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A dimensional comparison between delusional disorder, schizophrenia and schizoaffective disorder

José E. Muñoz-Negro [a,b], Inmaculada Ibanez-Casas [b], Enrique de Portugal [c], Susana Ochoa [d], Montserrat Dolz [d], Josep M. Haro [d], Miguel Ruiz-Veguilla [e], Juan de Dios Luna del Castillo [f], Jorge A. Cervilla [a,b,*]

[a] Mental Health Unit, Granada University Hospital, Granada, Spain
[b] Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM), Department of Psychiatry, University of Granada, Spain
[c] Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM), Gregorio Marañón Hospital, Madrid, Spain
[d] Parc Sanitari Sant Joan de Déu, Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM), Sant Boi de Llobregat, Barcelona, Spain
[e] Mental Health Unit, Virgen del Rocío University Hospital, Sevilla, Spain
[f] Facultad de Medicina, Universidad de Granada, Spain

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ABSTRACT

Introduction: Since the early description of paranoia, the nosology of delusional disorder has always been controversial. The old idea of unitary psychosis has now gained some renewed value from the dimensional continuum model of psychotic symptoms.
Aims: 1. To study the psychopathological dimensions of the psychosis spectrum; 2. to explore the association between psychotic dimensions and categorical diagnoses; 3. to compare the different psychotic disorders from a psychopathological and functional point of view.
Material and methods: This is an observational study utilizing a sample of some 550 patients with a psychotic disorder. 373 participants had a diagnosis of schizophrenia, 137 had delusional disorder and 40 with a diagnosis of schizoaffective disorder. The PANSS was used to elicit psychopathology and global functioning was ascertained using the GAF measure. Both exploratory and confirmatory factor analyses of the PANSS items were performed to extract psychopathological dimensions. Associations between diagnostic categories and dimensions were subsequently studied using ANOVA tests.
Results: 5 dimensions – manic, negative symptoms, depression, positive symptoms and cognitive – emerged. The model explained 57.27% of the total variance. The dimensional model was useful to explained differences and similarities between all three psychosis spectrum categories. The potential clinical usefulness of this dimensional model within and between clinical psychosis spectrum categories is discussed.

1. Introduction

Different psychotic disorders compose the so-called schizophrenia or psychosis spectrum which mainly includes schizophrenia, schizoaffective disorder and delusional disorder. Until now, controversy persists as to whether the psychosis spectrum is better explained by categorical or dimensional approaches (Allardyce et al., 2007). Categorical nosology does not reach to comprehensively capture and incorporate the most recent advances in the realm of psychosis. Although categorical diagnoses are clinically useful, they overlap in genetics, risk factors, clinical presentation, management needs and outcomes (Murray et al., 2004). Dimensions are not diagnosis-specific, but combining them with categorical approaches gets a better predictive validity than only one of them (Dikeos et al., 2006). Furthermore, psychotic dimensions also remain stable after 5–10 years (Russo et al., 2014). Dimensions may help us with treatment planning, research and prognostic decision-making (Barch et al., 2013). van Os and other authors, demonstrated the existence of a psychopathological continuum expressing the psychotic phenotype to increasing levels of intensity, from healthy people to the most deteriorated schizophrenia (Allardyce et al., 2007; van Os et al., 2000; Stefanis et al., 2002; Hanssen et al., 2003; Rossler et al., 2007). Thus, it has been suggested that environmental risk factors would interact with genetic proneness to psychosis that could be expressed to the extreme of becoming persistent and subsequently be clinically relevant (van Os et al., 2009; Linscott and van Os, 2013). Finally, dimensions have now officially replaced categorical subtypes of schizophrenia in DSM-5 (Barch et al., 2013; van Os and Tamminga, 2007). Such dimensions are: hallucinations, delusions, disorganized speech, abnormal psychomotor behaviour, negative symptoms, impaired cognition, depression and mania (American Psychiatric Association, 2013). So far, very few studies have explored the psychopathological dimensions of the psychosis continuum with samples including

* Corresponding author at: Departamento de Psiquiatría, Facultad de Medicina, Universidad de Granada, Avenida de Madrid 11, 18012 Granada, Spain.
E-mail address: jcervilla@ugr.es (J.A. Cervilla).

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patients with delusional disorder. For this reason, we raised the question of studying psychopathological dimensions in a sample including a large number of delusional disorder patients. We set to study the psychopathological dimensions of the schizophrenia spectrum, to explore the relationship between the dimensions obtained and the categorical diagnostics and to compare the different diagnoses of psychosis from a psychopathological and functional point of view.

2. Material and methods

2.1. The sample

A cross sectional sample of 550 patients (n = 550) with a psychosis spectrum disorder (137 patients with delusional disorder, 373 patients with schizophrenia and 40 patients with schizoaffective disorder) was included. The sample was created by combining data from 5 independent studies using compatible and similar assessment methods. Each study had a single interviewer for the clinical and psychopathological assessments who were all formally trained by the same senior trainer (JC). The studies' and clinical interviewer's names are as follows: NEDENA Study (*Estudio de Necesidades en Esquizofrenia por Neurodesarrollo Anormal*, MD, Barcelona), DELIREMP Study (*Estudio Empírico de Trastorno Delirante*, EP, Barcelona), ESPIGAS Study (*Estudio de Psicosis Granada Sur*, MRV, Granada), GENIMS Study (*Genes e Inmunología en Esquizofrenia*, RML, Granada) and PARAGNOUS Study (*Estudio Descriptivo de Trastornos Paranoicos*, JEMN, Granada). Participating patients were consecutive attendees to participating psychiatric outpatient clinics and all were in a remitting or maintenance stage of their disorder in community-based out-patient care that included antipsychotic medication in all cases. Inclusion criteria were: 1. To meet DSM-IV diagnostic criteria for schizophrenia, delusional disorder and schizoaffective disorder, respectively. 2. Being older than 18 years old. 3. Patient agreement to participate. Exclusion criteria: 1. Mental retardation. 2. Any type of dementia. The clinical settings were public mental health services included in the Spanish Health Service located in Andalusia and Catalonia, Spain. All participants received a study instruction sheet giving sufficient information to enable them to sign the informed consent, after that they returned a signed copy thereof. The study was performed in accordance with ethical standards of the 1964 Helsinki Declaration and was approved by the local ethical committees of every participating hospital.

2.2. Assessments

Sociodemographic variables, including sex, age, educational level and marital status were recorded. The Spanish version of PANSS (Peralta and Cuesta, 1994) was utilized to measure psychopathology since PANSS is the standard scale valid and reliable for this purpose (Kay et al., 1987). PANNS is a measurement instrument designed to evaluate positive and negative symptoms in schizophrenia from both points of view, dimensional and categorical. It is composed by 30 items, 7 items for positive scale, another 7 items for negative scale and 16 different items for general psychopathology. Items scoring range for increasing symptoms intensity from 1 to 7. In addition, it also calculates a composed scale to set the positive or negative subtype of every patient. Global functioning was assessed using the Global Assessment of Function Scale, GAF (American Psychiatric Association, 1994). GAF is a standard procedure to measure global outcomes in psychiatric patients within in a continuum ranging from a state of total health to another of maximum illness. It is composed by only one item, ranging from 100 points scoring (satisfactory performance in a whole array of activities and excellent evaluation of his values and personal qualities by the rest of people) to a 1 point scoring (manifest death expectation).

2.3. Statistical analyses

Descriptive statistics for age, sex, educational level, GAF score and PANSS score for the different diagnostic groups were calculated. Then, 30 items of PANSS were included in an exploratory and confirmatory factor analysis. Data suitability for factor analysis was checked applying both, the Barlett's test of sphericity and the Kaiser–Meyer–Olkin test. Then, we used principal components analysis to extract the smallest number of factors that enable us to explain as much of the total variance of the data as possible. The number of factors to retain was chosen utilizing Kaiser's criterion and the Catell's scree test (Cattell, 1966). Kaiser's criterion retains only those factors with an eigenvalue of 1 or more. Scree test give us a graphical indication to the optimum number of factors to be retained. All factors above the plot's elbow were selected. Additionally, Monte Carlo parallel analysis was also performed to compare the size of the eigenvalues with those obtained from a randomly generated data of the same size, retaining only those exceeding the corresponding last ones. After the principal components analysis a confirmatory factor analysis was done. To aid in the interpretation of this factors, and assuming that they were correlated between them, oblique rotation using the Oblimin technique (Tabachnick and Fidell, 2007) was also conducted. Finally, we performed one-way ANOVA to study the distribution of the psychopathological dimensions across the categorical psychosis spectrum disorders and to evaluate psychopathological and global functioning differences among such disorders. Further post-hoc analyses were performed to study differences among diagnostic groups using SPSS Statistics 20. Since we have no previous data on inter-rater reliability procedures for diagnostic interviews and for PANSS, one-way ANOVA tests were performed to establish the grade of homogeneity among data from the different samples (Table 1. Supplementary material). In addition, we performed an alpha Cronbach technique to analyse the internal consistency of each obtained dimension.

3. Results

3.1. The sample

There were statistically significant differences between psychosis spectrum disorders regarding sex, age, global functioning and educational level. Male sex was predominant 60.3%, reaching the 65% in patients with schizophrenia and around 50% for the other groups. Mean age was 40.1 years (SD = 14.9) the patients with schizophrenia were significantly younger 35.8 years (SD = 13.1) than those with delusional disorder 49.7 years (SD = 14.7). As for educational level, incomplete primary studies were significantly more frequent among DD patients, whilst complete higher studies were more frequent among schizophrenic patients. University studies were not significantly different between DD and schizophrenic patients and both groups did differ significantly from schizoaffective patients among whom no one completed a university degree (Table 1).

3.2. Global functioning and PANNS psychotic symptoms

The overall mean score for GAF was 54.1 (SD = 15.8) and the differences between psychosis spectrum disorders showed statistical significance ($F = 42.46$: $P \leq 0.000$). Statistical significant differences were found between patients with delusional disorder and patients with schizophrenia ($P \leq 0.000$) and between schizophrenia and schizoaffective disorder ($P \leq 0.001$), but it did not between delusional disorder and schizoaffective disorder. Overall, psychotic symptoms both negative and positive were less frequent among DD patients (Table 1).

Table 1
Sociodemographical and clinical descriptives of the sample.

	Delusional disorder	Schizoaffective disorder	Schizophrenia
Frequencies by case origin			
GENIMS	28	5	99
DELIREMP	86	0	0
NEDENA	0	0	102
ESPIGAS	0	0	105
PARAGNOUS	23	35	67
Total	137	40	373

	Delusional disorder	Schizoaffective disorder	Schizophrenia	Statistic	Sig.
Age, mean (SD)	49.78 (14.70)	46.65 (14.39)	35.86 (13.13)	$F = 56.24$	0.000
GAF, mean (SD)	62.73 (13.14)	60.28 (16.12)	48.25(14.61)	$F = 42.46$	0.000
Sex, %					
Male	49.3	50	65.4	$\chi^2 = 12.71$	0.002
Female	50.7	50	34.6		
Education, %					
Incomplete primary school	34.4%	17.9%	18.5%	$\chi^2 = 109.89$	0.000
Complete primary school	3.8%	48.7%	44%		
Higher education	22.4%	33.3%	25.5%		
University	10.4%	0%	12%		
PANSS, mean (SD)					
Positive	14.95 (5.86)	23.53 (8.93)	18.27 (6.95)	$F = 25.69$	0.000
Negative	11.60 (5.63)	19.15 (9.29)	18.54 (7.71)	$F = 43.21$	0.000
Gen. psychopathology	27.60 (10.02)	41.80 (17.71)	33.53 (10.73)	$F = 27.09$	0.000
Composite score	3.34 (6.27)	4.00 (10.92)	−27 (9.95)	$F = 9.39$	0.000

3.3. Psychopathological dimensions extracted

All 30 items of the positive and negative syndrome scale (PANSS) were included in to a principal components analysis (PCA). The KMO score was 0.90 and the Bartlett's test of sphericity score 8515.4 respectively. Both reached statistical significance, indicating that data was indeed suitable for PCA.

PCA identified six components with eigenvalues of 1 or more, explaining 60.80% of the variance. The scree-plot suggested that the data were better described by a five-component solution, explaining

Table 2
Confirmatory factor analysis and Cronbach's alpha.

Variables	Factors				
	1	2	3	4	5
	Manic	Negative	Depression	Positive	Cognitive
Hyperactivity	**.747**	.071	−.091	.193	−.098
Tension	**.729**	−.055	.154	−.191	.115
Anxiety	**.659**	−.014	.392	−.105	−.064
Hostility	**.626**	−.057	−.100	.328	−.200
Poor impulse control	**.603**	.073	.064	.085	.269
Uncooperativeness	**.468**	−.094	−.063	.136	.212
Unusual thoughts content	**.439**	−.034	.024	.250	.167
Poor rapport	.053	**−.933**	−.106	.047	−.151
Emotional withdrawal	−.013	**−.889**	.008	.051	−.050
Lack of spontaneity and flow of conversation	−.038	**−.883**	−.060	−.004	.014
Social withdrawal	−.017	**−.848**	.086	.057	−.125
Blunted affect	−.011	**−.796**	−.004	−.040	.165
Motor retardation	−.069	**−.561**	.247	−.038	.227
Difficulty in abstract thinking	−.034	**−.532**	−.167	−.037	.366
Active social avoidance	.089	**−.455**	.379	.233	−.085
Disturbance of volition	.410	**−.412**	.096	−.032	.221
Depression	.165	−.115	**.703**	−.101	−.015
Guilt feelings	.030	−.003	**.643**	.022	.029
Somatic concerns	.009	.120	**.480**	.354	.102
Preoccupation	.293	−.230	**.379**	.143	.139
Delusions	064	.011	.046	**.832**	.003
Suspiciousness/persecution	.041	−.107	.161	**.789**	−.132
Lack of judgement and insight	.058	−.065	−.277	**.525**	.126
Hallucinations	.021	−.145	.154	**.522**	.198
Grandiosity	.334	.146	−.343	**.334**	.067
Conceptual disorganization	.278	−.016	−.051	.023	**.678**
Mannerisms and posturing	−.167	.055	.180	.214	**.661**
Disorientation	.041	−.043	−.068	−.102	**.629**
Poor attention	.457	−.177	.058	−.108	**.485**
Stereotyped thinking	.198	−.160	.038	.136	**.465**
Eigenvalues	8.881	3.563	1.765	1.743	1.232
Variance	29.602%	11.877%	5.883%	5.811%	4.106%
Inter-rater (inter-centre) Cronbach's alpha	.82	.90	.60	.74	.65

57.27% of the variance in the sample. This was further supported by the results of parallel analysis (Table 2. Supplementary material), which showed only 5 components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size. Then, we performed a confirmatory factor analysis which indicated that the five components model was the most suitable to retain (Table 2). Hence, the five factors (psychopathological dimensions) obtained were as follows: Factor 1 (manic dimension), included the following PANSS items: hyperactivity, tension, anxiety, poor impulse control, unusual thoughts contents (with an eigenvalue = 8.88; explaining 29.60% of the total variance.). Factor 2 (negative symptoms dimension) was comprised by poor rapport, emotional withdrawal, lack of spontaneity and flow of conversation, social withdrawal, blunted affect, motor retardation, difficulty in abstract thinking and disturbance of volition (eigenvalue = 3.56; explaining 11.87% of the variance). Factor 3 (depressive dimension) consists of symptoms such as depression, guilt feelings, somatic concerns, active social avoidance and preoccupation (eigenvalue = 1.76; 5.88% of the total variance). Factor 4 (positive symptoms dimension) clustering PANSS items such as delusions, suspiciousness/persecution, lack of judgement and insight, hallucinations and grandiosity (eigenvalue = 1.74; 5.81% of the total variance). Factor 5 (cognitive and psychomotor dimension) grouped the following symptoms: conceptual disorganization, mannerisms and posturing, disorientation, poor attention, stereotyped thinking (eigenvalue = 1.23 and explains the 4.10% of the total variance). We also calculated the internal consistency for all items of each factor taking into account the 5 different participating centres (see Table 2's last row for Cronbach's alpha values).

3.4. Association between psychopathological dimensions and categorical psychotic disorders

We used ANOVA tests to study the association between the three DSM-IV categorical psychotic disorders and the psychopathological five dimensions identified (see Table 3 and Graphic 1). Differences in all five psychopathological dimensions scores differed significantly across the three psychotic disorders ($F = 42.46$; $P \leq 0.000$). When post hoc analyses was made, there were not statistical differences between schizophrenia and schizoaffective disorder in negative symptoms factor (means difference −2.14; $P \leq 0.355$), positive symptoms (means difference −1.70; $P \leq 0.155$) nor in the cognitive and psychomotor dimension (means differences −1.17; $P \leq 0.30$). Neither between delusional disorder and schizophrenia for depression factor (means difference −1.70; $P \leq 0.09$). The rest of comparisons resulted in significant differences between diagnoses in terms of psychopathological dimensions (see Supplementary Table 3).

Moreover, post hoc analyses found that depressive and manic dimensions were significantly higher among schizoaffective patients whilst negative and cognitive and psychomotor dimensions were significantly lower among DD patients. The positive dimension was lower for DD, intermediate for schizophrenia and higher for schizoaffective disorder (Table 3 and Graphic 1).

Table 3
Associations between PANSS dimensions and diagnostic categories (ANOVA).

	Delusional disorder	Schizophrenia	Schizoaffective	F	Sig.
Dimensions, mean (SD)					
Manic	11.29 (5.56)	14.01 (6.16)	20.80 (8.77)	35.43	0.000
Negative	15.09 (7.43)	23.31 (9.50)	25.46 (11.99)	40.90	0.000
Depression	6.89 (3.19)	7.70 (3.50)	10.00 (5.23)	11.42	0.000
Positive	13.52 (5.27)	15.22 (5.44)	16.93 (6.85)	7.25	0.001
Cognitive	7.37 (3.18)	10.10 (4.45)	11.28 (5.72)	22.55	0.000

4. Discussion

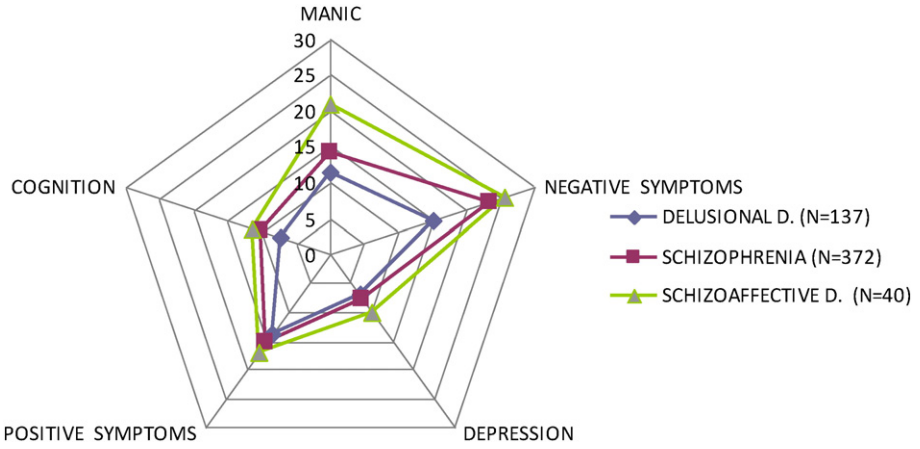
We set out to identify psychopathological dimensions in a large and unique sample of psychotic patients including a relatively large number of DD patients. In the event, we found 5 statistically valid psychopathological dimensions (named as manic, negative, depressive, positive and cognitive and psychomotor), explaining nearly 60% of sample's variance, that virtually parallel findings from similar studies where no or few DD patients had been included (Bell et al., 1994; Lindenmayer et al., 1994; Russo et al., 2014). When studying dimensions variance across different psychotic disorders we found that DD patients tended to have less cognitive and negative symptoms whilst schizoaffective patients had higher scores on both affective dimensions. These empirical findings support the notion of a psychosis spectrum along such psychopathological dimensions showing increasing severity from DD to schizoaffective disorder with schizophrenia as an intermediate category for all symptoms.

4.1. Sample characteristics and functioning

The sample amalgamates patients from different studies held in different locations although all studies used similar methods and were conducted by the same team whilst locations were all within Spain. Nonetheless, to our knowledge, this sample includes the largest subsample of DD patients (137) ever reported using the PANSS or GAF instruments allowing us to test whether different DSM-IV psychotic categories varied in the expression of five psychopathological dimensions. There was an excess of women among DD and schizoaffective disorder compared with schizophrenia what incidentally coincides with most epidemiological studies findings (Perala et al., 2007). Interestingly, 40% of DD patients had not completed primary education, a percentage that was significantly higher than those of schizophrenia or schizoaffective disorder. Whilst such finding might be a by-product of varying sampling locations, it could also mean that childhood school functioning or schooling itself could be poorer among DD patients. Global functioning was better for DD patients and worse for schizophrenia patients with schizoaffective patients having intermediate functioning levels. Global functioning can be interpreted as a by-proxy measure of global outcome and our findings are in line with previous studies demonstrating worse outcome in psychotic disorders with less expression of affective symptoms and/or an excess of females (Petkari et al., 2011).

4.2. Psychopathological psychotic dimensions

The ability of the model to explain the variability of the sample was quite good compared to similar studies that ranged from 51% of the total variance to the 68.7% (Russo et al., 2014; Bunk et al., 1999; Rapado-Castro et al., 2010). Insofar as the composition of the sample varies, the underlying dimensions may change. However, most dimensional studies identify either 4 or 5 dimensions, typically including positive, negative, disorganization and affective psychopathological dimensions. Additional dimensions found in less replicated studies were: substance abuse, anxiety, early onset/developmental, insight, cognition, hostility and behavioural/social disturbances (Potuzak et al., 2012). More recently, one study distinguished between high-order dimensions (affective and nonaffective psychosis) and first-order dimensions (mania, negative, disorganization, depression, delusions and hallucinations) (Russo et al., 2014), although this study did not incorporate DD patients. DSM-5 officially recommends profiling schizophrenia patients using the following dimensions: hallucinations, delusions, disorganized speech, abnormal psychomotor behaviour, negative symptoms, impaired cognition, depression and mania (American Psychiatric Association, 2013). The differences between studies are not only due to the wide sample variability but also to methodological questions, especially the choice of instruments measuring psychotic



Graphic 1. Dimensions and categories.

symptoms, being item selection, perhaps the most important decision in the whole process as suggested by a previous study (Peralta and Cuesta, 2007).

Overall, the five psychopathological dimensions extracted from our mixed psychosis spectrum patients were very similar to those found by most previous studies using PANSS regardless their case-mix. Thus, our five-factor structure only differed in some PANSS' items when compared to that of Lindenmayer (Lindenmayer et al., 1994; Lindenmayer et al., 2004), considered as a potential gold-standard factorization as extracted from the PANSS. Their sample was, albeit, just composed by patients with schizophrenia unlike our more broad psychosis spectrum sample including the largest series ever published of DD patients. Another study reported a similar five-dimension model in two different samples, one of them composed only by patients with schizophrenia and the other one including schizoaffective patients (Bell et al., 1994). Moreover, our model is also similar to an array of other studies using the PANSS in samples including patients with mixed psychotic categories (Rapado-Castro et al., 2010; Bunk et al., 1999; Bell et al., 1994). In addition, one other study utilizing a large retrospective sample of psychotic patients' medical records (N = 1294, including 108 cases with delusional disorder), concluded after testing several competing factor models that the best model explaining major psychoses was that composed by positive, negative, mania, depression and disorganization dimensions (Serretti and Olgiati, 2004). Finally, our model is quite parallel to widely accepted comprehensive dimensional proposals based on epidemiological studies (Lindenmayer et al., 1994; van Os et al., 2010). As it is the case in our study, a recent review demonstrated that most previous studies found just one dimension formed by positive symptoms (Potuzak et al., 2012), although some have reported two or more dimensions of positive symptoms, typically splitting delusions and hallucinations into distinct dimensions (van Os et al., 1996; Bassett et al., 1994; Toomey et al., 1997; Peralta and Cuesta, 1999; Cuesta and Peralta, 2001; Cuesta et al., 2003; Cardno et al., 2001). Even though DSM-5 psychotic dimensions are highly compatible with our 5-dimension model, it admittedly suggests considering positive symptoms into separate delusions and hallucinations dimensions for alleged clinical utility, such as specific therapeutic measures (Barch et al., 2013). Negative symptoms more frequently included within reported negative dimensions were: blunted affect, restricted thinking, alogia and slowed activity (Potuzak et al., 2012). Although they tend to appear grouped together in one single dimension, it has been posed that there is sufficient evidence to distinguish between two different negative factors: 1. Restricted emotional expression. 2. Avolition (Barch et al., 2013). Both factors tend to exist in studies using varying case-mixes of the psychosis spectrum disorders and they seem to hold up cross-culturally (Barch et al., 2013). Interestingly our dimensions mix is also highly compatible with findings on similar studies using DD patients only (Serretti et al., 1999; de Portugal et al., 2013).

Clinical relevance of such division of negative symptoms stem from existing evidence in favour of their prognostic value, as they may differentially predict aspects such as clinical presentation (Strauss et al., 2013), functional outcome (Tattan and Creed, 2001; Strauss et al., 2013), cognitive deficits (Suslow et al., 1998; Gur et al., 2006), emotional deficits (Gur et al., 2006; Henry et al., 2007) and neurobiological variation (Fahim et al., 2005);Gur et al., 2007; Dichter et al., 2010). Our negative dimension merged such negative symptoms with prognostic value. Most previous studies reported two different dimensions for affective symptoms, i.e. manic and depression (Potuzak et al., 2012). Both dimensions have an important value for prognosis and outcome as they are known to influence outcome (Crumlish et al., 2005; Bowie et al., 2006; Petkari et al., 2011) and treatment choice and/or response (Addington et al., 1998; Peralta and Cuesta, 2008). Finally, there is increasing evidence of the validity of a cognitive dimension in psychosis spectrum disorders and its utility to predict functional abilities (Green et al., 2004; McClure et al., 2007; Heinrichs et al., 2010; Cervellione et al., 2007; Ibanez-Casas et al., 2013a,b).

4.3. Psychopathological dimensions vs. psychotic categories

Our study show that DD patients tend to have less intensity of all five described psychotic dimensions whilst schizoaffective patients have a heavier loading in all five dimensions. Schizophrenic patients are placed half-way from each other category but closer to schizoaffective patients in negative and cognitive symptoms whilst closer to DD patients in both affective dimensions which are, in turn, expressed grossly in excess among schizoaffective patients. Interestingly, negative symptoms seem to exist in all categories, including DD, maybe as epiphenomena to positive symptoms and/or as consequence or their treatment. On the whole, we pose that such findings are supportive of the notion of a psychosis spectrum across these three psychotic categories, which is also supported by repeated replications from different studies cross-validating a similar psychopathological dimension structure relatively independently of which psychotic categories case-mixed are used.

Therefore, the difficulties in the diagnostic process arise in the borders between categories, well as comorbidities or uncertain diagnosis. In those borders, the real overlap between them is more than evident. A dimensional approach contributes to overcome obstacles that are largely due to the intrinsic limitations of the categorical approach to capture the reality of actually existing psychotic phenotype in nature. When the concordance between dimensions and categories is analysed, delusional disorder emerge as a well defined, distinct and more benign entity than schizophrenia and schizoaffective disorder, not only in all

the psychopathological dimensions but also regarding global functioning. It is also relevant to highlight the existence of negative symptoms in DD. This occurs in contradiction with the canonical definition of the DSM-5 as a disease in which the existence of negative symptoms listed in criterion A for schizophrenia are exclusion criterion for delusional disorder (American Psychiatric Association, 2013) and has also been reported elsewhere by independent samples (Serretti and Olgiati, 2004; de Portugal et al., 2013). A similar case is arguable regarding the cognitive dimension which is also present in DD. Thus, contrary to previous and current diagnostic criteria we show that DD patients do have indeed some degree of cognitive impairment, something that has been reported earlier (Ibanez-Casas et al., 2013a,b; Ibanez-Casas and Cervilla, 2012).

Finally, the evidence that there seem to be a continuum from DD patients to schizoaffective patients in affective symptoms and from DD to schizophrenia in negative, cognitive and functional symptoms suggest that the conceptualization of currently valid DSM-5/ICD-10 psychotic categories can be improved by intra and inter categorical profiling of psychopathological dimensions in these three psychosis spectrum disorders.

4.4. Clinical implications

Our results suggest points that can be of use in clinical practice. Firstly, from a diagnostic viewpoint, current subtyping of psychotic categories could use a multi-dimensional method (similar to the one already used in DSM-5 for schizophrenia) for all psychotic categories including DD and schizoaffective disorder. We pose such common subtyping suggestion would be more valid in view of our (and many others') data rather than keeping the current content subtyping (in DD) or affective symptom subtyping (in schizoaffective disorder) criteria still present in DSM-5. Secondly, the pan-psychotic use of psychopathological dimensions for subtyping may help improving personalized profiling of treatments that could be devised on the basis of high-loaded dimensions in each patient such as the selection of antidepressants or certain antipsychotics if depressive dimension is high, for instance. Finally, the use of dimensions can also be of use in predicting of general outcome and, thus, determine the clinician's choice of preventative measures in those cases with high-loadings predicting poorer prognosis, such as negative or cognitive psychopathology (Petkari et al., 2011).

5. Conclusions

Our study demonstrates, including a rare mixture of sufficient number of DD, schizophrenia and schizoaffective disorder patients, a psychopathological dimension structure that is very similar to most previously described in different samples combining varied mixtures of disorders. We interpret this as supportive of the notion of existing psychotic psychopathological dimensions that can be of clinical use in both identifying different psychotic disorders and profiling their clinically valid subtypes.

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.schres.2015.10.039.

Contributors

All authors have contributed substantially to the manuscript. Drs. Muñoz-Negro and Dr. Cervilla have led the initial writing of the report and all authors have participated in corrections and comments. Drs. De Portugal, Muñoz-Negro, Dolz, Ibanez-Casas, Ochoa and Cervilla have participated in study design and either in patient interviewing or training of interviewers. Drs. Haro, Ruiz-Veguilla and Cervilla have participated in statistical analyses and writing of report. Dr. Cervilla has been the overall supervisor of this research and its report.

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Conflict of interest

All authors declare no conflict of interests.

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