Schizotypal Personality Traits in Nonpsychotic Relatives Are Associated With Positive Symptoms in Psychotic Probands

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Abstract

There remains disagreement over whether increased risk of schizotypal personality disorder (SPD) is confined to the relatives of patients with a diagnosis of schizophrenia or whether it is a more general characteristic of the relatives of all psychotic patients. To examine the relationship between schizotypal dimensions in relatives and psychopathological syndromes in patients with functional psychoses, factor analysis was carried out on (1) ratings from Present State Examination (PSE) interviews with 172 consecutively admitted patients with psychosis (52% of them with schizophrenia), and (2) ratings on items from three schizotypal scales concerning 263 of their nonpsychotic first degree relatives. The factors derived from the patients' PSE interviews were correlated with the schizotypal factors and the nine *DSM–IV* criteria for SPD concerning the relatives and subjected to a canonical correlation analysis. In this study, no differences were observed concerning the distribution of schizotypal factors or *DSM–IV* schizotypal features in the relatives of patients with different psychotic diagnoses. However, a syndrome characterized by delusions, hallucinations, and thought interference (positive symptoms) in patients was correlated with high scores on the three schizotypy scales and with positive and negative schizotypal features in relatives.

Keywords: Schizotypy, schizophrenia, psychosis, canonical correlation analysis.

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Since Emil Kraepelin published the 8th edition of his textbook of psychiatry in 1909–1913 (Kraepelin 1919), in which he described the abnormal personalities of some relatives of schizophrenia patients, investigators have attempted to capture the core features of this type of personality (Kendler 1985). In one of the most influential studies, Kety and colleagues (1968) found that milder syndromes described as latent, borderline, or uncertain schizophrenia were concentrated in the biological rather than the adoptive relatives of schizophrenia adoptees. These findings pointed to a genetic link between schizophrenia and what Bleuler (1911) called "latent schizophrenia" and were the basis for the introduction into *DSM–III* of a new category termed schizotypal personality disorder (SPD) by Spitzer and colleagues (1979). Many subsequent studies have found a higher rate of SPD and other personality disorders (i.e., paranoid and schizoid) in the relatives of schizophrenia patients when compared to relatives of control subjects (Kendler et al. 1981; Baron et al. 1983; Gunderson et al. 1983; Siever et al. 1990). As a consequence, SPD has come to be regarded as being one phenotypic expression of familial-genetic liability to schizophrenia (Battaglia et al. 1997). However, most studies comparing the rates of SPD or schizotypal traits in the relatives of schizophrenia patients with the rates in relatives of affective psychotic patients failed to confirm the specificity of SPD to the former (Squires-Wheeler et al. 1988, 1989; Coryell and Zimmerman 1989; Kety et al. 1994). It is possible that SPD is a phenotypic expression of familial-genetic liability to a particular psychotic phenotype that is found within several diagnostic categories.

Some studies have reported a familial resemblance between the schizotypal symptoms shown by schizophrenia patients and their relatives. Clemenz and colleagues (1991) found that physical anhedonia but not perceptual aberration correlated between siblings, and Grove and colleagues (1991) reported that several schizotypy measures, including physical anhedonia and perceptual aberration, run together in families. Tsuang (1993) showed that negative symptoms in schizophrenia patients were correlated, at the trend level, with negative symptoms in their relatives. Kirkpatrick and colleagues (2000) showed that

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schizophrenia patients with the deficit syndrome tended to have nonpsychotic relatives with higher degrees of social isolation. Mata and colleagues (2000) found that positive symptoms in schizophrenia patients were correlated with higher degrees of schizotypy in their relatives. Other studies (Lenzenweger and Loranger 1989; Kendler et al. 1995, 1996) found that some measures and dimensions of schizotypy discriminate relatives of schizophrenia patients from relatives of patients with other psychotic disorders. However, a general limitation of the above-mentioned studies is that they took into account only schizophrenia (but not all the range of psychotic) patients, thus assuming the specificity of schizotypy to schizophrenia.

We determined to study the relatives of a sample of patients selected solely on the basis of the presence of psychotic symptoms, so as to avoid having to make initial assumptions about the diagnostic specificity of SPD. The first hypothesis we wished to test was that the rate of schizotypal traits in relatives would not differ across probands with different psychotic diagnoses. Our next step was to examine the relationship between psychopathological syndromes in the psychotic patients and schizotypal dimensions in their relatives.

Method

Information on Probands. Patients aged 16 to 50 years who were consecutively admitted to two South London hospitals with at least one psychotic symptom according to the Research Diagnostic Criteria (RDC, Spitzer et al. 1978) but without evidence of gross organic pathology were extensively investigated within 3 days of admission. A detailed description of the procedure can be found elsewhere (Jones et al. 1993; Sham et al. 1994). Patients in whom drug or alcohol abuse was considered to be a major etiological factor were excluded. Phenomenological assessment was made using the Present State Examination (PSE) of Wing and colleagues (1974), conducted by three experienced clinicians who had been trained at the same center. Diagnoses were made according to RDC using information from the PSE interviews and case notes, and patients were divided into four diagnostic categories: schizophrenia, schizoaffective psychosis, affective psychosis, and atypical psychosis. The information collected included sociodemographic data (sex, age, race, marital status, social class of patient and father) as well as historical information regarding educational achievement, and age at first psychiatric contact with any psychiatric services as a measure of age at onset (Sham et al. 1994).

After patients' consent was obtained, all available mothers were directly interviewed concerning the patients' childhood personality and social adjustment using the retrospective scales employed by Foerster and colleagues (1991*a*, 1991*b*); these scales provide ratings on childhood premorbid schizotypal and schizoid personality traits (PSST) and premorbid social adjustment for the periods of 7 to 11 years (PSA1) and 12 to 16 years (PSA2). PSST scores range from 0 to 21, while PSA1 and PSA2 scores range between 5 and 35, higher scores indicating greater impairment on all three scales. Interviewers were blind to diagnostic information concerning the probands.

Information on Relatives. After patients' consent was given, personal interviews were carried out with as many first degree relatives as possible (n = 263), blind to patient diagnosis. Those relatives were first assessed using the Schedule for Affective Disorders and Schizophrenia (Endicott and Spitzer 1978). Then they were assessed with three different scales for schizophrenia spectrum disorders:

1. Kings Schizotypy Questionnaire (KSQ): This 63-item self-administered questionnaire with yes/no answers was derived from *DSM* criteria of SPD and developed by M. Williams (1993); it covers both cognitive-perceptual and interpersonal symptoms. Exactly 202 relatives completed this questionnaire.
2. The 28-item version of Venables' Survey of Attitudes and Experiences Scale (SAE): This self-administered questionnaire with yes/no answers was derived by S. Wilkins (1988) from much longer versions in order to study psychophysiological aspects of schizophrenia spectrum disorders. Exactly 193 relatives completed this questionnaire.
3. Modified version of the IPDE (Loranger 1988): 27 items, including all the features listed in the *DSM–IV* and ICD–10 criteria of cluster A personality disorders (paranoid, schizoid, and schizotypal), were selected from this semistructured interview. All the items are scored "0" if absent, "1" if probable, and "2" if definite. Exactly 252 of the relatives were evaluated with this interview.

Analyses. To identify symptom dimensions in the probands, initial unrotated factors were extracted with principal component analysis on the 19 main affective and psychotic syndromes from the PSE (listed in table 1). Briefly, these 19 main syndromes were constructed to diminish the number of items (140) of the original PSE, as this high number would make it impossible to undertake a factor analysis, by adding up the individual scores of those items that could be easily merged into a more "general" item/syndrome with an affective or psychotic content. Those factors with an eigenvalue greater than 1 were subjected to varimax rotation. Regression factor scores were computed in each case for further analyses.

To identify symptom dimensions in the relatives, factor analysis was also undertaken on each of the three

Table 1. Factor analysis of Present State Examination main syndromes on probands ($n = 172$)

Main syndromes	Factor 1 14% Depression	Factor 2 12% Mania	Factor 3 11% Delusions-hallucinations	Factor 4 8% Negative thought disorder	Factor 5 7% Disorganization	Factor 6 6% Paranoia	Factor 7 6% Poor rapport
Depression	0.78						
Social isolation	0.77						
Depressive delusions	0.65						
Mania		0.80					
Grandiose delusions		0.75					
Thought interference			0.71				
Hallucinations			0.68				
Bizarre delusions			0.68				
Delusions of passivity			0.64				
Negative formal thought disorder				0.80			
Bizarre behavior				0.74			
Catatonia				0.43			
Positive formal thought disorder					0.76		
Incoherence					0.67		
Paranoid delusions						0.74	
Lack of insight						0.64	
Rapport difficult							0.82
Inappropriate affect							0.47

Note.—Percentages in column heads indicate the proportion of variance that the factor explained.

schizotypy scales. In this case, as these had many items and it is preferable for subsequent analysis to have fewer factors, we used the scree plot test (Cattell 1966) to select the number of factors to be subjected to varimax rotation. Regression factor scores were again produced for each case for subsequent analyses.

Scores for the nine features of *DSM–IV* SPD were created by selecting individual items from the three scales that matched each feature, with items related to observational features (i.e., odd speech, odd behavior, inappropriate affect) being extracted from only the IPDE semistructured interview. *DSM–IV* diagnoses of SPD were also made in the relatives according to the presence of five or more of these features.

Statistical significance was tested using the χ^2 statistic for group differences in dichotomous variables' Mann-Whitney U test for differences in continuous variables between two groups; and one-way analysis of variance, with Bonferroni correction for multiple tests, for differences in continuous variables between more than two groups. We used Spearman correlation coefficients to assess relationships between schizotypal factors and *DSM–IV* extracted features in relatives, as the latter was considered to be a discrete variable. However, Pearson's correlation coefficients were used to assess relationships between factors in the probands and schizotypal factors and features in the relatives, as we were mostly interested in the relationship between factors in probands and relatives and we considered them as continuous variables. To explore the combinations of syndromes in patients that correlated with combinations of schizotypal factors in relatives, a canonical analysis (Hotelling 1936) was undertaken. The purpose of a canonical analysis is to characterize the independent statistical relationships that exist between two or more sets of variables (Kettenring 1982). The analysis involves the calculation of canonical variables in each of the two sets, and the associated canonical correlations. The combination of canonical variables and correlations summarizes how the variables within one set are associated with the variables within the other set. Significance for all these analyses was set at $p < 0.05$.

Results

One hundred seventy-two patients met the inclusion criteria; none of the patients were related to one another. Relatives of 113 (65.7%) of the patients were available for interviews, with a range of 1 to 6 relatives per proband.

Patients with relatives interviewed and patients without relatives interviewed were similar in age, ethnicity, marital status, index diagnosis, paternal social class, and age of onset; however, more of the males were in the group without interviewed relatives ($\chi^2 = 8.79$; $p = 0.003$).

Characteristics of the Probands. Fifty-nine of the patients were female (34%), and the mean age at assessment of patients was 27.9 years (range = 16–50; standard deviation [SD] = 7.1). One hundred sixteen (67%) patients were white-European, and only 23 (13%) were married or cohabiting; the mean age of onset was 21.9 years (SD = 6.3). In 52 cases (32%), this was the first admission to a psychiatric hospital, the mean duration of illness being 4.6 years (SD = 5.4). An RDC diagnosis of schizophrenia was made in 90 (52%) cases, 77.8 percent of them male; schizoaffective psychosis in 30 (17%) cases, 56.7 percent male; affective psychosis in 43 (25%) cases, 48.8 percent male; and atypical psychosis in 9 (5%) cases, 50 percent male. For the demographic characteristics there were no significant differences between diagnoses.

One hundred and twenty-seven mothers of psychotic patients were interviewed. PSST was rated in 119 cases, PSA1 in 121 cases, and PSA2 in 120 cases; the numerical discrepancies arose because a rating of PSST required the patient to have been in contact with the mother up until age 16 years, while PSA1 and PSA2 required contact at 5 to 11 and 12 to 16 years, respectively. The mean score for PSST was 8.4 (SD = 2.2); for PSA1, 11.8 (SD = 4.2); and for PSA2, 15.4 (SD = 6.0). After Bonferroni correction for multiple tests, no significant differences were found between diagnostic categories.

The factor analysis of the 19 PSE syndromes extracted 7 factors, which explained 64 percent of the variance (table 1). After a varimax rotation, all syndromes except blunting of affect had at least one factor loading greater than 0.4. The first factor had heavy loading in depression, social isolation, and depressive delusions; the second in mania and grandiose delusions; the third in thought interference, hallucinations, bizarre delusions, and delusions of passivity; the fourth in negative formal thought disorder and bizarre behavior and to a lesser extent catatonia; the fifth in positive formal thought disorder and incoherence; the sixth in paranoid delusions and lack of insight; and the seventh in difficult rapport and inappropriate affect. Factors were respectively named (1) depression, (2) mania, (3) delusions-hallucinations, (4) negative thought disorder, (5) disorganization, (6) paranoia, and (7) poor rapport.

Sex differences were found in the mania syndrome, with higher scores in females (Mann-Whitney U test, $z = 2.4$, $p = 0.01$).

Characteristics of the Relatives. Of the 263 first degree relatives who participated, 163 (62%) were female. Their relation with the probands was 103 (39.2%) mothers, 53 (20.2%) fathers, and 107 (40.7%) siblings.

No significant differences were found for the three schizotypy scales between the different relative groups. Mean scores (with SD, range) of the three schizotypy scales for the three relatives groups were mothers: KSQ 8.5 (7.4, 0–36), SAE 7.2 (4.6, 0–19), IPDE 3.6 (3.7, 0–19); fathers: KSQ 8.3 (7.0, 2–35), SAE 7.9 (3.6, 1–16), IPDE 4.4 (4.0, 0–16); and siblings: KSQ 8.7 (7.2, 0–31), SAE 7.0 (3.7, 0–19), IPDE 3.0 (4.3, 0–31).

Factor analysis of each of the three scales employed to measure schizotypy in the relatives was undertaken. After the analysis, seven factors were obtained from the three scales.

1. From the KSQ, two factors explaining 22 percent of the variance were extracted: positive schizotypy and negative schizotypy. The positive factor included most of the items from the four cognitive-perceptual subscales (perceptual alterations, magical thinking, paranoid ideation, and ideas of reference) and the negative factor included most of the ones in the subscales of social anxiety and social isolation. Males tended to score higher on the negative factor, although this failed to reach statistical significance (Mann-Whitney U test, $z = 1.9$, $p = 0.06$).
2. Factor analysis of the SAE yielded two factors, with 25 percent of the variance explained: schizophrenism and anhedonia. Higher mean scores on the anhedonia factor were found in males ($z = 2.8$, $p = 0.005$).
3. The IPDE showed the presence of three factors that explained 34 percent of the variance: schizoid, paranoid, and schizotypal. Males tended to score higher on the paranoid factor ($z = 2.2$, $p = 0.03$) and females on the schizotypal factor ($z = 2.0$, $p = 0.04$).

Concerning the nine *DSM–IV* criteria of SPD, males had greater scores on the items for "no close friends" ($z = 2.5$, $p = 0.01$) and "inappropriate affect" ($z = 2.6$, $p = 0.009$). Table 2 shows the correlation between the seven syndromes obtained by factor analysis and the nine *DSM* criteria for SPD in the relatives.

When the mean scores for each of the seven factors and each of the nine *DSM* SPD criteria were compared between relatives divided according to the four diagnostic categories of their respective probands, no significant differences were found. Only four relatives received a *DSM–IV* diagnosis of SPD. Two of them were relatives of schizophrenia patients, and two were relatives of affective patients. Similarly, no differences were found when relatives were classified as having two, three, or four schizotypal features.

Correlations Between Probands and Relatives. Pearson's correlation coefficients were calculated between the

Table 2. Spearman correlation matrix between schizotypal factors and *DSM–IV* features of schizotypal personality disorder in relatives (n = 263)

Schizotypy features	KSQ positive	KSQ negative	SAE schizophrenism	SAE anhedonia	IPDE schizoid	IPDE paranoid	IPDE schizotypal
Ideas of reference	0.74***	0.40***	0.58***	0.05	0.41***	0.47***	0.03
Excessive social anxiety	0.16*	0.66***	0.54***	0.17*	0.54***	0.22**	–0.09
Magical thinking	0.65***	0.02	0.30***	–0.23**	0.15	0.20*	0.32***
Unusual perceptual experiences	0.60***	0.62***	0.63***	0.13	0.44***	0.19*	0.21**
Odd behavior	0.11	–0.05	–0.02	–0.04	–0.01	–0.05	0.67***
No close friends	0.16*	0.77***	0.55***	0.50***	0.62***	0.08	0.00
Odd speech	0.12	–0.01	0.09	0.01	0.04	–0.07	0.72***
Inappropriate affect	–0.11	0.40***	–0.01	0.67***	0.56***	–0.14*	0.09
Suspiciousness	0.53***	0.30***	0.48***	–0.03	0.46***	0.76***	0.20*

Note.—IPDE = Personality Disorder Examination; KSQ = Kings Schizotypy Questionnaire; SAE = Survey of Attitudes and Experiences Scale.

* $p < 0.05$; ** $p < 0.005$; *** $p < 0.001$

seven syndromes derived from the PSE in the probands and both the seven factors in the relatives from the schizotypy scales and the nine *DSM* criteria for SPD (table 3). Six of the seven syndromes in the probands were correlated with one or more of the syndromes or *DSM* features in the relatives. Thus, the depression syndrome in the probands was correlated with suspiciousness in the relatives; the delusions-hallucinations syndrome in the probands correlated with the positive, negative, schizophrenism, and schizoid syndromes, and with five of the schizotypal features (ideas of reference, magical thinking, unusual perceptual experiences, no close friends, and suspiciousness) in the relatives; the negative thought disorder syndrome was negatively correlated with the schizoid syndrome and inappropriate affect in the relatives; the disorganization syndrome was correlated with odd speech, odd behavior, and the schizotypal factor in the relatives; the paranoia syndrome was correlated with having no close friends in the relatives; and the poor rapport syndrome was correlated with unusual perceptual experiences in the relatives. The delusions-hallucinations syndrome was the only one that showed significant correlations with the total scores of the three schizotypy scales.

Canonical Correlation Analyses. Two canonical correlation analyses were performed (table 4). The first analysis correlated the syndromes in the probands with the schizotypal syndromes in the relatives. The first canonical correlation of this analysis showed that the delusion-hallucinations syndrome in the probands was correlated with a linear combination comprising SAE anhedonia, KSQ positive schizotypy, and IPDE schizotypal factors in relatives.

The second canonical correlation analysis, between the syndromes in the probands and the nine features of *DSM–IV* criteria of SPD in the relatives, showed that the delusion-hallucinations syndrome in the probands was correlated with a linear combination of odd behavior, inappropriate affect, magical thinking, and unusual perceptual experiences in relatives.

Conclusions

Methodological Issues. Several limitations must be addressed before discussing the main findings of the study. First, regarding the factor analyses, the most important limitation is the modest size of the sample. Gorsuch (1983) stated that at least five to ten patients per variable are needed to obtain reliable results when using principal component analysis. As our probands' sample comprised 172 patients, we selected all the 19 main affective and psychotic syndromes, so the ratio of patients per variable was 9:1. We had a sample of 263 relatives, but not all of them completed the three schizotypy scales. Thus, the ratio of subjects per variable was low for the KSQ (3:1) but acceptable for the SAE (7:1) and for the IPDE (9:1). However, the factor solution of the first scale was easily interpretable and similar to that obtained by its original author.

Second, there are some methodological limitations regarding the samples examined in the study. For example, there is a high discrepancy in sex distribution between probands and relatives, with males representing 66 percent of the probands group but only 38 percent of the relatives group. As it is a hospital-based study, it is reasonable to have a higher proportion of males in the

Table 3. Pearson's correlations between psychotic syndromes in probands (n = 172) and schizotypal syndromes and features in relatives (n = 263)

	Depression	Mania	Delusions-hallucinations	Negative thought disorder	Disorganization	Paranoia	Poor rapport
KSQ total score	0.01	–0.03	**0.24*** **	–0.05	–0.07	0.03	0.08
SAE total score	–0.01	–0.03	**0.17***	–0.10	–0.10	0.02	0.01
IPDE total score	0.13	–0.11	**0.14***	–0.10	0.08	0.00	0.01
KSQ positive	0.03	–0.03	**0.16***	–0.03	–0.05	–0.09	0.05
KSQ negative	–0.02	–0.03	**0.19***	–0.07	–0.04	0.10	0.11
SAE schizophrenism	0.04	–0.14	**0.17***	–0.02	–0.04	0.05	0.05
SAE anhedonia	–0.02	–0.01	0.14	–0.05	–0.08	0.09	0.05
IPDE schizoid	0.06	–0.04	**0.16***	**–0.14***	–0.04	0.08	0.03
IPDE paranoid	0.08	–0.09	0.08	–0.03	0.08	–0.07	–0.05
IPDE schizotypal	0.00	–0.03	0.04	–0.01	**0.25**** **	–0.09	0.01
Ideas of reference	0.04	–0.07	**0.17***	–0.05	–0.04	0.02	0.02
Excessive social anxiety	0.11	–0.02	0.07	–0.05	–0.09	0.06	0.01
Magical thinking	–0.05	0.13	**0.25*** **	–0.04	0.08	0.07	0.02
Unusual perceptual experiences	0.04	–0.02	**0.30**** **	–0.06	–0.04	–0.04	**0.18***
Odd behavior	0.00	–0.09	0.10	0.04	**0.16***	–0.04	0.02
No close friends	0.02	–0.05	**0.19***	–0.05	–0.07	**0.17***	0.05
Odd speech	0.02	–0.05	0.00	0.06	**0.18****	–0.03	0.00
Inappropriate affect	0.00	0.03	0.10	**–0.21****	–0.10	0.12	–0.03
Suspiciousness	**0.18***	–0.10	**0.22****	–0.08	–0.03	0.01	–0.02

Note.—IPDE = Personality Disorder Examination; KSQ = Kings Schizotypy Questionnaire; SAE = Survey of Attitudes and Experiences Scale.
Significant correlation coefficients are in bold font.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.005$; **** $p < 0.001$

Table 4. Canonical correlations between psychotic syndromes in the probands and schizotypal syndromes and features in the relatives

	First correlation
First canonical analysis (0.39)	
Probands	
Depression	−0.28
Mania	1.61
Delusions-hallucinations	**3.84**
Negative thought disorder	0.09
Disorganization	−0.58
Paranoia	0.86
Poor rapport	0.88
Relatives	
KSQ positive	**2.62**
KSQ negative	0.37
SAE schizophrenism	−0.80
SAE anhedonia	**2.88**
IPDE schizoid	0.41
IPDE paranoid	−0.53
IPDE schizotypal	**1.43**
Second canonical analysis (0.40)	
Probands	
Depression	−0.64
Mania	1.98
Delusions-hallucinations	**4.69**
Negative thought disorder	−0.60
Disorganization	−0.69
Paranoid	−0.80
Poor rapport	0.65
Relatives	
Ideas of reference	0.35
Excessive social anxiety	−1.28
Magical thinking	**1.85**
Unusual perceptual experiences	**1.82**
Odd behavior	**2.61**
No close friends	0.07
Odd speech	−0.90
Inappropiate affect	**2.26**
Suspiciousness	−0.23

Note.—IPDE = Personality Disorder Examination; KSQ = Kings Schizotypy Questionnaire; SAE = Survey of Attitudes and Experiences Scale. Significant correlation coefficients ($p < 0.05$) are in bold font.

probands group. Besides, mothers of psychotic patients tend to be more collaborative than fathers, so, as we had twice as many mothers as fathers in our relatives group, the higher proportion of females in this group is understandable. No differences were found for the schizotypy scales between the three relative groups (fathers, mothers, and siblings). None of the sociodemographic characteristics significantly differed between diagnostic categories. Another issue regarding the samples is that of using probands who did not have relatives participating in the study. However, this problem is almost solved by the fact that no significant differences were found between those probands with available relatives and those who did not have such relatives.

Third, a few methodological issues should also be considered regarding the instruments and analyses. To assess schizotypy in relatives, we used self-administered scales, some of which (i.e., KSQ, SAE) are not published. However, as already mentioned, these scales are based on published ones. For the observational features of *DSM–IV* SPD (i.e., odd speech, odd behavior, and inappropriate affect), we used the appropriate items of the IPDE semi-structured interview. Multiple comparisons were performed using multiple scales, so we assumed the possibility of type I errors. To minimize the impact of this type of error, post hoc tests (Bonferroni correction) were carried out where appropriate.

Diagnostic Specificity of Schizotypal Personality Disorder. The first goal of our study was to determine whether schizotypy in relatives has diagnostic specificity. It did not; we found similar scores for severity of schizotypal features and its factors in the relatives of schizophrenia patients when compared with the relatives of schizoaffective, affective, and atypical psychotic patients. Nor were differences found when features of, or indeed a diagnosis of, SPD were considered. Squires-Wheeler and colleagues (1988, 1989) also found that the rates of schizotypal features did not differ significantly between the offspring of schizophrenia patients and the offspring of affective patients. Similarly, Yeung and colleagues (1993) found that the prevalence of *DSM–III* SPD did not differ among the relatives of schizophrenia, bipolar, depressed, and atypical psychosis probands. In a recent study, Kendler and colleagues (1995) argued against both the highly specific and the nonspecific hypothesis, proposing that schizotypal traits reflect vulnerability to nonaffective psychoses. Our results are compatible with this view, suggesting that there is a relationship between schizotypy and broadly defined schizophrenia, thus supporting the concept of a schizophrenia spectrum composed of the broad range of psychotic disorders and schizotypy.

Factor Analysis and Correlations Between Syndromes in Probands and Relatives. In our factor analysis of the probands' symptomatology in order to obtain dimensions of psychopathology, the variables that were entered included a range of affective and nonaffective psychotic symptoms. Not surprisingly, our factor solution bears considerable resemblance to the one obtained by Van Os and colleagues (1996) in a subset of this sample using 20 main items of the OPCRIT checklist (McGuffin et al. 1991) and two variables regarding type and age of onset. However, it should be considered that our probands were assessed during an acute psychotic episode with an instrument (PSE) that is concerned with psychopathology present in the past month as opposed to over the lifetime.

Factor analysis of the schizotypy scales yielded a total of seven factors. From the KSQ scale two factors were obtained: positive and negative schizotypy syndromes. Positive schizotypy included the subscales of perceptual alterations, magical thinking, paranoid ideation, and ideas of reference; negative schizotypy included social isolation and social anxiety. These two syndromes bear considerable resemblance to the ones obtained by Kendler and colleagues (1991) using a structured interview. From the SAE scale another two factors emerged, called following Venables and colleagues (1990), schizophrenism and anhedonia. From the IPDE interview, we obtained three factors that were respectively called schizoid, paranoid, and schizotypal. Items regarding schizoid personality disorder mostly loaded in the schizoid factor, while items regarding paranoid personality disorder did the same in the paranoid factor and those regarding SPD in the schizotypal factor. Summarizing the results of the factor analysis, we can see that the seven factors cover a wide range of symptoms of schizotypy. We have two positive factors (KSQ positive and SAE schizophrenism), a negative factor (KSQ negative), an anhedonia factor (SAE anhedonia), a paranoid factor (IPDE paranoid), a schizoid factor (IPDE schizoid), and a factor mostly composed of *DSM* positive schizotypal features (IPDE schizotypal).

When we carried out a Pearson's correlation analysis between psychopathological syndromes in the psychotic patients on the one hand, and schizotypal syndromes and features in their relatives on the other, our purpose was to look for individual associations. As seen in table 3, few significant correlations were obtained except a large number with the delusions-hallucinations syndrome in the probands. This low number of correlations could have been due to the fact that the relationships between symptoms in probands and relatives could be better explained by a combination of syndromes than by individual syndromes. For this reason, we went on to canonical analyses.

The same conclusion emerges from both types of analyses: relatives of patients with a delusions-hallucinations syndrome have significantly higher total scores in all three schizotypy scales, as well as in 9 out of the 16 syndromes or features. This suggests that schizotypy in the relatives of psychotic patients is best predicted by probands' scores on a positive syndrome mostly composed of delusions, hallucinations, and thought interference.

Previous studies evaluating familial morbid risk of psychosis with factor-derived subsyndromes of schizophrenia have yielded contradictory results, some finding increased morbid risk in the relatives of patients with negative symptoms (Farmer et al. 1984; McGuffin et al. 1984; Verdoux et al. 1996; Van Os et al. 1997) and others in relatives of patients with disorganization (Cardno et al. 1997). Baron and colleagues (1992) found that the morbid risk

for schizophrenia and SPD was markedly reduced in first degree relatives of probands with predominant negative symptoms. However, we must point out that such studies take into account only relatives who have psychotic illnesses. In our study, we excluded such individuals and instead concentrated on nonpsychotic relatives.

This study provides preliminary evidence of a common etiologic component between the delusions-hallucinations syndrome of the functional psychoses and schizotypal traits in nonpsychotic individuals. No conclusions can be drawn from our results about the genetic liability of negative symptoms as our negative thought disorder factor was not typical of the negative syndrome dimensions that have emerged from most previous factor analytical studies. As the delusions-hallucinations syndrome of our factor solution was mostly composed of Schneiderian first rank symptoms, it appears that schizotypy is more specific to these symptoms rather than to schizophrenia per se. The fact that psychotic positive symptoms are correlated with all types of schizotypal symptoms in relatives, and not only with positive ones, indicates that the clinical features of schizophrenia and schizotypy are not etiologically continuous and that the etiologic distinctness of positive and negative symptoms in psychoses cannot be assumed.

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