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## OPEN

# The Diagnostic Spectrum of Sexual Hallucinations

Jan Dirk Blom, MD, PhD, Rosemarij J. B. van Veen, MD, Emma H. C. van Rooijen, MD, and Christina W. Slotema, MD, PhD

**Abstract:** Sexual hallucinations are little known, yet often extremely burdening, phenomena. In this systematic review, we summarize what is known about their phenomenology, prevalence, etiopathology, ensuing distress, and treatment options. Sexual hallucinations can be experienced as genital or orgasmic sensations, although other sensory modalities can also be involved. With the notable exception of orgasmic auras in the context of epilepsy, sexual hallucinations tend to be distressing and embarrassing in nature. Our analysis of 79 studies (together describing 390 patients) indicates that sexual hallucinations are more frequent in women than in men, with a sex ratio of 1.4:1, and that they are most prevalent in schizophrenia spectrum disorders, with rates ranging from 1.4% in recently admitted patients to 44% in chronically hospitalized patients. Other underlying conditions include epilepsy, the incubus phenomenon (possibly the most prevalent cause in the general population, associated with sleep paralysis), narcolepsy, and sedative use. As regards the sedative context, we found more medicolegal than purely medical cases, which sadly underlines that not all sexually explicit sensations experienced in anesthesia practice are indeed hallucinations. In the absence of evidence-based treatment protocols for sexual hallucinations, practice-based guidelines tend to focus on the underlying condition. Further research is needed, especially in the fields of substance abuse, posttraumatic stress disorder, and borderline personality disorder, where only anecdotal information on sexual hallucinations is available. Moreover, awareness of sexual hallucinations among health professionals needs to be improved in order to facilitate counseling, diagnosis, and treatment.

**Keywords:** epilepsy, multimodal hallucination, narcolepsy, schizophrenia spectrum disorder, sleep paralysis

## INTRODUCTION

Sexual hallucinations are often extremely burdening. And yet in clinical practice they rarely receive the attention they deserve.<sup>1</sup> Common examples are the sensation of being touched in erogenous zones, being stimulated sexually, being penetrated, and experiencing unbidden orgasms. Hallucinated sexual sensations may be unimodal or multimodal in nature, and need not involve the genital organs per se. For example, they may also concern

hallucinated voices that make sexually explicit remarks, complex visual hallucinations with a sexual content, or hallucinations involving the fondling of one's buttocks or breasts.<sup>1,2</sup> Sexual hallucinations are sometimes interchangeably but erroneously labeled *genital hallucinations*, whereas the latter phenomena may comprise hallucinated tactile, algesic, and itchy sensations without any erotic connotations. Figure 1 presents a general classification of hallucinations per sensory modality. In line with the work of authors like Parish and Gibson, it goes beyond the traditional five senses and instead recognizes 15 sensory modalities that may be involved, including the sexual modality.<sup>3,4</sup> Hierarchically, each type of hallucination in the first column can be divided into subtypes (e.g., verbal auditory, nonverbal auditory). For our present purposes, the second column in Figure 1 shows only the subtypes known for sexual hallucinations.

Sexual hallucinations are often experienced in several modalities simultaneously. Moreover, they are experienced in a wide variety of clinical contexts, among which are epilepsy, narcolepsy, the incubus phenomenon, schizophrenia spectrum disorders, and substance use. Although they have long been considered rare, they are now viewed as merely underreported, most likely because many people experiencing them, as well as many health professionals, feel too embarrassed to discuss them. Another reason may be that they do not feature in major classifications such as the *International Classification of Diseases* (ICD-11) and the *Diagnostic and Statistical Manual*

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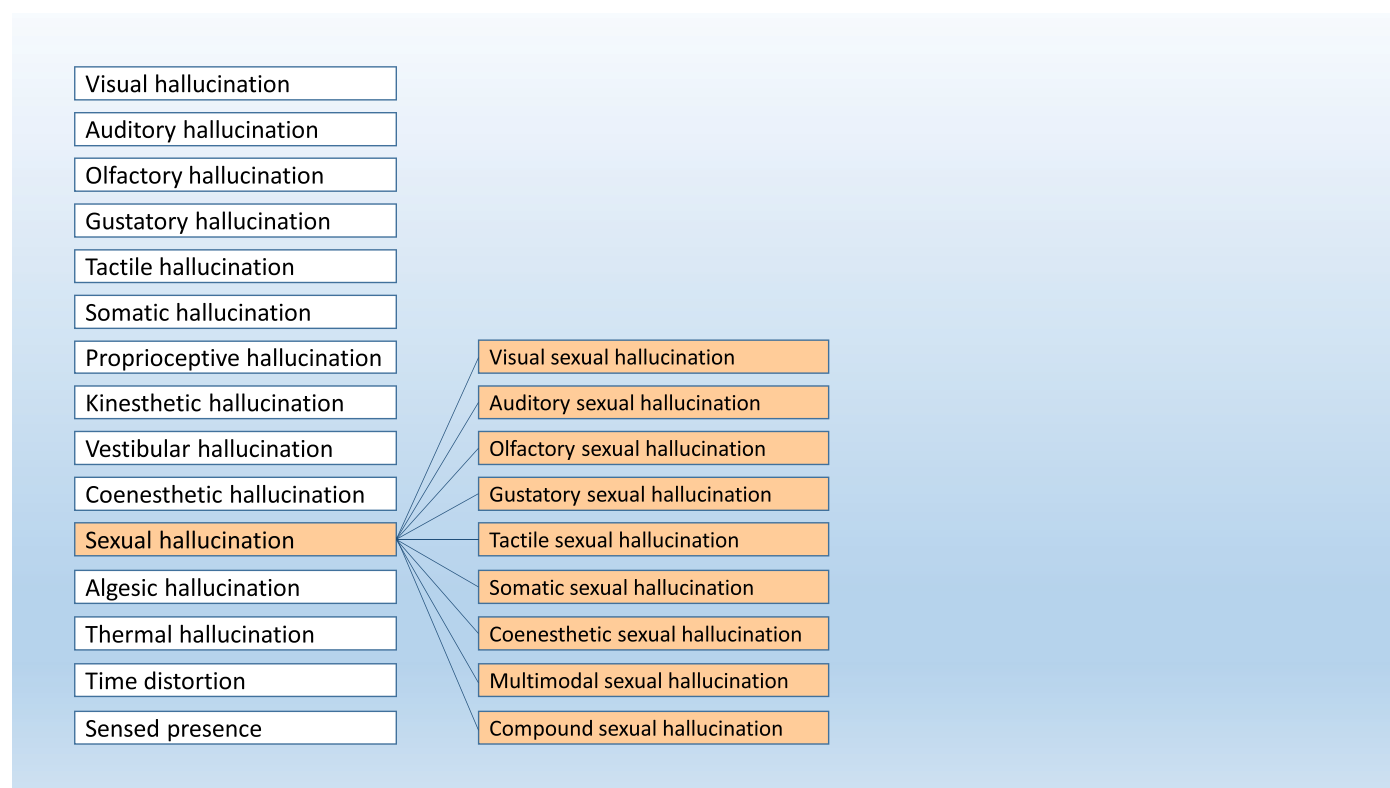
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**Figure 1.** Classification of hallucinations per sensory modality, with subtypes of sexual hallucinations.

of *Mental Disorders* (DSM-5-TR).<sup>5,6</sup> Due to the ensuing lack of familiarity among health professionals, they may be mistaken for (or clustered with) other symptoms or even go unrecognized in clinical practice. A case in point is that the literature sometimes refers to sexual hallucinations as *sexual illusions*, *sexual dreams*, *sexual fantasies*, *pseudohallucinations*, or *accusations of sexual trespassing*.<sup>7–10</sup> None of these terms adequately characterize sexual hallucinations, which are sexually explicit perceptions experienced during wakefulness in the absence of exogenous or (physiological) endogenous triggers. As perceptual phenomena they are distinguished from sexual dreams (which are experienced during sleep), sexual fantasies, obsessions, and delusions (which are all cognitive in nature), hypersexuality (i.e., nymphomania and satyriasis), gender dysphoria and transgenderism (which are sometimes but not necessarily accompanied by coenesthetic sexual hallucinations), and genital hallucinations that are not sexually charged (as in koro, for example, where the penis is perceived as retracting into the body). Although somewhat debatable, we also distinguish sexual hallucinations from persistent genital arousal disorder (PGAD), a condition that may be accompanied by sexual hallucinations but that, in and of itself, tends to be conceptualized as a *genitopelvic dysesthesia* (see Text Box 1).

## METHODS

We carried out a systematic literature search in PubMed, Embase, PsycINFO, Google Scholar, and the historical literature up until 1 July 2023 using the search terms *sexual hallucination*,

*erotic hallucination*, *genital hallucination*, and variants thereof (e.g., *genital hallucinosis*, *sexual fantasy*, and *orgasmic aura*). The digital searches were complemented by backward searches. We had no language restrictions and hence included articles written not only in English but also in Dutch, French, German, Italian, Spanish, Swedish, and Russian. Articles were excluded when they contained no original case descriptions or no original prevalence figures, and also when the phenomena described did not comply with our definition of sexual hallucinations as *sexually explicit perceptions experienced during wakefulness in the absence of exogenous or (physiological) endogenous triggers*. Of note, we excluded two articles that offered duplicates of a total number of four case reports. From all remaining case reports, we extracted the following data: (1) year of publication, (2) sex and age of the patient, (3) phenomenological descriptions of the hallucinations and the sensory modalities in which they were experienced, (4) clinical diagnosis, (5) test results, (6) type of treatment, and (7) outcome with duration of follow-up. Whenever possible, we also charted the reported levels of distress. From all relevant prevalence studies, we extracted sample sizes, target populations, prevalence figures, and type of prevalence (e.g., point prevalence, one-year prevalence, lifetime prevalence).

## RESULTS

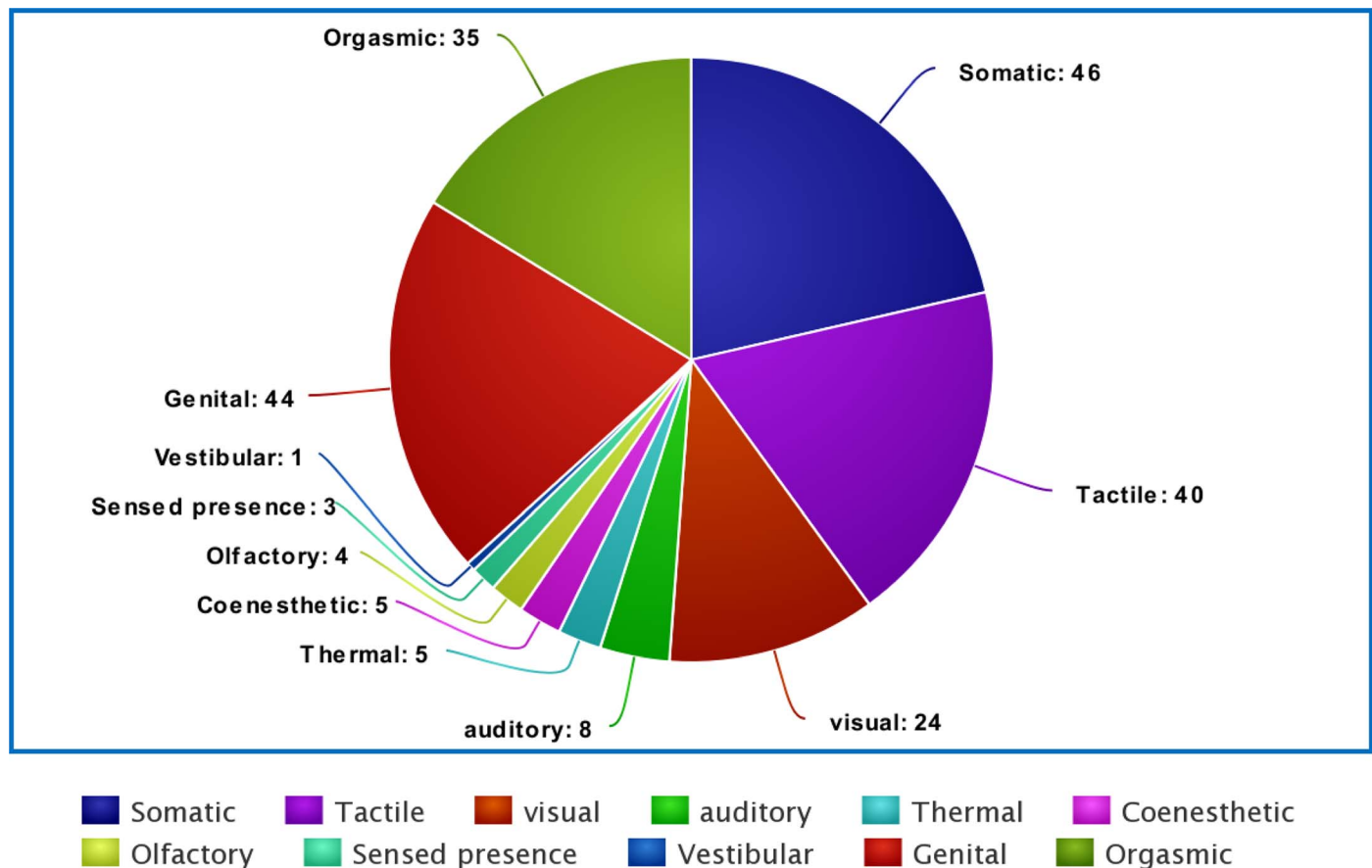
Our systematic search for data on sexual hallucinations yielded 14 prevalence studies reporting on 279 people and 65 case reports comprising 111 case descriptions. Supplemental Figure 1 depicts a PRISMA flow diagram (<http://links.lww.com/HRP/A213>).

### Text Box 1 Persistent Genital Arousal Disorder

PGAD, formerly known as persistent sexual arousal syndrome (PSAS), is characterized by unbidden and often prolonged episodes of genital arousal. This sensation may go on for hours, days, or weeks, with 10% of the cases persisting lifelong. PGAD is usually conceptualized as a dysesthesia that arises in the absence of conscious sexual arousal or desire.<sup>11</sup> It is therefore considered different from hyperarousal and hypersexuality. PGAD has a reported lifetime prevalence of 1%, but actual rates may be higher. The condition is chiefly reported in middle-aged women.<sup>12</sup> Its etiopathology is not fully understood, but it has been described in the context of panic disorder and depressive disorder, and in combination with medicines taken to treat these disorders, including antidepressants and anticonvulsants, but also dopamine agonists and antagonists, opioids, and cannabinoids.<sup>13</sup> Other underlying conditions include local pelvic conditions such as arteriovenous malformations, Tarlov cysts, clitoral engorgement, clitoral priapism, and pudendal nerve neuropathy. Phenomenologically and etiologically, there appears to be some overlap with sexual hallucinations, with several case reports of PGAD describing unwanted orgasms in the context of central conditions such as epilepsy and brain tumors,<sup>13</sup> which fully complies with the criteria for sexual hallucinations.

Supplemental Tables 1 (<http://links.lww.com/HRP/A214>) and 2 (<http://links.lww.com/HRP/A215>) provide an overview and summary of the studies included; Supplemental Table 3 (<http://links.lww.com/HRP/A216>) provides a full reference list of all studies included. Of the 390 people described, 58% were female (sex ratio 1.4:1). The mean age for all individuals described in the case reports (reported in 90% of those reports, or 26% of the 390 total cases) was 39 years (range, 18–78 years). Sixty-four

percent of the individuals experienced multimodal sexual hallucinations, with a maximum of five sensory modalities being involved simultaneously. As an illustration of such a compound sexual hallucination comprising visual, olfactory, tactile, somatic, and auditory aspects, one woman reported how she saw, smelled, and felt a shadowy figure descend upon her and initiate physical intercourse with her while she was also exposed to sexually laden remarks.<sup>14</sup> Figure 2 shows



**Figure 2.** Proportions of people described in the case reports that we retrieved (n = 111) reporting sexual hallucinations for nine sensory modalities and for genital and orgasmic sensations (in percentages).

the nine sensory modalities described in the different studies, as well as the proportions of people describing sexual hallucinations in these modalities and the frequencies of genital and orgasmic sensations. Of the hallucinations documented in the case studies, the somatic modality was the most frequently reported (46% of the individuals), followed by the tactile (40%) and visual (24%) modalities; 44% were genital and 35% orgasmic in nature or had an orgasmic component.

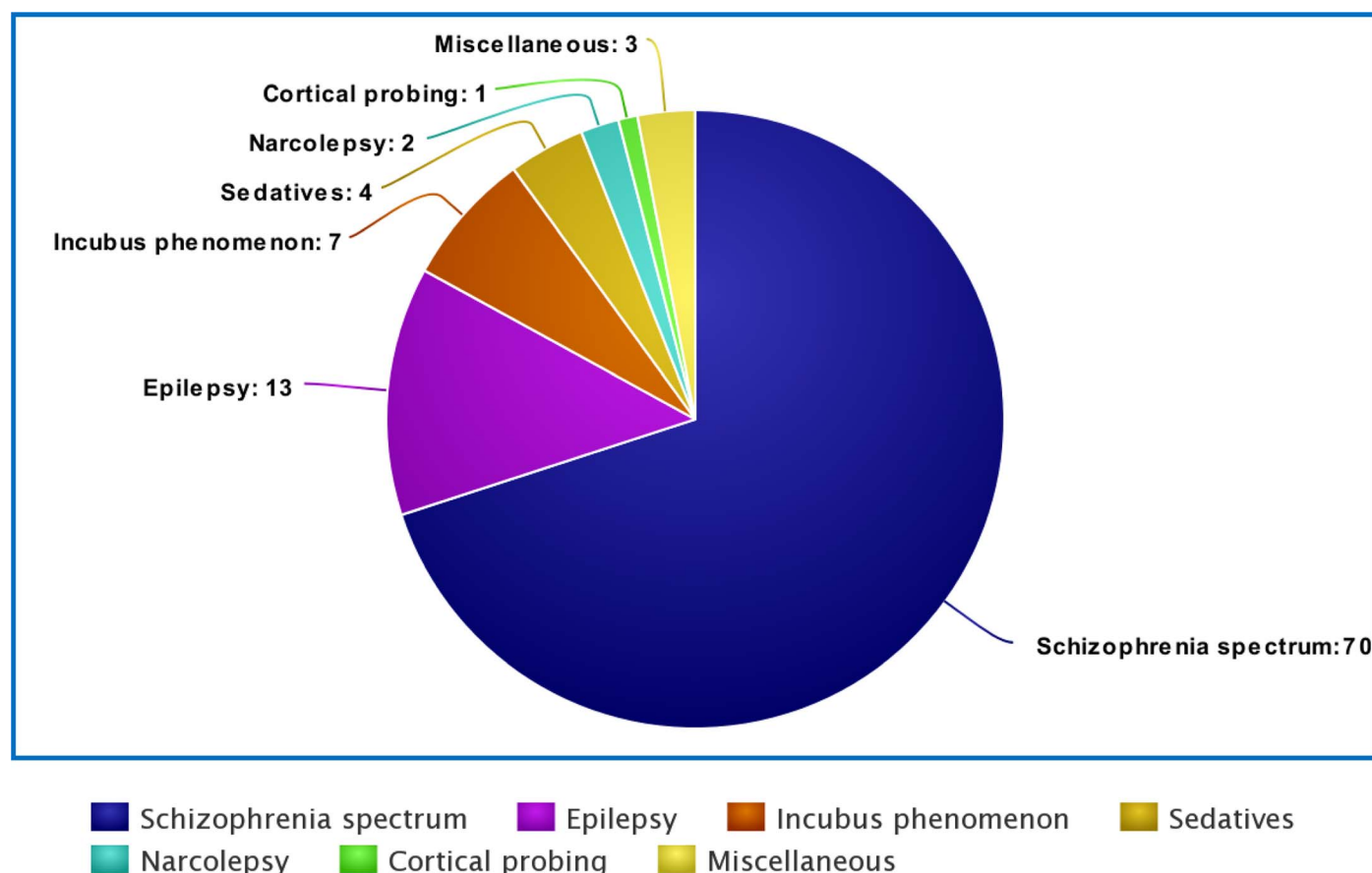
Of the 390 people with sexual hallucinations, 90% experienced them in the context of schizophrenia spectrum disorder (70%), epilepsy (13%), or the incubus phenomenon (7%). Figure 3 shows the distribution of these and other conditions taken to underlie the hallucinations. In what follows, we will analyze the hallucinations per diagnostic category.

### Schizophrenia Spectrum Disorders

From the 11 prevalence studies and the 22 case descriptions of schizophrenia spectrum disorders (Supplemental Table 1, <http://links.lww.com/HRP/A214> and Supplemental Table 2, <http://links.lww.com/HRP/A215>), which together provided data on 282 people, we learn that the phenomenology of the sexual hallucinations reported is extremely diverse in this group, as are the levels of ensuing distress. The hallucinations range from unimodal

and multimodal to full-blown entity experiences (i.e., compound hallucinations) with or without orgasmic sensations that are experienced as pleasurable, neutral, or horrifying. Akhtar and Tomson<sup>2</sup> describe a man who “saw” scenes of intense sexuality “as if projected on a screen,” inducing sensations in corresponding body parts, sexual arousal, and finally ejaculation. McGuire and colleagues<sup>15</sup> report on a woman who frequently experienced recurrent sexual hallucinations, being convinced that several elderly men had actual sexual intercourse with her. Lim and Blom<sup>16</sup> present the case of a male Muslim patient who experienced a *jinn* (invisible spirit) carrying out sexually laden acts. In a literature review on lilliputian hallucinations, a rare phenomenon with numerous causes, 6 of 226 cases (3%) involved tiny people carrying out sexually explicit acts entailing visual, auditory, somatic, or tactile sensations.<sup>17–23</sup> Of these six cases, four (67%) involved a schizophrenia spectrum disorder. Delusions of sex change were reported for 26% of 127 people diagnosed with schizophrenia.<sup>24,25</sup> Although coenesthetic hallucinations involving sex change are not always easy to distinguish from transgenderism or gender dysphoria,<sup>26,27</sup> we have, on the basis of the descriptions given, decided to include these cases in our overview.

The 11 prevalence studies we identified yielded a broad but suggestive range of prevalences. Blom and Mangoenkarso<sup>1</sup> found a



**Figure 3.** Distribution of clinical diagnoses for sexual hallucinations (in percentages; N = 351). In this diagram the group “miscellaneous” comprises single cases of obsessive-compulsive disorder, Charles Bonnet syndrome, migraine, status after thyroidectomy, neuroborreliosis, limbic encephalitis, postencephalitic state, non-REM sleep parasomnia, intoxication with caffeine citrate, and posttraumatic stress disorder (two cases).



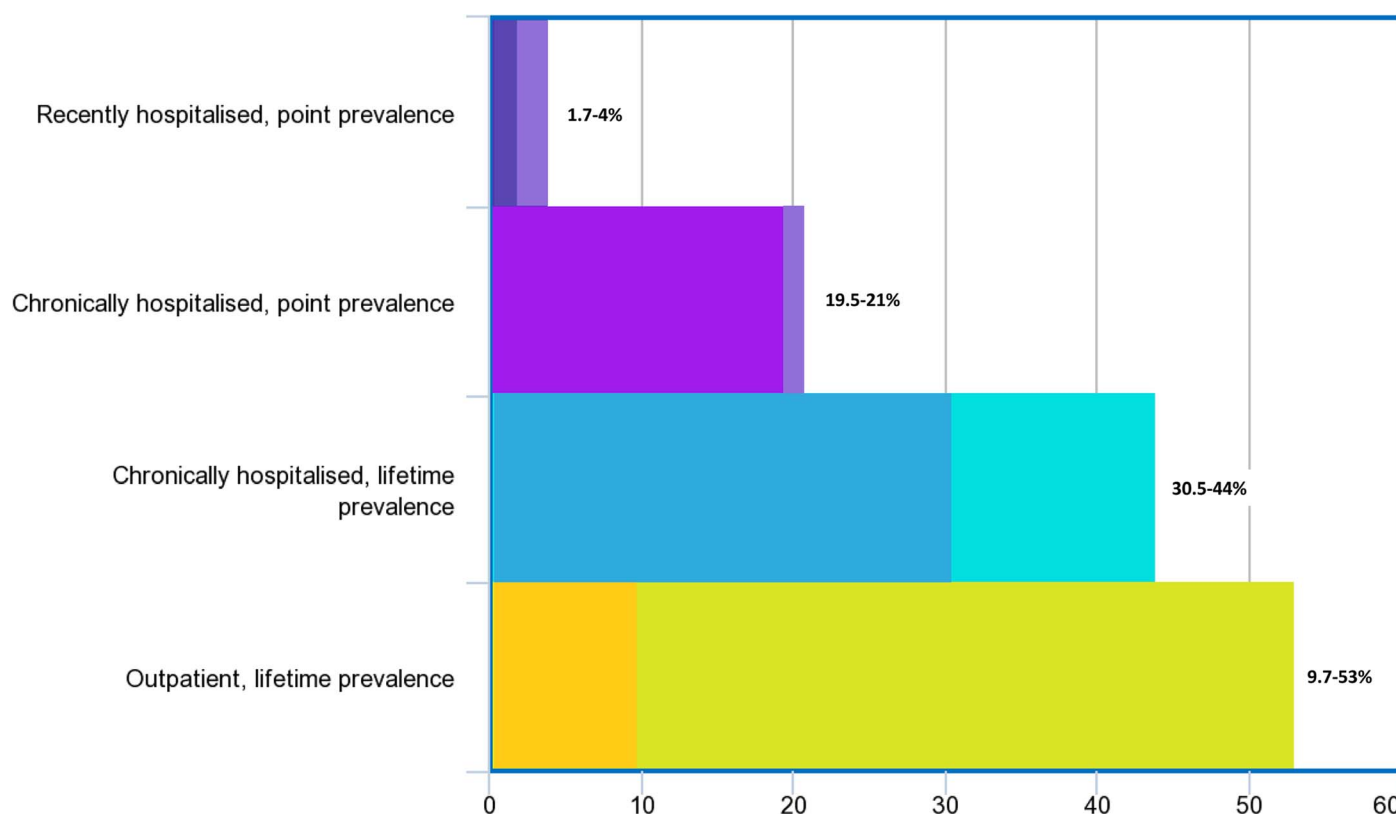
one-year prevalence of 1.7% in 778 clinical patients, while Small and colleagues<sup>28</sup> reported a rate of 4% for 50 recently hospitalized patients. In a group of 167 chronically hospitalized patients, Gerges and colleagues<sup>29</sup> recently found a current rate of 21%, and in a similar group of 113 patients, Lyketsos and colleagues<sup>30</sup> earlier computed a current rate of 19.5%. In their study, Gerges and colleagues<sup>29</sup> mention a lifetime prevalence of 30.5%, whereas five decades earlier in a similar but entirely female population, Gittleson and Dawson-Butterworth<sup>25</sup> found a lifetime prevalence of 44% for genital hallucinations. According to Lebovitz and colleagues,<sup>31</sup> of 40 voice hearers receiving treatment at an outpatient clinic, 53% reported that the utterances had a sexual content, while an unknown proportion also experienced bodily sexual hallucinations. In 92 outpatients at ultrahigh risk of psychosis, Thompson and colleagues<sup>32</sup> found a lifetime prevalence of 9.7%.

These figures stem from studies with varying populations and methodologies, and should by no means be taken for actual prevalence figures. The pattern they suggest, however, is that the point prevalence of sexual hallucinations in recently hospitalized patients with schizophrenia spectrum disorders lies between 1.7% and 4%, the point prevalence in chronically hospitalized patients between 19.5% and 21%, and the lifetime prevalence in chronically hospitalized patients between 30.5% and 44% (Figure 4). In other words, the prevalence of sexual hallucinations appears to increase in proportion to the duration and severity of psychosis. The other way around, it might imply that sexual hallucinations that go unrecognized

(and thus untreated) predispose for a more chronic course, although this hypothesis is obviously in need of further study. By comparison, the lifetime prevalence in (at-risk) outpatient populations—lying between 9.7% and 53%—then appears to be rather high. The reason may be that the studies reporting on outpatients included hearing voices with a sexual content, whereas most other studies did not. What all studies indicate is that sexual hallucinations are extremely diverse in schizophrenia spectrum disorders, and far from rare. Moreover, three studies revealed strong associations with previous (sexual) trauma, with odds ratios up to 8.7, meaning that the chance of developing sexual hallucinations was almost nine times higher for psychotic patients with a trauma history than for those without.<sup>1,12,31</sup> In conformity with the dopamine hypothesis, antipsychotics are the treatment of choice for sexual hallucinations in the context of schizophrenia spectrum disorders—which in 43% of the cases described ( $n = 14$ ) led to full recovery, in 50% to partial recovery, and in 7% to a refractory state. In therapy-resistant cases, clozapine (or clozapine-plus) may be considered, even though we did not find any reports on this for sexual hallucinations as such. What we did find were two case reports on electroconvulsive treatment plus antipsychotics, one of which led to full, and one to partial, recovery.<sup>33</sup>

### Epilepsy

A relation between sexual hallucinations and epilepsy has been suspected since antiquity, especially in relation to ecstatic visions

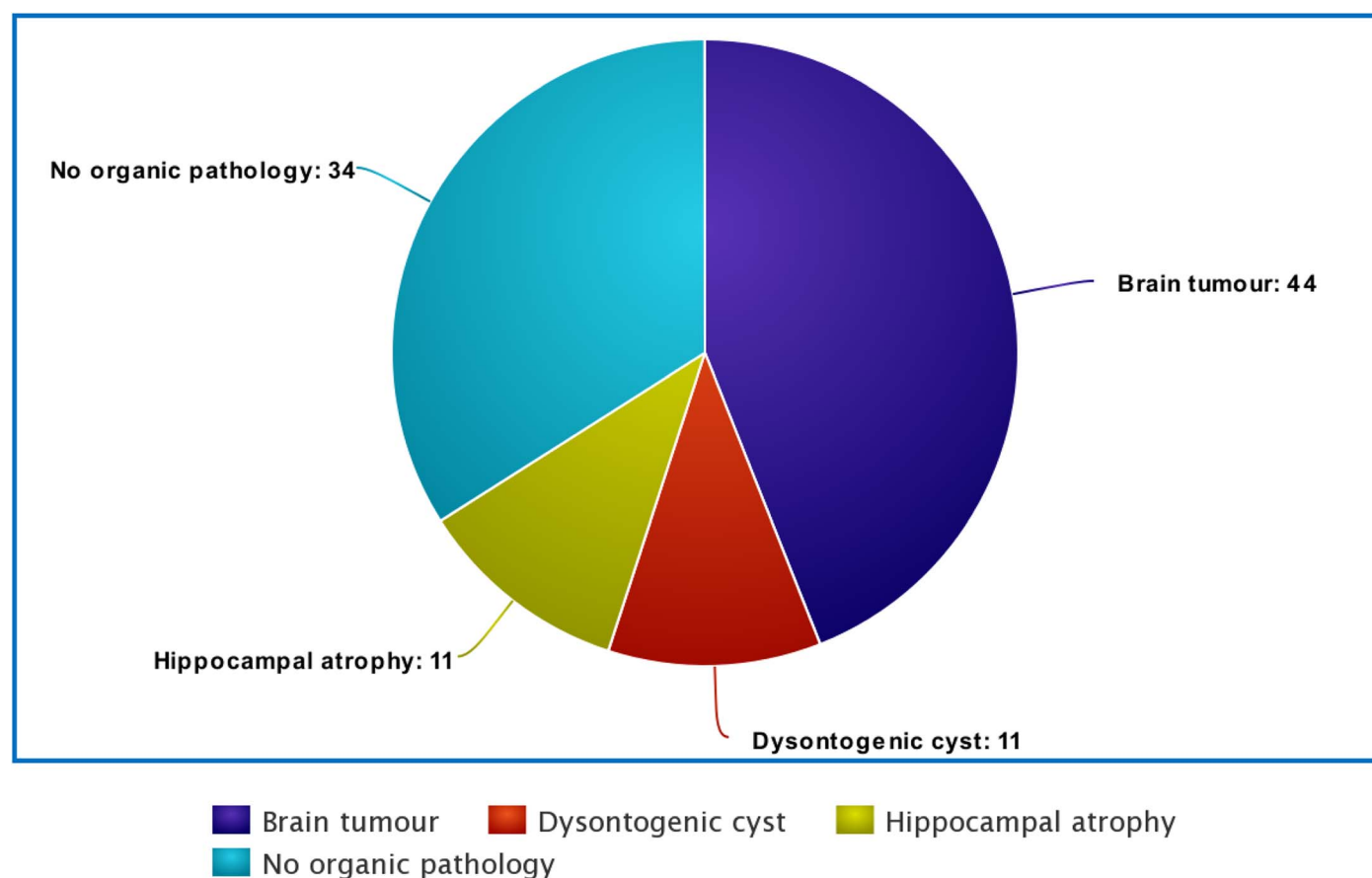


**Figure 4.** Prevalences (in percentages) of sexual hallucinations in subgroups of people diagnosed with schizophrenia spectrum disorders ( $n = 282$ ).

and orgasmic seizures.<sup>34</sup> Very little is known, however, about the frequency and content of *ictal sexual hallucinations*, likely because most patients are amnesic for ictal experiences. Nonetheless, we found seven cases, including one involving reflex epilepsy in a woman who, during tooth brushing, experienced sexual arousal and orgasmic sensations, followed by seizures (“tooth-brushing-induced epilepsy”).<sup>35–40</sup> In a study among 100 patients experiencing paroxysmal visceral symptoms during epileptic seizures, Mulder and colleagues<sup>41</sup> found two more cases of ictal genital/sexual hallucinations. In all, three (33%) of the nine cases that we found involved parietal-lobe epilepsy and two (22%), temporal-lobe epilepsy. Four of these ictal cases (44%) were due to brain tumors, one to a dysontogenetic cyst (11%), and one to hippocampal atrophy (11%). Although based on a small number of studies, these cases indicate that organic cerebral pathology should be taken into consideration in ictal sexual hallucinations (Figure 5).

*Sexual hallucinations experienced as auras* have been documented more extensively. Of the 46 published cases that we retrieved, all but one involved women.<sup>42</sup> Most reports (59%) described temporal-lobe epilepsy with orgasmic auras, with or without bodily sexual hallucinations. The majority of these cases were characterized as embarrassing but pleasant. One woman even lowered the dose of her antiepileptics to increase the number of random orgasms, while another regretted the

surgery she had undergone for a brain tumor; she missed the random episodes of intense sexual arousal that she had become used to.<sup>43,44</sup> These accounts stand in stark contrast to that of a woman who experienced unbidden sexual arousal accompanied by visual sexual hallucinations that made her weep from desperation.<sup>45</sup> Kasper and colleagues<sup>46</sup> described a woman who experienced an ego-dystonic gender transformation concomitant with epileptic seizures secondary to a cystic lesion in the right nucleus amygdalae. The alterations described by this woman entailed hairy arms, a deep voice, and the conviction that she had turned into a man (coenesthetic sexual hallucination). Another special case involves orgasmic and other sexual hallucinations experienced to the face (extracampine sexual hallucinations; i.e., hallucinations experienced outside the regular field of perception).<sup>42</sup> Sometimes sexually charged phenomena may be hard to categorize. Thus, Hansen and Brodtkorb<sup>34</sup> described a man who reported an “oscillating erotic sensation, like twinkling polar light” and a woman who could “sense the colours red and orange without seeing them. The feeling has an erotic aspect. It starts in the stomach and spreads upwards. It is pleasant, but not similar to ordinary joy. It is like an explosion.” In other cases it can be difficult to determine the exact cause of the sexual hallucinations. Jastak and Malamed,<sup>47</sup> for instance, report on a young woman with epilepsy who awoke after a nitrous-oxide-assisted dental



**Figure 5.** Underlying organic pathology in ictal sexual hallucinations, in percentages (n = 9).

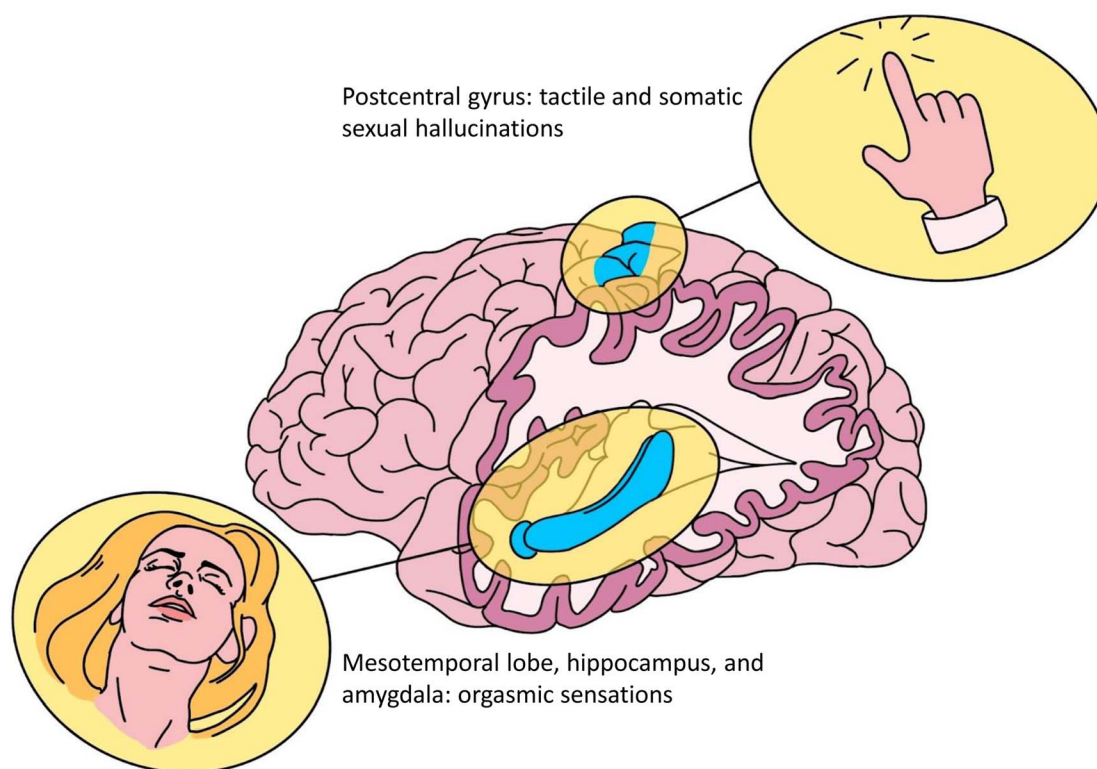
procedure while experiencing “sexual stimulation.”<sup>47</sup> In her case it was unclear whether the hallucinations were epileptic in nature or due to the anesthetic administered. Based on the limited number of studies carried out in this area, in orgasmic auras the hippocampus, amygdala, and mesial temporal lobe of the nondominant hemisphere appear to be involved most often, whereas in tactile and somatic hallucinations it is presumably the postcentral gyrus that is involved (Figure 6).<sup>48–50</sup> The first line of treatment in all epilepsy-related sexual hallucinations is antiepileptics except when a demonstrable underlying organic disorder is present, which was the case in 54% of the studies on epilepsy that we reviewed (Figure 7). Treatment with antiepileptics was mentioned in 36% of the reports, which in 63% of the cases led to full, and in 19% to partial, recovery. Surgery (often in combination with antiepileptics) was described in 34% of the reports, with an 87% full recovery rate and a 7% partial recovery rate (although it should be noted that some patients died within months post-surgery due to complications or tumor regrowth). Most surgical interventions involved the resection of tumors or sclerotic areas. Amygdalohippocampectomy is also advocated sometimes even though this procedure introduces the risk of disrupting the physiological sexual response cycle.<sup>51</sup>

### The Incubus Phenomenon

The incubus phenomenon is an entity experience that may occur in the context of sleep paralysis. It mostly presents in

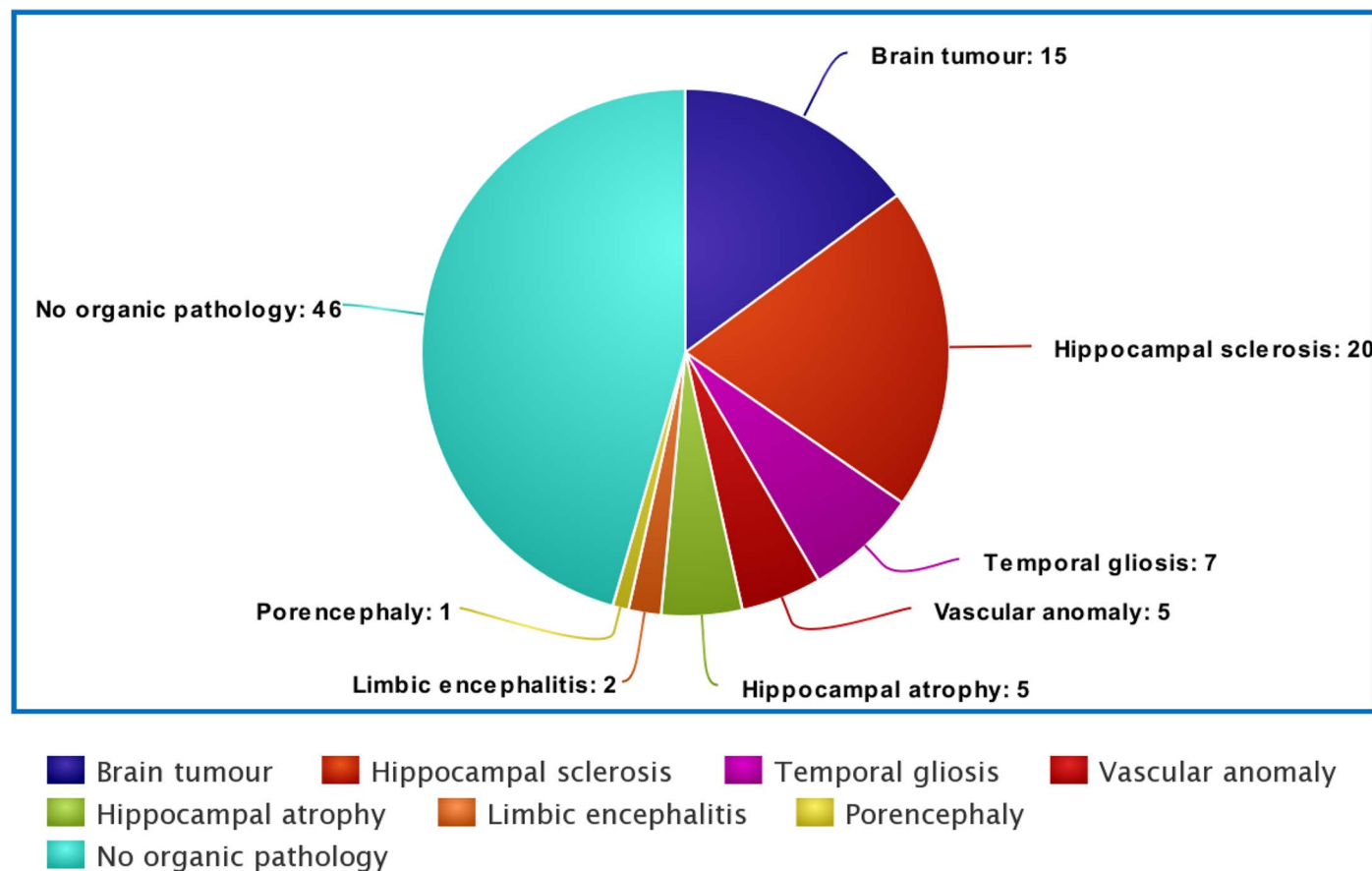
the form of a compound hallucination mimicking an actual person or creature that is seen or felt sitting on the thorax, where it exerts pressure and carries out aggressive or sexually explicit acts. While the sexual element of this experience has been described in numerous texts since antiquity,<sup>52,53</sup> and some authors even today characterize the incubus as “the demon lover,”<sup>33,54</sup> only a few present-day studies detail this specific manifestation. One possible explanation is that the Waterloo Unusual Sleep Experiences Questionnaire, which has been used in the majority of sleep-paralysis studies from the 1990s onward, does not assess the condition’s possible sexual connotations. Nonetheless, Cheyne and colleagues,<sup>55</sup> who developed the questionnaire, described 13 women (from a group of 1273 undergraduate students) who characterized their incubus experiences “as feeling very much like being sexually assaulted or raped.”<sup>55</sup> The authors computed a concomitant prevalence of 1% (or 4% of the people reporting an incubus phenomenon in this group). Since the lifetime prevalence of the incubus phenomenon in the general population lies around 10%, this implies that one in every 250 people experiences sexually laden variants at least once during their lives, making it the most frequent type of sexual hallucination altogether.<sup>56</sup> Whether this is actually the case needs further study, but since most people experience the incubus phenomenon only once during their lifetimes, in most cases reassurance and psychoeducation will suffice.

In the scientific literature we found 15 case descriptions of sexually charged incubus phenomena. All but one of these



**Figure 6.** Brain areas involved in tactile and somatic sexual hallucinations and in unbidden orgasms; left lateral view with temporal lobe partly removed to expose the amygdala and hippocampus. Based on Penfield & Rasmussen (1950),<sup>48</sup> Surbeck et al. (2013),<sup>49</sup> and Chaton et al. (2018).<sup>50</sup> © 2022 Esther Blom





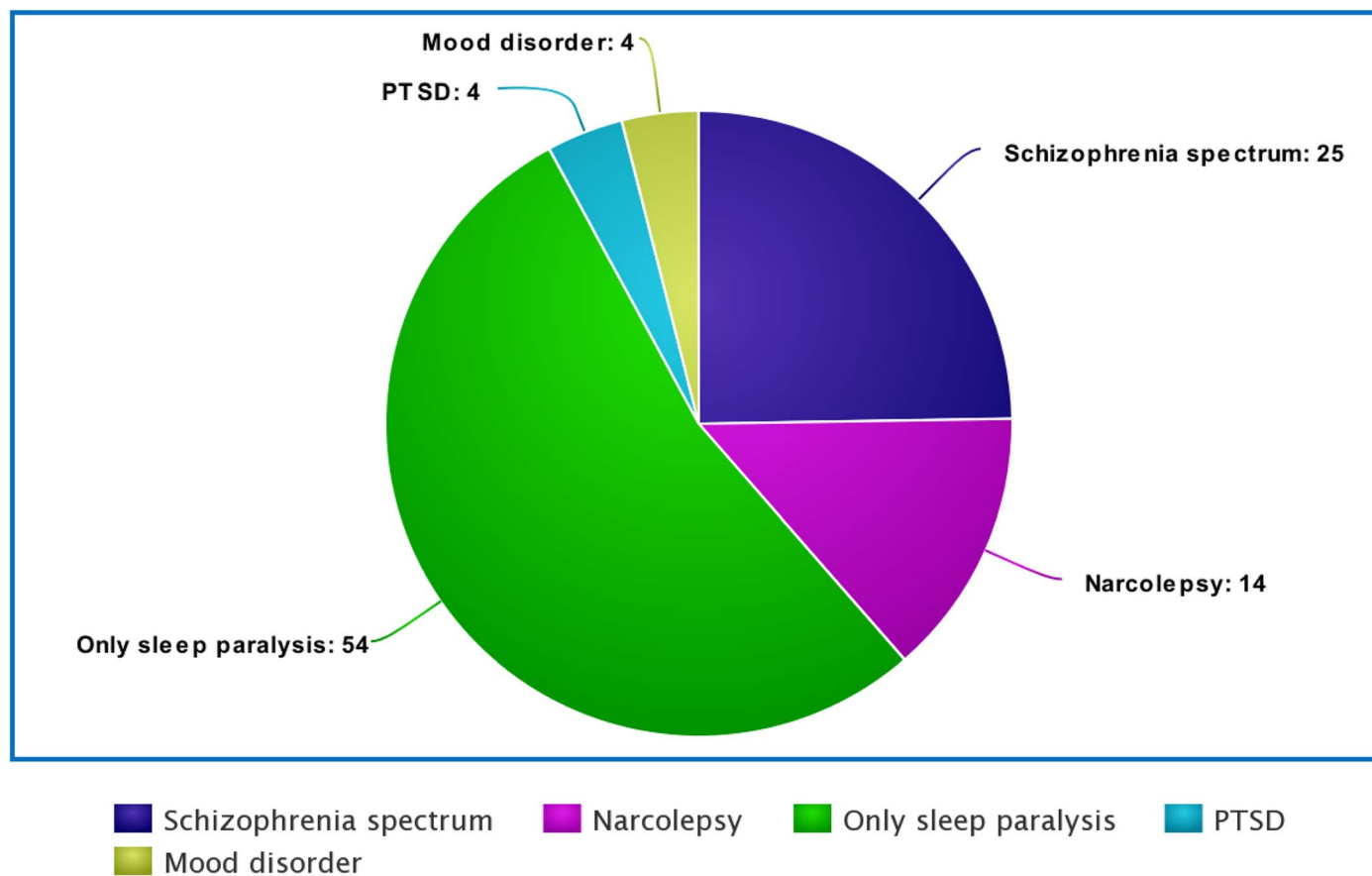
**Figure 7.** Underlying organic pathology in sexual hallucinations experienced as auras in epilepsy, in percentages (n = 44).

had occurred during sleep paralysis, and all but two involved people with comorbid or underlying diagnoses. Figure 8 shows the distribution of the diagnoses for all 28 cases, including the 13 cases reported by Cheyne and colleagues.<sup>55</sup> Of note, four of these cases were described in the context of narcolepsy (see below). The above-mentioned atypical case without sleep paralysis involved a woman who, every night, for four years in a row, sensed that she was having sexual intercourse with a young man lying on top of her. She was diagnosed with a psychotic disorder and treated successfully with olanzapine.<sup>57</sup> Physiologically, the incubus phenomenon is attributed to a dissociation of sleep phases that produces states of (apparent) wakefulness and intrusions of hallucinoid phenomena. People undergoing this entity experience accordingly tend to be convinced that they are awake even though spectral EEG analyses indicate that their state of consciousness shows similarities to that in false awakening.<sup>58</sup> This suggests that the incubus phenomenon transpires during an intermediary state between wakefulness and rapid-eye-movement (REM) sleep, with intermingled aspects of both consciousness states playing specific roles. It has been suggested that the content of these phenomena may stem from prior sexual trauma, although this hypothesis has not been corroborated by empirical studies.<sup>57</sup> Thus, in a group of 31 people with sleep paralysis, only one participant linked her experiences to abuse

memories.<sup>59</sup> Instead, an important role in the mediation of the incubus phenomenon is assigned to the limbic system with its function in selecting and elaborating dream plots.<sup>60</sup> Along with the amygdala, the nucleus basalis of Meynert, and several related structures, the limbic system constitutes the brain's threat-activated vigilance system, which typically reacts to external threat cues by disambiguating them so as to gain a quick impression of their (potentially lethal) nature. The incubus phenomenon is considered the false-positive result of this system in that it is a reaction to *endogenously* mediated stimuli (notably sleep paralysis), followed by a series of self-reinforcing arousal mechanisms.<sup>61</sup> And as mentioned above, since most people will experience the incubus phenomenon only once during their lifetimes, in most cases reassurance and psychoeducation will suffice. In recurring cases, a polysomnographic evaluation may be useful, with treatment, if necessary, of any underlying sleep disorders.

### Narcolepsy

Sexual hallucinations in the context of narcolepsy have hardly been described, but published cases suggest that these are highly realistic and disruptive. We retrieved eight case descriptions, seven of which involved lively multimodal experiences of repeated sexual violence. Four individuals described by Hays,<sup>62</sup> for instance, were fully convinced that they had



**Figure 8.** Sexual hallucinations in the context of the incubus phenomenon, with distribution of comorbid pathology, in percentages (n = 28). Note that all but one case coincided with sleep paralysis.

been the victim of rape and other sexual assaults multiple times throughout their lives. In these four cases, the accompanying state of sleep paralysis may have added substantially to the sense of dread. All four had previously been misdiagnosed with affective or psychotic disorders, and three of them—once diagnosed correctly—had benefited from treatment with amphetamines. Szücs and colleagues<sup>63</sup> report on two similar cases. One of the people described by them had even filed a complaint of sexual assault with the police, only to realize later that it was impossible for this situation to have actually taken place. Stein and colleagues<sup>10</sup> described the case of a woman who had developed narcolepsy with cataplexy secondary to neuroborreliosis and who, upon closure of the eyes, experienced multimodal sexual hallucinations.<sup>10</sup> When, after seven years, she was treated with intravenous ceftriaxone, she showed partial recovery. Finally, Coelho and colleagues<sup>64</sup> recount the atypical case of a man with narcolepsy who, during sexual intercourse, had out-of-body experiences and saw himself from above making love to his wife. As in other instances of narcolepsy, the first choice of treatment in such cases is a stimulant.

### Sedatives

Sexual hallucinations in the context of sedative use have been reported since 1846, the year that ether was introduced as an

anesthetic.<sup>65,66</sup> Most of the early reports involved chloroform or ether, whereas more recent reports involve nitrous oxide, propofol (whether or not in combination with fentanyl or sufentanil), methohexital, and benzodiazepines. Despite the large number of articles on this topic, we found only 17 original case descriptions. Moreover, the prevalence of these hallucinations is uncertain. Several large-scale studies that screened for sexual hallucinations in the context of sedative use failed to identify any cases.<sup>67–69</sup> However, in a study of 1500 women who had undergone endoscopy or dental treatment, Dundee<sup>70</sup> identified four who had complained of sexual assault during the procedure. All four had been sedated with midazolam in dosages of  $\geq 0.1$  mg/kg body weight, whereas none in the group with lower dosages had reported sexually laden incidents.<sup>67</sup> On the basis of earlier safety studies, Dundee<sup>70</sup> calculated that the incidence of sexual hallucinations under the influence of low dosages of midazolam must lie between 1:50,000 and 1:100,000, whereas the incidence is 1:200 for higher dosages. The mechanism underlying these hallucinations is probably best accounted for by the perceptual release model, which holds that memories, dream content, and fantasies may be “projected outward” in the form of hallucinations during states of lowered consciousness, analogous to the way that dreams and hypnotic hallucinations are mediated.<sup>9,71,72</sup> Empirical

evidence for this mechanism stems from a prospective study by Yang and Yi<sup>73</sup> among 300 women who had undergone abortion with the aid of propofol and fentanyl, of whom 10% reported vivid sexual dreams during recovery from the anesthesia. It has been suggested that this mechanism involves the activation of basal forebrain cholinergic neurons, which also play a role in the physiology of dreaming.<sup>74</sup> Although the majority of sexual hallucinations described in the context of sedative use were rated as negative and undesirable, they were all brief and self-limiting and never warranted any type of treatment. Since several instances of actual sexual abuse under anesthesia were falsely claimed to be sedative-induced sexual hallucinations, we will pay further attention to this issue in the Discussion.

### Substance Use

Among the many substances that may induce sexual hallucinations, during the nineteenth century Parish already listed belladonna, opioids, and nitrous oxide, while other historical reports also mention chloroform and ether.<sup>3,65</sup> Opioid-induced hallucinations are often described as blissful, paradisiacal, or sexually charged, and 10%–18% of people addicted to opioids report orgasm-like sensations while using heroin or cocaine.<sup>75,76</sup> In a retrospective study of 402 case records of patients treated for delirium tremens, a decrease in the number of hallucinations involving animals (zoopsia) was found between 1897 and 1985, and a simultaneous increase in the number of sexual hallucinations.<sup>77</sup> It is unknown whether this change was due to actual changes in the frequencies of these hallucinations or to changes in people's notions of what they can share with their treating health professionals. After all, a similar trend was seen in the reporting of sexual dreams, which, in a study among healthy women, increased from 36% to 72% between 1958 and 1996.<sup>78</sup> Although case reports and small case series thus suggest that sexual hallucinations are common in substance abuse, prevalences are unknown. Treatment can probably be limited to the discontinuation of the substance used, although it is as yet unknown whether sexual hallucinations may perhaps also be experienced in the form of recurring flashbacks in hallucinogen persisting perception disorder (HPPD).<sup>79</sup>

### Posttraumatic Stress Disorder

Sexual hallucinations in posttraumatic stress disorder (PTSD) may present as faithful reexperiences of traumatic events or as variations thereof, especially when they take the form of reperceptive hallucinations.<sup>80</sup> Although numerous studies describe (sexual) trauma as a risk factor for verbal auditory hallucinations,<sup>81–85</sup> we were able to retrieve hardly any studies that specifically linked trauma, PTSD, and sexual hallucinations. In an older study, Ellenson<sup>14</sup> reported on 60 incest survivors, all of whom experienced visual hallucinations of shadowy figures that were described as dark, featureless silhouettes, often male, and often threatening in nature. In Ellenson's study other sensory modalities were sometimes also involved, such as the auditory (whispers, voices), olfactory, and tactile modalities, but only one woman actually talked of sexual hallucinations.

Moreover, this last was in the context of an incubus phenomenon. In sum, we suspect that PTSD is a condition in which sexual hallucinations might be more common than currently known, but empirical studies need to be conducted.

### Miscellaneous

Finally, sexual hallucinations have also been documented for hypoparathyroidism, migraine, paraneoplastic limbic encephalitis, non-REM sleep parasomnia, and obsessive-compulsive disorder.<sup>86–90</sup> One other case involves visual sexual hallucinations after cataract surgery (i.e., Charles Bonnet syndrome).<sup>22</sup> Based on our clinical experience, we believe that sexual hallucinations may also be common in the context of borderline personality disorder. Although we were unable to find any case reports to back up this assumption, we did find qualitative studies that describe the sexual overtones of hallucinations that are experienced, including women's reports of sensations of their private parts being touched.<sup>91,92</sup> Other reasons for expecting sexual hallucinations in borderline personality disorder are (1) the relatively high prevalence of sexual trauma, with rates varying from 26% to 71%, (2) the strong association between (sexual) trauma and sexual hallucinations in other patient groups,<sup>1</sup> and (3) the repeated and consistent finding that individuals with borderline personality disorder also experience other types of hallucinations, with prevalences ranging from 13% to 60%.<sup>1,12,29,93–95</sup> These findings are at odds with the traditional views that hallucinations are rare in borderline personality disorder and that at their worst they are of a fleeting and self-limiting nature. And yet the studies cited indicate that hallucinations in this group are phenomenologically indistinguishable from those experienced by people with a schizophrenia spectrum disorder, that certainly not all of them are of a fleeting nature, and that the burden they may cause is often high.<sup>93,96</sup> Taken together, these findings support our presumption that sexual hallucinations are in need of careful analysis in this group, while also taking into account the previous findings by Niemantsverdriet and colleagues<sup>94</sup> and Slotema and colleagues<sup>97</sup> that comorbidity with other disorders may also play a role.

### DISCUSSION

The data analyzed in the present study suggest that sexual hallucinations are not rare but merely underreported, and that they occur in various clinical contexts (which, moreover, warrant diverging therapeutic approaches). With lifetime prevalences of up to 44% in chronic subpopulations, especially in schizophrenia spectrum disorders, they are surprisingly frequent. In an earlier study, Lim and colleagues<sup>98</sup> found that in schizophrenia spectrum disorders, multimodal hallucinations are more prevalent than unimodal ones (53% versus 27%), including auditory ones, which have long been considered the most characteristic type of hallucination in this group.<sup>98</sup> Since sexual hallucinations were not covered in Lim's study or in any of the ten large epidemiological studies that preceded it, sexual hallucinations may well have been missed in these earlier studies or have been filed away under the general heading of

“multimodal hallucinations.”<sup>99</sup> This is exactly the reason why we advocate the extended classification of hallucinations presented in the Introduction, and why we think it is of vital importance to use the term *sexual hallucination* when applicable. These phenomena were already described during the era of classical psychiatry, and there is no reason to believe that they ceased to exist. On the contrary, the present study demonstrates that people still suffer from them, and probably in much larger numbers than currently known. So, if they are rarely described today, they have been merely overlooked because of the widespread tradition in clinical psychiatry to limit the number of sensory modalities to five. An adjuvant reason may be the equally widespread tradition to neglect the content of hallucinations.<sup>100</sup> This is not the place to discuss the merits of the traditional form-based approach to psychopathology, but in recent years it has become clear that attention to content may be of substantial aid in establishing the origin of hallucinations and in weighing therapeutic options.<sup>85</sup> In sum, as regards the hallucinations under discussion here, we believe that stressing their sexual content and addressing them as “sexual hallucinations” are in many cases of vital importance for diagnosis and treatment.

### Phenomenological Continuum

Although the sexual hallucinations reported on in different subgroups somewhat overlap, and their phenomenology in relation to diverging underlying conditions is in need of further elucidation, a number of differences may facilitate their diagnosis in clinical practice.

- In epilepsy, the majority of sexual hallucinations take the shape of unbidden sexual arousal, orgasms, and states of sexual bliss. Except for their brief and paroxysmal nature, they thus tend to resemble what people experience in persistent genital arousal disorder (with some publications actually attributing instances of PGAD to epilepsy).
- In the context of sedative use, they tend to be genital/tactile in nature, brief, and self-limiting.
- In schizophrenia spectrum disorders, the hallucinated sensations may involve any of the sensory modalities either separately or concurrently, varying from hallucinated whispers with a sexual content to compound personifications carrying out sexual acts. Alternatively, the hallucinations may constitute “projections” perceived outside oneself, either in three-dimensional space or as if projected on a screen.
- In narcolepsy and the incubus phenomenon, they are most often described as dream-like sequences featuring graphic unbidden sexual acts in which, as a rule, people vividly experience themselves being victimized by someone or something. The extreme sense of dread in these latter instances appears to be connected with the feeling of powerlessness that comes with muscle atonia.

The distress induced by sexual hallucinations tends to be high. The only exceptions that we came across were some aura phenomena in the context of epilepsy (notably, orgasmic

auras) and some types of sexual hallucination in patients with schizophrenia spectrum disorder (e.g., sexually laden lilliputian hallucinations) in which the experiences were rated as positive (e.g., when perceiving erotically charged projections that people could enjoy watching).

### Underlying Mechanisms

Theoretically, sexual hallucinations can be mediated by any part of the network involved in the sexual response cycle. This network is traditionally thought to include frontal, sensory, motor, reward, and brain stem regions (i.e., orbitofrontal cortex, nucleus accumbens, insula, anterior cingulate cortex, operculum, right angular gyrus, paracentral lobule, amygdala, hippocampus, hypothalamus, ventral tegmental area, dorsal raphe, and cerebellum).<sup>101</sup> In actual practice, however, the network is much larger, recruiting temporal areas for auditory, occipital, and temporal areas for visual, and areas at the temporo-parieto-occipital junction for coenesthetic, sexual hallucinations. Only a few empirical studies have captured underlying mechanisms while people were actively hallucinating. Among them are EEG and neuroimaging studies of people experiencing orgasmic auras. These studies indicate that the mesial temporal lobe of the right (or nondominant) hemisphere is involved, as well as the right amygdala and hippocampus.<sup>48,102</sup> By contrast, genital hallucinations are primarily linked to the genital projection zone of the sensory cortex.<sup>103</sup> In male participants, electrical stimulation of the posterior part of the frontal lobe, moreover, resulted in sexual arousal and ejaculation, whereas stimulation of the postcentral gyrus resulted in genital hallucinations.<sup>49,104</sup> In female participants, electrical stimulation of the left and right hippocampus and of the right amygdala mediated orgasmic sensations.<sup>49,50</sup> Ruff<sup>38</sup> described a woman with a tumor in the superior postcentral gyrus who experienced clitoral warmth, breast engorgement, and paroxysmal orgasms, as well as a man with a tumor compressing the superior postcentral gyrus who experienced genital warmth, erections, ejaculations, and orgasms.<sup>38</sup> Whether sexual hallucinations are exclusively attributable to central mechanisms like these, as opposed to PGAD (which, in many instances, is attributed to peripheral mechanisms) is in need of further study. The same holds true for the role played by specific parts of the central network in relation both to phenomenologically different sexual hallucinations (such as visual, auditory, and coenesthetic ones) and to those with different etiologies (e.g., epilepsy, substance use, trauma).

### Controversy: Sexual Hallucinations and Sedatives

Ever since the earliest use of ether, the association of sexual hallucinations with the use of sedatives has remained a controversial topic. In 1847 (i.e., a year after the introduction of ether as an anesthetic) two young women accused their dentist of sexual abuse while they were under the influence of ether. One of these cases held up in court, with the dentist being convicted and sentenced to prison.<sup>105</sup> As documented in the medical literature and in civil and criminal proceedings, during the 1840s and 1850s the issue of real versus hallucinated



sexual violations in the context of anesthesia practice was hotly debated.<sup>65</sup> It was not until well over a century later, during the early 1980s, that this issue aroused new interest due to the wide media coverage of then-recent accusations of sexual misconduct by health professionals. During the decade that followed, Dundee<sup>106</sup> collected data on 41 alleged assaults under the influence of intravenous midazolam or diazepam, 27 of which contained an element of sexuality.<sup>106</sup> Eventually, seven of these cases led to lawsuits. Obviously, both parties involved in such cases have much at stake. During the late 1980s, most countries hence implemented codes of conduct for practitioners working with sedatives—codes designed to safeguard both parties.<sup>107</sup> Whether much has improved since then remains unknown, especially since these phenomena are difficult to assess in a systematic way. Judging by a recent review on the topic, awareness, at least, has been increased.<sup>108</sup> That sedative-related sexual experiences almost exclusively involve women in vulnerable positions remains a salient detail.<sup>109</sup> It also stands in stark contrast to the sex ratio of 1.4:1 for sexual hallucinations in the general population. Another salient detail is that we retrieved no more than 17 medical case descriptions of sexual hallucinations in association with sedative use, whereas in 1990 Dundee<sup>67</sup> had already found 27 medicolegal cases. If anything, these numbers indicate that each and every accusation deserves proper medical *and* medicolegal evaluation, and that adherence to safety protocols when working with sedatives is paramount to the protection of both parties.

### Limitations

The present article constitutes the first overview of sexual hallucinations in different clinical contexts, but with no more than 390 cases analyzed, it is far from definitive. Moreover, since the studies reviewed lacked a uniform design, most are in need of replication in larger populations with, most preferably, uniform criteria and research methods.

### Conclusions

Although sexual hallucinations have been described since antiquity, they are still little-known, underreported phenomena. Probable reasons for this are (1) ignorance among patients *and* health professionals of sexual hallucinations as acknowledged phenomena, (2) ignorance of the circumstances under which they may be experienced, (3) patient as well as clinician discomfort with discussing taboo subject matters, (4) feelings of vulnerability when performing or undergoing medical and dental procedures, and, as a corollary, (5) the theoretical and sometimes practical possibility of third parties selling the sensations of actual transgressive behavior as a mere hallucination. As a consequence, it is very well possible that an unknown proportion of the general population suffers in silence from these often extremely burdening and disruptive phenomena, while others already under the care of health professionals may go undiagnosed and untreated. Therefore, sexual hallucinations deserve due attention in clinical practice, especially given the

estimated lifetime prevalences of around 0.4% in the general population (due to their association with the incubus phenomenon) and of over 40% in chronically hospitalized patients with schizophrenia spectrum disorders. Sexual hallucinations equally deserve further scientific scrutiny. We recommend systematic approaches for both the study of sexual hallucinations in the general population and in well-defined target populations. Examples of the latter groups are people diagnosed with schizophrenia spectrum disorders, epilepsy, narcolepsy, PTSD, and borderline personality disorder. The same holds true for people suffering from (recurring instances of) the incubus phenomenon, and those who are exposed to sedatives and other substances. As a special point of interest, the role of sexual trauma *and* that of sexual deprivation in the mediation of these phenomena merits consideration, as does the degree of overlap between sexual hallucinations and persistent genital arousal disorder. Hopefully, future studies will provide us with evidence-based treatment guidelines for sexual hallucinations, but until then we recommend targeting the underlying disorder in clinical practice.

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