Do adverse life events at first onset of auditory verbal hallucinations influence subsequent voice characteristics? Results from an epidemiological study

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A R T I C L E  I N F O

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A B S T R A C T

Understanding what happens at first onset of auditory verbal hallucinations (AVHs) is extremely important on a clinical and theoretical level. Previous studies have only focused on age with regard to first onset of AVHs. In the current epidemiological study, we examined a number of aspects relating to first onset of AVHs, such as the role of adverse life events at first onset of AVHs on symptom severity and general mental health. For this purpose, we compared participants who reported adverse life events at first onset of AVHs (adverse-trigger group; \( N = 76 \)) to those that did not report any specific events at first onset of AVHs (no-adverse-trigger group; \( N = 59 \)) on a large array of variables. Results showed that AVHs in the adverse-trigger group were experienced as more emotional compared to the no-adverse-trigger group. In addition, the adverse-trigger group more often reported hallucinations in other (non-auditory) sensory modalities (e.g. visual) compared to the no-adverse-trigger group. Furthermore, the adverse-trigger group reported poorer general mental health, reported having contact with mental health professionals more often, and also reported more frequently taking medication for psychological problems in general. The implications of these findings are discussed.

1. Introduction

The onset of auditory hallucinations, as a symptom of a psychosis, has been linked to a number of risk factors, such as complications at birth, city birth, and adverse life events (see McDonald and Murray, 2000; Read et al., 2005; Bentall and Fernyhough, 2008). The focus of the present study was on adverse life events at first onset of auditory verbal hallucinations (AVHs). In a recent model of AVHs, Waters et al. (2012) describe the first onset of hallucinations to be triggered by a traumatic insult, in combination with emotional factors that could either increase severity and negative content of the AVHs or, in some cases, act as a buffer promoting less negative content. Indeed, negative content of AVHs has been identified as a factor that increases the risk of transition to a clinical condition and consequently need for care (e.g. Johns et al., 2014; Daalman et al., 2011). Although traditionally associated with psychiatric and neurological diagnoses, AVHs can also be present in individuals in the general population without the need for professional health care, or without a psychiatric and/or neurological diagnosis (Johns et al., 2014; Kompus et al., 2013; Larøi et al., 2012; Sommer et al., 2010). A recent epidemiological study conducted in the Norwegian general population (Kråkvik et al., 2015) reported a 7.3% lifetime prevalence of AVHs. In the present study, we used data from the Kråkvik et al. (2015) study in order to compare individuals who had indicated a specific adverse life event at the first onset of their AVHs with individuals who had not indicated the presence of such events at the first onset of their AVHs, on a series of characteristics, such as voice
severity, frequency, and emotional valence. We have called the first group the “adverse-trigger” group, and the second group the “no-adverse-trigger” group. Comparing these groups within a general population sample may yield clues about the etiology of AVHs and whether these groups represent different trajectories within a more general continuum ranging from non-clinical voices to clinical hallucinations (see van Os et al., 2009). Moreover, studying individuals who experience AVHs in the general population allows for exploring the role of adverse life events at first onset of their AVHs albeit without the confounding factors related to the development of psychiatric diagnosis. Another advantage is that non-clinical individuals may provide us with a better understanding of the factors that are relevant in leading to, or protecting from, a diagnosis and consequent need for professional health care. Such protective factors have been identified previously (e.g. in studies comparing individuals with and without the need for care) and include intact cognitive functioning, adaptive coping strategies, and beliefs about voices (see Johns et al., 2014).

Thus, the overall aim of the present study was to compare voice-hearers in the general population with and without adverse life events at first onset of the AVHs. To the best of our knowledge, this is the first study that has examined these issues. Therefore, there was no a priori hypothesis and the analyses were purely exploratory.

2. Methods

2.1. Participants

The participants were a sub-group from a randomly selected and representative sample of the Norwegian population (n = 2533) that was collected as part of a cross-sectional epidemiological study on the prevalence of AVHs in the Norwegian general population (see Kråkvik et al., 2015). This original sample included both participants that reported AVHs sometime in their life and those that did not report such experiences. In order to avoid cultural differences in the sample, participants had to be born, raised, and currently living in Norway, and speak Norwegian. A randomly selected and representative sample of the Norwegian population was identified by the Norwegian Central Bureau of Statistics. In total, 8000 individuals aged 18 years and older were invited to participate via postal questionnaires. A total of 1692 individuals could not be reached and 11 individuals did not wish to participate in the study, leaving 7820 individuals who were contacted and did not explicitly decline to participate. Of these 7820 individuals, 2533 (32.4%) completed and returned the questionnaire, and therefore formed the final study sample.

For the present sample, a sub-group of the above sample was selected based on answers given on the Launay-Slade Hallucination Scale (LSHS) (Launay and Slade, 1981; the revised version used in the present study was based on, Larri et al., 2004; Larri and Van der Linden, 2005). Participants who answered affirmatively (“possibly applies to me” or “certainly applies to me”) to 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/or item 8 (“I often hear a voice speaking my thoughts aloud”) of the LSHS, were included in the hearing-voices group, resulting in 168 participants. Thereafter, based on a question regarding situations related to the first onset of AVHs (“What situation were you in the first time you started hearing voices?”), the participants were further divided into two groups: those participants who had their first AVH experience in a particular context or situation (possible options to select were: “marital problems”, “left home”, “depression”, “divorce”, “broken heart”, “relational problems”, “bullying”, “unemployed”, “accident”, “violence”, “war”, “alcohol/drugs use”, “death and grief”, “other”) and those who had not had their first AVH experience associated with a particular context or situation (i.e. those who only answered to the option: “no particular situation”). The first group is called the “adverse-trigger” group, and the second group the “no-adverse-trigger” group (see Fig. 1). The options for contexts/situations in which the AVHs occurred for the first time were a selection of adverse life events based on questions from the Life Events and Difficulties Schedule (Brown and Harris, 1989). Participants who did not provide answers for the adverse trigger questions were excluded (n = 33), resulting in a total of 135 participants. The sociodemographic characteristics of both groups are shown in Table 1.

![Flow-chart of the sample selection process](image)

Fig. 1. Flow-chart of the sample selection process. *Returned questionnaire. **Based on answering affirmatively on item 1 or 2 of the Launay-Slade Hallucination Scale.

### Table 1

| Sociodemographic group characteristics | Adverse-trigger group | No-adverse-trigger group |
|----------------------------------------|-----------------------|--------------------------|
| **N** | 76 (SD) | 59 (SD) |
| **Age (in years)** | 43.1 (± 14.1) | 37.1 (± 14.6) |
| **Age at first onset of AVH (in years)** | 21.8 (± 15.2) | 16.3 (± 10.9) |
| **Sex** | | |
| - male | 37 (48.7) | 22 (37.3) |
| - female | 39 (51.3) | 37 (62.7) |
| **Marital status** | | |
| - unmarried/not cohabitant | 24 (31.6) | 20 (33.9) |
| - married | 21 (27.6) | 21 (35.6) |
| - cohabitant | 18 (23.7) | 12 (20.5) |
| - widow/er | 3 (3.9) | 1 (1.7) |
| - separated/divorced | 10 (13.2) | 4 (6.8) |
| **Living status** | | |
| - alone | 21 (27.6) | 8 (13.6) |
| - with spouse/partner or other adult | 30 (39.5) | 20 (33.9) |
| - alone with child/children | 8 (10.5) | 5 (8.5) |
| - with spouse/partner and child/children | 10 (13.2) | 16 (27.1) |
| - other | 6 (7.9) | 9 (15.3) |
| **Highest educational level** | | |
| - primary school | 9 (11.8) | 5 (8.5) |
| - vocational school | 13 (17.1) | 17 (28.8) |
| - secondary school | 14 (18.4) | 10 (16.9) |
| - college | 30 (39.5) | 14 (23.7) |
| - university (4 years or more) | 10 (13.2) | 12 (20.3) |
| **Occupation** | | |
| - employed | 35 (46.1) | 39 (66.1) |
| - unemployed | 3 (3.9) | 2 (3.4) |
| - social welfare | 22 (28.9) | 6 (10.2) |
| - student/military service | 9 (11.8) | 7 (11.9) |
| - other | 7 (9.2) | 4 (6.8) |
| **Family history of AVH** | | |
| - yes | 17 (22.4) | 13 (22.0) |
| - no | 12 (15.8) | 4 (6.8) |
| - don’t know | 47 (61.8) | 42 (71.2) |
2.2. Questionnaire items

Differences between the two groups were explored on other items taken from the revised version of the LSHS (i.e. the item: “I have been troubled by hearing voices in my head”, and various items assessing the presence of hallucinations in non-auditory modalities), as well as questions related to the emotional valence of the voices (positive, negative, positive and negative, neutral, other), frequency of the voices (daily, several times a week, several times a month, monthly or more seldom, yearly or more seldom), and age of first onset of AVHs. In addition, participants were asked to answer questions regarding their general mental health (bad, not quite good, good, very good), whether they have contacted a psychologist, MD, or other health professional because of difficulties related to the voices (yes now, yes before, no never), and whether they are using, or have used, medication for AVHs (yes, no, not applicable) or medication for various psychological problems not related to AVHs (yes, no, not applicable).

2.3. Statistical analysis

The results were subjected to statistical significance testing using the Fisher’s exact test to compare the adverse-trigger and no-adverse-trigger groups with regard to the questionnaire items listed above. For questions that allowed more than one answer (i.e. questions regarding emotional valence and the presence of hallucinations in non-auditory modalities), a Fisher’s exact test was conducted for each of the categories. Differences between the groups with regard to age and age of first onset of AVHs were compared using independent samples t-tests. The significance level was adjusted using the false discovery rate method for multiple testing (Benjamini and Yekutieli, 2001) (p = 0.015 for Fisher’s exact tests; p = 0.033 for t-tests). We also conducted stepwise binomial logistic regression analysis with backward integration in order to assess which variables (AVH characteristics, mental health and medication) predicted group membership (adverse-trigger, no-adverse-trigger). In order to increase the statistical power of the analyses, the Fisher’s exact test to compare the adverse-trigger and no-adverse-trigger group. In order to increase the statistical power of the analyses, the Fisher’s exact test to compare the adverse-trigger and no-adverse-trigger group (p = 0.012). The other modalities were not significant after statistical correction (i.e. olfactory: p = 0.033, tactile: p = 0.729, and all modalities: p = 0.078).

2.4. Ethical standards

The study was approved by the Regional Committee for Medical Research Ethics in Central Norway (REC Central).

3. Results

3.1. Differences in AVH characteristics

Table 2a shows the percentages of participants in each group who experienced their AVHs in terms of emotional valence. The groups differ significantly with the adverse-trigger group displaying more positive and negative voices (p = 0.005) and less neutral voices (p = 0.001) than the no-adverse-trigger group.

Furthermore, participants in the adverse-trigger group were found to be significantly more troubled by their voices (p = 0.007) than participants in the no-adverse-trigger group. The frequency distribution for this question is presented in Table 2b.

When comparing frequent (daily, weekly) and less frequent (monthly, yearly or more seldom) AVHs between the groups, there were no significant differences between the groups. However, from a qualitative perspective, Table 2c suggests the presence of an interaction between the group and the distribution of the frequencies. In particular, hallucinations that occur rarely (i.e. yearly or more seldom) were more often reported in the no-adverse-trigger group, whereas hallucinations that occur daily seem to be more prevalent in the adverse-trigger group.

3.2. Differences in hallucinatory experiences in non-auditory modalities

Of the 168 participants who reported AVHs in the present sample, some also experienced hallucinations in one or more other, non-auditory modalities (visual, tactile, olfactory). In the adverse-trigger group, 73.3% of participants reported the presence of visual hallucinations, 50% tactile, 50.6% olfactory, and 32.9% all modalities. Concerning the no-adverse-trigger group, 52.5% of participants reported visual hallucinations, 45.8% tactile, 31% olfactory, and 18.6% all modalities. Fisher’s exact tests demonstrated that participants from the adverse-trigger group significantly reported more visual hallucinations compared to the no-adverse-trigger group (p = 0.012). The other modalities were not significant after statistical correction (i.e. olfactory: p = 0.033, tactile: p = 0.729, and all modalities: p = 0.078).

3.3. Differences in general mental health and contact with a health professional

The adverse-trigger group significantly reported poorer general mental health than the no-adverse-trigger group (p = 0.007). From a qualitative standpoint, it is particularly interesting to underline that 45.8% of the no-adverse-trigger group reported a very good mental health (very good: 45.8%, good: 50%, not quite good: 4%, bad: 0%).

Table 2

| a) Emotional valence of voices | AT group n = 76 (%) | No-AT group n = 59 (%) | b) Troubled by voices | AT group n = 76 (%) | No-AT group n = 59 (%) | c) Frequency of voices | AT group n = 76 (%) | No-AT group n = 59 (%) |
|--------------------------------|---------------------|------------------------|----------------------|---------------------|------------------------|----------------------|---------------------|------------------------|
| Positive                      | 14 (18,4)           | 14 (23,7)              | Certainly not       | 29 (38,2)           | 35 (59,3)              | Daily voices           | 12 (15,8)           | 3 (5,1)                |
| Negative                      | 11 (14,5)           | 5 (8,5)                | Possibly not        | 9 (11,8)            | 11 (18,6)             | Several times a week   | 6 (7,9)             | 12 (20,3)             |
| Positive/Negative             | 32 (42,1)           | 11 (18,6)             | Uncertain           | 9 (11,8)            | 2 (3,4)                | Several times a month  | 14 (18,4)          | 4 (6,8)               |
| Neutral                       | 17 (22,4)           | 30 (50,8)             | Possibly yes        | 13 (17,1)           | 3 (5,1)                | Monthly or more seldom | 27 (35,5)          | 18 (30,5)             |
| Other*                        | 13 (17,1)           | 3 (5,1)               | Certainly yes       | 15 (19,7)           | 6 (10,2)               | Yearly or more seldom  | 16 (21,1)           | 22 (37,3)             |

* This category included specific examples of voice content, which could be positive, negative or neutral. AT group = Adverse-trigger group; No-AT group = No-adverse-trigger group.
health status whereas only 9.2% in the adverse-trigger reported this (see Table 3). In addition, the adverse-trigger group was found to report significantly more contact with a health professional (psychologist, MD, or other health professional) because of difficulties related to their AVHs than individuals in the no-adverse-trigger group (p = 0.004).

### 3.4. Differences in medication use

The groups did not differ significantly after correction for multiple testing (p = 0.024) with regard to the use of medication specifically for their AVHs. However, the tendency is explained by 2.6% of participants in the no-adverse-trigger group answering positively to this question, compared to 19.3% in the adverse-trigger group.

Also, with regard to the use of medication for various psychological problems not related to AVH, there was a significant difference between both groups (p = 0.002), with 21.4% of participants in the no-adverse-trigger group reporting to haven taken medication for various psychological problems not related to AVHs compared to 52.3% in the adverse-trigger group.

### 3.5. Differences in age and age at first onset

Independent sample t-tests revealed that the adverse-trigger group was significantly older than the no-adverse-trigger group [t (133) = −2.43, p = 0.017] and also significantly older at first onset of AVHs [t (116) = −2.17, p = 0.025] (see Table 1).

### 3.6. Predicting group (adverse-trigger, no-adverse-trigger)

A stepwise binomial logistic regression analysis revealed that group membership was significantly predicted by the variable “use of medication for various psychological problems not related to AVHs” (p = 0.006; B (SE) = −1.46 (0.53); Exp(B) = 0.23) and variable “presence of mainly neutral voices” (p = 0.067; B (SE) = −0.96 (0.52); Exp(B) = 0.38) after 9 steps (Nagelkerke $R^2 = 0.222$). A model with these two variables significantly predicted group membership with an accuracy of 66.3%, that is 7.3% more accurate than the non-model.

### 4. Discussion

In general, the results suggest that the AVHs in the adverse-trigger group are more severe compared to the no-adverse-trigger group. This was related to a number of voice characteristics including the experience of AVHs with more emotional content (less neutral, more positive/negative) and comorbid visual hallucinations. In addition, the adverse-trigger group reported poorer general mental health, were more often in contact with health professionals because of difficulties related to the AVHs, as well as displayed more frequent use of medication for psychological problems in general. Thus, severity of the voice-hearing experience in the non-clinical population seems to be related to whether or not an adverse life event (adverse-trigger) occurred when the AVHs first appeared. One possible explanation is that the adverse trigger may have elicited more severe voices and poorer mental health as it necessitated emotional coping strategies, suggesting that hallucination-proneness in itself may not lead to troublesome voices, but rather, that it is the presence of an adverse trigger at first onset of AVHs in addition to hallucination-proneness that may result in troublesome AVHs. This implies that the adverse-trigger group may be regarded as subclinical, i.e. positioned on a continuum between individuals who did not experience adverse life events at first onset of AVHs and individuals who have experienced psychotic episodes. We would thus predict the adverse-trigger group to have a higher risk of transitioning to psychosis (or other mental disorders), suggesting that presence of an adverse trigger at first onset of AVHs might be a factor to take into account when determining the degree of risk for psychosis or other mental disorders. The presence or absence of adverse life events at first onset of AVHs may act as a phenomenological, or behavioral, pre-morbid marker for psychosis. Future longitudinal studies are needed to examine this relationship.

Another difference between the groups was notably the age at first onset of voices. Participants that reported an adverse life event at first onset of AVHs were on average older than those that did not report an adverse life event (21.8 years vs. 16.3 years). Similarly, Daalman et al. (2011) found that age at first onset was significantly higher in a group of psychotic patients compared to a non-clinical group of voice-hearers (21.4 years vs. 12.4 years). Also, Powers et al. (2017) showed that individuals with hallucinations and diagnosed with a psychotic disorder reported a later first onset of AVHs than self-identified clairaudient psychics who do not have a diagnosis (22.9 years vs. 7.5 years). While the present study does not include a clear clinical group or a clairaudient psychotic group, it is interesting to observe that on a subclinical level, the age of onset of AVHs appears to be in childhood/early adolescence, whereas for more severe symptoms the onset tends to be later in life (early adulthood). This may be indicative of sensitive periods in development when triggers have adverse effects on AVHs. As pointed out by Daalman et al. (2011), early vs. late age of onset may indicate different etiologies for AVHs in non-clinical and clinical participants – and possibly also for no-adverse-trigger and adverse-trigger (at first onset AVHs) participants.

On the other hand, extensive evidence can be found for an association between AVHs and the presence of earlier adverse life events, not directly related to the first onset of AVHs, in both clinical (Read and Argyle, 1999; Read et al., 2003; Morrison and Peterson, 2003; Offen et al., 2003; Hardy et al., 2005) and non-clinical (Bentall et al., 2012; Shevlin et al., 2007) populations. For example, Doraey et al. (2009) compared schizophrenia patients with and without a history of childhood trauma and found differences with regard to AVH intensity (louder in trauma group), AVH content (replaying past memories or related to a known person in trauma group) and the presence of olfactory and gustatory hallucinations (trauma > no-trauma). Although the former study did not look at first onset of AVHs, the results resemble those of the present study in that the authors report more severe AVHs in the trauma group (our adverse-trigger group could be considered a form of trauma group).

There are some limitations to the present study. First, the question regarding the presence of an adverse life event, was based on memory. This limit is, however, not specific to our study but is a limit for all studies that include retrospective data collection. On average, there were 20.3 ± 14.4 years between the first onset of voices and the current age of the participant. Thus, reports were retrospective in nature and it cannot be ruled out that some participants did not accurately remember when they heard the voices for the first time and whether it was related to a specific adverse life event. Future studies should include an “I don’t know/I don’t remember” response alternative in addition to a “yes” and “no” answer. On the other hand, perhaps the 33 participants who did not answer the adverse life event items, actually intended to say, “I don’t know” or “I don’t remember”. Second, the question about emotional content of the voices allowed for more than one answer in order to do justice to the diversity of the voice-hearing experience; but this

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Table 3

| Health status          | AT group (%) | No-AT group (%) | AT group (%) | No-AT group (%) |
|------------------------|--------------|-----------------|--------------|-----------------|
| BAD                    | 6 (7.9)      | 3 (5.1)         | 4 (5.3)      | 1 (1.7)         |
| Not quite good         | 22 (28.9)    | 6 (10.2)        | 17 (22.4)    | 2 (3.4)         |
| GOOD                   | 41 (53.9)    | 22 (37.3)       | 55 (72.4)    | 55 (93.2)       |
| Very good              | 7 (9.2)      | 27 (45.8)       |              |                 |

AT group = Adverse-trigger group; No-AT group = No-adverse-trigger group.
methodological choice also complicates the interpretation of the findings. We interpret the selection of more than one category as multiple voices with different character. Choosing more than one category may also have reflected that the same voice had different emotional impact on the voice-hearer over time. Alternatively, one could have asked participants to only rate the most dominant voice, however, this choice also has its limits such as participants having to decide what the dominant voice is, which introduces a bias and may not reflect the whole voice-hearing experience. It should be noted that in the present sample only 8% of participants selected more than one category. Third, it should be noted that individuals who have been seeking help for their AVHs may also have reflected more upon the reasons for having had these experiences and may thus have been more encouraged to identify an adverse trigger for their AVHs at first onset. In other words, it is possible that the adverse-trigger group includes some false positives whereas the no-adverse-trigger group may include some false negatives with regard to reporting an adverse life event at first onset of AVHs. However, it is difficult to say how reflecting upon one’s own AVHs might influence AVH characteristics. This would nevertheless be the topic of a different study where, for example, the effects of coping strategies are examined (for a review see Shergill et al., 1998). Fourth, we acknowledge the fact that a large survey-based study cannot fully embrace the phenomenological detail of AVHs, as would a more qualitative approach. Thus, it is difficult to compare the sample from this epidemiological study with other studies that are not of an epidemiological nature. On the other hand, the approach adopted in the present study has the advantage of allowing for a more representative sample and thus permits generalizing findings across normal populations. Finally, although this is a general population sample, we cannot rule out the possibility that some participants are also patients. To address this, we interpret the selection of more than one category as multiple voices with different emotional impact. In addition to examining past events related to first onset of AVHs, future studies should also examine information regarding momentary (present/current) triggers, for example, with the aid of the experience sampling method, through the use of smartphones and mobile-app technology. This should have consequences for how we assess high-risk individuals, by adding a question about adverse life events at first onset of AVHs. Future longitudinal studies are also needed in order to determine the percentage of transition to psychosis depending on the presence or absence of a trigger factor at first onset of AVHs. While the present study investigated the issue of long-term effects of adverse life events at the time of first onset of AVHs, another issue for future studies could be the assessment of emotional regulation strategies (maladaptive vs. adaptive) that these two groups use.

Conflict of interest

The authors declare no conflict of interest.

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