

Health and Disability

Prevalence of auditory verbal hallucinations in a general population: A group comparison study

BODIL KRÅKVIK,^{1,2} FRANK LARØI,^{3,4} ANNE MARTHA KALHOVDE,⁵ KENNETH HUGDAHL,^{4,6,7,8,9} KRISTIINA KOMPUS,⁴ ØYVIND SALVESEN,¹⁰ TORE C STILES² and EINAR VEDUL-KJELSÅS^{11,12}

¹Nidaros District Psychiatric Center, Department of Research and Development, St. Olavs University Hospital, Trondheim, Norway

²Department of Psychology, Norwegian University of Science and Technology, Trondheim, Norway

³Department of Psychology: Cognition and Behaviour, University of Liège, Liège, Belgium

⁴Department of Biological and Medical Psychology, University of Bergen, Bergen, Norway

⁵Jæren District Psychiatric Center, Bryne, Norway

⁶Division of Psychiatry, Haukeland University Hospital, Bergen, Norway

⁷Department of Radiology, Haukeland University Hospital, Bergen, Norway

⁸NORMENT Center of Excellence, University of Bergen, Bergen, Norway

⁹KG Jebsen Center of Neuropsychiatric Disorders, University of Bergen, Bergen, Norway

¹⁰Unit for Applied Clinical Research, Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway

¹¹Department of Research and Development, Division of Psychiatry, St. Olavs University Hospital, Trondheim, Norway

¹²Department of Neuroscience, Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway

Kråkvik, B., Larøi, F., Kalhovde, A. M., Hugdahl, K., Kompus, K., Salvesen, Ø., Stiles, T. C. & Vedul-Kjelsås, E. (2015). Prevalence of auditory verbal hallucinations in a general population: A group comparison study. *Scandinavian Journal of Psychology*, 56, 508–515.

The present study was specifically designed to investigate the prevalence of auditory verbal hallucinations (AVH) in the general population, and sought to compare similarities and differences regarding socio-demographics, mental health and severe life events between individuals who have never experienced AVH with those who had. The study also aimed to compare those who sought professional help for their experience of AVH with those who had not sought help. Through a postal questionnaire, 2,533 participants ages 18 and over from a national survey completed the Launay-Slade Hallucinations Scale and other measures examining AVH characteristics and other areas related to AVH. In total, 7.3% of the sample reported a life-time prevalence of AVH. Those with AVH were more likely to be single and unemployed, reported higher levels of depression and anxiety, and experienced a higher number of severe life events compared with those without AVH. Only 16% of those who experienced AVH in the general population sought professional help for these experiences. Compared to those who did not seek professional help, participants that had were more likely to experience AVH with a negative content, experience them on a daily basis, undergo negative reactions when experiencing AVH, and resist AVH. In conclusion, the prevalence of AVH was found to be relatively high. The results also revealed higher levels of reduced mental health for individuals who sought professional help, followed by those who did not, compared with those who had never experienced AVH.

Key words: Epidemiology, hearing voices, clinical and non-clinical hallucinations.

Bodil Kråkvik, Nidaros District Psychiatric Center, Department of Research and Development, St. Olavs University Hospital, Postbox 1893 Lade, N-7040 Trondheim, Norway. Tel: +4747359171; fax: +4772865401; e-mail: bodil.krakvik@stolav.no

INTRODUCTION

Auditory verbal hallucinations (AVH) are sensory experiences that take place in the absence of any external stimulation while in a fully conscious state (Beck & Rector, 2003). The phenomenon has mainly been associated with psychosis (Pierre, 2010), and schizophrenia (Larøi, 2012), but can also occur in other conditions such as affective disorder, personality disorder (Choong, Hunter & Woodruff, 2007), neurological disorders (Larøi, Sommer, Blom *et al.*, 2012) and in healthy individuals (Beavan, Read & Cartwright, 2011). The factors and phenomenological experiences associated with AVH have, however, most frequently been investigated in patients with schizophrenia.

Nevertheless, a better understanding of AVH is still needed especially in order to provide novel and effective interventions for those who are in need of professional help for the experience. To do so requires a better understanding of a variety of factors and mechanisms, such as the interaction

between AVH and mental health across different groups. In particular, far too few studies have examined the similarities and differences between those who have never experienced AVH, with those who do not need professional help for the experience, with those who do. Such an examination will, for example, help inform about how common the phenomenon is and could provide health authorities with important data and information.

How common is the experience of AVH in the general population? Prevalence rates varying from 0.6% to 84% were reported in a recent comprehensive review (Beavan *et al.*, 2011). Due to differences in definitions and methodology, important nuances about the experience and factors associated with AVH get lost in larger epidemiological studies (Daalman, Boks, Diederen *et al.*, 2011; Johns, Kompus, Connell *et al.*, 2014). In addition, the rates appear to be lower compared to more selected samples from the general population (Beavan *et al.*, 2011; Johns, Cannon, Singleton *et al.*, 2004; van Os, Hanssen, Bijl & Ravelli, 2000). Since AVH prevalence rates vary tremendously between

studies, epidemiological studies specifically designed to assess AVH are needed, which furthermore include large samples from the general population, and which provide both a more comprehensive and thorough examination of the experience of AVH. We therefore report the first epidemiological survey with randomly selected individuals from the general population to specifically examine the prevalence of AVH and factors associated with AVH.

General population studies (Johns *et al.*, 2004; Kendler, Gallagher, Abelson & Kessler, 1996; Ohayon, 2000; Tien, 1991; van Os *et al.*, 2000) as well as studies comparing patients with schizophrenia with non-patients (Johns *et al.*, 2014) all suggest that AVH in non-clinical and clinical groups may share some of the same psychological factors associated with AVH, such as anxiety and depression (Lawrence, Jones & Cooper, 2010), as well as a history of trauma (Daalman, Diederken, Derkx, van Luterveld, Kahn & Sommer, 2012; Lataster, van Os, Drukker *et al.*, 2006; Romme & Escher, 1989). Also, reduced brain activation in non-clinical groups with AVH has been found in speech areas (Kompus, Falkenberg, Bless *et al.*, 2013), resembling findings from clinical groups (Hugdahl, Løberg & Nygård, 2009). In addition to this, phenomenological similarities appear to be related to the perceptual and/or acoustic aspects of AVH (Daalman *et al.*, 2011; Honig, Romme, Ensink, Escher, Pennings & deVries, 1998; Leudar, Thomas, McNally & Glinski, 1997), whereas differences are related to aspects such as the negative content and severity of AVH, their deleterious impact on functioning, and the significantly higher age of onset of AVH in the clinical group compared with the non-clinical group (Larøi, 2012).

Despite these findings, a number of issues remain poorly understood. First, there is limited information on how widespread such experiences are in the general population. Second, there is limited information on how common the experience of non-clinical AVH is in different age groups, and in males and females. Third, previous studies have not examined how key characteristics differ in non-clinical AVH individuals compared with non-AVH individuals on a national level. Fourth, for tailoring idiosyncratic treatment it is important to compare individuals who have been troubled by their voices and sought professional help with individuals who have never sought professional help. Finally, there is limited information relating to whether previous studies can be replicated in different countries, with different cultures and views on AVH. We therefore report data from a national epidemiological survey carried out in Norway, which furthermore is specifically designed to study similarities and differences between individuals who have never experienced AVH with those who have experienced AVH, with an additional examination of age and gender effects.

The participants were divided into three different groups: (1) those without AVH; (2) those with AVH who have not sought professional help for their hallucinations; and (3) those with AVH who have sought professional help for their hallucinations. Specifying similarities and differences between these three groups may enable us to better understand the factors associated with the initiation, development and maintenance of AVH. Moreover, this may provide important clues as to why some individuals with AVH seek professional help, whereas others do not. In addition,

such an understanding may help when developing pertinent and effective treatment strategies for those suffering from AVH, in particular for patients with schizophrenia and other mental disorders where AVH are both frequent and troublesome.

Aims of the study

The aims of our study were threefold: (1) to investigate the prevalence of AVH in a large, randomly selected sample of the general population; (2) to compare individuals who report AVH with those who do not, regarding socio-demographic characteristics and mental health; and (3) to compare those who do not seek professional help for their experience of AVH, with those who do seek professional help, with respect to voice characteristics, frequency, triggers, distress, and coping strategies used.

METHODS

Participants

A randomly selected and representative sample of the Norwegian population, totaling 8,000 individuals aged 18 years or older, was invited to participate (via a postal questionnaire) in a cross-sectional study of the occurrence of voice-hearing in the Norwegian general population. Both subjects hearing and not hearing voices were invited to participate. In order to avoid any important cultural differences in the sample, participants had to fulfill the following criteria: (1) born, raised, and currently living in Norway and (2) ability to speak Norwegian.

The randomization was conducted by the Central Bureau of Statistics in Norway. The first 1,000 individuals who completed the questionnaire received a lottery ticket as an incentive for participating in the study. A reminder was sent to all the 8,000 individuals 6 weeks after the initial invitation. A total of 169 individuals could not be reached and 11 individuals refused to participate in the study, leaving 7,820 individuals who were contacted and did not explicitly decline to participate. The study was approved by the Regional Committee for Medical Research Ethics in Central Norway (REC Central).

Of the 7,820 individuals, 2,533 (32.4%) completed and returned the questionnaire, and therefore formed the final study sample. In order to distinguish between those who do not seek professional help for the experience of AVH and those who do, the latter had to answer affirmatively to the questions "Have you ever contacted a psychologist or MD or other health professional because of difficulties related to the voices?" and/or "Have you used, or are you using, prescribed medication because of the voices?" Those who did not meet the criteria for AVH (see below for details about this) were labeled NAVH ($N = 2,359$), those who confirmed that they had not sought professional help for their experience of AVH were labeled NPH ($N = 140$), and those who had sought professional help were labeled PH ($N = 30$).

Questionnaire

Screening for voice-hearing was based on a Norwegian translation of the Launay-Slade Hallucination Scale (LSHS; Launay & Slade, 1981), which is a self-report questionnaire designed to assess hallucination proneness. The version of the LSHS used was based on Larøi, Marczewski and Van der Linden (2004) and Larøi and Van der Linden (2005). It was translated from English to Norwegian using the back-translation procedure. Compared with the original version (Launay & Slade, 1981), the version used in our study included additional items to identify visual hallucinatory experiences and hallucinatory experiences in other modalities (tactile and olfactory hallucinations), and one item measuring the experience of feeling the presence of someone close who has passed away. In addition, this

version included an item that covers hypnagogic and hypnopompic hallucinations.

Those who answered affirmatively ("possibly applies to me" or "certainly applies to me") to both item 4 ("In the past I have had the experience of hearing a person's voice and then found that there was no-one there") and item 8 ("I often hear a voice speaking my thoughts aloud") of the LSHS were invited to answer additional questions about voice characteristics. These included personification (attributed to a real or familiar person), the valence of the voice (as negative, positive or neutral), frequency, triggers, coping strategies, the emotions that the voice elicited (positive or negative reactions), age at onset, and situations related to the first onset of AVH.

In addition, all individuals were also asked to complete the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983), which is a fourteen-item questionnaire that measures the severity of anxiety (7 items) and depression (7 items). Each item is rated on a four-point Likert scale, generating a total score ranging from 0 to 21. Both the anxiety (Cronbach's alpha = 0.82) and depression (Cronbach's alpha = 0.80) subscales showed good internal consistency.

Finally, all individuals answered questions regarding: their mental health; their use of professional help and/or medical treatment for other mental health problems, severe life events (e.g. death of a close family member, separation/divorce, bullying, imminent risk of death), as well as basic socio-demographic data (e.g., age, gender, civil status, educational level, job situation, and living situation). The questionnaire consisted of 71 items in total.

Statistical methods

The prevalence rate of voice-hearing in the Norwegian population as a whole was estimated after weighting the sample against national census data for 2011, obtained from Statistics Norway. The procedure was applied to correct for disparities between the study sample and the Norwegian population in terms of age and gender. The sample data was divided into six groups for each gender and age, which was then weighted against corresponding groups in the Norwegian population. A logistic model was used to examine the effect of gender and age on voice-hearing.

Descriptive statistics were computed for the three groups. Associations between ordered variables and the voice-hearing group were tested using the Kruskal-Wallis test. Associations between unordered categorical variables and the voice-hearing group were tested using Fisher's exact test. *P*-values less than 0.05 were considered statistically significant. Confidence intervals (CI) (95%) were computed for each odds ratio.

All analyses were performed using R version 2.13.1 (Ihaka & Gentleman, 1996), which is a free software environment for statistical computing and graphics.

RESULTS

Life-time prevalence of AVH

A total of 170 (7.25%, 95% CI = 6.16–8.35) reported having AVH at least once in their life-time. The proportion of individuals who reported that they had not sought professional help for AVH (NPH group) was 6.2% (95% CI = 5.22–7.18), while the proportion of individuals who reported that they had sought professional help for AVH (PH group) was 1.1% (95% CI = 0.71–1.49).

The percentage that heard voices daily was 0.88% (95% CI = 0.45–1.33), several times a week, 1.01% (95% CI = 0.55–1.48), several times a month, 1.00% (95% CI = 0.57–1.43), monthly or less 3.32% (95% CI = 2.53–4.11), and annually or less 2.77% (95% CI = 2.13–3.42).

The highest prevalence rate was in the age group <30 years (14.6%, 95% CI = 10.97–19.00), respectively followed by the age groups 30–39 years (7.8%, 95% CI = 5.39–10.83), 50–59 years

(6.4%, 95% CI = 4.45–8.79), 40–49 years (6.0%, 95% CI = 4.09–8.33), and 60–69 years (4.6%, 95% CI = 2.38–6.23). The age group with the lowest prevalence rate was the ≥70 years group (2.8%, 95% CI = 1.20–5.37). Although our data did not show an overall gender difference (Table 1), a logistic regression model with age category and sex as covariates showed that the interaction between age and sex was significant (*p* = 0.04). As shown in Fig. 1, in the age group 50–59 years, females reported significantly more AVH than men (8.4% versus 3.8%, *p* = 0.03), while in the age group 60–69 years, males reported significantly more AVH than women (6.4% versus 1.7%, *p* = 0.03).

Socio-demographic data

Table 1 presents the distribution of socio-demographic data according to group (NAVH, NPH, PH). There were no significant differences between the groups with respect to gender or education. The percentage of individuals who were single was significantly higher in the two AVH groups (NPH and PH group) compared to the NAVH group. Both AVH groups were also to a lesser extent in employment compared with those without AVH. Further, there was a significant difference in age between the NAVH group and the NPH group (higher mean age in the NAVH group). Lastly, the age of the women was significantly lower than the mean age of the men in the AVH groups (*p* = 0.03).

Mental health

As shown in Table 2, the Kruskal-Wallis test revealed an overall significant difference between all three groups for the HADS total score, the HADS anxiety subscale, and the HADS depression subscale. Moreover, individuals in both AVH-groups reported higher numbers of different types of severe life events than those in the NAVH-group. Bullying and the death of a close family member were the most frequently reported severe experience in the AVH groups, whereas the death of a close family member was the most frequently reported severe life experience by those who had never experienced AVH. However, there were no significant differences between the two AVH groups in terms of the experience of bullying. Lastly, individuals in the AVH groups were more likely than those in the NAVH group to have consulted a health professional or to have used drugs for mental health problems other than problems related to AVH.

The experience of AVH

As shown in Table 3, the number of reports of daily voice-hearing experiences was significantly higher for individuals in the PH-group compared with those in the NPH-group (27.6% versus 6.6%, *p* < 0.003). There were no significant group differences for the other frequency categories.

The proportion of individuals reporting AVH with a positive and neutral valence was higher among those in the NPH group compared with the PH group. Individuals in the PH group more often reported negative AVH and a combination of positive and negative AVH, and were more likely to hear voices commenting upon them compared with the NPH group. Even though no

Table 1. Descriptive statistics, standard errors, P-values, and pairwise comparisons between the studied groups regarding the socio-demographic characteristics of the participants

Characteristic	Without AVH (NAVH) (n = 2,359)		Without professional help (NPH) (n = 140)		With professional help (PH) (n = 30)		Overall differences among groups	NAVH versus NPH	NAVH versus PH	NPH versus PH
	Mean	SE	Mean	SE	Mean	SE				
Age	52.1	0.3	42.2	1.3	44.3	2.7	0.003	0.001	0.07	0.38
Male	51.5	0.5	45.1	2.3	47.6	3.3				
Female	49.0	0.5	40.5	1.6	40.1	4.3				
n		%	n	%	n	%				
Gender							0.07	0.05	0.27	0.06
Male	1,079	45.7	52	37.1	17	56.7				
Female	1,280	54.3	88	62.9	13	43.3				
Marital status							0.002	0.04	0.005	0.02
Single	342	14.6	36	25.7	14	46.7				
Married	1,295	55.1	50	35.7	6	20.0				
Common-law spouse	442	18.8	37	26.4	4	13.3				
Separated, divorced	168	7.2	11	7.9	6	20.0				
Widowed	103	4.4	6	4.3	0	—				
Education (years)							0.47	0.27	0.67	0.65
≤ 10	956	40.7	49	35.0	13	43.3				
11–13	299	12.7	23	16.4	5	16.7				
> 14	1,094	46.6	68	48.6	12	40.0				
Occupation							0.01	0.002	<0.001	0.01
Employed	1,548	65.9	84	60.0	9	30.0				
Unemployed	35	1.5	4	2.9	2	6.7				
Social welfare	582	24.9	27	19.3	14	46.7				
Homemaker	15	0.6	1	0.7	0	—				
Student/military service	92	3.9	14	10.0	3	10.0				
Other	78	3.9	10	7.1	2	6.7				

Note: AVH: auditory verbal hallucinations.

significant differences were found concerning commanding voices, those in the PH group acted, made choices, or let themselves be influenced by the voice more often than those in the NPH group ($p < 0.02$). Individuals in the PH group were also more likely than those in the NPH group to report negative feelings associated with the experience of AVH (such as anxiety, loneliness, sadness, uncertainty, jealousy, and aggression). There were no significant differences between the two groups with

regard to positive reactions to the experience of AVH (such as happiness, calmness and confidence). Concerning coping strategies, the PH group was more likely than the NPH group to beg the voice to keep silent, ignore the voice, and try to understand the voice, while the NPH group was more likely to do nothing in response to the experience. By contrast, the PH group reported more often that begging the voice to keep silent (13.3% versus 2.9%) resulted in an increased AVH intensity.

Differences between the AVH groups were also observed regarding life-experiences related to the first onset of AVH. Individuals in the NPH group were more likely to report that the first experience of AVH did not relate to any particular situation, compared with the PH group that reported situations such as relational problems, heartbreak, and violence as being linked to the first onset of AVH. Moreover, compared to individuals in the PH group, a higher proportion of individuals in the NPH group reported that their experience of AVH did not disrupt their interaction with others (32.1% versus 88.3%, $p < 0.002$). There were no significant group differences with regard to personification (OR = 1.11, $p = 0.84$, 95% CI = 0.45–2.72) or age at onset of AVH ($p = 0.34$).

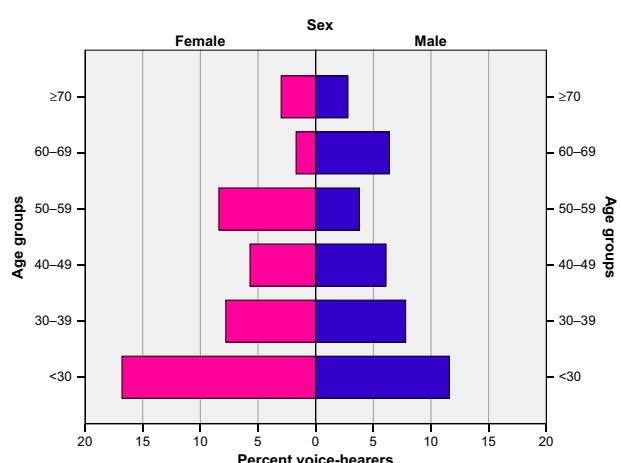


Fig. 1. Gender distribution of voice-hearers in different age groups.

DISCUSSION

Our study investigated the prevalence of AVH in a randomised sample of 2,533 individuals from the Norwegian general

Table 2. Comparisons between the three studied groups regarding mental health and severe life events

Characteristic	Without AVH (NAVH) (n = 2,359)		Without professional help (NPH) (n = 140)		With professional help (PH) (n = 30)		Overall diff. among groups	NAVH versus NPH	NAVH versus PH	NPH versus PH	NPH/NAVH	PH/NAVH	PH/NPH
	Mean	SE	Mean	SE	Mean	SE							
HADS total	7.4	0.1	10.4	0.6	16.5	1.7	0.01	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
HADS anxiety	4.4	0.1	6.7	0.4	9.3	0.8	0.002	0.03	<0.001	0.01	0.01	0.01	0.01
HADS depression	3.0	0.1	3.7	0.3	7.1	1.0	0.004	0.03	0.01	<0.001	<0.001	<0.001	<0.001
General mental health	3.3	0.01	3.1	0.1	2.4	0.2	0.04	<0.001	0.001	0.001	<0.001	<0.001	<0.001
Professional help for other mental problems	3.1	0.02	2.6	0.1	2.0	0.1	0.002	<0.001	0.04	0.04	<0.001	<0.001	<0.001
Drug therapy for other mental problems	3.3	0.02	3.0	0.1	1.8	0.2	0.002	0.01	0.01	0.01	<0.001	<0.001	<0.001
Severe life events	1.4	0.02	1.8	0.1	2.3	0.2	<0.001	0.007	0.02	0.02	<0.001	<0.001	<0.001
	n	%	n	%	n	%	p	p	p	p	Odds Ratio	95% CI	Odds Ratio
Death of a close family member													
Yes	1,524	64.7	74	53.2	19	63.3	0.02	0.01	0.85	0.42	0.6	0.43-0.89	0.9
No	830	35.3	65	46.8	11	36.7	0.01	<0.001	0.03	0.05	2.1	1.39-3.18	5.0
Danger/accident													
Yes	348	14.8	37	27.0	14	46.7							
No	1,997	85.2	100	73.0	16	53.3	<0.001	<0.001	0.05	0.84	1.9	1.31-2.69	2.1
Divorce/separation													
Yes	757	32.2	65	47.1	15	50.0							
No	1,594	67.8	73	52.9	15	50.0	0.003	0.002	0.01	0.07	2.5	1.76-3.60	6.1
Bullying/humiliation													
Yes	731	31.2	74	53.2	22	73.3							
No	1,615	68.8	65	46.8	8	26.7							

Note: AVH: auditory verbal hallucinations.

Table 3. Comparisons between the two AVH groups regarding the experience of hearing voices^a

Characteristics	Without professional help (NPH) (n = 140)	With professional help (PH) (n = 30)	Statistics		
	n (%)	n (%)	p	Odds Ratio	95% CI
Frequency of the voices			0.04		
Daily	8 (6.6)	8 (27.6)			
Several times a week	15 (12.3)	3 (10.3)			
Several times a month	20 (16.4)	3 (10.3)			
Monthly or less	44 (36.1)	10 (34.5)			
Annually or less	35 (28.7)	5 (17.2)			
Valence of the voices					
Positive	32 (22.9)	1 (3.3)	0.01	0.1	0.00–0.77
Negative	6 (4.1)	10 (33.3)	0.02	10.9	3.20–40.83
Pos./Neg.	35 (25.0)	17 (56.7)	0.0017	3.9	1.60–9.68
Neutral	48 (34.3)	3 (10.0)	0.01	0.2	0.04–0.75
Content of the voices					
Comment on me	29 (20.7)	14 (46.7)	0.01	3.3	1.34–8.24
Comment on others	19 (13.6)	7 (23.3)	0.26	1.9	0.61–5.52
Commanding	31 (22.1)	11 (36.7)	0.11	2.0	0.78–5.06
Emotional reactions					
Positive	56 (40.0)	8 (26.7)	0.21	0.6	0.20–1.39
Negative	45 (32.1)	25 (83.3)	0.0025	10.4	3.60–37.08
Coping strategies					
Understand	26 (18.6)	12 (40.0)	0.02	2.9	1.13–7.32
Listen to the voices	41 (29.3)	10 (33.3)	0.67	1.2	0.46–2.98
Do nothing	51 (36.4)	7 (23.3)	0.21	0.5	0.18–1.40
Ignore the voices	24 (17.1)	11 (36.7)	0.02	2.8	1.05–7.12
Beg the voice to keep silent	8 (5.7)	8 (26.7)	0.0018	5.9	1.74–20.23
Talk with others	4 (2.9)	3 (10.0)	0.11	3.7	0.52–23.48
Eat	3 (2.1)	1 (3.3)	0.54	1.6	0.03–20.36
Relax	3 (2.1)	1 (3.3)	0.54	1.6	0.03–20.36
Use alcohol/drugs	2 (1.4)	1 (3.3)	0.44	2.4	0.04–46.83
Strategies to elicit the voices					
Do nothing	100 (71.4)	23 (76.7)	0.66	1.3	0.49–3.92
Think about the voices	22 (15.7)	8 (26.7)	0.19	1.9	0.66–5.29
Beg the voice to keep silent	4 (2.9)	4 (13.3)	0.03	5.2	0.90–29.59 ^b
Use alcohol/drugs	8 (5.7)	3 (10.0)	0.41	1.8	0.29–8.26
Circumstances related to the first onset of the voices					
No particular situation	66 (47.1)	7 (23.3)	0.02	0.3	0.12–0.89
Marital problems	2 (1.4)	1 (3.3)	0.44	2.4	0.04–46.83
Left home	5 (3.6)	3 (10.0)	0.15	3.0	0.44–16.36
Depression	18 (12.9)	14 (46.7)	0.06	5.9	2.24–15.40
Divorce	2 (1.4)	2 (6.7)	0.14	4.9	0.34–69.81
Broken heart	4 (2.9)	6 (20.0)	0.0024	8.3	1.82–43.32
Relational problems	4 (2.9)	7 (23.3)	0.0006	10.1	2.36–51.11
Bullying	8 (5.7)	5 (16.7)	0.06	3.3	0.78–12.27
Unemployed	2 (1.4)	1 (3.3)	0.44	2.4	0.39–46.83
Accident	2 (1.4)	1 (3.3)	0.44	2.4	0.39–46.83
Violence	4 (2.9)	4 (13.3)	0.03	5.2	0.90–29.59 ^b
War/violence	1 (0.7)	1 (3.3)	0.32	4.7	0.06–377.63
Alcohol	5 (3.6)	3 (10.0)	0.15	3.0	0.44–16.36
Deaths and grief	14 (10.0)	3 (10.0)	1.0000	1.0	0.17–3.95

Notes: ^a The participants had the opportunity to select multiple options; ^b When using Fisher's exact test it can lead to inconsistencies between p-values and the confidence interval. R-version 2.13.1.

population. We found that the current life-time prevalence of AVH was 7.3%. Thus, AVH may be considered to be a relatively common experience, affecting more than 250,000 individuals aged 18 years or older in Norway. Of those who reported AVH, approximately 84% had not sought professional help for their experience of the hallucinations.

Our results revealed a general pattern characterized by reduced mental health and a higher number of severe life events for those who had sought professional help for their experience of AVH (PH group), followed by those with AVH who had not sought professional help (NPH group), compared with those who have never experienced AVH (NAVH group). In addition, our findings

are in line with those reported in earlier studies that investigated differences and similarities in AVH in psychotic and non-psychotic individuals (Daalman *et al.*, 2011; Honig *et al.*, 1998). In these studies, patients described their experiences of AVH as predominately negative and distressing, while non-patients perceived them as predominantly positive and as not negatively affecting their everyday functioning. Further, our results reflect diversity in the two groups regarding their coping strategies. The PH group resisted the voice ("beg the voice to keep silent"), while the most frequently reported coping strategy in the NPH group was acceptance ("do nothing"). In this respect, our results for the PH group showed an interesting similarity with psychotic patients experiencing AVH, for whom the experience is to a large extent emotionally negative (the "voices" making negative comments about the patient). It therefore seems that AVH in the PH group were different from AVH in the NPH group in that the latter group did not experience their AVH as negative and distressing.

Our results regarding prevalence are in line with those reported in earlier epidemiological studies such as the Netherlands Mental Health Survey and Incidence study (NEMESIS; van Os *et al.*, 2000), which showed higher rates for non-clinically relevant hallucinations and lower rates for clinically relevant hallucinations (respectively 6.2% and 1.7%), and that younger age was associated with higher psychotic ratings. However, the study from the Netherlands grouped all hallucination types together, and thus it is difficult to directly compare their findings with those from our study. This aspect highlights a further advantage of our study, namely that AVH were specifically explored and examined.

Our results reflect the association between affective conditions and the severity of AVH, which is described in a recent review (Hartley, Barrowclough & Haddock, 2013). We found that levels of anxiety and depression differed significantly between all three groups. However, the HADS total was within the normal range, both for individuals in the NAVH group and for those in the NPH group. This was not the case for those in the PH group: the average score for the PH group was above 11, indicating need for treatment (Zigmond & Snaith, 1983). However, the scores on the HADS-D and HADS-A scales were lower for the individuals in the PH group compared with Chadwick, Lees & Birchwood's (2000) clinical sample of individuals who heard voices. This might indicate that even if an individual seeks professional help for their experience of AVH, their condition is not synonymous with serious mental illness such as schizophrenia, schizoaffective disorder, or psychotic depression. Furthermore, we also found that, compared with the NPH group, individuals in the PH group were more likely to have consulted mental health professionals and used medications for mental problems other than for their AVH.

In addition, our results confirm the association between the experience of severe life events and hallucinatory experiences described in the results in a national study of the British population (Johns *et al.*, 2004). Our findings showed that individuals in the PH group reported a higher number of different types of severe life events than those in the NPH group, followed by the NAVH group. A dose-response effect, with higher frequencies of different types of trauma and an escalation in the

risk of voice hearing, is also reported in other studies (Shevlin, Murphy, Read, Mallett, Adamson & Houston, 2011; Whitfield, Dube, Felitti & Anda, 2005). In addition, individuals in the PH group were more likely to report relational problems preceding the onset of AVH, compared with individuals in the NPH-group, who reported that the first onset of AVH was not related to a particular situation.

The strength of our study is its specific focus on AVH, and the use of a randomized epidemiological survey design. The limitations of our study include a low response rate (32.4%), which may run the risk of inflating the estimate of the number of people experiencing AVH in the general population. It is naive, however, to expect that a questionnaire on AVH mailed by post should yield return rates similar to those for other national surveys about a less sensitive topic. Second, no strict diagnostic criteria were employed, for example, for hallucinations (confirming that the experience also has the full force of a true perception, excluding illusions and other related experiences, etc.). Finally, the cross-sectional nature of the data precludes conclusions regarding causality. In conclusion, our study has provided important information about the extent of AVH in the general population in a Scandinavian country and culture, with an estimated life-time prevalence of 7.25%. Although our study could not empirically demonstrate which factors were associated with the initiation and maintenance of AVH, the results support other findings showing that reduced mental health and the experience of traumatic life events early in life are related to the severity of AVH. Together, these findings indicate the importance of promoting mental health, as well as the importance of interventions directed toward the experience of traumatic life events, the (negative) content of AVH, and the coping strategies used by those experiencing AVH. In addition, a focus on the experience of AVH in a national epidemiological survey might help encourage people to talk more openly about these experiences and thus potentially reduce the stigma associated with AVH.

This research was supported by grants from St. Olavs University Hospital and The Norwegian University of Science and Technology in Trondheim. Part of the research was funded by an ERC Advanced Grant (#249516) awarded to Kenneth Hugdahl. We are thankful to those who participated in this study. We also thank Kathrine Johansen and Jannie Jansdatter at St. Olavs University Hospital in Trondheim, who contributed with logistical support and Kyrre Svarva at The Norwegian University of Science and Technology in Trondheim for statistical assistance.

REFERENCES

- Beavan, V., Read, J. & Cartwright, C. (2011). The prevalence of voice-hearers in the general population: A literature review. *Journal of Mental Health*, 20, 281–292.
- Beck, A. T. & Rector, N. A. (2003). A cognitive model of hallucinations. *Cognitive Therapy and Research*, 27, 19–52.
- Chadwick, P., Lees, S. & Birchwood, M. (2000). The revised Beliefs About Voices Questionnaire (BAVQ-R). *British Journal of Psychiatry*, 177, 229–232.
- Choong, C., Hunter, M. D. & Woodruff, P. W. (2007). Auditory hallucinations in those populations that do not suffer from schizophrenia. *Current Psychiatry Reports*, 9, 206–212.
- Daalman, K., Boks, M. P., Diederen, K. M., de Weijer, A. D., Blom, J. D., Kahn, R. S., *et al.* (2011). The same or different? A

- phenomenological comparison of auditory verbal hallucinations in healthy and psychotic individuals. *Journal of Clinical Psychiatry*, 72, 320–325.
- Daalman, K., Diederik, K. M., Derkx, E. M., van Luterveld, R., Kahn, R. S. & Sommer, I. E. (2012). Childhood trauma and auditory verbal hallucinations. *Psychological Medicine*, 42, 2475–2484.
- Hartley, S., Barrowclough, C. & Haddock, G. (2013). Anxiety and depression in psychosis: A systematic review of associations with positive psychotic symptoms. *Acta Psychiatrica Scandinavica*, 128, 327–346.
- Honig, A., Romme, M. A., Ensink, B. J., Escher, S. D., Pennings, M. H. & deVries, M. W. (1998). Auditory hallucinations: A comparison between patients and nonpatients. *Journal of Nervous and Mental Disease*, 186, 646–651.
- Hugdahl, K. K., Løberg, E. E.-M. & Nygård, M. M. (2009). Left temporal lobe structural and functional abnormality underlying auditory hallucinations in schizophrenia. *Frontiers in Neuroscience*, 3, 34–45.
- Ihaka, R. & Gentleman, R. (1996). R: A language for data analysis and graphics. *Journal of Computational and Graphical Statistics*, 5, 299–314.
- Johns, L. C., Cannon, M., Singleton, N., Murray, R. M., Farrell, M., Brugha, T., et al. (2004). Prevalence and correlates of self-reported psychotic symptoms in the British population. *British Journal of Psychiatry*, 185, 298–305.
- Johns, L. C., Komups, K., Connell, M., Humpston, C., Lincoln, T. M., Longden, E., et al. (2014). Auditory verbal hallucinations in persons with and without a need for care. *Schizophrenia Bulletin*, 40, S255–264.
- Kendler, K. S., Gallagher, T. J., Abelson, J. M. & Kessler, R. C. (1996). Lifetime prevalence, demographic risk factors, and diagnostic validity of nonaffective psychosis as assessed in a US community sample. The National Comorbidity Survey. *Archives of General Psychiatry*, 53, 1022–1031.
- Komups, K., Falkenberg, L. E., Bless, J. J., Johnsen, E., Kroken, R. A., Krakvik, B., et al. (2013). The role of the primary auditory cortex in the neural mechanism of auditory verbal hallucinations. *Frontiers in Human Neuroscience*, 7, 144. doi:10.3389/fnhum.2013.00144.
- Larøi, F. (2012). How do auditory verbal hallucinations in patients differ from those in non-patients? *Frontiers in Human Neuroscience*, 6, 25. doi:10.3389/fnhum.2012.00025.
- Larøi, F., Marczewski, P. & Van der Linden, M. (2004). Further evidence of the multi-dimensionality of hallucinatory predisposition: Factor structure of a modified version of the Launay-Slade Hallucinations Scale in a normal sample. *European Psychiatry*, 19, 15–20.
- Larøi, F., Sommer, I. E., Blom, J. D., Fernyhough, C., ffytche, D. H., Hugdahl, K., et al. (2012). The characteristic features of auditory verbal hallucinations in clinical and nonclinical groups: State-of-the-art overview and future directions. *Schizophrenia Bulletin*, 38, 724–733.
- Larøi, F. & Van der Linden, M. (2005). Normal subjects' reports of hallucinatory experiences. *Canadian Journal of Behavioural Science*, 37, 33–43.
- Lataster, T., van Os, J., Drukker, M., Henquet, C., Feron, F., Gunther, N., et al. (2006). Childhood victimisation and developmental expression of non-clinical delusional ideation and hallucinatory experiences: Victimization and non-clinical psychotic experiences. *Social Psychiatry and Psychiatric Epidemiology*, 41, 423–428.
- Launay, G. & Slade, P. D. (1981). The measurement of hallucinatory predisposition in male and female prisoners. *Personality and Individual Differences*, 2, 221–234.
- Lawrence, C., Jones, J. & Cooper, M. (2010). Hearing voices in a non-psychiatric population. *Behavioural and Cognitive Psychotherapy*, 38, 363–373.
- Leudar, I., Thomas, P., McNally, D. & Glinski, A. (1997). What voices can do with words: Pragmatics of verbal hallucinations. *Psychological Medicine*, 27, 885–898.
- Ohayon, M. M. (2000). Prevalence of hallucinations and their pathological associations in the general population. *Psychiatry Research*, 97, 153–164.
- Pierre, J. M. (2010). Hallucinations in nonpsychotic disorders: Toward a differential diagnosis of "hearing voices". *Harvard Review of Psychiatry*, 18, 22–35.
- Romme, M. A. & Escher, A. D. (1989). Hearing voices. *Schizophrenia Bulletin*, 15, 209–216.
- Shevlin, M., Murphy, J., Read, J., Mallett, J., Adamson, G. & Houston, J. E. (2011). Childhood adversity and hallucinations: A community-based study using the national Comorbidity Survey Replication. *Social Psychiatry and Psychiatric Epidemiology*, 46, 1203–1210.
- Tien, A. Y. (1991). Distributions of hallucinations in the population. *Social Psychiatry and Psychiatric Epidemiology*, 26, 287–292.
- van Os, J., Hanssen, M., Bijl, R. V. & Ravelli, A. (2000). Strauss (1969) revisited: A psychosis continuum in the general population? *Schizophrenia Research*, 45, 11–20.
- Whitfield, C. L., Dube, S. R., Felitti, V. J. & Anda, R. F. (2005). Adverse childhood experiences and hallucinations. *Child Abuse & Neglect*, 29, 797–810.
- Zigmond, A. S. & Snaith, R. P. (1983). The Hospital Anxiety and Depression Scale. *Acta Psychiatry Scandinavia*, 67, 361–370.

Received 7 January 2015, accepted 22 April 2015