



Auditory and non-auditory hallucinations in first-episode psychosis: Differential associations with diverse clinical features



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ABSTRACT

Data from 247 first-episode psychosis patients were used to explore associations between types of hallucinations and nine diverse clinical characteristics. Psychopathology was rated using the *Scale for the Assessment of Positive Symptoms* and *Scale for the Assessment of Negative Symptoms* (SANS). Childhood adversity was assessed with seven instruments; family history with an adapted version of the *Family Interview for Genetic Studies*; age at onset of psychosis and duration of untreated psychosis (DUP) with the *Symptom Onset in Schizophrenia* inventory; and insight with the *Birchwood Insight Scale*. Both principal component analysis-derived *Auditory* and *Non-Auditory Hallucinations* were similarly associated with delusions of influence, negative affect delusions (jealousy and sin/guilt), interpersonal childhood abuse, DUP, and insight. However, the two hallucination domains had different associations with grandiose/religious, paranoid, and somatic delusions; SANS score; childhood violence exposure; cannabis use disorders; and cocaine/other drug use disorders. Neither *Auditory* nor *Non-Auditory Hallucinations* were associated with childhood neglect, age at onset, alcohol use disorders, family history, or mode of onset of psychosis. Findings support considering hallucinations not as a unitary psychopathological construct. They represent at least two domains and are correlated in different ways with diverse clinical variables.

1. Introduction

Hallucinations are a core criterion in schizophrenia and related psychotic disorders. In patients with first-episode psychosis in particular, hallucinations are known to be very common (e.g., a prevalence of 73% in a study of 143 first-episode patients by Rajapakse et al., 2011, and a prevalence of 75% in a study of 160 first-episode patients by Mbewe et al., 2006). The most common hallucinations experienced are auditory (Mbewe et al., 2006; Peralta and Cuesta, 1999; Rajapakse et al., 2011) followed by visual, somatic, and other hallucinations, with different rates of prevalence in both first-episode (Rajapakse et al., 2011), as well as chronic patient samples (Chaudhury, 2010; Thomas et al., 2007).

Despite the high prevalence, knowledge about sociodemographic and clinical correlates of hallucinations is limited. Although previous studies have uncovered some associations between hallucinations and sociodemographic and clinical features, very few studies have focused on patient characteristics that are related to different types of hallucinations in first-episode psychosis. We aimed to first identify the factor structure of different types of hallucinations and then to explore clinical

correlates of those types of hallucinations in a large first-episode psychosis sample.

In order to define the psychopathological areas of schizophrenia, previous studies have performed factor analyses that could identify underlying dimensions of the various symptoms. Most performed principal component analysis (PCA) of items from the *Scale for the Assessment of Positive Symptoms* (SAPS; Andreasen, 1984) and its complement, the *Scale for the Assessment of Negative Symptoms* (SANS; Andreasen, 1983). Yet, few studies have involved recent-onset or first-episode psychosis, and just one focused on latent dimensions of hallucinations specifically (Vázquez-Barquero et al., 1996), which found two factors: the first included auditory hallucinations, voices commenting, and voices conversing, and the second included visual and somatic/tactile hallucinations; olfactory hallucinations loaded onto neither factor.

Knowledge about possible relations between these domains and others clinical variables is limited, especially in first-episode psychosis. Regarding sociodemographic characteristics, female first-episode patients had a higher score for visual and auditory hallucinations than their male counterparts (Thorup et al., 2007), and patients with a

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positive family history of psychosis were more likely to have tactile hallucinations (Uçok and Bikmaz, 2007). Pertaining to clinical features, Evensen et al. (2011) reported better cognitive insight in first-episode patients with hallucinations only compared to patients with delusions only.

Studies of associations between childhood trauma and hallucinations have been more extensive. In a recent study investigating the correlation between auditory verbal hallucinations and childhood traumatic events, Misiak et al. (2016) found that such events, as well as sexual abuse, predicted the extent of auditory hallucinations in females. Moreover, a recent study focused on visual hallucinations uncovered that the experience of childhood interpersonal trauma increased the risk of experiencing such hallucinations (Solevsik et al., 2016). Furthermore, childhood rape was associated with non-auditory hallucinations (Longden et al., 2016). Uçok and Bikmaz (2007) investigated correlations between all types of hallucinations and childhood traumatic events; those having suffered emotional abuse were more likely to experience auditory hallucinations, and voices commenting, while physical neglect was related to visual and tactile hallucinations.

Some of the variability in the limited findings to date is likely due to the different assessment processes, varying characteristics of the samples, and the nature of statistical analyses employed. We performed a secondary analysis of data collected during a cross-sectional and retrospective study of the effects of premorbid cannabis use on the early course of psychotic disorders. We wanted to make use of the richness of the available data by exploring a broad range of clinical variables. First, we conducted a PCA of the six types of hallucinations measured with the SAPS, for data reduction purposes, and given substantial inter-correlations among the six variables. Then, we explored associations between hallucinations (specifically, domains of hallucinations derived from the PCA) and nine clinical features: age at onset of psychotic symptoms, mode of onset of psychotic symptoms (i.e., acute, subacute, or gradual onset), family history of psychosis, substance abuse/dependence, five types of delusions, negative symptom severity, three types of childhood adversity, duration of untreated psychosis (DUP), and insight.

2. Methods

2.1. Setting and sample

Consecutively admitted patients with first-episode psychosis were approached for study participation. A total of 247 participants were enrolled from August 2008 to June 2013 from three inpatient psychiatric units in Atlanta, Georgia and three in Washington, D.C. Eligible patients were 18–40 years of age, English-speaking, and able to give informed consent. Exclusion criteria included known or suspected mental retardation, a Mini-Mental State Examination (Cockrell and Folstein, 1988; Folstein et al., 1975) score of < 24, presence of a major medical condition compromising ability to participate, prior treatment for psychosis lasting longer than three months, and prior hospitalization for psychosis earlier than three months before the index hospitalization.

2.2. General procedures

Once psychotic symptoms were stabilized sufficiently for informed consent and participation, trained masters- or doctoral-level assessors conducted the in-depth assessments. When possible, collateral assessments were also carried out with family members/informants in order to gather additional information useful in the rating of family history of psychosis, mode of onset of psychosis, and age at onset/DUP. All procedures were approved by all relevant Institutional Review Boards, and all participants provided written informed consent.

2.3. Measures and rating scales

For evaluating diverse clinical variables, psychopathology, and diagnosis, patients were tested with an extensive assessment. Positive and negative symptoms of psychotic disorders were measured with the SAPS (Andreasen, 1984) and its complement, the SANS (Andreasen, 1983). The SAPS has 34 items and contains four subscales: hallucinations, delusions, bizarre behavior, and positive formal thought disorder. We previously performed a PCA involving the 12 SAPS delusions items in this sample (Paolini et al., 2016), which uncovered five delusion domains: (1) delusions of influence (being controlled, mind reading, thought broadcasting, thought insertion, and thought withdrawal), (2) grandiose/religious delusions, (3) paranoid delusions (persecutory delusions and delusions of reference), (4) negative affect delusions (jealousy and sin/guilt delusions), and (5) somatic delusions. Those domains are used in the present analysis. The SANS has 25 items included in five subscales: affective flattening, avolition-apathy, anhedonia-asociality, and attentional impairment. For each item of the SAPS and SANS the ratings range from 0 = none to 5 = severe. Test-retest reliability and construct validity have been demonstrated for these widely used instruments (Rogers, 2001). We rated the SAPS and SANS with regard to the greatest intensity of symptoms at present or in the previous month, rather than with regard to the day of the assessment only, as treatment had usually begun during the several days prior to assessment.

Age at onset of psychosis was determined using the *Symptom Onset in Schizophrenia* (SOS) inventory (Perkins et al., 2000). The date of the onset of psychosis (and thus the age at onset of psychosis) was derived based on consensus-based best estimates of the onset of hallucinations or delusions, whichever came first. Age at onset could not be reliably determined for 23 patients.

Mode of onset of psychosis was defined according to the World Health Organization International Pilot Study of Schizophrenia (Jablensky et al., 1992) as acute with sudden onset, acute with precipitous onset, subacute, gradual, and insidious. This categorization of the mode of onset of psychosis was derived using a consensus-based best-estimate approach, reviewing all available information from the patient assessment, informant assessment(s) when available, the medical record, and the treating clinician. In the present analysis, mode of onset was trichotomized as acute, subacute, and chronic. Due to the complexity of retrospectively rating mode of onset of psychosis, data on this variable were available for only 162 patients.

An adapted version of the *Family Interview for Genetic Studies* (FIGS; Maxwell, 1992) was used to collect detailed data on family history of a number of psychotic symptoms, diagnoses, and/or medications or hospitalization; participants were divided into two groups, those with and without a family history of either broadly defined psychosis or narrowly defined schizophrenia. Data on family history was missing for 23 patients.

Diagnoses of psychotic disorders and substance-related disorders were assessed using the *Structured Clinical Interview for DSM-IV Axis I Disorders* (SCID; First et al., 1998). Regarding substance use disorders, we combined the two groups of cocaine abuse/dependence and other substance abuse/dependence (e.g., ecstasy, methamphetamine, PCP) due to the small number of patients using such substances. We grouped abuse/dependence of each substance (alcohol, cannabis, and cocaine/other substances) into three categories: no abuse/dependence, current or lifetime abuse, and current or lifetime dependence. Data on alcohol use were missing for 13 patients, cannabis use for 14 patients, and cocaine/other substance use for 11 patients.

We used seven instruments that assess childhood/adolescent adversity: the *Childhood Trauma Questionnaire–Short Form* (CTQ-SF; Bernstein et al., 2003), the *Trauma Experiences Checklist* (TEC; Cristofaro et al., 2013), *Parental Nurturance* (Barnes and Windle, 1987), *Parental Harsh Discipline* (Ge et al., 1994; Mrug et al., 2008), *Violence Exposure* (Mrug et al., 2008), *Friends' Delinquent Behavior* (Mrug et al., 2012), and *School*

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