450 people who responded to TV programme about voices	34% reported being able to cope with their voices, 66% said that they could not. Copers reported less disruption from voices, were less likely to follow commands, more likely to use active coping strategies and felt stronger than their voices. Copers were more likely to accept voices as part of them than non-copers who rejected their voices as not part of themselves
Leudar et al. (1997)	28 participants; 14 people diagnosed with schizophrenia and 14 people with no mental health problems	Structured interview focusing on pragmatic properties of voices.	The two groups' voices shared many pragmatic properties; a focus on everyday activity, rarely having access to other voices, rarely bizarre content and participants did not feel compelled to obey their voices' commands. The clinical group were more likely to hear violent voices and were less likely to consider their voices as having any value
Honig et al. (1998)	48 participants: 18 people diagnosed with schizophrenia, 15 with dissociative identity disorder and 15 controls	Semi-structured interview concerning characteristics of auditory verbal hallucinations (AVH), onset and development, personal interpretation, coping strategies, and life history	Form of voices was similar; all heard voices both inside and outside the head and all heard voices speaking in the third person, although this was more common in the group diagnosed with schizophrenia. Content and responses to voices distinguished the groups. The non-clinical group heard mostly positive voices (93%) whereas the clinical groups' voices were mostly negative (67%). The clinical groups found their voices more frightening, more frequent, more disruptive, and believed that they had less control over their voices
Davies et al. (2001)	102 participants: 18 people diagnosed with schizophrenia, 29 evangelical Christians and 55 in control group	1 item on the LSHS, and specially devised "Affective Experiences" and "Perception of Voices" questionnaires.	All of the people with schizophrenia reported having ever heard a voice compared to 59% of the evangelical Christians and 27% of the control group, 78% of the schizophrenia group reported hearing them "all the time" compared to 59% of the evangelical Christians and 0% of the control group. The evangelical Christian group rated their voices as more positive than the control group who, in turn, rated them as more positive than the schizophrenia group

Johns et al. (2002a, b)	30 participants; 14 diagnosed with schizophrenia compared with 16 diagnosed with tinnitus	Mental Health Research Institute Unusual Perceptions Scale (MUPS; Carter et al. 1995)	The two groups' voices were similar in terms of physical characteristics (e.g. volume, clarity and frequency) but that the schizophrenia group's voices were more negative whereas the tinnitus group were mainly positive. Both groups reported negative emotional responses to their auditory hallucinations and this distress was related not only to the hallucinations themselves (form and content), but to the participants' beliefs about their voices (that they would harm them) and their perceived lack of control
Jones et al. (2003)	20 participants; 11 patients, 5 people who had used mental health services but not necessarily for voices and 4 non-clinical voice-hearers	Q-Methodology; participants rated their agreement with 45 statements about voices. Data was factor analysed to produce 6 factors describing a range of beliefs about voices	Of the six factors, the most commonly held perspective was that of the "positive spiritual perspective". The eight people who held this view believed that voices were positive experiences that were spiritual in nature and were critical of the biomedical approach. Those who did not use mental health services were less likely to rate their voices as negative experiences compared to users of mental health services, although their experiences were not uniformly positive and some did find managing their voices difficult
Andrew et al. (2008)	43 participants; 22 clinical voice-hearers diagnosed with psychotic disorders and 21 non-clinical voice-hearers with no history of mental health problems	Self-report measures of voices, beliefs about voices, trauma and mood	Clinical voice-hearers reported voices that were more negative, distressing, frequent and uncontrollable. They held more negative beliefs about their voices' intentions and power. Both groups had experienced trauma (>75%) but the clinical group had experienced a greater number of traumas and were more likely to have experienced childhood sexual abuse. Multiple regression analyses revealed that the best predictor of distress was beliefs about voices (particularly malevolence) and that the best predictor of beliefs about voices was trauma, specifically post-traumatic symptomatology

(continued)

Table 2.1 (continued)

Study	Participants	Method	Main findings
Sommer et al. (2010)	103 non-clinical voice-hearers	Structured interview using PSYRATS (Haddock et al. 1999)	Mostly respondents reported that voices did not disturb their everyday lives (91%), that they could stop their voices if they did disturb them (55%) and that they never heard negative voices (71%). Almost 60% of the participants believed that their voices came from external sources, mostly from benevolent spirits. 18% reported commenting voices and 11% reported voices that spoke to each other
Sorrell et al. (2010)	50 participants: 32 clinical voice-hearers and 18 non-clinical voice-hearers.	Self-report measures of voices, beliefs about voices and relating style	Non-clinical voice-hearers rated their voices as less malevolent, omnipotent and more benevolent than clinical voice-hearers. Distress was significantly associated with ratings of voices as dominating and intrusive and a relating style involving the voice-hearer distancing themselves from their voices
Daalman et al. (2011)	229 participants: 118 psychotic outpatients and 111 control participants.	Psychiatric and structured interview measures	Clinical and non-clinical groups could not be distinguished in terms of physical characteristics of their voices but the non-clinical group rated their voices as less negative, distressing, frequent and uncontrollable. The best predictor of whether a voice-hearer had been diagnosed with a psychotic disorder was "negative emotional valence of content" (more than half of voices having negative content)
Linden et al. (2011)	7 participants: non-clinical voice-hearers	Functional magnetic resonance imaging (fMRI)—participants signalled presence of AVH by button press and again when instructed to imagine voices using auditory imagery	AVH and auditory imagery were associated with similar activation in the "human voice area" in superior temporal sulcus and its contralateral homologue, bilateral inferior frontal gyri and the supplementary motor area (SMA). Activity of the SMA preceded that of auditory areas during auditory imagery but the two processes occurred instantaneously in AVH, highlighting the difference in subjective control

Diederen et al. (2011)	42 participants: 21 clinical and 21 non-clinical voice-hearers	fMRI whilst hearing voices	Several common areas of activation: bilateral inferior frontal gyri, insula, superior temporal gyri, supramarginal gyri and postcentral gyri, left precentral gyrus, inferior parietal lobule, superior temporal pole, and right cerebellum. No significant differences in AVH-related brain activation were present between the groups
Hill et al. (in preparation)	40 participants: 20 clinical and 20 non-clinical voice-hearers	Self-report questionnaires concerning voices, beliefs about voices, attachment and trauma	Clinical voice-hearers had more negative beliefs about voices, more post-traumatic symptoms and were more likely to report insecure attachment styles Both post-traumatic symptoms and attachment avoidance (negative beliefs about others) were associated with voice-related distress, an effect mediated by negative beliefs about voices. The association between post-traumatic symptoms and negative beliefs about voices was mediated by negative beliefs about other people. The authors conclude that distress results from negative beliefs about voices, influenced by negative beliefs about others in general which are formed in the context of negative life experiences
Hill et al. (in preparation)	12 participants: 6 clinical voice-hearers and 6 non-clinical voice-hearers	IPA of interviews concerning life history, historical and current experience of and beliefs about voices	Five main themes emerged; “The individual”, “The voice”, “Beliefs about voices”, “Sequelae of voices” and “Voices and mental health”. Non-clinical voice-hearers mainly reported positive or neutral experiences of voices and a range of explanatory beliefs in the context of a much higher quality of life, both currently and historically, than the clinical group

they clarify whether they are comparable to the AVH experienced by those diagnosed with a clinical disorder. Sommer et al. (2010) recently attempted to describe the phenomenology of voices in 103 non-clinical voice-hearers using the *Psychotic Symptom Rating Scale* (PSYRATS; Haddock et al. 1999). The majority of their sample said that their voices did not disturb their everyday lives (91%), that they could stop their voices if they did disturb them (55%) and that they never heard negative voices (71%). Almost 60% of the participants believed that their voices came from external sources, mostly from benevolent spirits. Interestingly, a sizeable minority of these voices would count as "first rank" symptoms of schizophrenia (Schneider 1959), due to the form they took (18% of participants reported hearing commenting voices and 11% heard voices that talked to each other). Thus, it would appear that non-clinical voices take a similar form to clinical voices but are much less negative and disruptive. These observations also speak to the need for a quantification of the sensitivity and particularly the specificity of Schneiderian symptoms for the distinction of schizophrenia from non-clinical experiences and from other pathologies.

2.3 Comparing Clinical and Non-clinical AVH Using Psychological Methodology

Romme and Escher (1989) were the first researchers to write in depth about AVH existing outside of clinical disorder and to compare the experiences of non-clinical and clinical voice-hearers. Their research was sparked when Romme and his patient appeared on Dutch television to discuss her problems with hearing voices and they appealed for people who experienced this problem to contact them. They were surprised when a third of the 450 respondents reported that they were able to cope with their voices, contrary to the received wisdom of the day that voices were destructive symptoms of mental illness that did not have positive meaning. They decided to investigate further and posted questionnaires to these respondents, analysing the 173 returned questionnaires in terms of those who said they could, and could not, cope with their voices, termed "copers" and "non-copers". Copers generally experienced positive voices, although a sizeable proportion (39%) said that their voices were mainly negative. The coping group could be distinguished from the non-coping group because they reported less disruption from their voices, felt stronger than their voices, and were less likely to follow their commands. Strategies for coping also differed between the two groups—copers were more likely to use active strategies such as selective listening and setting limits with their voices whereas non-copers were more likely to report relying on distraction.

Rather than considering voices in isolation, the researchers were interested in what was happening in the person's life when they started hearing voices. The majority of respondents (70%) could pinpoint an event that had occurred before the onset of their voices; for 34% this was a traumatic event like an accident or death

and for 36% it was another significant, but not necessarily traumatic event, like pregnancy or falling in love. In addition to perceived coping, the researchers were interested in any differences between those who had been psychiatric patients and those who had not. It appeared that there were notable social differences between these two groups with the non-clinical voice-hearers being more likely to be married (60% vs. 39%), to have told other people about their voices (98% vs. 86%) and to feel supported by others (98% vs. 51%).

Later, Romme's research group compared the form and content of AVH in clinical and non-clinical voice-hearers in more detail, using psychiatric interviews (Honig et al. 1998). They recruited 18 patients diagnosed with schizophrenia, 15 patients diagnosed with dissociative disorder, and 15 non-patients. All participants were asked about the characteristics of their voices, history of their voices and circumstances related to onset, present triggers, personal interpretation of the voices, coping strategies, and their life history. To the researchers' surprise, the form of voices in the three groups was similar: all heard voices both inside and outside the head and all heard voices speaking in the third person, although this was more common in the group diagnosed with schizophrenia. What distinguished the groups was the content of voices and their responses to them. The non-clinical group heard predominantly positive voices (93%) whereas the clinical groups' voices were predominately negative (67%). The clinical groups reported their voices as more frightening, more frequent, and more disruptive and believed that they had less control over their voices.

Like Romme and Escher (1989), Honig et al. (1998) also found that the majority of voice-hearers (70%) could trace the onset of their voices back to a traumatic event, although this was significantly more often the case for the clinical participants (77% schizophrenia group, 100% dissociative group) compared to the non-clinical group (53%). The overall level of traumatic experience was high, with the majority of participants experiencing emotional neglect or physical or sexual abuse as children, only a minority had not suffered any abuse or neglect (17% schizophrenia group, 14% dissociative group, and 27% of the non-patient group).

These initial studies suggest that clinical and non-clinical voices can be distinguished by their content and by the experients' emotional and behavioural reactions to them. These findings have been corroborated by recent research which has compared clinical and non-clinical voice-hearers on the PSYRATS auditory hallucination scale (Andrew et al. 2008; Daalman et al. 2011; Hill et al. in preparation). These three studies all found that non-clinical voice-hearers rate their voices as less negative in content, less distressing, less frequent, and more controllable. Variables that are more descriptive of physical characteristics of voices such as location, loudness, and number of voices do not appear to differ between the groups. These findings are consistent with those of Honig et al. (1998) and suggest that it is not the form of voices that contributes most to distress but their content and the subsequent distress they cause. Indeed, Daalman et al. (2011) used logistic regression to examine which variables were predictive of being diagnosed with psychotic disorder and found that the best predictor was "negative emotional valence of content" (more than half of voices having negative content).

2.4 The Relationship Between Voices and Distress

The consensus from the literature comparing clinical and non-clinical voice-hearers is that, on the whole, non-clinical voices are less negative in content and provoke less distress (see Table 2.1 for summary of the available literature; Romme and Escher 1989; Leudar et al. 1997; Honig et al. 1998; Davies et al. 2001; Johns et al. 2002a, b; Jones et al. 2003; Andrew et al. 2008; Sommer et al. 2010; Sorrell et al. 2010; Daalman et al. 2011). What is not understood, and would clearly be useful to know for clinicians, are the reasons why some people hear voices that are distressing and disabling whereas others experience them as neutral or even positive. Recent cognitive models of psychotic symptoms may be of use here as they posit that unusual and unshared experiences are not inherently pathological but may develop into psychotic experiences with an associated need for care for some people (Chadwick and Birchwood 1994; Garety et al. 2001; Morrison 2001).

Cognitive models of psychotic symptoms suggest that it is not the existence of voices per se that causes distress but the individual's appraisals of their voices (Chadwick and Birchwood 1994; Garety et al. 2001; Morrison 2001). Different models have identified different types of appraisals as important. Distress and need for care have been hypothesised to result from appraisals of voices as malicious and powerful (Chadwick and Birchwood 1994), as external to the self and personally relevant (Garety et al. 2001) or because the appraisals themselves are unacceptable to that individual's culture (Morrison 2001). All cognitive models suggest that individuals' appraisals result from schemas that develop in the context of their life experiences.

Chadwick and Birchwood's (1994) specific model of distress in voice-hearers has been well researched and supported. Beliefs about voices' power and intentions have been shown to predict subsequent affective-behavioural responses better than voice content or topography in numerous studies (Chadwick and Birchwood 1994; Birchwood and Chadwick 1997; Soppitt and Birchwood 1997; Sayer et al. 2000; van der Gaag et al. 2003). This model suggests that beliefs about voices are informed by interpersonal schemata that are influenced by the individual's life experiences. Thus, an individual who has experienced early adversity (e.g. trauma) could develop interpersonal schemata that posit other people as dominant and threatening and the self as subordinate and vulnerable. This might cause the individual to be wary about relationships, whether these are with people in the social world or with their voices. This speculation has been indirectly supported in work demonstrating that voice-hearers' perceptions of power and rank differences between themselves and their voices are mirrored by their perceptions of power and rank differences between themselves and others in their social world (Birchwood and Chadwick 1997; Birchwood et al. 2004).

Andrew et al. (2008) directly tested this model in a mixed group of clinical and non-clinical voice-hearers, specifically investigating differences in beliefs about voices between these two groups and whether trauma history had influenced their beliefs. Their findings supported the cognitive model of voices (Chadwick and

Birchwood 1994; Birchwood and Chadwick 1997); the clinical group believed that their voices had more negative intentions (malevolence) and more power to carry out their negative intentions (omnipotence) compared to the non-clinical group. Unsurprisingly, they also had significantly higher levels of anxiety and depression. Experience of trauma was high across the sample; the majority of both groups had experienced trauma (>75%) but the clinical group had experienced a greater number of traumas in their lives and were significantly more likely to report experience of childhood sexual abuse. Multiple regression analyses revealed that the best predictor of distress was beliefs about voices (particularly malevolence) and that the best predictor of beliefs about voices was trauma, specifically post-traumatic symptomatology. The authors interpret their findings as suggesting that trauma could act as a vulnerability factor for developing AVH but that the nature of the trauma and the extent to which it is resolved may represent a maintaining factor by influencing the individual's beliefs about their voices.

Others have suggested that relationships between individuals (and thus between voice-hearers and their voices) are complex and can be examined on more than just the dimension of power (Haywood 2003; Vaughan and Fowler 2004). They draw on Relating Theory (Birtchnell 1996, 2002) which describes how people relate on two dimensions; intimacy as well as power. Vaughan and Fowler (2004) demonstrated that voice-related distress is associated with the perceived relationship between voice-hearer and voice, independent of beliefs about voices' malevolence and omnipotence. Sorrell et al. (2010) attempted to replicate this study using 32 clinical voice-hearers and 18 non-clinical voice-hearers. Their findings supported previous research suggesting that non-clinical voice-hearers rate their voices as less malevolent, omnipotent, and more benevolent than clinical voice-hearers (Andrew et al. 2008). They also supported the hypothesised association between relating styles and distress; distress was significantly associated with voice-hearers' rating of voices as dominating and intrusive, and the voice-hearers distancing themselves from their voice. However, they were unable to replicate Vaughan and Fowler's finding that the association between distress and perceived relationship between voice and voice-hearer is independent of beliefs about voices' malevolence and omnipotence.

Our own research has investigated whether trauma and attachment schema influence beliefs about voices and thus distress associated with voices (Hill et al. in preparation). We replicated Andrew et al.'s (2008) study with 20 non-clinical voice-hearers and 20 clinical voice-hearers and also found that although there were similarly high levels of trauma between the groups, the clinical group reported a higher number of, and more severe, post-traumatic symptoms. Like previous studies (Andrew et al. 2008; Sorrell et al. 2010), we also found that non-clinical voice-hearers reported more positive beliefs about voices' benevolence and fewer beliefs about voices' malevolence and omnipotence. We also examined participants' attachment styles and found that clinical voice-hearers were significantly more likely to report insecure attachment style than non-clinical voice-hearers. We measured attachment in terms of attachment anxiety and attachment avoidance, which roughly correspond to Bowlby's (1969, 1973, 1980) internal working models of self and

others. The clinical group had significantly higher scores on attachment avoidance, which corresponds to a negative internal working model of others. Mediation analyses (employing the procedure from Preacher and Hayes 2004) revealed that the association between post-traumatic symptoms and voice-related distress was mediated by negative beliefs about voices (malevolence and omnipotence). The association between attachment avoidance (negative beliefs about other people) and voice-related distress was also mediated by negative beliefs about voices (malevolence and omnipotence). Furthermore, the relationship between post-traumatic symptoms and negative beliefs about voices was mediated by negative beliefs about other people. We interpreted these findings as supporting the cognitive model and as suggesting that some people are distressed by their voices is because they hold negative beliefs about them; this pessimistic approach towards the voices is rooted in their negative beliefs about other people in general which have developed in the context of negative life experiences.

There is growing evidence then that beliefs about voices, developed in the context of life experiences, are important in determining whether someone becomes distressed by them. However, it could be argued that there has been a narrow focus on one model of voices and the content of voices has been dismissed as secondary to beliefs about voices. However, it may be premature to decide that content is unimportant because it may still influence beliefs about voices in important ways. Further research is thus needed to determine the relationship between voice content, beliefs, and distress.

A related criticism of the current literature is its focus on quantitative analysis to the exclusion of more qualitative exploration of what is a fascinating and idiosyncratic experience. The literature tells us that non-clinical voice-hearers are less distressed and disrupted by their voices but it sheds little light on details such as the identity of voices, what they say, how voice-hearers explain their presence, etc. Just two studies have employed qualitative methodology and both used it to answer specific research questions (Leudar et al. 1997; Jones et al. 2003). Leudar et al. (1997) examined pragmatic properties of voices, specifically how participants identify specific voices as individuals, how dialogue between the participants and their voices was arranged, and how voices influence the participants' activities. Jones et al. (2003) used a method that was used to research individuals' viewpoints on a subject (Q-methodology; Stephenson 1953) to explore voice-hearers' beliefs and found that rather than a dichotomy between mental illness and spirituality they reported a wide range of beliefs that could be grouped into six general perspectives, representing a range of psychological, biomedical, and spiritual viewpoints, the most commonly held perspective was that of the "positive spiritual perspective".

Our research group decided to use an open methodology to learn about our participants and their experiences of voices, in the context of their life histories and in their own words. Interpretative Phenomenological Analysis (IPA; Smith et al. 2009) was thought to be an ideal tool to achieve these ends as it is an idiographic, qualitative method which seeks to explore the individual's own understanding of their personal experience. We interviewed each of our 40 participants at length

(some interviews took up to 3 h) and analysed the transcripts from 12 interviews (six from each group). Although we tried to use an exploratory rather than theory-driven approach, a semi-structured interview schedule had to be drawn up to direct the interviews and this focused on three main areas—the participant's life history, historical, and current experience of voices and beliefs about voices. We found the transcripts could be coded in terms of five main themes: "The individual", "The voice", "Beliefs about voices", "Sequelae of voices", and "Voices and mental health". Participants described in their own words how their voices had started, what they thought had caused them, descriptions of what and who they heard, how their voices fitted in with their lives, how other people reacted to them as voice-hearers, and what they thought of other people who heard voices. The findings are too rich to describe in depth here (see Thornton 2009 unpublished PhD thesis; Hill et al. in preparation) but, overall, the themes echoed previous research—the non-clinical voice-hearers mainly reported positive or neutral experiences of voices and a range of explanatory beliefs in the context of a much higher quality of life, both currently and historically, than the clinical group.

2.5 Examining Non-clinical Voice-Hearers Using Biological Methodology

The last 15 years has seen an upsurge in the number of studies using neuroimaging to examine the brain whilst a participant is actually experiencing voices. As would be expected, speech and language areas are most often implicated. Whilst all studies have demonstrated the involvement of the temporal lobes, there is no consensus about the involvement of other brain areas. Part IV within this volume provides an overview of this neuroimaging of hallucinations using volunteers diagnosed with clinical disorders.

Several research groups have attempted to investigate the biological basis of non-clinical voices using fMRI, a non-invasive technique that is sensitive to local changes in blood oxygenation and thus provides indirect measures of neural activation. This technique has a very good spatial (in the millimetre range) and reasonable temporal (in the second range) resolution. Barkus et al. (2007) scanned eight non-clinical participants who were deemed to be highly prone to hallucinations on the basis of high scores on the Launay-Slade Hallucination Scale (Launay and Slade 1981) and the Oxford Liverpool Inventory of Feelings and Experiences (Mason et al. 1995), as well as having produced a high number of false alarm responses on a signal detection task. The signal detection task was repeated while the participants were being scanned and the activity present during false alarms minus the activity present during correct rejections was taken to represent the areas active during hallucination-like phenomena. These areas were the right middle temporal gyrus (MTG), bilateral fusiform gyrus, and the right putamen. Barkus et al. conclude that non-clinical AVH are mediated by similar patterns of cerebral activation as found in studies of AVH in participants diagnosed with schizophrenia.

However, this conclusion may be overstating the case somewhat considering that the major language and auditory areas suggested by clinical studies (e.g. Dierks et al. 1999; van de Ven et al. 2005; Allen et al. 2008) were not activated and the non-clinical hallucinations in this study were false perceptions of single words in ambiguous circumstances and thus may not be an adequate model of AVH.

Our research group has used fMRI to map the real-time brain activation of seven non-clinical voice-hearers whilst they were hearing voices and signalling their on- and offset by pressing buttons (Linden et al. 2011). Activation during AVH was observed in language areas in frontal and temporal cortex and specifically in the "human voice area" (Belin et al. 2000) in the superior temporal sulcus (STS). A similar activation pattern was observed in the same participants during active auditory imagery (see Fig. 2.1). This was the first time activity of this area without external stimulation was reported. The individual mapping of the human voice area requires a special procedure that is not in common use (see Box 2.1) and thus the null results of previous studies with clinical hallucinators may reflect the difficulty of detecting the human voice area in group maps of temporal cortex rather than true absence of activation. We therefore cannot exclude that the cortical activation pattern in mainly frontal and temporal areas is fairly similar between clinical and non-clinical hallucinations. AVH imaging studies in clinical voice-hearers have also occasionally reported limbic activation (e.g. Dierks et al. 1999) and one attractive hypothesis would be that this activation, possibly reflecting greater distress or generally higher emotional tone, distinguishes clinical from non-clinical hallucinations, but results so far are not consistent enough to permit such a conclusion. Of note, a recent study on 21 clinical and 21 non-clinical voice-hearers did not find a difference in hallucination-related fMRI patterns (Diederen et al. 2011). Further work will now be needed to ascertain the neural mechanisms associated with the clear difference in the subjective experience and distress of clinical and non-clinical voice-hearers.

Another important aspect of the physiological processes that lead to hallucinations is the relative timing of brain activation. The default mode of action (including speech) generation by the brain implements a forward model that anticipates which areas in the own brain would be affected by the action and suppresses them temporarily. This mechanism has been adduced as explanation why we cannot tickle ourselves. It may also explain why inner rehearsal of speech normally does not become audible. Such a suppression of auditory areas during inner speech may not occur in some patients with schizophrenia, leading to hallucinations. This could be reflected in instantaneous activation of prefrontal (supplementary motor area: SMA), language production (inferior frontal gyrus: IFG), and reception areas (STS, including the "human voice area") during hallucinations, whereas this chain of activation proceeds over several seconds in the case of auditory imagery (see Fig. 2.2). Previous work in clinical voice-hearers has also identified superior temporal activation coinciding with the onset of hallucinations, but here other temporal and frontal areas preceded the superior temporal gyrus activation (Hoffman et al. 2008). The literature on the sequence of brain activations leading up to hallucinations is still not consistent enough to allow firm conclusions.

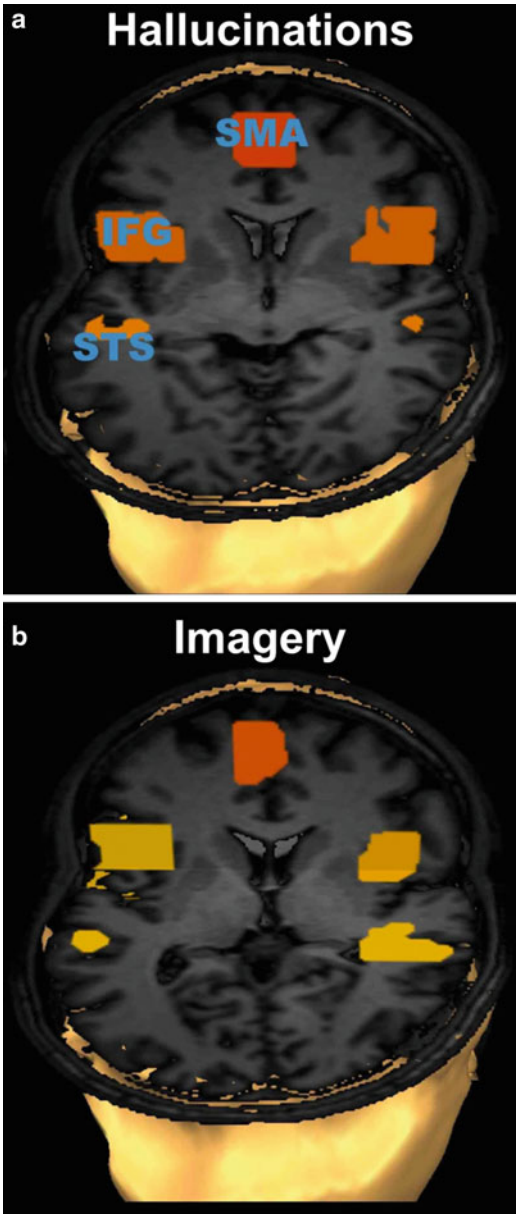

Fig. 2.1 Similar activation pattern seen in hallucinations (**a**) and auditory imagery (**b**) —prefrontal (supplementary motor area *SMA*), language production (inferior frontal gyrus *IFG*), and reception areas (superior temporal sulcus *STS*, including the "human voice area")

Box 2.1 How to Investigate Neural Correlates of Hallucinations?

Neural correlates of hallucinations can be investigated in at least three different ways. The earliest approach, taken by Penfield and Perot in the 1950s and 1960s, was to stimulate the brain electrically and record patients' report of their experience (Penfield and Perot 1963). A related approach is to assess whether stimulation techniques (mostly transcranial magnetic stimulation, TMS), applied to specific brain regions, can interrupt or attenuate hallucinations. In addition to these interventional approaches, several ways of passive measurement of correlates of hallucinations are possible. Patients with continuous hallucinations can be exposed to additional auditory stimuli and their brain activity recorded with fMRI or electroencephalography (EEG). If their brain responses in particular areas deviate from those during a non-hallucinating state, it can be inferred that these areas were involved in the hallucinatory process and consequently less or more responsive to the external stimuli. More direct evidence can be obtained from scanning voice-hearers directly while they report hallucinations (e.g. through pressing a button), although the brain activity associated with the monitoring and reporting of the voices is a possible confound. Here, the time course of reported hallucinations can be used to model brain activity at the whole-brain level and the resulting correlation maps reveal areas with increased or decreased activity during voice-hearing (see also Part IV, this volume). It may also be possible to extract the brain activation patterns associated with hallucinations without the need to recur to online self-report, for example through data driven analysis techniques like independent components analysis (van de Ven et al. 2005; Jardri et al. 2007), but further work is needed to validate this approach. It may also be of interest to probe the activation of specific, functionally defined brain areas during hallucinations. In our work, we have adapted the procedure described by Belin et al. (2000) for identifying the human voice area. This is achieved by contrasting the brain responses to human voices and physically matched non-voice sounds. It is then possible to use this area as an independent region of interest to probe whether activity is increased during hallucinations. This was the case in our study (Linden et al. 2011), which lends further support to the idea that the brain circuits of hallucinations involve the same specific sensory pathways that are recruited for the analysis of external stimuli.

2.6 Conclusions

It is now widely recognised that voices can be experienced outside of psychiatric disorder, existing in a similar form but tending to be less negative and distressing. There is growing evidence to suggest that more negative appraisals of voices, influenced by more negative appraisals of others in general, are instrumental in

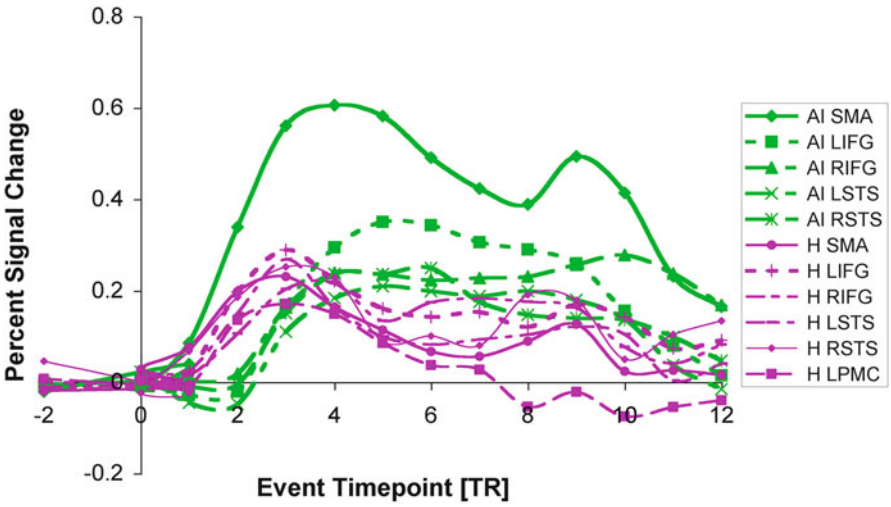

Fig. 2.2 Event-related averaging of activation in SMA, *left* and *right* IFG, and *left* and *right* STS during AI (in *green*) and hallucinations (H, in *purple*), averaged across participants and trials (no temporal smoothing applied). The three TRs preceding the onset of AI or H were set as baseline. The time courses show almost instantaneous activation onsets and peaks during hallucinations but a clear latency shift between SMA and the other areas during AI. This figure was previously published in Linden et al. (2011). (Reproduced with permission from Oxford University Press)

determining how distressing voices are perceived. There is also evidence to suggest that these negative appraisals develop from negative life experiences such as trauma and attachment difficulties. However, exploration of the predictors of distress has tended to focus on appraisals, particularly of voices' power and intent. Conversely, other factors that are likely to influence a person's reaction to and coping with voices, such as their content, have so far remained under-researched. It is also unclear whether there are distinct biological differences between the two types of experience. Initial fMRI data suggests that non-clinical AVH are associated with similar frontal and temporal activation patterns as clinical AVH but further work is needed to confirm these findings and explore the neural mechanisms underlying the clear difference in distress associated between these two groups.

In addition to their recognised importance as a clinical symptom, hallucinations are also of paradigmatic relevance to theories of perception and awareness. The considerable prevalence of auditory hallucinations in the population suggests that the boundaries between external and internal perception may be more fluid that simple input–output models might suggest. The stunning ability of the human brain to reconstruct sensory experience in the absence of adequate physical stimuli, which has been implicated in the chronic hallucinations of deafferentation syndromes (Brasić 1998), is likely to have conferred an evolutionary advantage, for example in preserving the constancy of sensory experience and aiding sensory memories. It has also been implicated in the genesis of religion, culture, and the earliest examples of epic poetry (Jaynes 1976), although this account has remained controversial.

There can be little ambiguity about the dysfunctional and distressing nature of the chronic hallucinations of the patient diagnosed with schizophrenia. Conversely, most non-clinical voice-hearers of our acquaintance valued their hallucinations as a positive and enriching experience, and one would stretch the concept of the schizophrenia spectrum by placing these generally well-balanced individuals anywhere in the pathological range. The work on the cognitive and biographical determinants of attitude towards voices by us and others has elucidated the pathways towards clinical and non-clinical hallucinations to some degree. It is still an open question why a considerable portion of the population, in the absence of any sensory deficits, are prone to regular and even chronic hallucinatory experience. The association with vividness of mental imagery, which is under voluntary control and thus a categorically different phenomenon, is tenuous at best (Sack et al. 2005; Oertel et al. 2009). Interesting topics for future research will be whether similar benign chronic perceptual aberrations exist in other sensory modalities, whether clinical and non-clinical AVH may be genetically linked and whether some of the appraisal styles of non-clinical voice-hearers can be utilised in symptom-focused cognitive therapy to help those people who do not experience their voices as benevolent companions but as burden and threat.

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