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Do schizophrenic patients who managed to get to university have a non-developmental form of illness?

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ABSTRACT

Background. Many people who develop schizophrenia have impairments in intellectual and social functioning that are detectable from early childhood. However, some patients do not exhibit such deficits, and this suggests that they may have suffered less neurodevelopmental damage. We hypothesized that the aetiology and form of schizophrenia may differ in such patients. We therefore studied a group of schizophrenic patients who were functioning well enough to enter university prior to illness onset.

Methods. The casenotes of 46 university-educated patients and 48 non-university-educated patients were rated on several schedules including the OPCRIT checklist, and the two groups were compared using univariate statistical techniques. Principal components analysis was then performed using data from all patients, and the factor scores for each principal component were compared between groups.

Results. Univariate analyses showed the university-educated patients had an excess of depressive symptoms, and a paucity of core schizophrenic symptoms. Four principal components emerged in the principal components analysis: mania, biological depression, schizophrenic symptoms, and a reactive depression. University-educated patients scored significantly higher on the reactive depression principal component, and lower on the schizophrenic symptoms principal component, than the non-university-educated patients.

Conclusions. University-educated patients may have a non-developmental subtype of schizophrenia.

INTRODUCTION

The neurodevelopmental theory of schizophrenia (Murray & Lewis, 1987; Weinberger, 1987) asserts that at least a proportion of cases of schizophrenia arise from abnormal neurodevelopment. In accord with this, cohort studies have demonstrated that impairments in IQ, social functioning and motor control are detectable many years before the onset of the disorder (Jones, 1997; Walker *et al*. 1999; Davidson & Weiser, 2000).

Jones and others (see Jones, 1995) demonstrated that low educational test scores predicted later schizophrenia, with a linear association between scores and risk of schizophrenia. Two larger studies, on army conscripts (David *et al*. 1997; Davidson *et al*. 1999), confirmed this linear association between intellectual function and risk of schizophrenia.

Several lines of evidence suggest that lower IQ in schizophrenia is associated with neurodevelopmental impairment. First, IQ deficits predate illness onset, and are relatively stable over time (Goldberg & Weinberger, 1994; Russell *et al*. 1997). Secondly, perinatal birth complications, particularly low birth weight and hypoxia, predispose to low IQ in normal children (Naeye & Peters, 1987; Seidman *et al*. 2000; Matte *et al*. 2001), and are well-replicated risk factors for schizophrenia. Lastly, evidence is mounting that well relatives of schizophrenic patients have lower IQs than controls (Byrne *et al*. 1999;

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Kremen *et al.* 1998; Faraone *et al.* 1999) suggesting an overlap in the genetic predisposition to schizophrenia and low IQ.

In some patients, however, neuropsychological abilities appear to be unimpaired (Silverstein & Zerwic, 1985; Strauss & Silverstein, 1986; Silverstein *et al.* 1988; Palmer *et al.* 1997) and some studies even suggest an increased risk of schizophrenia in people of very high intellectual ability (Davidson *et al.* 1999; Isohanni *et al.* 1999). Three explanations might account for the existence of such patients: they too may be cognitively impaired and they would be functioning at an even higher level if they had not been predisposed to schizophrenia. Another explanation is that they suffer from an atypical form of bipolar affective disorder, since this diagnosis is associated with better pre-morbid adjustment (Cannon *et al.* 1997) and higher pre-morbid (Cannon *et al.* 1997; Gilvarry *et al.* 2000) and current (Goldberg *et al.* 1993) IQ than schizophrenia. A third explanation is that they represent a subgroup of schizophrenia, with minimal neurodevelopmental impairment. The latter two explanations might not necessarily be incompatible.

Murray *et al.* (1992) espoused a neurodevelopmental classification of schizophrenia. A neurodevelopmental subtype was hypothesized, with cognitive impairment, early onset, male predominance, structural brain changes, and poor outcome. The other subtype was thought to be aetiologically related to bipolar affective disorder, more common in females, with few negative symptoms, and little or no cognitive deficit or structural brain changes.

Crow (1990), Van Os *et al.* (1998) and others have argued that a continuum view of psychosis best fits the available evidence. The latter group postulate that patients at one end of this continuum have an insidious onset, negative symptoms and poor outcome, and neurodevelopmental risk factors, such as childhood dysfunction, increased ventricular volume and genetic risk of schizophrenia. Those at the opposite end of the spectrum are more likely to have a family history of affective disorder, a more acute onset, which is more likely to be precipitated by life events, more affective symptoms and less negative symptoms.

We aimed to explore the aetiology, symptomatology and outcome of schizophrenia in patients who had previously functioned well enough to proceed to university education. By comparing these patients with more typical schizophrenic patients, we hoped to clarify the significance of pre-morbid functioning in the aetiology of schizophrenia. We hypothesized that, compared to typical schizophrenic patients, university-educated schizophrenic patients would have a less neurodevelopmental aetiology, reflected in a paucity of obstetric complications and family history of psychosis, more affective and less negative symptoms, and a better outcome. In other words, we predicted that university-educated patients would lie towards the 'non-neurodevelopmental' end of the spectrum of psychosis proposed by Van Os *et al.* (1998).

METHOD

The university-educated (UE) cases were identified from a case register of all admissions to the Bethlem and Maudsley hospitals from 1980 to 1993, with a clinical diagnosis of schizophrenia, aged 16–50 years at the time of admission. Patients who had ever entered a degree course were classed as UE. Of the 49 patients who had entered a degree course, only 29 (59%) had completed it. The remainder had had their studies curtailed, usually as a consequence of their illness. No patient had entered university after illness onset. One in four of the remaining cases on the register were used to form a pool of 99 patients. From these, 49 non-university educated (NUE) cases, were matched to the UE cases on age at diagnosis (± 5 years) and gender. We matched for age at diagnosis as this was a potential confounder, since patients with a later onset of schizophrenia complete more education than those with early onset (Isohanni *et al.* 2001).

The casenotes were rated by E. A. using the Operational Criteria Checklist for Psychotic Illness (OPCRIT), version 3.31 (McGuffin *et al.* 1991) and some additional information. This comprised demographic details, the Lewis–Murray scale (Lewis *et al.* 1989) for obstetric complications, a rating scale for developmental milestones (0 = no problems reported; 1 = problems reported; 2 = professional advice sought), history of psychiatric illness in first degree relatives, pre-morbid employment status (unem-

Table 1. *Demographic data including RDC diagnoses*

	NUE ($N = 48$)	UE ($N = 46$)	χ^2	P
Schizophrenia	36	35		
Schizoaffective disorder				
Manic	4	0	4·65	NS
Depressed	4	6		
Bipolar	1	4		
Unspecified functional psychosis	3	1		
Male	32	33	0·28	NS
Female	16	13		
Married (at onset)	4	13	6·30	< 0·05
Caucasian	46	37		
Afro-Caribbean	1	1		
African	0	3	5·54	NS
Asian	0	1		
Other	1	3		
Father's employment				
Nil	3	0		
Manual	24	13	10·50	< 0·005
White collar	16	15		
Professional	5	18		
	Mean (S.D.)	Mean (S.D.)	t	P
Age at diagnosis (years)	24·6 (8·0)	25·4 (7·7)	−0·46	NS
Time since onset (months)	107·2 (74·6)	110·3 (65·3)	−0·22	NS
Number of hospitalizations	3·9	3·5	0·76	NS
Total time in hospital (months)	11·4	12·4	−0·33	NS

NS, $P > 0·05$.

ployed/unstable/stable) lifetime psychotropic drug treatment, and the Strauss–Carpenter Outcome Scale (Strauss & Carpenter, 1974).

The OPCRIT checklist and computerized algorithm were used to generate diagnoses according to the Research Diagnostic Criteria (Spitzer *et al*. 1978). Schizophrenia, schizoaffective disorder and non-specific functional psychosis were included. One NUE and three UE cases were excluded from the analysis, due either to insufficient data, or to an RDC diagnosis other than the above.

Statistical analysis

Statistical analysis was done using SPSS for Windows 10.0.7 (SPSS, 2000) and CLUMP for MS-DOS (Curtis, 1999).

Univariate analysis

Owing to the exploratory nature of the study, all of the OPCRIT variables relating to onset, symptomatology and course were analysed, as well as those from our own checklist. Fisher's exact test was used for 2×2 tables. For larger contingency tables, exact chi-square tests were calculated using the Monte Carlo method (Curtis, 1999). Mann–Whitney U tests were used for ordered categorical variables. Type I error was controlled by selecting a significance value of $P \leqslant 0·0005$, using the Bonferroni method.

Principal components analysis (*PCA*)

We used principal components analysis to reduce the number of variables, in order to avoid the problems of multiple testing, and to identify latent syndromes that might differentiate between the two groups. As socio-economic status was a potential confounder, it was included in the PCA, so that its contributions to any factors could be assessed. The PCA was performed on all cases combined. Factor regression scores were then saved as variables for each case, and Student's t tests were used to compare the mean factor scores between the two groups.

RESULTS

Demographic data

Demographic data are presented in Table 1. The groups were comparable on gender (although

Table 2. *Univariate analysis: binary data* (*results in bold typeface survived Bonferroni correction*)

	NUE ($N = 48$)	UE ($N = 46$)	2-sided P (Fisher's exact test)
Blunted affect	**19**	**3**	**< 0·0005**
Persecutory/jealous delusions/hallucinations	**43**	**23**	**< 0·0005**
Poor pre-morbid social adjustment	**35**	**15**	**< 0·0005**
Definite psychosocial stressor prior to onset	2	16	< 0·005
Delusions of influence	46	30	< 0·005
Abusive/accusatory/persecutory hallucinations	45	29	< 0·005
Ever prescribed anti-depressant*	8	23	< 0·005
In-patient or day-patient at last casenote entry*	10	1	< 0·01
Incoherent	19	6	< 0·01
Positive formal thought disorder	32	16	< 0·01
Well organized delusions	14	25	< 0·01
Delusions and hallucinations lasting 1 week	14	21	< 0·01
Ever had antidepressants*	8	23	< 0·05
Inappropriate affect	36	22	< 0·05
Rapport difficult	2	8	< 0·05
Family history of schizophrenia (1st degree)*	6	4	NS
Family history of affective disorder (1st degree)*	8	8	NS
Definite obstetric complications (Lewis–Murray)*	9	6	NS
Ever had ECT*	1	6	NS
Ever had lithium*	5	11	NS
Catatonia	0	2	NS
Speech difficult to understand	8	6	NS
Negative formal thought disorder	7	5	NS
Restricted affect	27	21	NS
Diurnal variation in mood (worse mornings)	0	1	NS
Diminished libido	5	3	NS
Middle insomnia (broken sleep)	4	4	NS
Persecutory delusions	48	41	NS
Bizarre delusions	38	36	NS
Widespread delusions	14	15	NS
Delusions of passivity	31	34	NS
Primary delusional perception	6	5	NS
Other primary delusions	3	5	NS
Thought insertion	9	11	NS
Thought withdrawal	8	9	NS
Thought broadcast	13	10	NS
Delusions of guilt	3	6	NS
Delusions of poverty	1	0	NS
Nihilistic delusions	2	2	NS
Third person auditory hallucinations	34	25	NS
Running commentary voices	27	21	NS
Other (non-affective) auditory hallucinations	5	9	NS
Non-affective hallucination in any modality	7	11	NS
Lifetime diagnosis of alcohol abuse/dependence	3	4	NS
Lifetime diagnosis of cannabis abuse/dependence	7	7	NS
Lifetime diagnosis of other abuse/dependence	2	0	NS
Alcohol abuse/dependence with psychopathology	4	5	NS
Cannabis abuse/dependence with psychopathology	2	6	NS
Other abuse/dependence with psychopathology	2	1	NS
Lack of insight	48	42	NS
Deterioration from pre-morbid level of function	46	40	NS
Psychotic symptoms respond to neuroleptics			

All items are from the OPCRIT checklist, except those marked*.

both groups had an excess of males), age at diagnosis, RDC diagnosis, ethnicity, length of illness and number and length of hospitalizations. However, there were significant differences in father's occupation at birth, with UE patients having higher socio-economic status than NUE patients. UE patients were more likely to be married at illness onset, probably reflecting better social functioning.

Univariate statistics

Univariate analyses are presented in Tables 2 and 3. UE patients scored higher on depressive symptoms, and lower on core schizophrenic

Table 3. *Univariate analysis: ordered categorical variables* (*results in bold typeface survived Bonferroni correction*). *Higher mean ranks denote greater pathology, except in the case of pre-morbid employment status*

	Mean rank NUE	Mean rank UE	Mann–Whitney *U*	*P*
Pre-morbid employment status*	**30·85**	**57·54**	**380·5**	**< 0·00001**
Poor concentration	**35·98**	**57·19**	**551·0**	**< 0·0001**
Dysphoria	40·02	52·67	745·0	< 0·005
Suicidal ideation	40·33	52·33	760·0	< 0·005
Init. insomnia	40·84	50·82	784·5	< 0·005
Distractibility	38·91	53·92	691·5	< 0·005
Impairment/incapacity during disorder	49·75	41·81	852·0	< 0·05
Reckless activity	47·79	43·00	903·0	< 0·05
Agitated activity	40·56	50·90	778·5	< 0·05
Slowed activity	49·47	41·16	824·0	< 0·05
Developmental score*	49·04	45·89	1030·0	NS
Insidious onset	46·76	39·75	770·0	NS
Excessive activity	46·50	44·50	1008·0	NS
Reduced need for sleep	44·52	47·65	961·0	NS
Loss of energy/tiredness	45·36	46·71	1001·5	NS
Pressured speech	44·27	47·93	949·0	NS
Thoughts racing	46·26	45·71	1019·5	NS
Elevated mood	45·79	46·23	1022·0	NS
Irritable mood	45·30	46·78	998·5	NS
Loss of pleasure	42·42	50·00	860·0	NS
Excessive self-reproach	45·95	46·06	1029·5	NS
Early morning waking	43·91	47·23	936·0	NS
Excessive sleep	45·64	46·41	1014·5	NS
Poor appetite	43·68	48·59	920·5	NS
Weight gain	47·20	44·66	974·5	NS
Increased appetite	46·38	45·58	1014·0	NS
Weight loss	45·38	46·70	1002·0	NS
Affective symptoms predominate	45·03	47·08	985·5	NS
Increased sociability	44·94	47·19	2157·0	NS
Increased self-esteem	45·42	46·65	1004·0	NS
Grandiose delusions	46·17	45·81	1024·0	NS

All items are from the OPCRIT checkoutlist, except those marked*.

symptoms, than NUE patients. The illness was more likely to have been precipitated by psychosocial stress in the UE patients.

Principal components analysis

The variables that were used in the PCA were the same as those used in the univariate analysis, except for 24 variables, which were excluded as they had no correlations with any other variables at the $P < 0{\cdot}05$ level, and were thus very unlikely to load strongly onto any PCs. Four PCs were retained, as determined by the Scree test (Cattell, 1966), accounting for 27% of the variance in the data. Since there were no theoretical grounds to assume that the PCs were independent, the Oblimin method was used for factor rotation, with Kaiser normalization (Kaiser, 1958). All correlations between PCs were small ($r \leqslant 0{\cdot}1$).

The pattern matrix for the principal components can be seen in Table 4. The first three PCs are recognizable clinical syndromes, namely mania, biological depression, and schizophrenic symptoms. The fourth PC contained a mixture of depressive symptoms and variables relating to socio-economic status, with a negative loading for blunted affect. This PC is probably best described as 'reactive depression', although other interpretations are possible.

Comparisons of factor scores showed that UE cases scored significantly lower on the 'schizophrenic symptoms' PC, and significantly higher on the 'reactive depression' PC (see Table 4).

DISCUSSION

Previous work in this area

Two previous studies have primarily examined the clinical differences between schizophrenic patients with differing levels of education.

Table 4. *Principal components analysis: the upper part of the table shows the mean regression factors score for each component in each group (these showed significant differences for the schizophrenic symptoms and reactive depression components): the lower part of the table shows the pattern matrix after Oblimin rotation (eigen values ⩽ 0·4 are not shown)*

	Component			
Variable	M	BD	SS	RD
Mean regression factor scores in UE	0·13	−0·04	−0·33	0·74
Mean regression factor scores in NUE	−0·12	0·04	0·31	−0·71
2-tailed *P* value	NS	NS	< 0·005	< 0·001
Regression factor scores higher in:	—	—	NUE	UE
		Pattern matrix		
Ever taken lithium*	0·69			
Excessive activity	0·81			
Distractibility	0·52			
Agitated activity	0·68			
Pressure of speech	0·77			
Thoughts racing	0·79			
Elevated mood	0·79			
Diurnal variation in mood	0·45			
Increased self-esteem	0·59			
Grandiose delusions	0·57			
Irritable mood	0·44	0·50		
Affective symptoms predominate	0·59	0·44		
Developmental delay*		0·40		
Reduced sleep		0·52		
Loss of energy/tiredness		0·50		
Dysphoria		0·68		
Loss of pleasure		0·76		
Diminished libido		0·47		
Middle insomnia		0·48		
Poor appetite		0·81		
Weight loss		0·70		
Definite psychosocial stressor prior to onset			−0·52	
Insidious onset			0·58	
Persecutory/jealous delusions/hallucinations			0·41	
Third person auditory hallucinations			0·51	
Running commentary			0·55	
Abusive/accusatory/persecutory voices			0·61	
Impairment/incapacity during disorder			0·55	
Deterioration from previous level of functioning			0·43	
More chronic course			0·72	
Currently in-patient or day-patient*			0·43	
Worse functional outcome (Strauss–Carpenter Outcome Score)*			0·75	
Occupation of father (higher SES)*				0·43
Stable pre-morbid employment*				0·52
Ever taken antidepressants*				0·41
Blunted affect				−0·47
Poor concentration				0·49
Suicidal ideation				0·56

M, Mania; BD, biological depression; SS, schizophrenic symptoms; RD, reactive depression.
* These variables are from our own checklist, the remainder are OPCRIT items.

Cernowsky *et al.* (1994) examined correlations between educational achievement and 87 symptoms of schizophrenia in 108 schizophrenic patients. Higher-achieving patients were less apathetic, with more insight and better pre-morbid function than those with lower educational levels.

Swanson *et al.* (1998) divided 162 schizophrenic patients into two groups based on years of education, with 13 years as the cut-off. The more educated group ($N = 65$) had less severe symptoms, particularly negative symptoms, and better pre-morbid adjustment, cognitive function and quality of life, but did not differ from

the less-educated group on number of hospitalizations or length of illness.

Other studies have examined the relationships between current neuropsychological impairment and symptomatology. Silverstein & Zerwic (1985) compared neuropsychologically impaired and intact schizophrenics, using a broad definition of intactness, which included 62% of the sample. The intact schizophrenics had more delusions of reference and persecutory delusions, less incomprehensibility, and better insight, but did not differ on number of hospitalizations or length of illness.

In a similar study, Torrey *et al.* (1994) used a narrower definition of intactness, which only included 27 (11%) of their sample. The intact patients had less negative symptoms and higher scores on the Global Assessment of Functioning Scale (American Psychiatric Association, 1987) than the impaired patients. There were no differences on demographic variables, family history of psychiatric disorders or neuroimaging findings.

Palmer *et al.* (1997) divided a group of 171 schizophrenic patients into neuropsychologically normal (27%) and impaired groups. The 'normal' group had fewer negative and extrapyramidal symptoms, were less likely to be on anticholinergic medication, and had a greater frequency of socialization in the previous year.

In summary, the most consistent findings are a relative paucity of negative symptoms, better pre-morbid functioning, and better outcome in high functioning schizophrenic patients. Number of hospitalizations and length of illness do not seem to be strongly related to education or cognitive impairment.

Methodology

We chose university entry as a marker of high pre-morbid functioning because educational attainment is an objective, fixed indicator of functioning, which is unaffected by any subsequent deterioration. Previous research has shown that education is a good global measure of pre-morbid functioning in schizophrenia. DeQuardo *et al.* (1995) examined the relationships between various estimates of pre-morbid cognitive and social functioning in schizophrenic patients. There were only weak correlations between psychosocial and cognitive measures, but years of education was strongly correlated with both cognitive and psychosocial measures, suggesting that a high level of performance in both domains was required to remain in education. A recent cohort study by Isohanni *et al.* (2001) demonstrated that only 6% of schizophrenic patients in Finland completed tertiary education, compared with a base-rate of 26%. University entry thus identifies a small subgroup of cases, with the highest pre-morbid functioning.

Casenote studies are inevitably limited by the quality of the information recorded in the notes. Fortunately, the relevant data could be found in almost all cases. Moreover, the instruments used, such as the OPCRIT checklist and the Lewis–Murray (Lewis & Murray, 1987) and Strauss–Carpenter (Strauss & Carpenter, 1974) scales, were designed for use with casenotes. The rater was not blind to educational achievement, which may have introduced bias, although this is unlikely to explain the robust effects that we have found. As this was an exploratory study, we analysed a large number of variables, and for this reason we employed the Bonferroni correction and performed the PCA analysis on the data. Owing to the relatively small sample size, however, the results of the latter should be treated cautiously.

Obstetric complications and developmental milestones

There were no significant group differences on these variables. Although most casenotes contained some information on these variables, the reliability of such data is likely to have been poor.

Symptom clusters

There have been numerous previous attempts to factor analyse schizophrenic symptoms (Liddle, 1987; Peralta *et al.* 1992; Thompson & Meltzer, 1993; Kitamura *et al.* 1995; Cardno *et al.* 1996; Lenzenweger & Dworkin, 1996; Mellers *et al.* 1996; Vàzquez-Barquero *et al.* 1996; Karakula & Grzywa, 1999). The most commonly-found solution contains three factors: reality distortion, psychomotor poverty and disorganization. Our 'core schizophrenic symptoms' PC contains symptoms from all three of these factors. Other studies have found four (Van Os *et al.* 1999) and five-factor solutions (Kitamura *et al.* 1995), which typically include mania and depression

factors. Our sample was enriched with high functioning cases, so our factor solution may not be applicable to all schizophrenic populations. Our approach also differs from most, in that we chose to include variables relating to illness onset, treatment, course and outcome, whereas most studies have focused only on symptoms. We chose this approach because if different syndromes exist within schizophrenia, it is likely that they differ not only in symptoms, but also in mode of onset, treatment, course and outcome.

Affective symptoms

We hypothesized that the UE patients would show more affective symptoms than the NUE patients. In the univariate analysis (Tables 2 and 3) five out of the 12 symptoms that differ significantly between groups are depressive symptoms, and all are more common in UE patients.

The first and second PCs in the principal component analysis (see Table 4) clearly represent mania and biological depression, respectively, but there were no differences between the two groups on scores for either of these two PCs. Many of the depressive symptoms that distinguished the two groups (suicidal ideation, poor concentration and antidepressant use) loaded onto the reactive depression PC, along with occupation of father, and stable pre-morbid employment, and a negative loading for blunted affect. The UE patients had significantly higher scores on this PC than the NUE patients ($P < 0{\cdot}001$).

It therefore seems that the depressive symptoms fall into two groups – the more biological symptoms of depression, which do not discriminate well between the two groups, and a second cluster of depressive symptoms, more prevalent in UE patients, possibly related to socio-economic status.

There are two possible explanations for these findings. One possibility is that there was better recognition of depression in UE patients, which would be consistent with the large excess of antidepressant use in the UE group. Better recognition could occur through less masking of depression, or a greater willingness to ascribe symptoms to a mood disorder.

A second possibility is that UE patients suffered a greater loss of social and occupational functioning by becoming ill than their NUE counterparts, leading to an excess of reactive depression. The co-segregation of some depressive symptoms with socio-economic status supports this explanation, as does previous research showing that, compared with non-suicidal patients, schizophrenic patients who kill themselves are more aware of the effects of their illness, feel inadequate in relation to their goals, and fear further mental disintegration (Drake *et al.* 1985).

The excess of suicidal ideation in the UE group may signify a preventable cause of mortality in this group, and is supported by previous research. Farberow (Farberow *et al.* 1966) found that schizophrenic patients who committed suicide had higher levels of education than non-suicidal patients. In a 25-year follow-up study, Dingman & McGlashan (1986) identified good pre-morbid functioning as a risk factor for suicide in schizophrenia. Drake and colleagues (1984) found that 73% of schizophrenic patients who committed suicide had attended college, compared with 29% of non-suicidal patients (OR = 6·7).

Schizophrenic symptoms

Scores on the 'schizophrenic symptoms' PC were significantly higher in the NUE patients. This PC comprises both positive and negative symptoms, insidious onset without psychosocial stressors, and a chronic course with deterioration. Many of these variables were also more prevalent in NUE cases in the univariate analysis. This supports the notion that the NUE schizophrenic patients had a more severe, chronic form of schizophrenia than their UE counterparts, similar to the neurodevelopmental form postulated by Murray and colleagues (1992).

The excess of negative symptoms in NUE patients is supported by previous research. Negative symptoms have previously been associated with a weak academic record (Johnstone *et al.* 1995), low pre-morbid IQ (Frith *et al.* 1991) and poor global neuropsychological function (reviewed in McGlashan & Fenton, 1992).

Psychosocial stress

Sixteen UE, but only two NUE patients, were positive for the OPCRIT variable 'definite psychosocial stressor prior to onset'. This finding can be interpreted in the light of the stress-

diathesis model of psychosis, proposed by Rosenthal (1960). According to this model, patients with a strong neurobiological predisposition to psychosis are likely to become ill even in the absence of stress, whereas those without such a diathesis require a greater amount of stress to precipitate psychotic symptoms.

There is evidence that life events at onset confer a good prognosis. In a prospective study of 111 first-admission schizophrenic patients, Harder *et al*. (1981) found that life-event stress at onset was associated with a better outcome at 2 years. Van Os *et al*. (1994) followed up recent-onset psychotic patients for an average of 42 months. Life-event-positive patients were ten times more likely to have a symptom severity of 'mild' or 'recovered' during the follow-up period, spent less time in hospital, and had more antidepressant and less antipsychotic medication.

The excess of psychosocial stressors at onset in UE patients, therefore, suggest that they have less neurodevelopmental diathesis than NUE patients do. However, life events and stress may be consequences, rather than precipitants of illness. UE patients may have been more fully engaged in society, leading to a greater degree of disruption, and therefore stress, during the emergence of their psychotic symptoms.

Conclusions

University-educated schizophrenic patients have fewer core schizophrenic, and more depressive symptoms than NUE patients, more psychosocial stress at onset, and a less chronic course. These findings suggest that UE patients have less neurodevelopmental impairment than do NUE patients.

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