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Elevated Levels of Schizotypal Features in Parents of Patients With a Family History of Schizophrenia Spectrum Disorders

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Abstract

There is some evidence that schizotypal traits are related to a genetic or familial liability to develop schizophrenia. However, it is unclear whether the number of schizotypal traits is elevated in parents of schizophrenia patients compared with controls. This study used the Schizotypal Personality Questionnaire to investigate the difference in number of schizotypal traits between both parents of 36 patients with schizophrenia (n = 72 persons) and 26 healthy married control couples (n = 52 persons).

Parents of patients had a lower score on the positive dimension of schizotypy than healthy controls. There was no difference on the negative or disorganization dimension between groups. The difference on the positive dimension might have been caused by a difference in response style between parents of patients and controls due to the fact that parents are more familiar with schizophrenia than controls. Of interest, parents with a family history of schizophrenia spectrum disorders had more positive and negative schizotypal traits than parents without a family history of schizophrenia spectrum disorders. Because these two groups of parents differ in only genetic risk, not familiarity with schizophrenia, results suggest that the negative and positive dimension of schizotypy are related to a familial or genetic vulnerability to schizophrenia.

Keywords: Schizophrenia, parents, Schizotypal Personality Questionnaire, genotypical marker, schizotypal dimensions.

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Family, twin, and adoption studies indicate that genetics plays an important role in the etiology of schizophrenia (Tsuang et al. 1991; McGuffin et al. 1995). The transmission of schizophrenia is probably not caused by a single gene but results from the combined action of several different genes (McGuffin et al. 1995). Which genes are involved is not clear. Over a dozen genome-wide scans have been reported on independent cohorts of families from several countries, but no gene has yet been found to clearly contribute to schizophrenia (DeLisi et al. 2002).

The genetic liability to schizophrenia is not specific to only that disorder. Several psychiatric and personality disorders are manifestations, of varying severity, of the same underlying vulnerability. Psychiatric disorders that are found to be associated with the liability to schizophrenia are a subset of affective disorders (Baron and Gruen 1991), schizoaffective disorders, other nonaffective psychoses, and psychotic affective illnesses (Kendler et al. 1995*b*). Personality disorders that are found to be associated with the liability to schizophrenia are a paranoid personality disorder (Baron et al. 1985; Kendler et al. 1993*b*; Tsuang et al. 1999) and a schizoid and avoidant personality disorder (Kendler et al. 1993*b*). In addition, a schizotypal personality disorder has been frequently related to schizophrenia (Baron et al. 1983, 1985; Kendler and Gruenberg 1984; Kendler et al. 1993*b*, 1995*a*, 1995*b*; Battaglia et al. 1991, 1995; Cadenhead and Braff 2002) (see, for review, Tsuang et al. 1999).

In this study, we concentrate on the difference in number of schizotypal traits between parents of patients with schizophrenia and healthy controls. Schizotypal traits are especially interesting because these traits have a stronger familial relationship to schizophrenia than other personality traits (Kendler et al. 1993*b*). In addition, schizophrenia and schizotypy contain the same symptom dimensions: a positive, a negative, and a disorganization symptom dimension (Vollema and Hoijtink 2000).

Although several studies report that schizotypal traits are related to a genetic liability to develop schizophrenia, they are not consistent in reporting which schizotypal traits are elevated most in relatives of patients as com-

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pared with controls. Various instruments are used to investigate schizotypal personality traits in relatives of patients with schizophrenia. Studies that used the Schizotypal Personality Questionnaire (SPQ) (Raine 1991) suggest that positive schizotypal traits are better discriminators of relatives versus controls than are negative traits (Kremen et al. 1998; Yaralian et al. 2000). In contrast, several studies that used interviews or self-report measures other than the SPQ report that negative schizotypal traits are better discriminators of relatives versus controls than positive traits (Katsanis et al. 1990; Clementz et al. 1991; Grove et al. 1991; Franke et al. 1993; Thaker et al. 1993; Kendler et al. 1995*a*, 1996). Part of the studies that used self-report measures other than the SPQ found even lower scores on the positive dimension of schizotypy in relatives of patients as compared with controls (Katsanis et al. 1990; Clementz et al. 1991; Thaker et al. 1993).

The finding that the positive symptoms are elevated in relatives of patients seems to be restricted to the SPQ. It has previously been suggested that this restriction can be explained by the possibility that the most often used self-report instruments, the Perceptual Aberration Scale (PAS) (Chapman et al. 1978) and the Magical Ideation Scale (MIS) (Eckblad and Chapman 1983), have overt psychotic-like items, unlike the SPQ. Because of their overt psychotic-like content, the PAS and MIS are supposed to be more vulnerable to a defensive response style in relatives of patients than the SPQ. That is, if people want to deny psychotic-like schizotypal traits within themselves, the score on the positive dimension of the PAS and MIS is expected to be more affected than the score on the positive dimension of the SPQ (Vollema et al. 2002).

Of all studies that compared the number of schizotypal traits between relatives of patients and controls, only two focused on the difference between parents of patients and controls (Docherty 1993; Catts et al. 2000). An advantage of studying parents of patients compared with other types of first degree relatives is that the parents' own status with regard to schizophrenia can be determined with some degree of confidence because these individuals generally have passed the age of risk for developing schizophrenia. The two studies that compared parents of patients with healthy controls used instruments other than the SPQ. Docherty (1993) used the Schedule for Schizotypal Personalities (Baron et al. 1981). Catts et al. (2000) used three questionnaire-based methods, the PAS (Chapman et al. 1978), the Physical Anhedonia Scale (Chapman et al. 1976), and the Eysenck Personality Questionnaire (EPQ) (Eysenck and Eysenck 1975). The only difference between parents of patients and controls that is reported in these studies is that parents of patients obtained higher scores on the Psychoticism scale of the EPQ. However, this scale measures impulsive personality traits and unconventional asocial ideas and does not seem to represent a basic schizotypal dimension (Vollema and van den Bosch 1995).

A recent study suggests that the positive dimension but not the negative and disorganization dimension of schizotypy as measured with the SPQ reflects a genetic vulnerability to schizophrenia (Vollema et al. 2002). Therefore, one would expect to find a difference between parents of patients and healthy controls in number of only positive schizotypal traits if one measured schizotypal traits with the SPQ.

We compared the number of schizotypal traits between both parents of schizophrenia patients and healthy control couples. For this purpose, the SPQ was used. It is important to study both parents of patients because it is not clear whether schizophrenia is due to unilineal inheritance (only one parent is expected to carry the schizophrenia genotype) or to bilineal inheritance (both parents are expected to carry the schizophrenia genotype). By including both parents of a schizophrenia proband, one can ensure the inclusion of the obligate carrier(s). By comparing parents of patients with healthy control *couples* one can correct for assortative mating. Assortative mating—a tendency for mated pairs to be more similar for some phenotypic traits than would be the case if the choice of a partner occurred at random— occurs for a variety of physical and psychological traits, including mental illness (Parnas 1988; Mathews and Reus 2001).

Apart from investigating whether parents of patients differ from healthy control couples, we also investigated whether parents of patients with a family history of schizophrenia spectrum disorders (those who have relatives with a schizophrenia spectrum disorder beyond their offspring) differ from parents of patients without a family history of schizophrenia spectrum disorders (those who have no relatives with a schizophrenia spectrum disorder beyond their offspring) on the schizotypy dimensions of the SPQ. Parents of patients without a family history of schizophrenia spectrum disorders seem a perfect control group if one wants to study whether schizotypal features reflect a genetic vulnerability to schizophrenia. There is no reason to assume that parents of patients with and parents of patients without a family history of schizophrenia spectrum disorders differ in their response style, because both groups of parents are familiar with schizophrenia. There is only one difference between parents with a family history of schizophrenia spectrum disorders and parents without such a family history. Parents with a family history of schizophrenia spectrum disorders are supposed to be more enriched in terms of genetic risk than parents without such a family history (Verdoux et al. 1996).

Parents of patients who were treated at the Department of Psychiatry of the University Medical Center Utrecht as well as parents who were members of a national association for relatives of schizophrenia patients were approached. The control couples were recruited by advertisements in different kinds of local and national newspapers and by asking the parents of patients if they knew a couple without a psychiatric (family) history who would be willing to participate as controls in this study.

We hypothesized that parents of patients would have a higher (more pathological) score on the positive dimension of the SPQ than healthy control couples. Furthermore, we hypothesized that parents of patients with a family history of schizophrenia spectrum disorders would have a higher score on the positive dimension of schizotypy, than parents of patients without a family history of schizophrenia spectrum disorders.

Method

Subjects. Both parents of 36 patients with schizophrenia (n = 72 persons) and 26 healthy married control couples (n = 52 persons) participated in this study after written informed consent was obtained. The groups were comparable with respect to age, handedness, IQ, and level of education.

Parents of patients were defined as having a family history of schizophrenia spectrum disorders if one or more of their first (apart from their child) or second degree relatives had a schizophrenia spectrum disorder. A schizophrenia spectrum disorder included all psychotic disorders not related to substance abuse, affective disorders with psychotic symptoms, and cluster A personality disorders.

All participants were physically healthy and had no history of neurological illness and no history of drug or alcohol abuse. To ensure that schizotypal traits in parents of patients are related to a familial or genetic defect that produces a susceptibility to schizophrenia and not to the illness itself, parents of patients were excluded if they had a history of a schizophrenia spectrum disorder.

Healthy controls were excluded if they or their first degree relatives had a history of drug or alcohol abuse; a personality disorder; or a history of a depressive, manic, or psychotic illness. Furthermore, healthy controls were excluded if their second degree relatives had a history of psychotic illness.

At least one of the children of the parents of patients met *DSM–IV* (APA 1994) criteria for schizophrenia.

Interviews. The diagnosis of *DSM–IV* schizophrenia in the children of the parents was determined by using the Comprehensive Assessment of Symptoms and History (CASH) (Andreasen et al. 1992) after written informed consent was obtained from the patients. To assess the presence of a psychiatric disorder in parents of patients and in healthy control couples, the CASH interview and the Schedule for Affective Disorders and Schizophrenia–Lifetime interview (Endicott and Spitzer 1978) were used. In addition, clinical assessment of all participants included the Structured Interview for *DSM–IV* Personality Disorders (De Jong et al. 1996) to establish the presence of a personality disorder. Information about family history was obtained with the Dutch translation of the Family Interview for Genetic Studies (National Institute of Mental Health 1991). If participants were unsure whether a relative had a psychiatric disease, they consulted the relative in question, another relative, or the relative's doctor. Psychiatrists or psychologists who had extensive training in diagnostic interviewing carried out the interviews.

Questionnaire. To investigate schizotypy, we used the SPQ (Raine 1991), a 74-item self-report questionnaire with a dichotomous response format (yes/no). The SPQ was developed to measure *DSM–III–R* criteria for schizotypal personality disorder. It can be used as a screening instrument in the general population for the identification of individuals with schizotypal traits. Recent factor analytical studies with the SPQ suggest that the items can be reduced to three dimensions: positive schizotypy, disorganization schizotypy, and negative schizotypy (Raine et al. 1994; Vollema and Hoijtink 2000). Vollema and Hoijtink (2000) used confirmatory factor analysis with responses on items, whereas Raine et al. (1994) used responses on subscales of the SPQ. The three-dimensional model of Vollema and Hoijtink (2000) led to a better fit than the model of Raine et al. (1994). Therefore, we followed Vollema and Hoijtink (2000) in the allocation of items to dimensions. Positive schizotypy consists of magical ideation, unusual perceptual experience, delusional atmosphere, referential thinking, and suspiciousness. The disorganization dimension of schizotypy consists of odd speech and odd or eccentric behavior. Negative schizotypy consists of social anxiety, referential thinking, no close friends, constricted affect, and suspiciousness. All subjects filled out the SPQ.

Demographic Measures (IQ, Handedness, Level of Education). Current IQ of participants was estimated with the short version of a Dutch intelligence test, the Groningen Intelligence Test (Luteyn and Van der Ploeg 1983). Handedness was assessed by means of the Edinburgh Handedness Inventory (Oldfield 1971). Level of education of participants was estimated with the revised Dutch scoring system of Verhage (1983). This

scoring system makes a distinction between seven levels of education ranging from level 1 (less than 6 years of primary education) to level 7 (a university degree).

Data Analysis. Data were analyzed using SPSS, version 9.0.

Spearman correlation analyses were done to investigate a possible dependency between husband and wife. A significant correlation was found between husbands and wives on the positive dimension of the SPQ ($r_s = 0.442$, $p = 0.000$), on the negative dimension of the SPQ ($r_s = 0.459$, p = 0.000), and on the disorganization dimension of the SPQ ($r_s = 0.282$, $p = 0.027$).

Differences in number of schizotypal traits and demographic differences between groups (parents of patients vs. control couples) were calculated with a repeated measurement analysis if scores were normally distributed. Group was treated as between factor; sex was treated as within factor. By treating sex as within factor we could control for the dependency between husband and wife. If scores were not normally distributed, the mean value of the score of each couple was calculated and used in a Mann-Whitney *U* test. The mean value was used to take the dependency between husband and wife into account.

Age was normally distributed and was therefore compared between groups with a repeated measurement analysis. Handedness, IQ, and level of education were not normally distributed and were therefore compared between groups with a Mann-Whitney *U* test.

The distribution of the scores on each dimension of schizotypy was found to be highly skewed. We transformed the data by calculating the natural logarithm of the raw data + 1 (1 was added to bound away the data from 0). The transformed data did yield a normal distribution for the positive and the negative symptom scale. Differences between parents of patients and control couples on the positive and negative symptom dimension were therefore computed with repeated measurement analyses, whereas the difference between these groups on the disorganization dimension of schizotypy was computed with a Mann-Whitney *U* test. Median values and interquartile ranges are reported in the tables. To account for the dependency between husband and wife, we used mean values within one couple to calculate these median values.

To test the second hypothesis, parents of patients were divided into two groups: parents of patients with a family history of schizophrenia spectrum disorders, and parents of patients without such a family history. Because scores were not normally distributed, even after logarithmic transformations, the differences between parents of patients with and without a family history of schizophrenia spectrum disorders were computed with Mann-Whitney *U* tests.

In case of a significant difference between groups (between parents of patients and control couples, or between parents of patients with and without a family history of schizophrenia spectrum disorders), we investigated whether the use of the individual items of the symptom dimensions of the SPQ elaborated on any of the group comparisons.

An additional analysis (Mann-Whitney *U* test) was done to investigate whether there are differences between parents of patients who carried a psychiatric diagnosis and parents of patients who did not carry such a diagnosis.

Two-tailed tests were used for all analyses, and significance levels were set at $p < 0.05$. *P* values are reported if data are significant or if data tend toward significance ($p < 0.06$).

Results

Demographic Characteristics of the Sample. Parents of patients and healthy control couples were comparable with respect to age, current IQ, handedness, and level of education (table 1).

Of the 72 parents of patients included, 27 persons carried a psychiatric diagnosis according to *DSM–IV* criteria and/or Research Diagnostic Criteria (Spitzer et al. 1978). One control woman was diagnosed with a simple phobia.

Of the 72 parents of patients included, 42 had no family history of schizophrenia spectrum disorders and 30 had a family history of schizophrenia spectrum disorders. Parents of patients with a family history of schizophrenia spectrum disorders did not differ from parents of patients without a family history of schizophrenia spectrum disorders on the relevant demographic data (age, level of education, handedness, and IQ). Of the patients' parents who carried a psychiatric diagnosis, 15 had a family history of schizophrenia spectrum disorders and 12 did not have such a family history.

Differences in schizotypal features between groups. Parents of schizophrenia patients did not differ from healthy control couples on the negative dimension of schizotypy or on the disorganization dimension of schizotypy. Groups did differ on the positive dimension of schizotypy as measured with the SPQ. However, the difference between groups on the positive dimension of schizotypy was not in the direction we hypothesized. Parents of patients had a significantly lower score on the positive dimension of schizotypy than healthy controls (table 2). When comparing parents of patients with healthy control couples on the items of the positive

Table 1. Demographic characteristics of parents of patients and healthy controls

	Biological parents of schizophrenia patients (*n* = 36 couples)	Healthy controls (*n* = 26 couples)	Between-group differences
Age[1]	Median = 54.85 (IQR = 4.17)	Median = 55.36 (IQR = 3.83)	*ns*
Current IQ[2]	Median = 115.50 (IQR = 22.00)	Median = 123.50 (IQR = 16.13)	*ns*
Handedness[2]	Median = 0.92 (IQR = 0.22)	Median = 0.81 (IQR = 0.38)	*ns*
Level of education[2]	Median level = 5.50 (14.5 yrs of education) (IQR = 1.00)	Median level = 5.50 (14.5 yrs of education) (IQR = 1.00)	*ns*

Note.—IQR = interquartile range; *ns* = nonsignificant.

[1] Repeated measurement analysis.

[2] Mann-Whitney *U* test.

Table 2. Differences between parents of patients and healthy controls on the schizotypy dimensions

	Biological parents of schizophrenia patients (*n* = 36 couples)	Healthy controls (*n* = 26 couples)	Between-group differences
Positive dimension[1]	Median = 2 (IQR = 2.88)	Median = 3.5 (IQR = 4.13)	$p = 0.027$
Magical ideation[2]	Median = 0.50 (IQR = 1.00)	Median = 1.00 (IQR = 2.12)	$p = 0.016$
Unusual perceptual experience[2]	Median = 0.00 (IQR = 0.00)	Median = 0.00 (IQR = 1.00)	$p = 0.053$
Delusional atmosphere[2]	Median = 0.00 (IQR = 0.00)	Median = 0.50 (IQR = 1.00)	$p = 0.012$
Referential thinking[2]	Median = 0.50 (IQR = 1.00)	Median = 0.50 (IQR = 1.50)	*ns*
Suspiciousness[2]	Median = 0.50 (IQR = 1.38)	Median = 0.50 (IQR = 1.63)	*ns*
Negative dimension[1]	Median = 5 (IQR = 6.50)	Median = 4.75 (IQR = 9.38)	*ns*
Disorganization dimension[2]	Median = 1.5 (IQR = 3.88)	Median = 1.75 (IQR = 4.00)	*ns*

Note.—IQR = interquartile range; *ns* = nonsignificant.

[1] Repeated measurement analysis.

[2] Mann-Whitney *U* test.

dimension of the SPQ, we found that parents of patients had a significantly *lower* score than control couples on the items delusional atmosphere and magical ideation. On the unusual perceptual experience items, the difference between groups tended toward significance (table 2).

Parents of patients with a family history of schizophrenia spectrum disorders had a significantly higher score on the positive and negative dimensions of the SPQ than parents of patients without a family history of schizophrenia spectrum disorders. No difference between parents of patients with a family history of schizophrenia spectrum disorders and parents of patients without such a family history was found on the disorganization component of the SPQ (table 3). When comparing parents of patients with and without a family history of schizophrenia spectrum disorders on items of the positive symptom dimension of the SPQ, we found that parents of patients with a family history of schizophrenia spectrum disorders had a significantly higher score on the items unusual perceptual experience, referential thinking, and suspiciousness than parents of patients without such a history (table 3). When comparing parents of patients with and without a family history of schizophrenia spectrum disorders on items of the negative dimension of the SPQ, we found that parents of patients with a family history of schizophrenia spectrum disorders had a significantly higher

Table 3. Differences between parents of patients with a family history and without a family history of schizophrenia spectrum disorders on the schizotypy dimensions

	Parents of schizophrenia patients with a family history(n = 30)	Parents of schizophrenia patients without a family history (n = 42)	Between-group differences
Positive dimension[1]	Median = 3.00 (IQR = 2.75)	Median = 1.00 (IQR = 2.00)	p = 0.000
Magical ideation	Median = 0.00 (IQR = 2.00)	Median = 0.00 (IQR = 0.25)	*ns*
Unusual perceptual experience	Median = 0.00 (IQR = 0.25)	Median = 0.00 (IQR = 0.00)	p = 0.029
Delusional atmosphere	Median = 0.00 (IQR = 0.00)	Median = 0.00 (IQR = 0.00)	*ns*
Referential thinking	Median = 1.00 (IQR = 2.00)	Median = 0.00 (IQR = 1.00)	p = 0.021
Suspiciousness	Median = 1.00 (IQR = 2.00)	Median = 0.00 (IQR = 1.00)	p = 0.017
Negative dimension[1]	Median = 7.00 (IQR = 8.25)	Median = 2.50 (IQR = 6.25)	p = 0.000
Social anxiety	Median = 1.00 (IQR = 2.00)	Median = 0.00 (IQR = 1.25)	p = 0.051
Referential thinking	Median = 1.00 (IQR = 2.00)	Median = 0.00 (IQR = 1.00)	p = 0.021
No close friends	Median = 2.00 (IQR = 4.00)	Median = 0.50 (IQR = 3.00)	p = 0.025
Constricted affect	Median = 1.00 (IQR = 2.00)	Median = 0.00 (IQR = 1.00)	p = 0.010
Suspiciousness	Median = 1.00 (IQR = 2.00)	Median = 0.00 (IQR = 1.00)	p = 0.017
Disorganization dimension[1]	Median = 2.00 (IQR = 6.25)	Median = 0.50 (IQR = 4.25)	*ns*

Note.—IQR = interquartile range; *ns* = nonsignificant.

[1] Mann-Whitney *U* test.

score on the items referential thinking, no close friends, constricted affect, and suspiciousness than parents of patients without such a history. On the social anxiety item, the difference between groups tended toward significance (table 3).

Parents of patients with a psychiatric illness themselves scored significantly higher on the positive, the negative, and the disorganization dimension of the SPQ as compared with parents who did not carry a psychiatric diagnosis. However, when parents of patients who carried a psychiatric diagnosis were excluded from data analyses, results remained the same. Parents of patients with a family history of schizophrenia spectrum disorders still scored significantly higher on the positive and negative dimension of the SPQ compared with parents of patients without such a family history.

Discussion

Contrary to our expectation, parents of schizophrenia patients had a lower score on the positive symptom dimension of the SPQ than healthy control couples. We found no difference on the negative and disorganization dimension of schizotypy between parents of schizophrenia patients and control couples. Of interest, parents of patients with a family history of schizophrenia spectrum disorders had more positive and negative schizotypal traits than parents of patients without a family history of schizophrenia spectrum disorders.

Although a lower score on the positive dimension of the SPQ in parents of patients compared with healthy control couples was contrary to our expectation, this result is consistent with several previous studies that compared the number of schizotypal traits between relatives of patients and controls (Katsanis et al. 1990; Clementz et al. 1991; Thaker et al. 1993). Several reasons might explain the finding that relatives have a significantly lower score on the positive dimension of schizotypy than controls. First, this may be the result of a defensive response set among schizophrenia patients' relatives. Relatives might wish to distance themselves from what they may perceive as the illness-related symptoms of their ill relatives. Second, the lower score on the positive dimension of schizotypy in relatives of patients compared with controls might be caused by a familiarity with psychotic disorders in relatives. This familiarity might lead some relatives to underestimate or fail to recognize in themselves attenuated

forms of some of the characteristics of positive schizotypy. It was previously suggested (Vollema et al. 2002) that the SPQ as compared with other self-report instruments is less vulnerable for a difference in response style between relatives of patients and controls. The current study results, however, suggest otherwise.

Our finding of a lower score on the positive dimension of the SPQ in relatives of patients compared with controls was not consistent with the results of the studies of Kremen et al. (1998) and Yaralian et al. (2000). Both these studies reported a *higher* score on the positive dimension of the SPQ in relatives of patients compared with controls. A methodological difference between the studies of Kremen et al. (1998) and Yaralian et al. (2000) and our study might explain the inconsistency in study results. We included only parents of patients, whereas Kremen et al. (1998) and Yaralian et al. (2000) included mainly siblings of patients. Including both parents of patients instead of siblings or offspring might have reduced the power of this study. If schizophrenia is unilineally inheritable, only one parent of a proband is expected to carry the schizophrenia genotype. Because we included both parents to ensure the inclusion of the obligate carriers, it is possible that half of the parents included do not carry the schizophrenia genotype. Furthermore, parents of patients constitute the healthiest group of family members. All of our subjects were able to marry, and chances for them to still develop schizophrenia were negligible because they had passed the age of risk. However, because our study results and the results of Kremen et al. (1998) and Yaralian et al. (2000) are the opposite, it is highly unlikely that this methodological difference explains the inconsistency. It is more likely that patients' parents have a higher tendency than parents' siblings to underestimate in themselves attenuated forms of the characteristics of positive schizotypy.

It may be argued that the difference in number of positive schizotypal traits between parents of patients and healthy controls is attributable to biased sampling. This possibility cannot be ruled out, but several reasons render it unlikely. First, we found a lower score in relatives of patients compared with controls not on all the symptom dimensions of the SPQ but only on the positive dimension. Second, we approached a broad range of parents of schizophrenia patients as well as a broad range of control couples.

The data of our study do support our second hypothesis; parents of patients with a family history of schizophrenia spectrum disorders had more positive schizotypal traits than parents of patients without such a family history. So when we included a perfect control group (a group that differed not in response style but only in genetic risk to develop schizophrenia), results of our study supported the previous study results of Kremen et al. (1998) and Yaralian et al. (2000). Apart from more positive schizotypal traits, parents of patients with a family history of schizophrenia spectrum disorders also had more negative schizotypal traits than parents without such a family history. Although more negative schizotypal traits have not been found with the SPQ (Kremen et al. 1998; Yaralian et al. 2000), this finding is supported by studies that used other self-report measures or interviews (Katsanis et al. 1990; Clementz et al. 1991; Grove et al. 1991; Franke et al. 1993; Thaker et al. 1993; Kendler et al. 1995*a*, 1996).

Some additional analyses were done to investigate whether use of the individual items of the three schizotypal dimensions elaborated on any of the group comparisons. Our analyses revealed that only some items allocated to a symptom dimension showed a significant difference between groups. Our finding that unusual perceptual experience, referential thinking, and suspiciousness constitute an important dimension of schizotypy is supported by the other studies that used the SPQ (Kremen et al. 1998; Yaralian et al. 2000). Kremen et al. (1998) and Yaralian et al. (2000) do not support our finding that the no close friends (socially anhedonic) item and the constricted affect item constitute important dimensions of schizotypy. However, our finding that the no close friends (socially anhedonic) item constitutes an important dimension of schizotypy is supported by Kwapil (1998). In addition, our finding that the constricted affect item constitutes an important dimension of schizotypy is suggested by Battaglia and Torgersen (1996).

Various definitions of having a family history are used in different studies. Some studies verify the prevalence of only schizophrenia in relatives (e.g., Walker and Shaye 1982; Sharma et al. 1999). We chose to investigate the prevalence of schizophrenia spectrum disorders in parents of patients because results of the Roscommon Family Study (Kendler et al. 1993*a*) argue strongly against the hypothesis that the familial liability to schizophrenia is highly specific to only that disorder. However, it remains unclear which illnesses are genetically related to schizophrenia. Because there is some uncertainty about the illnesses related to the schizophrenia spectrum, we cannot exclude the possibility that some of the parents of patients were misclassified as obligate or nonobligate carriers. However, with our broad definition of schizophrenia spectrum disorders, we trust we misclassified as few parents of patients as possible.

Future studies that investigate the difference in schizotypal traits between relatives of patients and controls should pay attention to the effects of instrument variation. Kendler et al. (1996) found that compared with psychiatric interviews, self-report questionnaires are less

successful at assessing underlying familial vulnerability to schizophrenia. Based on this finding of Kendler et al. (1996) and on the current finding that parents of patients have a different response style than healthy control couples, we recommend the use of interviews in addition to the use of the SPQ in future studies. In addition, future studies should investigate why and which relatives of schizophrenia patients differ in their response style from healthy controls.

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