



# Olfactory hallucinations in schizophrenia and schizoaffective disorder: A phenomenological survey

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## ABSTRACT

Olfactory hallucinations (OHs), so it has been argued, are prognostic of a poorer outcome, are unpleasant, and cannot be well explained within current theoretical accounts of hallucinations. We examined these and related issues by conducting structured interviews with 51 participants who experienced OHs and who were previously diagnosed with schizophrenia or schizoaffective disorder. We found no relationship between disease severity measures and type or frequency of OHs. As with prior research, we too noted the predominance of negative OHs, but with many reports of positive OHs, and also found significant relationships between frequency of OHs and severity of tactile hallucinations. We then examined whether odor imagery or involuntary memory might account for the presence of OHs, but these possibilities were not well supported. We then explored, using cluster analysis, whether or not our sample was homogenous. Two clusters were of especial interest; one which may reflect a 'sensory dysfunction group' and one characterized by more severe tactile hallucinations. The presence of tactile hallucinations may suggest a further novel cause of OHs, which we discuss. Our data suggest diverse causes for OHs in schizophrenia, none of which are consistent with current models of hallucinations in other modalities.

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## 1. Introduction

This report examines the phenomenology of olfactory hallucinations (OHs) in a group of schizophrenic participants who self-identified with this symptom. As we describe below, there are several reasons for studying OHs, but perhaps the most important concerns their apparent prognostic value. Kwapil et al. (1996) noted that "Clinical lore has suggested that such symptoms [OHs] in psychotic patients are indicative of severe psychopathology and poor prognosis" (p. 371); however, whether this belief is correct remains an open question. Pearlson et al. (1989) found that OHs were significantly more common in late onset schizophrenia, which would suggest that it was not particularly predictive, but the disproportionate number of females in the late onset group makes any conclusion problematic, as females are more prone to experience OHs than males (Kopala et al., 1994). In contrast, Kwapil et al. (1996) found some suggestive evidence in otherwise healthy individuals who scored high on a self-report scale indexing psychotic-like symptoms, including OHs. At 10 year follow-up, the subset of individuals who originally reported OHs were more likely to develop a clinical psychosis than the subset of individuals not reporting such experiences. Here, we determine whether more frequent reports of OHs are positively associated with

putative markers of severity (e.g. age of onset, number of hospitalizations, etc.). Such an association would provide support for the view that the presence of OHs is, indeed, prognostic of a poorer outcome.

Whilst several studies have examined the phenomenology of auditory hallucinations (e.g. David, 1999; Nayani and David, 1999), there have been no similar detailed examinations of OHs in schizophrenia. Notwithstanding, data has been collected on OHs, typically as part of larger studies on hallucinations, and this allows us to form a preliminary picture of their main characteristics. First, OHs appear to be relatively rare. Frequency estimates, usually based on a consecutive series of cases presenting at hospital for treatment, vary from 1% (Alliez and Nosida, 1925) to 35% (Kopala et al., 1994), and across all studies where frequency estimates were evident, the overall mean was 13.7% (Alliez and Nosida, 1925; Davidson, 1938; Bellack and Benedict, 1958; Rubert et al., 1961; Goodwin et al., 1971; Mueser et al., 1990; Kopala et al., 1994; Stedman and Clair, 1998). Second, OHs appear to occur more frequently in participants who also report the presence of delusions (Goodwin et al., 1971) and who report other hallucinations, especially tactile ones (Mueser et al., 1990). Third, examination of the type of OHs that have been described has led most authors to conclude that they are typically unpleasant (Bleuler, 1924; Bullen, 1899; Alliez and Nosida, 1925; Brill, 1932; Bromberg and Schilder, 1934; Davidson, 1938; Rubert et al., 1961; Goodwin et al., 1971). More specifically, where the quality of the OH (i.e. what it is reported to smell like) has been recorded, several authors have noted a preponderance of smoky, decay, body and animal-like odors. This is

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of interest not only because of what it might indicate about the genesis of OHs (more later), but also because it might reflect a considerable reporting bias. That is participants may simply be more prone to notice, gain insight into, and report an intrusive and disgusting OH relative to a pleasant smelling one. In the current study, we attempted to establish both the quality and affective tone of *all* of the OHs that our participants could recall, to determine whether negative OHs do in fact predominate, and to test whether negative OHs are accompanied by greater insight. In addition, we also wished to establish whether more frequent experience of OHs is associated with more frequent hallucinations in other modalities, and especially those in the tactile domain.

A further reason for studying OHs is that they are poorly explained by current theories of hallucinations, which were developed for the visual, and especially the auditory, form (e.g. Bentall, 1990; Slade, 1994). For auditory and visual hallucinations, it has been suggested that aberrant thoughts (e.g., auditory images/subvocalisations or visual images) get misattributed to the external world (Bentall, 1990) due to impaired metacognitive processes. However, this explanatory approach is problematic for OHs as many individuals appear unable to form mental images of smells (e.g., Engen, 1991; Crowder and Schab, 1995; Herz, 2000). Of course, it may be that individuals who experience OHs may have a greater ability to generate olfactory images. We investigate this possibility here by determining whether self-reported olfactory imagery ability is positively associated with frequency of OHs. Not only might imagery be one potential source of hallucinatory content, but another might be involuntary memories (i.e. from prior olfactory experiences, such as a partner's perfume) triggered, for example, by particular environmental (e.g. seeing the partner) or internal cues (e.g. thinking about the partner). Whether such involuntary memories occur in olfaction is also contentious, and although odors may be powerful retrieval cues (Engen, 1991), it is not known whether non-olfactory environmental or internal cues could trigger them. For this reason we also examined whether OHs in our sample were associated in some way with particular past events (suggesting the possibility of involuntary memory) and if particular environmental or internal cues accompanied particular OHs.

OHs also occur in many other conditions such as temporal lobe epilepsy and migraine (Greenberg, 1992; Stevenson and Case, 2005). Moreover, otherwise healthy individuals may experience a condition termed 'parosmia', whereby normally pleasant smells are experienced as markedly distorted in quality (Leopold, 2002). A noteworthy feature of parosmia is that such distortions usually result in the experience of foul smells – not pleasant ones – and the distortions are often of a smoky or burnt quality. As described above, OHs in schizophrenia are also typically foul, and descriptions of burnt or smoky odors have also been noted before. Thus one might speculate that a proportion of OHs in schizophrenia may not be hallucinations at all, but rather distorted experiences of genuine everyday odors that come to have markedly abnormal qualities. That this possibility should be taken seriously comes from an additional observation. People with schizophrenia, and their first-degree relatives, have impaired olfactory perception (Moberg et al., 1999; Hudry et al., 2002; Rupp et al., 2005; Turetsky et al., 2008). However, suggestive as this circumstantial case may be, it has not received direct support on the occasions where it has been tested. Kerekovic (1972) examined for nasal pathology in schizophrenics with and without OHs. Around 24% had some form of nasal pathology, and of these around ¼ had experienced OHs. So whilst some olfactory hallucinators had a defective sense of smell, many did not. Kopala et al. (1994) and Stedman and Clair (1998) examined whether a sample of schizophrenic participants differed in their odor identification performance – a good indicator of the general integrity of the olfactory system – in terms of whether or not they had experienced OHs. They found no difference in odor identification between groups reporting or not reporting OHs.

Although we also examine here for evidence favoring a parosmia account (e.g. is frequency of experiencing OHs correlated with say

evidence for head injury or history of smoking; is there a preponderance of burnt/smoky smells, etc.), it is plausible that OHs result from multiple causes. That is olfactory hallucinators as a group may not be homogenous, but rather reflect parosmia in some cases and in others, perhaps, the type of psychological causes (e.g. imagery and involuntary memory) that are hypothesized to account for auditory or visual hallucinations. We make a preliminary exploration of this possibility here using cluster analysis, and by then determining the features that differentiate the various clusters identified by this technique.

## 2. Method

### 2.1. Participants

Fifty-one participants (25 male, 26 female; age range = 23–63 years, mean = 42.1, S.D. = 11.1) undertook a structured interview by telephone. Participants who self-reported OHs were recruited from the Volunteer Register administered by the Schizophrenia Research Institute. Diagnosis was according to the treating psychiatrist, with 37 participants diagnosed with schizophrenia and 14 with schizoaffective disorder (9 of whom were of the depressive type, 2 bipolar and 2 bipolar mixed). Although there is currently much discussion surrounding diagnostic classifications, we chose to retain the bipolar and bipolar mixed participants as evidence suggests a common neurocognitive set of impairments and similar neurobiological basis across this spectrum of disorders (see Laursen et al., 2009; Smith et al., 2009). Mean age of onset was 23.1 (S.D. = 6.8), and mean duration of illness was 17.5 years (S.D. = 9.4).

### 2.2. Procedure

After securing written informed consent (the protocol was approved by the Macquarie University Human Research Ethics Committee), participants completed a 45 min structured interview administered in each case by the same interviewer. This consisted of five sections, which were given in the same order to all participants. Section one obtained demographic data including age, gender, education, ethnicity, language and employment history. Section two concerned the participant's medical background and included psychiatric diagnosis, details regarding first onset of their illness, hospital admission data, current medications and questions concerning conditions that are also known to generate OHs or abnormal olfactory perceptual experiences (e.g. epilepsy, migraine, sinusitis etc.). Section three obtained information about participant's alcohol, tobacco and drug usage.

Section four focused on OHs. Participants were first asked, "Have you ever experienced any unusual smells or smells that other don't notice?". Any responses were then listed, and this was followed by two further questions, probing for any other unusual external smell experiences and experiences concerning their own bodily odors. The interviewer then asked the same set of questions (a–d, below) for the first five (or fewer, if less than 5 reported) smell experiences identified above. These questions were: (a) How frequently has the experience occurred (several times a day; daily; every couple of days; weekly; monthly; <monthly)? (b) Has the experience occurred in the last month? (c) Was the smell pleasant, unpleasant or neutral? and (d) What do you think caused the smell (open question with additional probing to ascertain degree of insight)? Finally, the interviewer asked the participant to identify the most bothersome OH from the list of items that they had generated.

In answering the next series of questions, participants were asked to concentrate on the most recent occurrence of their most bothersome OH. The interviewer started by obtaining more details about this experience, including: (a) a description of the smell (using odor quality categories [see Table 5 for list of items]); (b) whether it reminded the participant of anything; (c) how it made them feel (frightened, disgusted, puzzled, etc.); (d) whether they could ignore it; (e) whether they responded to it (e.g. opened a window); (f) whether they could stop the smell (and if so, how); (g) where they thought the smell was coming from; and (h) probes for vividness and intensity. Participants were then asked about its duration, and the context in which it occurred. All of these questions were then repeated for either the most frequently experienced olfactory hallucination, or, if two were equally frequent, the first mentioned olfactory hallucination, but *only* if this differed from the most bothersome.

Section five of the interview concerned other unusual sensory experiences. Participants were asked about presence and severity of auditory (noises/non-verbal and verbal [2nd and 3rd person]), visual, somatic/tactile and gustatory hallucinations, as well as two further questions concerning experiences of 'loss of boundary' (e.g., thought insertion) and depersonalisation/derealisation, using the coding system from the Scales for Assessing Positive Symptoms (SAPS). Finally, participants were asked to try and form, sequentially, a mental image of: (1) their most bothersome OH; (2) a burning smell; and (3) a floral smell. In each case they were then asked to judge the vividness of the experience (can't imagine it; vague; clear or vivid).

### 2.3. Coding

For the most bothersome and most frequent OH (and for all OHs where such data were collected), odor qualities (see Table 5) were coded as 'a lot', 'a bit', 'unsure' or 'not at all'.

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