Delusions in first-episode psychosis: Principal component analysis of twelve types of delusions and demographic and clinical correlates of resulting domains

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ABSTRACT

Although delusions represent one of the core symptoms of psychotic disorders, it is remarkable that few studies have investigated distinct delusional themes. We analyzed data from a large sample of first-episode psychosis patients ($n=245$) to understand relations between delusion types and demographic and clinical correlates. First, we conducted a principal component analysis (PCA) of the 12 delusion items within the *Scale for the Assessment of Positive Symptoms* (SAPS). Then, using the domains derived via PCA, we tested a priori hypotheses and answered exploratory research questions related to delusional content. PCA revealed five distinct components: *Delusions of Influence*, *Grandiose/Religious Delusions*, *Paranoid Delusions*, *Negative Affect Delusions* (jealousy, and sin or guilt), and *Somatic Delusions*. The most prevalent type of delusion was *Paranoid Delusions*, and such delusions were more common at older ages at onset of psychosis. The level of *Delusions of Influence* was correlated with the severity of hallucinations and negative symptoms. We ascertained a general relationship between different childhood adversities and delusional themes, and a specific relationship between *Somatic Delusions* and childhood neglect. Moreover, we found higher scores on *Delusions of Influence* and *Negative Affect Delusions* among cannabis and stimulant users. Our results support considering delusions as varied experiences with varying prevalences and correlates.

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1. Introduction

Despite the growing interest in first-episode psychosis, a paucity of research on delusions is noticeable in this area of study (Compton et al., 2012; Rajapakse et al., 2011). It is remarkable how, at the present time, although delusions represent one of the core symptoms of schizophrenia and related psychotic disorders, it remains unclear as to whether or not these phenomena should be considered unitary or diversified (Sass and Byrom, 2015), and few studies have investigated distinct delusional themes, in particular in first-episode psychosis samples.

Moreover, very few studies have focused on possible underlying dimensions of different delusional themes. There has been some interest in detecting the factor structure of psychotic symptoms generally (Emsley et al., 2003; Peralta et al., 2013), and

one of the advantages of this analytic approach (i.e., factor analysis) is that it allows for the reduction of heterogeneity in data from a measurement instrument by identifying a group of coherent dimensions. Across different types of available tools measuring delusions, the *Scale for the Assessment of Positive Symptoms* (SAPS; Andreasen, 1984) has been extensively utilized, and several studies have performed factor analyses in order to identify the latent dimensions amongst its items (e.g., John et al., 2003; Minas et al., 1994; Peralta and Cuesta, 1999; Toomey et al., 1997). Those studies conducted an item-level factor analysis of SAPS items, and they included both delusions and non-delusion items. Conversely, only three studies (Ellersgaard et al., 2014; Kimhy et al., 2005; Vázquez-Barquero et al., 1996) conducted a factor analysis specifically using only the 12 SAPS delusion items. They found three different solutions, respectively composed of five, three, and four factors, meaning that their findings concurred only partially, which could be related to the characteristics of the study samples. Vázquez-Barquero et al. (1996) studied first-episode schizophrenia patients (without severe psychotic symptoms) from a rural community in Cantabria, Spain ($n=86$; range=15–54 years). Participants

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(n=411; range=18–45 years) included in the study of Ellersgaard et al. (2014) were inpatients and outpatients affected by schizophrenia-spectrum disorders (i.e., not only schizophrenia) coming from the two most populous cities in Denmark (i.e., Copenhagen and Aarhus). Lastly, the study of Kimhy et al. (2005) enrolled antipsychotic-free (for at least 14 days) inpatients (n=83; range=18–60 years) with diagnoses of schizophrenia/schizoaffective disorder (i.e., not a first-episode psychosis sample) in New York.

Several studies have investigated the prevalence of distinct delusional themes and their correlations with demographic or clinical variables (e.g., Freeman's extensive work on persecutory delusions (e.g., Freeman, 2007; Freeman and Garety, 2014), Startup's work on delusions of reference (e.g., Startup et al., 2009; Startup and Startup, 2005), Langdon and Coltheart's work on bizarre delusions (e.g., Coltheart et al., 2007; Langdon and Coltheart, 2000)). As reported in first-episode psychosis studies by Kim et al. (2011) and Rajapakse et al. (2011), persecutory delusions are the most prevalent type of delusions in this patient population. With respect to sociodemographic variables, first-episode psychosis studies have reported evidence showing a relationship between persecutory delusions and older age at onset (Galdos and van Os, 1995; Häfner et al., 1993), while there is not strong evidence for a relationship between persecutory delusions and sex. According to first-episode psychosis studies by Birchwood et al. (2005) and Drake et al. (2004), as well as findings among chronic patients described by Hartley et al., 2013, persecutory delusions are positively correlated with depression. On the other hand, such delusions are negatively associated with grandiose delusions, as reported by Garety et al. (2013) (though this study also did not involve first-episode psychosis patients in particular). Furthermore, persecutory delusions have been proven to be related to cannabis use in the general population (Freeman et al., 2011, 2013).

In this study, we made use of in-depth clinical research data from a large sample of hospitalized first-episode psychosis patients to test hypotheses related to delusional thought content. We had three objectives. The first was to conduct a principal component analysis (PCA) of the 12 delusion items of the SAPS. Second, we tested three a priori hypotheses. Third, we examined three exploratory research questions. In testing a priori and exploratory hypotheses/questions, we planned to use the extracted domains from the PCA.

With regard to PCA, given differences in the socio-demographic characteristics of prior studies (Ellersgaard et al., 2014; Kimhy et al., 2005; Vázquez-Barquero et al., 1996) and the limited literature available, such a factor analysis was warranted in our sample. Specifically, factor analysis of the 12 delusion items has never been performed among a hospitalized and predominantly African American, male, low income, and socially disadvantaged sample. Thus, rather than relying on results from different first-episode samples from other countries and settings, we first wanted to examine the factor structure in our unique sample.

Similar purposes guided our first a priori hypothesis; we investigated the prevalence of delusions, and in particular the prevalence of different delusional themes. We hypothesized that persecutory delusions would be the most prevalent type. Although the finding of persecutory delusions as the most prevalent type of delusions has been replicated, we wanted to prove this finding in our unique sample. Based on the limited prior literature, we secondly hypothesized that patients with persecutory delusions would be older in age at onset, but that there would be no particular relationships with sex. Finally, we also had the a priori hypothesis that depression would be linked positively with persecutory delusions and negatively with grandiose delusions.

After testing our hypotheses, we carried out exploratory analyses again based on limited previous research not specifically involving first-episode psychosis patients. First, we explored the relationship between the total scores on the extracted delusion domains and the SAPS hallucinations total score, as well as the *Scale for the Assessment of Negative Symptoms* (SANS; Andreasen, 1983) total score. Second, we explored whether greater childhood adversity would be associated with a greater severity of one or more of the various types of delusional thought content. Third, based on the aforementioned Studies of Freeman et al. (2011, 2013), we explored how cannabis use is related to delusional content (i.e., persecutory delusions, as well as the other types of delusions included in our sample), and also how the use of other drugs is associated with delusional content.

2. Method

2.1. Participants and procedure

Patients were selected using a preexisting database of 247 consecutively admitted patients with first-episode psychosis (see Birnbaum et al., in press; Fresan et al., 2015; Kelley et al., 2015 for detailed information regarding recruitment sites, eligibility criteria, and assessment procedures). All patients met the following inclusion criteria: (1) were English-speaking, (2) were within the age range of 18–40 years, (3) did not have known or suspected mental retardation, (4) had a Mini-Mental State Examination (Folstein et al., 1975; Cockrell and Folstein, 1988) score of ≥ 24, (5) did not have a significant medical condition compromising ability to participate, and (6) were able to provide informed consent. All patients were considered "first-episode" in that they had never been hospitalized for psychosis prior to three months before their index hospitalization (for most, this was the very first hospitalization) and they had received less than three months of treatment with an antipsychotic (for most, they had never been treated with an antipsychotic prior to index hospitalization). Having full data on the SAPS was the criterion for extraction from the previous database and inclusion in the present one; only two patients were excluded for missing values (resulting in n=245).

2.2. Assessments

Patients were administered an extensive battery to evaluate diverse clinical variables, psychopathology, and diagnosis. The SAPS was used to assess hallucinations, delusions, bizarre behavior, and positive formal thought disorder (Andreasen, 1984). The SANS was used to assess affective flattening or blunting, alogia, avolition-apathy, anhedonia-asociality, and attention (Andreasen, 1983). The SAPS has 34 items, including the 12 types of delusions, while the SANS includes 25 items. Items on both scales are rated 0–5 ("none," "questionable," "mild," "moderate," "marked," "severe"). Test-retest reliability and construct validity have been demonstrated for both instruments previously (Rogers, 2001) and in the current sample (see Birnbaum et al., in press). Moreover, the *Positive and Negative Syndrome Scale* (PANSS) was used as a global symptom severity measure (Kay et al., 1987). The PANSS depression item was used as a measure of depression severity, as it has been shown to give a valid approximation of depression in patients with schizophrenia (El Yazaji et al., 2002). 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).

Childhood adversity was assessed using seven instruments: the *Childhood Trauma Questionnaire–Short Form* (CTQ-SF; Bernstein et al., 2003), *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.,