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Do symptom dimensions or categorical diagnoses best discriminate between known risk factors for psychosis?

■ **Abstract** *Objective* To describe symptom dimensions of psychosis using detailed psychopathological information from epidemiologically defined incident cases which include the full spectrum of functional psychosis across all age ranges. Then, assess the comparative usefulness of the dimensional and categorical representations of psychosis in discriminating between demographic and pre-morbid risk factors. *Method* A total of 464 incident cases of psychosis assessed with OPCRIT (Operational Checklist for Psychotic Symptoms) were included in an exploratory factor analysis. Using Regression analyses we modelled the associations of the dimensional and categorical representations of psychosis with antecedent validating variables and compared the subsequent models using the likelihood ratio test. *Results* Factor analysis produced five-symptom dimensions, manic, disorganisation, depressive, delusional and auditory hallucinatory symptoms, explaining 58% of the total variance. Different dimensions were differentially associated with the pre-morbid risk factors. Neither the dimensional nor the categorical representations on their own were sufficient to explain associations with the antecedent validating variables. *Conclusion* Neither the dimensional or the diagnostic representation of psychosis was superior in discriminating between known risk factors, combining dimensional measures with categorical diagnoses will probably be more informative in determining the causes and correlates of psychosis.

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Introduction

The different psychotic diagnoses overlap in their pre-morbid risk factors, clinical presentations, management needs and outcomes. This lack of discrimination casts doubt as to how clinically useful the categorical classification systems used today are [23, 42], and has resulted in a search for alternative representations of psychoses. One approach is to identify psychopathological dimensions (groups of symptoms which occur together more often than would be expected by chance alone) using exploratory factor analyses (EFA). Individuals can then be defined by how high or low they score on the different dimensions, which may co-exist.

To date there is no definitive model for the symptom dimensions of psychosis, different studies suggesting different numbers of factors or variations in factor composition. These inconsistent findings may be due to differences in methodology [31], most EFA work having studied chronic or mixed stage samples however, if there are psychopathological changes during the course of a disorder [13, 15, 31], samples with different distributions of 'stage of disorder' will yield different symptom dimensions depending on the dominant stage studied. In addition the majority of work has examined patients within the traditional diagnostic categories, particularly schizophrenia, however the dimensions described do not appear specific to any one category. [22, 33]. Therefore, to develop our understanding of the dimensional representation of psychosis we need to study symptoms at specific stages and across the range of psychotic diagnoses.

Important in the design of an EFA is the choice of variables to include in the study. Concept driven instruments are likely to produce dimensions which reflect their underlying constructs, to avoid this bias recent studies have used OPCRIT (The Operational Checklist for Psychotic Disorders) [6, 7, 25, 28, 30, 35–37] which has no theoretical assumptions underlying its design and covers a comprehensive range of psychopathology, including affective symptoms. Finally, classification systems should be useful, that is provide non-trivial information about biological, social, prognostic and treatment correlates and we should evaluate competing systems using these associations. [19, 34]

Aims of the study

(1) To describe symptom dimensions using detailed psychopathological information rated on OPCRIT, from incident cases of psychosis. (2) Assess the nosological usefulness of the symptom dimensions by modelling their associations to demographic and pre-morbid risk factors. (3) Examine the comparative usefulness of the dimensional and categorical representations of psychosis in discriminating between demographic and pre-morbid risk factors.

Methods

■ Sample

Catchment area

Dumfries and Galloway is a geographically well-defined area in South-West Scotland. It has a stable population of around 147,000, of whom 99.5% are white. Psychiatric services are provided by one hospital and its associated community services. There is little or no private health care.

Patient identification

Case ascertainment has been described in detail elsewhere [1]. Briefly, we identified all patients who came in to contact with psychiatric services in Dumfries and Galloway over a 20-year period (1979–1998) who were given a clinical diagnosis of schizophrenia, schizoaffective disorder, delusional disorder, mania, drug induced psychotic disorder; acute, transient or unspecified psychotic disorder. Patients were excluded if they were not resident in Dumfries & Galloway, had presented previously with a psychotic episode out with the study period or had a demonstrable medical condition, which would account for their symptoms.

Patient characteristics

A total of 464 patients had a first episode of psychosis during the study period. There were 210 (45.26%) males and 254 (54.74%) females with a median age at presentation of 36 (inter-quartile range 25–55). Males and females showed a significant difference in the age of onset, the median age for males was 33 and for females it was 39.5 (Mann–Whitney, $p < 0.001$)

Assessment of psychopathology

■ Symptom ratings

The case records which were recognised to be comprehensive and above average at the most recent Royal College of Psychiatrists training approval visit and contain medical, informant, nursing, social work and occupational therapy notes and all correspondence for the 464 patients identified as having a first episode of psychosis were examined and OPCRIT was completed. OPCRIT is a checklist containing 90 items, exploring socio-demographic information, for psychotic and affective symptoms (we used binary (present/absent) ratings for the EFA). It was designed with case note review in mind and it has an associated computer algorithm allowing classification with different diagnostic systems. OPCRIT has established reliability [21, 24, 44] and is a convenient, widely used and validated assessment tool [4, 9]. Two experienced psychiatrists working independently (JA, GM) completed the OPCRIT checklist for the year of presentation and were blind to the clinically coded diagnosis.

■ Selection of symptoms for entry into factor analysis

We excluded items from OPCRIT not related to phenomenology, or where it would be difficult to determine if they were primary or in fact, secondary to medication (initial/middle insomnia, excessive sleep, reduced concentration, slowed activity, loss of energy, increased appetite, weight gain/loss). Items that could make the factor analytic procedures computationally unstable and therefore unreliable were: excluded when their variance was close to zero (catatonia, incoherent speech, diurnal variation, loss of pleasure, excessive self-reproach, early morning wakening, delusions of guilt, delusions of poverty, increased sociability, negative formal thought disorder, lack of insight) or when reliability was poor (primary delusions): used to create composite variables where there was high collinearity (a). Thought alienation: thought broadcasting, thought insertion and thought withdrawal) (b) blunted affect and flattened affect (c) Third person auditory hallucinations, thought echo and running commentary voices). There were 28 items entered into the EFA (see Table 1).

■ Reliability of opcrit ratings

Good inter-rater reliability for OPCRIT generated ICD10 and DSM IV diagnosis of schizophrenia has been demonstrated for this sample [1]. The raters (JA, GM) independently scored 45 randomly selected cases to calculate a kappa statistic of agreement for individual items.

Table 1 5-factor solution (with promax rotation)

	Kappa co-efficient Inter-rater reliability	Manic	Disorganised	Depressive	Delusional	Auditory hallucinations	Communality
Bizarre behaviour	0.87	0.33	0.49	0.07	−0.20	0.20	0.43
Excessive activity	0.84	0.86	−0.05	0.03	0.22	0.02	0.79
Reckless activity	0.62	0.80	−0.04	−0.08	0.16	−0.05	0.66
Distractibility	0.54	0.80	0.21	−0.14	0.10	0.06	0.71
Reduced need for sleep	0.76	0.77	−0.27	0.20	0.19	0.20	0.78
Agitated behaviour	0.61	0.76	0.01	−0.44	−0.15	0.12	0.80
Speech difficult to understand	0.80	0.13	0.86	0.04	0.15	−0.07	0.78
Positive formal thought disorder	0.88	−0.25	0.85	0.31	0.15	−0.11	0.92
Pressured speech	0.87	0.70	0.02	0.24	0.19	−0.16	0.61
Thoughts racing	0.78	0.77	−0.07	0.14	0.10	−0.02	0.63
Inappropriate affect	0.91	0.02	0.63	0.02	0.16	−0.01	0.42
Elated mood	0.83	0.81	0.01	0.03	0.14	−0.16	0.70
Irritable mood	0.81	0.81	−0.10	−0.28	0.01	−0.10	0.75
Dysphoria	0.78	0.04	−0.13	−0.90	0.11	−0.18	0.87
Suicidal ideation	0.73	−0.04	−0.02	−0.70	−0.03	−0.03	0.55
Persecutory delusions	0.87	−0.23	−0.09	−0.02	−0.71	−0.03	0.56
Well organised delusions	0.69	−0.25	−0.27	0.12	−0.81	−0.14	0.82
Increased self-esteem	0.76	0.73	0.17	0.09	−0.01	−0.22	0.61
Grandiose delusions	0.69	0.67	0.29	0.10	0.19	−0.03	0.57
Delusions of influence	0.69	−0.33	0.19	0.07	−0.28	−0.01	0.23
Bizarre delusions	0.70	−0.02	0.53	−0.03	0.15	0.07	0.31
Widespread delusions	0.86	−0.17	−0.02	0.07	−0.73	−0.02	0.57
Delusions of passivity	0.88	−0.16	0.39	−0.10	0.08	0.17	0.22
Abusive/accusatory voices	0.70	−0.23	−0.17	−0.07	0.24	0.68	0.61
Other hallucinations	0.67	−0.25	0.17	−0.33	0.15	−0.24	0.28
Restricted or blunted affect	0.70	−0.54	0.33	−0.16	0.17	−0.11	0.46
Thought alienation	0.81	−0.15	0.34	−0.16	−0.19	0.18	0.20
Third person auditory hallucinations	0.92	−0.08	−0.01	0.24	0.05	0.96	0.98

Exploratory factor analysis

■ Statistical procedure for fitting the common factor model on the tetrachoric correlation matrix

It is appropriate to use EFA to identify the latent symptom dimensions underlying psychotic presentations. EFA is based on the common factor model, which assumes that a variable in a battery of measured variables is a linear function of one or more common factors and one unique factor. Common factors are latent constructs that influence more than one variable and account for the observed correlations seen among them. The Unique factor (with a specific and an error component) influences only one variable and does not account for observed correlations. The common factor model estimates the pattern of association between the common factors and each variable and indexes them as factor loadings. As the OPCRIT symptom scale was of a binary nature, factor analytical methods appropriate to this type of were applied using TESTFACT 4 computer programme [45]. We did a principal factor analysis with communality iterations on the tetrachoric correlation matrix of the 28 OPCRIT derived psychopathological ratings.

■ Determination of the number of factors to extract

Determination of the number of factors to include in the model was guided by the scree test. The basic rationale for the scree test is that the battery of variables is measuring a limited number of factors well and a larger number of trivial, specific and error factors less well. Thus, the prominent factors account for most of the variance whereas the other factors are quite numerous but small [16]. By computing the eigenvalues for the correlation matrix and plotting them in descending value along the ordinate with the eigenvalue number as the abscissa, a straight edge can then be laid across the bottom portion of the eigenvalues where they form an approximately straight line. The point where the eigenvalue plot curves above the straight line formed by the smaller values gives the number of factors [8]. Review of the clinical meaningfulness and interpretability of the factors extracted and the reproducibility of these factors complemented the scree test.

■ Factor rotation to aid interpretation

To aid interpretation of the solution, factors are rotated in multidimensional space to find a solution with the best simple structure (i.e., where each factor is defined by a subset of variables that have large loadings relative to the other variables and in where each variable loads highly on only a subset of common factors). Two forms of factor rotation were used (1) Promax, which allows factors to be oblique (correlated), which we consider the appropriate method (2) Varimax, which produces orthogonal (uncorre-

lated) factor solution has been extensively used in previous published studies. We wished to determine wither the choice of rotational method significantly effects the factor solution.

■ Examination of the stability of the factor solution

A prime criterion for any rotated factor solution is that it should produce the same factors when random sets of individuals are drawn from the underlying population. If it cannot, the solution is of no value [16]. To assess the stability of the obtained factor solution we randomly split the sample in two and factor analysed the halves separately. We then assessed the congruence of the solutions using Pearson product moment and one-way random effects intraclass correlation co-efficients for the loadings in the corresponding factors.

■ Factor score estimation and the distribution of dimensions within diagnostic classes

For each patient we generated (1) OPCRIT derived diagnoses for The International Classification of Diseases, 10th revision (ICD-10) [46], Research Diagnostic Criteria (RDC) [38] and The Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) [3] and (2) factor score estimates for each factor. An individual was considered to have scored 'high' on a particular dimension if their score was above the upper tertile. 'High' score profiles were created for each diagnostic category.

■ The relationship of dimensions and categories to known premorbid risk factors

Using STATA statistical programme, release 9 [39], we fitted a series of linear/logistic regression models, with each pre-morbid validator as the dependent variable (1. gender, 2. age at presentation, 3. marital status, 4. unemployment at presentation, 5. poor pre-morbid work adjustment, 6. poor pre-morbid social adjustment 7. Drug and alcohol misuse within one year of onset of symptoms, 8. identified psychosocial stressor, 9. family history of schizophrenia in first or second-degree relatives and 10. family history of other psychiatric disorders severe enough to warrant referral to specialist services) and the dimensional scores as the independent variables.

We repeated these analyses, entering the diagnostic categories (DSM IV) as independent variables and again, with both dimensional and categorical schemata (the full model) as independent variables. Using the Likelihood ratio test we compared the series of analyses containing the full model with models constrained by dropping the categorical and the dimensional components in turn. [18].

Table 2 Factor correlations for analysis shown in

	Manic	Disorganised	Depressive	Delusional	hallucinations
Manic	1.000				
Disorganised	−0.129	1.000			
Depression	0.207	−0.323	1.000		
Delusional	0.339	−0.259	0.275	1.000	
hallucinations	−0.296	0.320	−0.362	−0.292	1.000

Results

■ Reliability of the opcrit ratings

All symptom ratings showed a good to excellent agreement except distractibility, which showed moderate agreements (Table 1). Similarly, satisfactory agreement was shown for the demographic and risk factors which all had a kappa above 0.7 except for psychosocial stressor (0.64) [2].

■ Factor structure

There were eight factors with eigenvalues greater than unity; the scree test suggested a 5-factors solution, explaining 58% of the variance but 4, 5 and 6 factor solutions were examined. The 5-factor solution made most substantive sense and is presented in detail here. Varimax and Promax rotated solutions gave similar results (Promax solution presented) (Table 1). The factors were mildly correlated (Table 2) and were predominately univocal (items only load highly on to one common factor). *Factor 1* is aligned to the manic symptoms of psychosis with principal loadings for excessive activity (0.86), reckless activity (0.80), distractibility (0.80), reduced need for sleep (0.77), agitated behaviour (0.76) pressured speech (0.70), thoughts racing (0.77), elated mood (0.81), irritable mood (0.81), increased self-esteem (0.73) and mood congruent grandiose delusions (0.67). Restricted/blunted affect (−0.54) had an opposite (negative) substantial loading i.e., a reverse relationship with the positively loaded "manic" symptoms. *Factor 2* included features of 'disorganisation' with the principal loadings; speech difficult to understand (0.86), positive formal thought disorder (0.85) inappropriate affect (0.63) in conjunction with bizarre behaviour (0.49) and bizarre delusions (0.53). *Factor 3* we have described as a 'depression factor' with agitated behaviour (−0.44) dysphoria (−0.71) and suicidal ideation (−0.81) loading on to it. All substantial loading on this dimension (and factor 4) are negative; this does not refer to the polarity of the constructs by themselves, but rather the sign is relational to the other loadings on that factor. It would be quite valid to reverse all signs on this factor (and the signs of the correlations between factors) to aid interpretation [16]. *Factor 4*, included the 'non-bizarre/non-mood

Table 3 Distribution of opcrit generated diagnoses

Diagnosis	DSM-IV			ICD-10			RDC		
	N (%)	Median age	Percent male	N (%)	Median age	Percent male	N (%)	Median age	Percent male
Schizophreniform	89 (19.2)	33	43.8	–			–		
Schizophrenia	113 (24.4)	33	54.0	304 (65.5)	34	51	278 (59.9)	36	49.3
Mania	67 (14.4)	39	38.8	51 (10.1)	37	39.2	58 (12.5)	40.5	37.9
Major Depression	9 (2)	42	11.1	4 (0.9)	28.5	25	9 (1.9)	37	33.3
Delusional disorder	32 (6.9)	72.5	31.3	–			–		
Unspecified	140 (30.4)	35.5	49.3	104 (22.4)	28.5	32.7	63 (13.8)	37	45.3
Schizoaffective	3 (0.7)	31	33.3	1 (0.2)	–	–	53 (11.4)	33	35.9
Not classified	11 (2.4)	65	27.3	–			2 (0.43)	23	0

congruent delusional symptoms'; persecutory delusions (−0.71), well organised delusions (−0.81), widespread delusions (−0.73). *Factor 5* was a second positive factor consisting of 'auditory hallucinations' abusive/accusatory/persecutory voices (0.68) and the composite variable of third person auditory hallucinations; thought echo and running commentary (0.96).

■ Stability of factors across split halves of the sample

The Pearson's product moment and the one-way random effects intra-class correlation for factor loadings across the two halves produced almost identical results therefore we have only reported the Pearson's correlation. The 5-factor solution produced the most similar results across the two halves, with factor loading correlations of 0.95, 0.73, 0.74, 0.89 and 0.62 ($p < 0.001$).

■ Opcrit generated diagnoses

The commonest diagnoses were schizophrenia and unspecified disorders, the proportions varied depending on the classification system used (Table 3).

■ Distribution of dimensions within dsm classification system

The results were similar for the three diagnostic systems (only DSM classification shown). Between the different DSM diagnostic categories, the median factor scores differed significantly (Kruskal–Wallis test, $p < 0.001$) as did the proportions of individuals scoring above the upper tertile for the different factors (symptom dimensions). For example, in the manic diagnostic category a high proportion scored above the upper tertile on the factor 1 'manic' dimension while individuals diagnosed with depression all scored high on the Factor 3 'depressive dimension'. However, within diagnostic categories there was also considerable within-group variation and overlap between categories (Table 4).

■ Association of dimensions to known premorbid risk factors

There was no significant association between any dimension and gender. Age at presentation was significantly associated with disorganisation, depressive and delusional dimensions (adjusted for gender), disorganisation showing the strongest association (estimated regression co-efficient = −8.50; p-value < 0.001 95% CI −10.08, −6.91), with the F test of linear restriction showing it to be significantly different from the association between age at presentation and the other dimensions ($p < 0.001$). Disorganisation was also significantly associated with being single at presentation (OR = 1.35, $p = 0.002$, 95% CI 1.11, 1.63), unemployed at onset of symptoms (OR = 1.35, $p = 0.02$, 95% CI 1.12, 1.64), having poor premorbid work adjustment (OR = 1.64, $p = 0.001$, 95% CI 1.33, 2.01) and poor premorbid social adjustment (OR = 1.25, $p = 0.04$, 95% CI 1.01, 1.53), while an inverse relationship was demonstrated with the manic dimension for these risk factors; single (OR = 0.69, $p < 0.001$, 95% CI 0.56, 0.84), unemployed (OR = 0.73, $p = 0.003$, 95% CI 0.59, 0.90) poor premorbid work adjustment (OR = 0.62, $p < 0.001$, 95% CI 0.47, 0.81) and poor premorbid social adjustment (OR = 0.53, $p < 0.001$, 95% CI 0.39, 0.72). No other dimensions were significantly associated with these risk factors except the delusional dimension which was inversely related to poor premorbid social adjustment (OR = 0.72, $p < 0.01$, 95% CI 0.57, 0.91). Only the depressive dimension was significantly associated with drug /alcohol use within the first year of symptoms (OR = 1.53, $p = 0.003$, 95% CI 1.15, 2.01) and presence of psychosocial stressors at presentation (OR = 1.61, $p < 0.01$, 95% CI 1.13, 2.30). It was also associated with family history of other psychiatric disorders (OR = 1.31, $p = 0.03$, 95% C.I 1.03, 1.66) as was the manic dimension (OR = 1.30, $p = 0.02$, 95% CI 1.04, 1.62). Finally, there were no significant associations between any dimension and a family history of schizophrenia.

Neither the dimensional model (the set of dimensional scores) nor the categorical model (the set of diagnoses) was sufficient to explain the associations

Table 4 The Proportion of individuals within DSM categories scoring above the upper tertile on symptom dimensions

	Manic N (%)	Disorganised N (%)	Depression N (%)	Delusional N (%)	Hallucinations N (%)
Schizophrenia	21 (19)	57 (50)	26 (23)	25 (22)	39 (35)
Schizophreniform	21 (24)	42 (47)	32 (36)	23 (26)	42 (47)
Manic	62 (93)	16 (24)	17 (67)	47 (70)	22 (33)
Major depression	3 (30)	1 (10)	10 (100)	5 (50)	3 (30)
Delusional disorder	1 (3)	0	4 (13)	4 (13)	1 (3)
Unspecified	44 (31)	38 (27)	38 (27)	38 (27)	44 (31)

(11 cases, which were unclassified and 2 schizoaffective cases, were excluded from this analysis)

Table 5 Contribution of dimensional and categorical models in the associations with premorbid risk factors

Dependent variable in logistic/linear model	Comparison of full model with model constrained by dropping the categorical diagnoses		Comparison of full model with model constrained by dropping the dimensions	
Premorbid risk factor	Likelihood ratio statistic	p-value	Likelihood ratio statistic	p-value
Gender	10.68	0.06	4.44	0.49
Age at presentation	22.78	<0.001	86.14	<0.001
Single at presentation	8.20	0.15	15.38	<0.01
Unemployed at presentation	13.63	0.02	10.25	0.07
Poor work adjustment	15.61	<0.01	15.35	<0.001
Poor social adjustment	19.25	<0.001	2.59	0.76
Alcohol/drugs misuse	6.06	0.19	18.92	0.002
Psychosocial stressor	12.90	0.02	18.07	0.002
Family History schizophrenia	6.25	0.28	6.37	0.27
Family psychiatric history	1.84	0.76	8.67	0.12

with all the pre-morbid variables (Table 5). None of the posited models were significantly related to gender, family history of schizophrenia or family history of other psychiatric disorders. The set of dimensions was an adequate model of association for single at presentation and alcohol/drug misuse within the first year of onset. However, the categorical model was more informative for poor social adjustment and unemployment at presentation. The full model (both sets of data) best represented the association of age at presentation, poor work adjustment and presence of a psychosocial stressor i.e., neither the dimensional or categorical model was sufficient on their own.

Discussion

■ Findings

In a population-based study of patients during the first year of a psychotic disorder we have shown a symptom structure composed of 5 dimensions; 'mania', 'disorganisation/bizarre', 'depression', 'non-bizarre/non-mood congruent delusions' and 'auditory hallucinations,' which explains 58% of the total variance. This solution was replicated when EFA were carried out on randomly split halves of the sample. Although diagnostic categories had different symp-

tom dimension profiles, these did not relate precisely to the diagnoses of psychoses in the currently used classification systems. Symptom dimensions showed different and distinct profiles of associations with known pre-morbid risk factors i.e., individual dimensions were able to discriminate between known risk factors. Our results indicate that using both the dimensional and categorical models of psychosis was more informative in terms of sensitivity to variation in demographic and risk factor profiles than either model independently.

■ Methodological considerations

Before interpreting our findings, we must consider potential limitations. Symptoms and risk factors were identified via case note review, although this is not the best way to detail clinical variables, the case notes were comprehensive and well maintained. The 2 raters were experienced psychiatrists demonstrating good inter-rater reliability for both individual item ratings and diagnostic categories. We used OPCRIT, to cover a wide range of psychopathology and demographic information, however not every symptom or known risk factor with a theoretical relationship to psychosis could be included, OPCRIT does not have a broad range of anxiety, catatonic or negative symptoms. A few candidate items had low variability,

which could reflect the chart review method, with clinicians perhaps failing to record all symptoms, however studies using face-to-face interviews have found similarly low prevalence for items such as insight [11]. Finally, we created composite items where symptoms showed high collinearity. With regard to pre-morbid functioning we used overall measures, however better discrimination may have been achieved if information on different domains of these validators were available [27]. The EFA solution has moderate communalities (average 0.59) and moderate over-determination of factors (one factor only having 2 items), however the large sample size should be adequate to produce accurate estimations under these conditions [14] replication of the structure using split half samples strengthens the EFA findings. Finally, multiple statistical tests were conducted to explore the relationship between dimensions and demographic risk factors this could theoretically result in a Type 1 error, however no adjustment for multiple tests have been used, as the a priori hypothesis was that differential associations would be present and adjustment could potentially result in important differences being deemed non-significant [32].

■ Symptom dimensions

Affective symptoms loaded on to two distinct 'manic' and 'depression' domains. This is consistent with findings from previous studies of psychoses rated using OPCRIT [25, 30, 36, 37] and in studies of recent onset psychosis. [23, 28]. The negative symptom blunted/flattened affect loaded on to this dimension in the opposite orientation to the manic symptoms, similar to another recent study [23].

The second 'disorganisation' factor' is also supported in the literature [17]. However, this has generally been associated with a negative domain, which we did not identify separately. It is possible that this is due to OPCRIT taking a narrow view of negative symptoms, focusing on negative formal thought disorder, restricted affect and blunted affect. This narrow view is, however stressed in the literature as it increases the chance of only primary negative symptoms being elicited rather than those secondary to positive symptoms or medication [10]. We excluded negative formal thought disorder in this study as it had a low prevalence, which in part may be consequent on the case note review methodology, as clinician's tend to document only prominent and severe poverty of speech. However, previous studies have found the symptoms of 'blunting of affect' and 'inappropriate affect' (both present in our study) to best discriminate between negative and disorganised syndromes while 'negative formal thought disorder' was a poor discriminator [5, 41]. Also, previous studies using OPCRIT have identified negative factors within mixed stage/chronic samples, where negative symptoms have a higher prevalence [6, 30]. In

order to examine the issue of negative symptoms in relation to the disorganisation factor, a post-hoc analysis was carried out in which associations between the dichotomous measures of negative symptoms (blunting/restricted affect) and, jointly, the five dimensions were assessed. This revealed significant associations with all five dimensions, but the odds ratio was strongest by far for the disorganisation dimension (OR = 7.5, 95% CI 4.2, 13.1) and significantly stronger than the OR with the depressive dimension ($\chi^2 = 5.3$, $p = 0.02$), the hallucinations dimension ($\chi^2 = 32.3$, $p < 0.0001$), the mania dimension ($\chi^2 = 42.8$, $p < 0.0001$) and the delusion dimension ($\chi^2 = 36.7$, $p < 0.0001$). Therefore, the disorganisation factor identified in this study to a degree, taps into the negative symptom domain, and with time, the dynamics of these associations may come more to the fore. Apart from the negative symptoms of blunted/restricted affect, we also found bizarre delusions (including schneiderian first rank delusions) to load moderately on to this dimension. In this first episode sample, there seems to be a clinically distinct dimension of disorganisation/bizarre delusions, which includes elements of both Bleulerian and Shneiderian constructs.

Most EFA studies suggest a unitary positive symptom dimension; however, not all studies of recent onset psychosis have found this single factor. [12, 28, 43]. We have found delusions to load on to three factors; bizarre delusions loading with the disorganisation symptoms; mood congruent delusions with the affective dimensions and finally persecutory and systematised delusions loading on a discrete dimension; suggesting potentially different underlying psychopathological mechanisms for different forms of delusion. Auditory hallucinations have loaded on to a separate dimension, this segregation of delusions and hallucinations has been reported previously [26, 41].

■ Relationship of symptom dimensions to clinical diagnostic categories

Diagnostic categories differed in their factor score profiles however; there was considerable overlap between categories. For example, disorganisation/bizarre is more common in DSM-IV schizophrenia (50%), but was not uncommon in other forms of psychosis. For example, 25% of patients diagnosed with mania scored in its top tertile. Similarly, 24% of the subjects diagnosed with DSM-IV schizophrenia scored in the highest tertile for the mania dimensional scores. The range of scores in each diagnostic category also indicates considerable intra-group variation. The mildly correlated factor solution and the observed overlap between categories on their factor score profiles suggests that symptom dimensions do not define classes of patients but co-exist within individuals.

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The association of dimensions and categories to known pre-morbid risk factors

There was a differential association between dimensions and risk factors e.g., the disorganised factor was strongly associated with younger age of onset, single status, unemployment and poor pre-morbid work and social adjustment. On the other hand, increasing scores in the manic dimension increased the probability of being married, employed and having good pre-morbid work and social adjustments. Manic and depressive dimensions were both associated with family history of psychiatric disorders (other than schizophrenia). Previous studies exploring the relationship between symptom dimensions and a family history of psychosis have been inconsistent showing either no or only weak associations. [7, 25, 29]. We did not find an association between any of the dimensions (or diagnoses) and a family history of schizophrenia, this result is consistent with findings from family studies, showing family history of non-affective psychosis throughout the spectrum of affective and non-affective psychosis [20].

Finally, neither dimensional or categorical models alone could best predict associations with pre-morbid risk factors, rather concomitant use of both representations provided significantly more information than either one system independently. The concurrent use of alternative representations of psychopathology has been proposed [40] and our finds support this assertion.

This dimensional model of first episode psychosis requires further validation using neurobiological strategies and prognostic variables nonetheless the results presented here support the idea that it is useful to conceive psychosis as overlapping symptom dimensions, each associated with a range of underlying and different risk factor profiles. However, in this study, the concomitant use of both dimensional and categorical models of psychosis was more sensitive to variations in demographic and risk factors than either model independently; combining dimensional and categorical representations of psychosis is likely to be most informative in elucidating the causes and correlates of psychosis.

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