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Short communication

Visual hallucinations in psychosis

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ABSTRACT

The Dutch version of the *Visual Hallucination Questionnaire* was used to assess lifetime visual hallucinations (VH) characteristics in 27 patients with psychosis. Our results confirmed substantial variance in many VH characteristics. Most patients reported multiple VH types. Complex VH were most prevalent, mainly consisting of people and animals, followed by simple, then geometric VH. Few patients experienced only simple VH. The VH generally had features resembling real perceptions. Insight was usually reduced. VH ranged from 'appropriate' and neutral to peculiar and delusion-associated. VH accompanied by fright and sound seem to be related to experiencing complex or multiple types of VH.

1. Introduction

Visual hallucinations (VH)[1] are defined as visually perceiving something while there is no external stimulus (Blom, 2015). VH occur in a wide range of neurological, psychiatric and eye diseases (Onofrj et al., 2015). However, VH are also experienced by about 17 per 1000 nonclinical persons per year (Tien, 1991). VH are traditionally divided into unformed (simple), geometric and formed (complex) types (Blom, 2013). Examples of simple VH include flashes of light and shapeless colors. Geometric VH include spider webs, honeycombs, gratings and spirals. Complex VH include faces, people, animals and landscapes. Research into the phenomenology of VH in various diseases is expanding (see (Onofrj et al., 2015)). However, little research into the clinical characteristics of VH in psychosis has been published, with only a few recent studies (Frieske and Wilson, 1966; Gauntlett-Gilbert and Kuipers, 2003; Goodwin et al., 1971; Mueser et al., 1990; Small et al., 1966). Moreover, different questionnaires are used in various diseases, making it difficult to compare outcomes. In the current study we therefore explored the clinical characteristics of VH in psychotic disorders based on a questionnaire that has previously been used in Parkinson's Disease Dementia (PDD) and Dementia with Lewy Bodies (DLB) (Mosimann et al., 2006; Santhouse et al., 2000). The aim was to expand the scarce knowledge about the phenomenology of VH in psychosis. Based on previous research, we hypothesized that VH content and characteristics are highly variable (Onofrj et al., 2015; Waters et al., 2014), and that they include simple, geometric and complex VH, with complex VH of animals and figures being most common. We also hypothesized that VH in psychosis are associated with reduced insight and a feeling of lack of control, and that they can have a personal, frightening, and supernatural character. Finally, we compared clinical characteristics of VH in psychosis those in PDD/DLB, using a similar questionnaire. To the best of our knowledge, this was the first such comparison that has been made.

2. Methods

2.1. Participants

The present study was part of a larger study (INZICHT part 1, registered in the Netherlands Trial Register (http://trialregister.nl, NTR5103)). Patients were recruited via the GROUP study (Korver et al., 2012), the University Center of Psychiatry (University Medical Center Groningen), the Lentis Center for Mental Health (for Groningen and Winschoten) and Anoiksis (the patients association of psychotic disorders).

The general inclusion criteria were the following: age between 18 and 55, proficiency in spoken Dutch and ability to give informed consent. Patients also had to meet DSM-IV-TR criteria for schizophrenia, schizophreniform disorder, schizoaffective disorder or psychotic disorder NOS (American Psychiatric Association, 2000). In case of

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[1] VH: visual hallucinations; [2] PDD: Parkinson's Disease with Dementia; [3] DLB: Dementia with Lewy Bodies

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psychiatric comorbidity, the psychotic disorder had to be predominating. For the phenomenology component of the study, only patients with VH (VH patients and VH-prone patients) were included, and the VH had to be related to the psychotic disorder. These last two criteria were evaluated by the patients' own psychiatrist. Pseudohallucinations, i.e. mental images that are actively generated by the subject (Onofrj et al., 2015), were not part of this study. Exclusion criteria were the following: psychiatric or neurological disorders which would presumably affect the data, visual acuity <50% (reading chart), visual field defects (Donders technique), and cognitive impairment (<26 on the Mini-Mental State Examination (Folstein et al., 1975)).

Participants received a 25 euro coupon for participating in INZICHT part 1. Approval from the Ethical Review Board was obtained. Participants gave their written informed consent prior to participation.

2.2. Questionnaires

Lifetime clinical characteristics of VH were assessed by 'The Visual Hallucination Questionnaire' (VHQ; 'De Visuele Hallucinatie Vragenlijst' in Dutch; see Appendix A for the English translation). This clinician-administered questionnaire is based on the Institute of Psychiatry Visual Hallucinations Interview (Santhouse et al., 2000). It was translated into Dutch according to the guidelines (Acquadro et al., 2008). If necessary, phrases were adapted to the Dutch context and formulated as specifically as possible. In case of fluctuating VH, the worst period was rated.

The Comprehensive Assessment of Symptoms and History (CASH) assessed hallucinations in different modalities; a derived question was formulated for gustatory hallucinations (Andreasen et al., 1992).

2.3. Statistical analysis

Analyses were performed with Statistical Package for Social Sciences 20 (IBM Corp., USA). First, four groups were formed. Group 1 included patients who experienced VH more often than 'only a couple of times' in the last month (VH patients; including CASH97 > 1). Group 2 included VH-prone patients (including CASH97 > 1, but not meeting the criteria for VH patients). Group 3 included non-VH patients (CASH97 = 0). Demographic and illness characteristics were compared using Fisher's exact and Kruskal–Wallis tests.

For VH patients and VH-prone patients, the results of the VHQ were used to form groups based on VH complexity. There were three groups including patients with only one type of VH (simple (n = 3), geometric (n = 0), complex (n = 7)); the fourth group included patients with multiple VH types (n = 17). The following characteristics were compared between these groups: age, cognitive functioning (MMSE), illness duration, age at first psychosis, having an eye disease, the time of the first and last VH (Q12, Q13), frequency and duration of VH (Q14, Q15), insight into VH (Q22), its frightening nature (Q23) and the auditory component (Q33). Fisher's Exact Test was used to analyze categorical data, ANOVA was used for continuous data.

3. Results

In total, 45 participants were included: 18 VH patients, 10 VH-prone patients, and 17 non-VH patients. The majority of patients (n = 32) were diagnosed with schizophrenia. Of the remainder, 9 were diagnosed schizoaffective disorder, 3 with psychotic disorder NOS and 1 with schizophreniform disorder. Almost 90% used at least 1 antipsychotic. The mean age was 35.9 years (SD 9.5), the mean illness duration 13 years (SD 9.2). Most (66.7%) were male. The mean visual acuity was 105% (SD 29). There were no significant differences between the groups regarding age, sex, illness duration and visual acuity. Auditory hallucinations were the most common, followed respectively by visual, tactile, olfactory and gustatory hallucinations. The sum of the CASH scores for all hallucinations (minus VH) was significantly higher in VH patients than in VH-prone patients and non-VH patients (mean (SD): VH patients 9.1 (3.2), VH-prone patients 5.8 (4.1), non-VH patients 4.2 (4.4); VH patients versus VH-prone patients: p = 0.049, VH patients versus non-VH patients: p = 0.000).

For the patients with VH (VH patients and VH-prone patients): 55.6% were male, the mean age was 36.6 (SD 9.5), the mean illness duration was 13.7 (SD 9.0), the mean visual acuity was 100.1% (SD 29.8%). Ten patients reported having any eye disease ((mean visual acuity 97%, SD 29.0%); which is similar to patients without an eye disease ((101.9%, SD 31.1), U = 93.500, p = 0.68)). Of these 10 patients, 6 belonged to the group with multiple VH types.

Results of the VHQ are described in Table 1 (see also Appendix A). VH generally consisted of individual objects, people or figures, rather than whole scenes. Most VH had intrinsic movements, but did not move along with head or eye movements. One third of the respondents reported an auditory component to their VH. The content of VH varied substantially: 66.7% of the patients reported simple VH, 22.2% reported geometric VH, and 88.9% reported complex VH. Of these complex VH, letters, words, musical note symbols and/or numbers were hallucinated by 25.9% of the patients. Most patients (63%) reported multiple types of VH, mostly simple and complex. Overall, 11.1% of the patients reported having only simple VH and 25.9% reported only complex VH. Around 56% described their most negative VH as 'very frightening', and 15% never experienced frightening VH.

Patients rated their most frightening VH differently, depending on the VH complexity (comparing the four groups based on complexity: p = 0.04). Patients experiencing only simple VH had never been 'very' frightened by their VH, whereas most patients with complex or multiple types of VH rated their most frightening VH as 'very' frightening (complex: 4 out of 7 patients; multiple types: 11 out of 17 patients). No patients with only simple VH reported an auditory component. However, of 9 patients who reported this multimodal hallucination, 6 belonged to the group with multiple types of VH and the rest to the group with only complex VH. There were no other associations between demographic, illness or VH characteristics and VH complexity (data not shown).

4. Discussion

First, our results show that in psychosis, experiencing VH is related to experiencing hallucinations in other modalities. The most striking finding is the wide clinical spectrum of VH in psychosis. Our study confirms previous research showing that VH in psychosis can be simple, geometric and complex, both black-and-white and colored, static and dynamic, of normal size and abnormal size, and may occur during day or night (Table 1; (Frieske and Wilson, 1966; Onofrj et al., 2015; Small et al., 1966; Waters et al., 2014)). Most patients experienced multiple VH types. Complex VH were the most common category, mainly containing people and animals, confirming the general view (Waters et al., 2014). Simple VH were experienced by a majority of patients; however, experiencing only simple VH was rare. Geometric VH occurred in a minority. One patient reported VH of car accidents and people being tortured. Such scenic hallucinations with very negative content have been described previously in psychosis (Onofrj et al., 2015). The current data demonstrate that VH in psychosis generally are similar to real visual perceptions, as most of them are normal sized, solid, anchored in the external space, as previously found (Waters et al., 2014). VH in psychosis patients have been described being as detailed as real perceptions. However, in our study population less detailed VH were more common. VH can be neutral and appropriate. However, our results also support previous data, showing that VH with a frightening content are common (Waters et al., 2014), and that VH in psychosis can clearly have a delusional, personal, extraordinary or hyper-religious character (Llorca et al., 2016; Onofrj et al., 2015; Small et al., 1966). These patients generally have reduced insight, which may be enforced by the fact that VH usually did not disappear after blinking, possibly providing

Table 1
Characteristics and phenomenology of VH in psychotic disorders (n = 27)[a,b].

	N **(%)**		***N*** **(%)**
Frequency		**Comparison with true visual percepts**	
A couple of times	5 (18.5)	More detailed	3 (11.1)
<1/week for a longer period	3 (11.1)	Less detailed	12 (44.4)
About once a week	2 (7.4)	As detailed	8 (29.6)
>1/week but <1/day	4 (14.8)	Both more and less	1 (3.7)
Once or more a day	13 (48.1)	All answers possible	3 (11.1)
Duration		**Transparency**	
Short duration, <1 s	2 (7.4)	Yes	6 (22.2)
Medium duration, 1–10 s	8 (29.6)	No	13 (48.1)
Long duration, >10 s	13 (48.1)	Both	5 (18.5)
All durations, not 1 mostly	3 (11.1)	?	2 (7.4)
Almost continuous	1 (3.7)	NA	1 (3.7)
Appearance		**VH move along with head or eye movement**	
Gradually	6 (22.2)	Yes	7 (25.9)
Suddenly	18 (66.7)	No	14 (51.9)
Both, not 1 predominantly	2 (7.4)	Both	2 (7.4)
Not applicable	1 (3.7)	?	4 (14.8)
Light intensity		**VH intrinsic movement**	
Daylight	3 (11.1)	Yes	15 (55.6)
Darkness	1 (3.7)	No	6 (22.2)
Twilight	5 (18.5)	Both	4 (14.8)
During every intensity of light	17 (63.0)	?	2 (7.4)
?	1 (3.7)	**Colored**	
Part of the day		Yes	12 (44.4)
In the daytime	3 (11.1)	No	5 (18.5)
In the evening	4 (14.8)	Both	10 (37.0)
In the night	0 (0)	**Spatial frame**	
In the morning	0 (0)	One scene	3 (11.1)
?	1 (3.7)	Individual things	18 (66.7)
Every part of the day	18 (66.7)	Both	3 (11.1)
In the daytime, evening, night	1 (3.7)	?	2 (7.4)
Precipitated by optic flow motion		NA	1 (3.7)
Yes	17 (63)	**Temporal evolution**	
No	9 (33.3)	Constant	15 (55.6)
?	1 (3.7)	Changing	5 (18.5)
Occur with eyes closed		Both	7 (25.9)
Yes	16 (59.3)	**Normal size**	
No	10 (37.0)	Yes	13 (48.1)
?	1 (3.7)	No	7 (25.9)
Sensitive to blinking		Both	5 (18.5)
Yes	5 (18.5)	?	2 (7.4)
No	20 (74.1)	**Auditory component**	
?	2 (7.4)	Yes	6 (22.2)
Think VH are real		No	18 (66.7)
Never	5 (18.5)	Both	3 (11.1)
Sometimes	8 (29.6)	**Delayed temporal palinopsia**[c]	
Always	14 (51.9)	Yes	13 (48.1)
Frightened by VH		No	13 (48.1)
Not	4 (14.8)	?	1 (3.7)
A bit	3 (11.1)	**Spatial palinopsia**[d]	
Quite	5 (18.5)	Yes	9 (33.3)
Very	15 (55.6)	No	17 (63.0)
Location		?	1 (3.7)
Right in front	13 (48.1)	**Polyopia**	
In the corner	3 (11.1)	Yes, they form a row	1 (3.7)
Both	9 (33.3)	Yes, but they form no row	1 (3.7)
?	2 (7.4)	No	21 (77.8)
		All answers possible	2 (7.4)
		?	1 (3.7)
		Missing	1 (3.7)
		Example	
Simple VH[e]	18 (66.7)	The whole visual field is filled with blue and red dots. By moving his finger in the air, he was able to connect these dots with a white line, forming letters or numbers. A flash of white light. Lights. Black stains. The whole sky looked like a rainbow, it was wonderful. Colors of energy around horses prior to a horserace, because of which he was able to see which horse was going to win the race.	
Geometric VH[f]	6 (22.2)	Miniature matrix-like buildings under the desk.	

(*continued on next page*)

Table 1 (*continued*)

Frequency	*N* (%)	Comparison with true visual percepts	*N* (%)
Complex VH[g]	24 (88.9)	Glitters, changing color and shapes. Colored triangles of different sizes. A luminous yellow circle. A staircase of piled drinking glasses. Fire coming out of someone's mouth, curving towards someone's ear. Because of this, he thought the person was the anti-Christ. Yellow, illegible writing on the wall. The word 'light' in white letters, luminous. Ghosts or shadows, that can be frightening. Familiar or unfamiliar people in public places. Deceased people. Images of people on the wall, like they were projected by a slide projector. Heads flying around, without bodies. Car accidents, mutilations and tortures mostly involving other people. A green, jelly-like baby dragon slipping under the door. Spiders, bears, pig, mouse. A rhino crossing the street. Snakes crawling out of his arm. A cow in the corridor of the school building. Seeing pets (parakeet/dog) that have passed away, in their living room. A bird flying out of a glass; the glass shook. A black canvas turning into a giant spider; later on, this spider sat on a Buddha statue's lap that stands next to the bed. Blue Avatars (from a movie) on the street. People leaving red flowers on the floor for him. Seeing someone else's painting, which was exactly the same as his. He concluded that person stole his painting and copied it. Jesus and Maria. Jesus talks about love. He also corrects him: when he does something illegally, Jesus gets mad at him. The Bible visualized.	

[a] General remarks:
- This is an ad hoc translation into English for publication purposes; the actual interviews took place in Dutch.
- The '?' as an answer possibility means that the question was not understood or that the answer was Unclear.
- For Q 15, 16, 18, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 36, 47, 49, 51, 52, 56, some patients reported that multiple answers fit their VH because the characteristics of their VH were not always the same. Therefore, extra answer possibilities were added (below the '?')
- Where it says 'he', this can mean 'he' or 'she'.

[b] Eye diseases as reported by patients: 5 patients: myopia (1 belonged to the group with only simple VH, 2 to the group with only complex VH, 2 to the group with multiple types of VH). 1 patient had myopia and presbyopia (group with only simple VH). 1 patient had strabismus surgery and presbyopia and astigmatism (group with multiple types of VH). 1 patient had a history of amblyopia oculus dextra; presbyopia oculus sinistra (group with multiple types of VH). 1 patient had presbyopia and astigmatism (group with multiple types of VH). 1 patient had strabismus surgery, myopia, color blindness, disturbed depth perception (group with multiple types of VH).

[c] The perseveration of a previously viewed object after a certain time (Santhouse et al., 2000).

[d] A persistent visual image in space (Santhouse et al., 2000).

[e] 'Yes' to question 37 and/or 38 (small particles and/or flashes/lines/colors/lightning/fire).

[f] 'Yes' to question 39 and/or 40 (regular and/or irregular patterns).

[g] 'Yes' to question 42, 43, 44, 45, 46, 48, 50, 53 and/or 55 (letters, words, musical note symbols, numbers, figures, persons, faces, objects and/or animals).

a feeling of lack of control (Waters et al., 2014). In addition, our study shows that this frightening character is related to experiencing complex and multiple types of VH. Our results showed an auditory component of VH in a minority of patients, which was related to experiencing complex and multiple types of VH.

Our data shows both similarities and differences with PDD/DLB patients from the literature (Mosimann et al., 2006). VH in PDD and DLB were found to be similar, typically consisting of complex VH (Mosimann et al., 2006). VH in PDD/DLB were mostly complex, static, colored, anchored in external space, opaque and seen in the central field of view, more often being unpleasant. This was comparable to the results from psychosis patients. The frequency of VH of people is about 70% in both psychosis and PDD/DLB. VH of animals were more common in psychosis (63% versus 46/25%). Another difference is the occurrence of simple VH, being less common in PDD (46.6%) and DLB (30%) as compared to 66.7% in psychosis patients. In both psychosis and in PDD/DLB, patients rarely experience only simple VH. The descriptions of VH in PDD/DLB and psychosis are very similar, consisting of people and animals in 'appropriate' or more extraordinary situations, but sometimes being more bizarre in psychosis. Another similarity with psychosis is that polymodal hallucinations also occur in PD, but with unknown frequency (Diederich et al., 2009). One difference with PD is that VH in psychosis were less sensitive to blinking (18.5% versus 35%).

Several limitations should be reported. The main limitation is the small sample size, especially in light of the great variability in VH symptomatology. This may limit the generalizability. Secondly, 10 participants reported 'any eye disease', which could potentially contribute to VH. However, as the visual acuity and occurrence of multiple types of VH in this group were similar to the patients without an eye disease, we see no reason to consider their VH to be different. Thirdly, the VHQ (and the questionnaire used in PDD/DLB) has not been validated and it is unknown how it corresponds with other questionnaires. Moreover, some VHQ questions have limited answer possibilities, preventing a detailed description. Additional answer possibilities were therefore added (see Appendix A, the answers shown below the question marks were added). Nevertheless, we believe that the VHQ

provides very elaborate and detailed information about the clinical characteristics of VH, thus justifying its use.

Finally, we recommend using one questionnaire for a range of disorders. The recently developed 'Questionnaire for Psychotic Experiences' (Sommer et al., 2018), available in many languages and developed for different populations, assesses phenomenological characteristics of hallucinations in multiple modalities. It may therefore be a good alternative to the VHQ.

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Appendix A

Question number	Question[a]	Answers	Frequency (*n* (%))
1	Participant number		15 (55.6)
			12 (44.4)
	Age (years)		Range: 19–54; mean (SD): 36.6 (9.5)
2	How many years of education have you completed?		Range: 11–28; mean (SD): 18.4 (4.1)
3	What is your education?[d]	Range 1–8 1 = None, 2 = Elementary education 8 = University	Range: 3–8; mean (SD): 6.63 (1.3)
4	Have you ever been diagnosed with an eye disease (for example presbyopia, myopia, diplopia, cataract, glaucoma, retinitis, retinal detachment, diabetes mellitus)?	Yes	10 (37.0) [b]
		No	17 (63)
		?	0 (0)
5	What type of medication do you use?	Sedative Antidepressant Stimulatory Antipsychotic Dopaminergic Anticholinergic	6 (22.2)
		Other	1 (3.7)
		None	2 (7.4)
		Multiple types	18 (66.7)[c]
6	Has your medication been changed during the last month?	Yes	6 (22.2)
		No	21 (77.8)
		?	0 (0)
7	Have you ever had visions when you were awake, or have you ever seen things other people could not see?	Yes	27 (100)
		No	0 (0)
		?	0 (0)
8	Do the visions only occur when falling asleep?	Yes	0 (0)
		No	27 (100)
		?	0 (0)
9	Do they only occur when waking from sleep?	Yes	0 (0)
		No	27 (100)
		?	0 (0)
10	Did you use drugs or take medication just before the visual experiences began?	Yes	6 (22.2)
		No	21 (77.8)
		?	0 (0)
11	Did you have a somatic illness just before the visual experiences began?	Yes	1 (3.7)
		No	26 (96.3)
		?	0 (0)
12	When did your visual experiences begin?	Last week	0 (0)
		Last month	0 (0)
		Last three months	0 (0)
		Last half year	0 (0)
		Last year	2 (7.4)
		More than a year ago	25 (92.6)
		?	0 (0)

13	When was your last vision?	Today	7 (25.9)
		This week	7 (25.9)
		This month	4 (14.8)
		Last three months	0 (0)
		Last half year	0 (0)
		Last year	1 (3.7)
		More than a year ago	8 (29.6)
		?	0 (0)
14	How often do they occur?	A couple of times	5 (18.5)
		Less than once a week for a longer period	3 (11.1)
		About once a week	2 (7.4)
		Several times a week but less than once a day	4 (14.8)
		Once or more a day	13 (48.1)
		?	0 (0)
15	How long do they typically last?	Short duration, <1 s	2 (7.4)
		Medium duration, 1–10 s	8 (29.6)
		Long duration, >10 s	13 (48.1)
		?	0 (0)
		All durations, not 1 duration predominantly	3 (11.1)
		Almost continuous	1 (3.7)
16	Do the visions emerge gradually or suddenly?	Gradually	6 (22.2)
		Suddenly	18 (66.7)
		?	0 (0)
		Both, not 1 predominantly	2 (7.4)
		Not applicable	1 (3.7)
17	During what level of light do the visions occur?	Daylight	3 (11.1)
		Darkness	1 (3.7)
		Twilight	5 (18.5)
		During every level of light	17 (63.0)
		?	1 (3.7)
18	During which part of the day do they occur?	During daytime	3 (11.1)
		In the evening	4 (14.8)
		In the night	0 (0)
		In the morning	0 (0)
		?	1 (3.7)
		Every part of the day	18 (66.7)
		In the daytime, evening and night	1 (3.7)
19	Have you ever had visions while you were moving (on a train, in a car)?	Yes	17 (63)
		No	9 (33.3)
		?	1 (3.7)
20	Do you see them with your eyes closed?	Yes	16 (59.3)
		No	10 (37.0)
		?	1 (3.7)
21	Do your visions go away if you blink?	Yes	5 (18.5)
		No	20 (74.1)
		?	2 (7.4)
22	Do you think your visions are real?	Never	5 (18.5)
		Sometimes	8 (29.6)
		Always	14 (51.9)
		?	0 (0)
23	How frightened are you by your visions?	Not	4 (14.8)
		A bit	3 (11.1)
		Quite	5 (18.5)
		Very	15 (55.6)
		?	0 (0)
24	Do you see them in front of you, or out of the corner of your eye?	In front	13 (48.1)
		Out of the corner	3 (11.1)
		?	2 (7.4)
		Both	9 (33.3)
25	When you compare your visions with real objects around you, are they in more detail, less detail or are they as detailed?	More	3 (11.1)
		Less	12 (44.4)
		As detailed	8 (29.6)
		?	0 (0)
		All answers possible, not one predominantly	3 (11.1)
		Both more and less	1 (3.7)
26	Can you see through them?	Yes	6 (22.2)
		No	13 (48.1)
		?	2 (7.4)
		Both	5 (18.5)
		Not applicable	1 (3.7)
27	Do the visions move when you move your eyes or move your head?	Yes	7 (25.9)
		No	14 (51.9)
		?	4 (14.8)
		Both	2 (7.4)
28	Do they move when you do not move your eyes or head?	Yes	15 (55.6)
		No	6 (22.2)
		?	2 (7.4)
		Both	4 (14.8)

29	Are they in color?	Yes	12 (44.4)
		No	5 (18.5)
		?	0 (0)
		Both	10 (37.0)
30	Are the visions like whole scenes, or individual objects/people/figures?	Whole scene	3 (11.1)
		Individual objects/people/figures	18 (66.7)
		?	2 (7.4)
		Both	3 (11.1)
		Not applicable	1 (3.7)
31	Do the visions usually change from one thing into another?	Yes	5 (18.5)
		No	15 (55.6)
		?	0 (0)
		Both	7 (25.9)
32	Are your visions normal in size?	Yes	13 (48.1)
		No	7 (25.9)
		?	2 (7.4)
		Both	5 (18.5)
33	Do your visions make sounds?	Yes	6 (22.2)
		No	18 (66.7)
		?	0 (0)
		Both	3 (11.1)
34	Have you ever looked at something and found that its image returned some time later?	Yes	13 (48.1)
		No	13 (48.1)
		?	1 (3.7)
35	Have you ever looked at something and found that its image persisted even after you looked away?	Yes	9 (33.3)
		No	17 (63.0)
		?	1 (3.7)
36	Do you see multiple copies of an image at the same time (if yes, do they form a row)?	Yes, and they form a row	1 (3.7)
		Yes, but they form no row	1 (3.7)
		No	21 (77.8)
		?	1 (3.7)
		All answers possible	2 (7.4)
		Missing	1 (3.7)
37	Is your field of view covered with small particles (rain drops, snow-flakes, specks, dots et cetera)?	Yes	10 (37.0)
		No	17 (63.0)
		?	0 (0)
38	Do your visions consist of flashes, lines, colors, zigzags or fire?	Yes	13 (48.1)
		No	14 (51.9)
		?	0 (0)
39	Do your visions include regular patterns (brickwork, netting, honey-combs, latticework, et cetera)?	Yes	4 (14.8)
		No	23 (85.2)
		?	0 (0)
40	Do your visions consist of irregular patterns (maps, hedges, bushes, et cetera)?	Yes	4 (14.8)
		No	23 (85.2)
		?	0 (0)
41	Do your visions include surfaces filled with objects, patterns or shapes?	Yes	2 (7.4)
		No	25 (92.6)
		?	0 (0)
42	Do you see letters?	Yes	5 (18.5)
		No	22 (81.5)
		?	0 (0)
43	Do you see words?	Yes	5 (18.5)
		No	22 (81.5)
		?	0 (0)
44	Do you see musical notes?	Yes	1 (3.7)
		No	26 (96,3)
		?	0 (0)
45	Do you see numbers?	Yes	3 (11.1)
		No	24 (88.9)
		?	0 (0)
46	Do your visions include a complete figure/group of figures?	Yes	12 (44.4)
		No (skip question 47)	14 (51.9)
		?	1 (3.7)
47	Is this figure/are these figures familiar?	Yes	7 (58.3)
		No	3 (25.0)
		?	0 (0)
		Both	2 (16.7)
48	Do you see a complete person or a group of people?	Yes	20 (74.1)
		No (skip question 49)	7 (25.9)
		?	0 (0)
49	Do you know this person/these people?	Yes	6 (30)
		No	4 (20)
		?	0 (0)
		Both	10 (50)

50	Do you see a face without a body?	Yes	12 (44.4)
		No (skip question 51 en 52)	15 (55.6)
		?	0 (0)
51	Is this face familiar?	Yes	6 (50)
		No	4 (33.3)
		?	0 (0)
		Both	2 (16.7)
52	Does the face have normal or abnormal characteristics?	Normal	7 (58.3)
		Abnormal	1 (8.3)
		?	2 (16.7)
		Both	2 (16.7)
53	Do you see objects?	Yes	8 (29.6)
		No (skip question 54)	18 (66.7)
		?	0 (0)
		Missing	1 (3.7)
54	Are these objects familiar?	Yes	5 (62.5)
		No	3 (37.5)
		?	0 (0)
55	Do you see animals?	Yes	17 (63.0)
		No (skip question 56)	10 (37.0)
		?	0 (0)
56	Are these animals familiar?	Yes	5 (29.4)
		No	8 (47.1)
		?	2 (11.8)
		Both	2 (11.8)
57	Can you describe/draw the things you see that other people cannot see?	See Table 1 for examples	

[a] General remarks:

- This is an ad hoc translation into English for publication purposes; the actual interviews took place in Dutch.
- The '?' as an answer possibility means that the question was not understood or that the answer was unclear.
- For Q 15, 16, 18, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 36, 47, 49, 51, 52, 56, some patients reported that multiple answers fit their VH because the characteristics of their VH were not always the same. Therefore, extra answer possibilities were added (below the '?').

[b] Eye diseases as reported by patients: 5 patients: myopia. 1 patient had myopia + presbyopia. 1 patient had strabismus surgery + presbyopia and astigmatism. 1 patient had a history of amblyopia with oculus dextra; oculus sinistra presbyopia. 1 patient had presbyopia and astigmatism. 1 patient had strabismus surgery, myopia, color blindness, disturbed depth perception.

[c] 4 patients reported taking one or more antidepressants + one or more antipsychotics; 9 patients reported taking one or more antipsychotics + other medication; 5 patients reported taking one or more sedatives + one or more antipsychotics.

[d] In the interview this was an open question; categorization took place by the authors afterwards.

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