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ORIGINAL PAPER

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Relationship between insight, cognitive function, social function and symptomatology in schizophrenia

The West London first episode study

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Abstract *Objective* To examine the nature and clinical correlates of insight in first-episode schizophrenia, and how these differ from findings in established schizophrenia. *Method* Insight (and insight dimensions), clinical symptoms, neurocognitive function and social function were assessed in 94 patients with first-episode schizophrenia or schizophreniform disorder according to DSM-IV criteria. *Results* Greater global insight was associated with more severe depression. Poor overall insight was associated significantly with more severe negative and disorganisation symptoms as well as poor working memory, and at a trend level with lower current IQ. Patients with poor insight perceived themselves to have a better level of independent performance at daily living activities. *Conclusion* In first-episode psychosis, the clinical correlates of poor insight are similar to those reported for established schizophrenia. Those patients with greater insight may be at risk of depression. The complex relationships between insight, positive and negative symptoms, neurocognitive dysfunction and social function may reflect the multidimensional nature of insight.

Key words insight · first-episode schizophrenia · cognition

Introduction

Impaired insight is common is schizophrenia [1], and associated with poor clinical outcome [2], specifically, poor medication adherence [3–7], poor social functioning [8], and a greater number of hospital admissions. Poor insight has been considered part of the phenomenology of schizophrenia [9], since most studies have found a significant relationship between symptom severity and degree of insight [10]. However, the study findings reported have been inconsistent, which may partly reflect differences in the definitions and assessment measures used, and partly variation in insight during the course of the illness [10]. Another view of poor insight in schizophrenia is that it can be a manifestation of the psychological reaction to the illness [11–14]. In support of this, studies have shown a positive association between degree of insight and severity of depression [11, 15, 16] and suicidality [17, 18], prompting the notion that lack of insight may guard against depressive symptoms. It has also been suggested that poor insight may reflect the cognitive impairment associated with schizophrenia [3, 19], particularly in relation to executive function and IQ [14, 19–27], although several studies have failed to find a link between insight and neurocognition [28–30, 71].

The clinical correlates of insight have been most commonly investigated in established schizophrenia, but studies in first episode schizophrenia offer a number of advantages. First, the confounding effects of the experience of treatment, hospitalisation and chronicity of illness are minimised. Secondly, as lack of insight has been identified as contributing to poor outcome, studies of patients with chronic illness may have selectively biased samples, in that poor outcome patients may be more likely to have remained in contact with services, and thus available for participation in studies. Thirdly, such studies offer the best opportunity to examine the possible influence of insight on the duration of untreated psychosis (DUP) although only very few studies [72] have systematically explored this relationship. It has been hypothesised that those patients with poor insight are likely to present with a longer DUP [31, 32], partly because

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they are less likely to be seeking help for their illness. Fourthly, study findings that improve understanding of the nature and clinical correlates of poor insight during the early phase of the illness might help to shape effective treatment strategies for early intervention services. Lastly, examining insight in the context of a prospective first-episode study, such as ours in West London, provides a valuable starting point for the study of the evolution of this phenomenon over the longer term.

Given the advantages of studying insight at first episode, several studies have now investigated this concept in such patients [33–37], although only a few have examined the relationship between insight and neurocognitive deficits [34–36]. Insight is now generally viewed as a multidimensional construct with at least three overlapping dimensions [38]. A shortcoming of some of the first-episode studies has been the use of a single scale item to measure insight. We chose to use a multi-dimensional scale, specifically designed to measure separately the specific dimensions of impaired insight in psychosis.

The main aims of the study were, first, to examine whether the relationships between insight, symptoms, social factors and neurocognitive function reported in established schizophrenia were also present at first presentation of the illness to psychiatric services. We used a cognitive test battery that assesses aspects of cognitive function known to be impaired in first-episode schizophrenia [39, 40]. Our second aim was to investigate separately the associations of each of the insight dimensions. Our third aim was to investigate the possible link between insight and DUP.

Subjects and methods

Patients from West and South West London were recruited as part of a prospective first episode study of schizophrenia [31, 40], within a catchment area population of over 700,000 people. To be eligible for the study, patients needed to fulfil the DSM IV criteria for schizophrenia or schizophreniform psychosis, be between 16 and 55 years of age, and have a good command of English. Patients who had a primary diagnosis of organic brain syndrome, learning disability or those who had been taking antipsychotic medication for more than 3 months were excluded from the study. Ethical approval was obtained from the relevant local research ethics committees. Written informed consent was obtained for each patient.

Clinical assessments

Insight was assessed using the Schedule for the Assessment of Insight (SAI: [38]). This scale comprises a semi-structured interview that obtains measures of three dimensions of insight: (1) awareness of mental illness, scored 0 to 6; (2) the ability to correctly attribute psychotic experiences, scored 0 to 4; and (3) acceptance of the need for treatment, scored 0 to 4. The maximum total score on the three dimensions is 14, but the scale also includes a supplementary question on hypothetical contradiction, scored 0 to 4. Thus, the maximum total score for the scale is 18, which indicates full insight.

The severity of psychotic symptoms was assessed using the Scale for the Assessment of Positive Symptoms (SAPS: [41]) and the Scale for the Assessment of Negative Symptoms (SANS: [42]). Scores for the positive, disorganisation and negative syndromes of schizophrenia [43] were derived for each patient as follows: sum of the global item scores for the SAPS hallucinations and delusions subscales (positive); sum of all SANS global items (negative); and sum of SAPS global item scores for bizarre behaviour and positive formal thought disorder (disorganisation). Each of these syndrome scores was then expressed as a proportion of the maximum total score for the syndrome.

The Montgomery–Asberg Depression Rating Scale (MADRS: [44]) was used to assess severity of depressive symptoms. A depression score was also generated for each patient by summing the MADRS item scores, with a possible maximum of 60.

Duration of untreated psychosis (DUP) was estimated by calculating the period between onset of psychotic symptoms and initiation of antipsychotic medication, as previously described (see [31]).

Social function was assessed using the Social Function Scale (SFS: [45]), which asks individuals to rate their abilities in seven areas of social function: activation-engagement, interpersonal communication, frequency of activities of daily living (independence-performance), competence at activities of daily living, participation in social activities, participation in recreational activities, and employment or occupational activity.

The National Adult Reading Test [46] was used to estimate pre-morbid IQ, and current IQ was calculated from four subtests of the Wechsler Adult Intelligence Scale—Revised [47]. For each subject, the difference between the pre-morbid and current IQ was calculated, yielding an IQ change score. Tests from the Cambridge Automated Neuropsychological Test Battery (CANTAB: [48]) were used as follows. *Spatial span* [49] measures the ability to remember the order of sequences of squares presented on the screen in increasing number. To test *Pattern recognition memory* [50], 12 abstract visual stimuli are presented sequentially on the screen. Each stimulus is then presented along with novel stimulus and patients are asked to touch the familiar stimulus. This is repeated with 12 different stimuli, giving a maximum possible score of 24. To test *Spatial working memory* [49], patients are required to 'open' sets of boxes, varying between 3 and 8 in number, to find tokens. Errors are recorded when boxes in which tokens have been found are re-opened. A measure of this strategy use was calculated, based on the observation that a common strategy employed in the performance of this task is to follow a predetermined sequence beginning with one box and returning to start a new search with that box after a token has been found. The *Planning* [49] task is a modification of the Tower of London task [51]. Subjects move coloured 'balls' in an arrangement displayed on the screen to match a goal arrangement. Subjects are asked to attempt the solution in the minimum number of moves, which could be 2, 3, 4 or 5. As a stringent measure of accuracy, the proportion of problems solved in the minimum number of moves, i.e. perfect solutions, is used. To test *Attentional set shifting* [52], subjects are required to learn a series of visual discriminations. One of two stimulus dimensions (shape or line) is relevant. Once correct responding is established, subjects are introduced to different exemplars of the same dimension for correct responding, testing their ability to generalise the rule they have just learned (intra-dimensional shift-IDS). At the later, extra-dimensional, shift stage (EDS) the rule is reversed so that a previously irrelevant dimension now became relevant. Performance at this stage is a measure of the ability to inhibit the previously correct response set by shifting attention from one dimension to another. Thus, the EDS is analogous to the attentional shift involved in Wisconsin Card Sort Test [53]. Neurocognitive variables from the CANTAB were derived as measures of short-term memory (spatial span), long-term episodic memory (pattern recognition memory errors), working memory (spatial working memory errors), strategy formation (from the spatial working memory task), planning (Tower of London perfect solutions), perseveration (attentional set shifting errors at the extra-dimensional set shifting stage) and attentional set shifting ability (number passing or failing task).

Statistics

The Statistical Package for Social Science (SPSS), version 10 was used to analyse the data. The data were inspected for linearity and outliers by plotting scatter graphs between insight and the relevant variables and no significant outliers were observed. The data were then inspected for tendency towards normal distribution by plotting histograms and all variables showed tendencies towards normal distribution with the exception of DUP that was positively skewed. Since this variable did not meet parametric assumption of normality, a logarithmic transformation (Log_{10}) was performed. In all cases, a two-tailed Pearson product moment was used to test the strength of association between variables.

Results

The 94 patients in the study sample had a median age of 23.5 (mean 26.2, SD 10.8) years. There were more males ($n = 72$) than females, but no significant differences were found between the genders on any measure. Insight and psychotic symptoms were assessed in all patients. In the majority of cases (85%), the clinical assessments were completed within 3 weeks of the first presentation to services and/or first hospital admission for schizophrenia. Measures of DUP and social function (SFS) were obtained for 92 patients. A total of 86 patients completed the assessment for depressive symptoms and 73 underwent neuropsychological testing. Those patients who did not undergo neuropsychological testing were compared with those that did, on the key assessment variables. The only significant differences found were that the former group had significantly poorer global insight ($t = -2.25$, df = 33.28, $P = 0.03$) and also reported significantly better social functioning ($t = 2.72$, df = 37.92, $P = 0.01$).

Table 1 provides information on the mean scores for global insight, insight domains, psychopathology and cognition in the study sample. On the SAI, 10 patients (10.8%) achieved the maximum score (14) for the three dimensions.

Table 1 Insight, psychopathology and cognition scores in the study sample

Measure	Mean (SD)
Global insight and insight domains: $n = 94$	
Total insight (max. 18)	10.08 (4.78)
Acceptance of need for treatment (max. 4)	2.77 (1.38)
Awareness of illness (max. 6)	3.66 (1.99)
Correct symptom attribution (max. 4)	2.03 (1.39)
Hypothetical contradiction (max. 4)	1.61 (1.07)
Psychopathology	
Positive syndrome (max. 1)	0.67 (0.27)
Negative syndrome (max. 1)	0.45 (0.26)
Disorganisation syndrome (max. 1)	0.49 (0.31)
Depression: MADRS total score (max. 60); $n = 86$	19.68 (9.34)
Cognition: $n = 73$	
Spatial span	5.72 (1.42)
Pattern recognition memory: number correct (max. 24)	20.13 (3.08)
Spatial working memory: errors	30.73 (19.22)
Spatial working memory: strategy	34.27 (4.73)
Planning: perfect solutions (max. 12)	7.54 (2.08)
Attentional set shifting: pass/fail	58/12
Attentional set shifting: EDS errors	8.29 (9.06)
Premorbid IQ: NART	100.09 (10.67)
Current IQ: (WAIS-R)	91.80 (12.42)

Symptom, social and cognitive correlates of total insight

Total insight correlated significantly and negatively with the negative syndrome ($r = -0.33$, $P = 0.001$) and the disorganisation syndrome ($r = -0.23$, $P = 0.03$), and positively with depression ($r = 0.23$, $P = 0.04$). Total insight also correlated negatively and significantly with the SFS subscale of Independence performance ($r = -0.25$, $P = 0.01$). No other social function subscales correlated with global insight. Of the neurocognitive measures, only spatial working memory errors correlated significantly with insight ($r = -0.24$, $P = 0.04$) although there were associations at a trend level with current IQ ($r = 0.20$, $P = 0.09$) and IQ change score ($r = -0.23$, $P = 0.06$). There were no differences in insight between those passing and failing the attentional set-shifting task ($t = 1.11$, df = 67, ns). Thus, poorer global insight was associated with less severe depressive symptoms, greater severity of negative and disorganisation symptoms, and poorer working memory. There was also a trend for lower current IQ to be associated with poor insight, especially for patients whose current IQ had declined from higher pre-morbid levels.

A stepwise linear regression analysis was performed to determine the variables that contributed independently to total insight. Negative and disorganisation syndrome scores, depression scores, SFS independence-performance subscale scores and spatial working memory errors were entered as the independent variables. Negative symptoms, spatial working memory errors and SFS independence-performance emerged as the only significant contributors towards overall insight, and these variables accounted for 37% of the variance (adjusted $R^2 = 0.370$, $F = 13.51$, $P < 0.001$). See Table 2 for details of beta coefficients for each contributing variable.

Symptom, social and cognitive correlates of insight dimensions

The dimensions of insight were then analysed separately, negative, positive, and disorganisation syndromes, depression scores, DUP, social function, spatial working memory, pattern recognition, spatial span, strategy scores, current IQ and premorbid IQ were entered into a correlation analysis. The 'need for treatment' dimension correlated negatively and significantly with disorganised syndrome scores ($r = -0.20$, $P = 0.05$), SFS independence performance ($r = -0.26$, $P = 0.01$) and at a negative trend level with SFS independence competence ($r = -0.19$, $P = 0.06$). Thus, patients who were less accepting of the need to

Table 2 Results of the model of fit for explanatory variables of dimensions of insight

Dependent variable	Explanatory variables	Standardised-coefficient	Std error	*t*	*P*
Total insight	Negative symptoms	−0.50	1.85	−5.06	0.001
	Spatial working memory	−0.31	0.03	−3.03	0.04
	Independence-performance	−0.28	0.06	−2.73	0.008
Accept need for treatment	Independence performance	−0.26	0.024	−2.5	0.01
Awareness of illness	Negative symptoms	−0.47	0.83	−4.21	0.001
Correct attribution of symptoms	Negative symptoms	−0.45	0.56	−4.27	0.002
	Spatial working memory	−0.27	0.07	−2.53	0.01
Hypothetical contradiction	Negative symptoms	−0.38	0.42	−3.87	0.001
	Depression	0.23	0.01	2.39	0.02

take medication showed more severe disorganisation symptoms but reported more social competence and independence.

The 'awareness of illness' dimension correlated positively and significantly with current IQ ($r = 0.24$, $P = 0.04$) and depression scores ($r = 0.23$, $P = 0.03$), and negatively and significantly with negative syndrome scores ($r = -0.30$, $P = 0.003$). This dimension also correlated at trend level with DUP ($r = -0.19$, $P = 0.07$) and spatial working memory ($r = -0.21$, $P = 0.07$). Thus, those patients with a poor awareness of their illness had worse global and specific neurocognitive deficits, more severe negative symptoms, less severe depressive features and a longer DUP.

The dimension of 'correct symptom attribution' was negatively and significantly associated with spatial working memory errors ($r = -0.24$, $P = 0.04$), negative syndrome scores ($r = -0.26$, $P = 0.01$), depression scores ($r = 0.21$, $P = 0.05$), and SFS interpersonal communication ($r = 0.22$, $P = 0.04$), and, at trend level, with SFS independence-performance ($r = -0.20$, $P = 0.054$). Thus, those patients who were less able to correctly attribute their illness symptoms performed more poorly on the spatial working memory task, had more severe negative symptoms, and were less depressed, but reported relatively high levels of social independence-performance.

The dimension of 'hypothetical contradiction' correlated significantly with negative deficit syndrome ($r = -0.35$, $P = 0.001$) and depression scores ($r = 0.23$, $P = 0.03$) and at trend level with DUP ($r = -0.18$, $P = 0.08$), current IQ ($r = 0.20$, $P = 0.09$), disorganised symptoms ($r = -0.19$, $P = 0.06$) and SFS independence performance ($r = -0.18$, $P = 0.09$). Thus, patients who demonstrated a higher degree of conviction in their beliefs had more severe negative symptoms, were less depressed, and had a lower IQ and a longer DUP. In addition, they presented more severe disorganisation symptoms but reported a relatively high level of social independence-performance.

Separate stepwise regression analyses were performed for each insight dimension. In each case, the insight dimension was entered as the dependent variable, and all those variables that correlated with each insight dimension at a 5% level of significance were entered as the independent variables. For awareness of illness, negative symptoms emerged as the only significant explanatory variable, and accounted for 20.5% of the variance (adjusted $R^2 = 0.205$, $F = 17.73$, $P < 0.001$). For correct attribution of symptoms, negative symptoms and spatial working memory errors emerged as significant contributors, explaining 27% of the variance in this dimension (adjusted $R^2 = 0.269$, $F = 12.94$, $P < 0.001$). Only the SFS item of independence-performance significantly explained any variance in need for treatment, and accounted for only 5.5% (adjusted $R^2 = 0.055$, $F = 6.21$, $P < 0.05$). The negative syndrome and depressive symptom variables significantly contributed to hypothetical contradiction, accounting for 20% of the variance (adjusted $R^2 = 0.198$, $F = 10.26$, $P < 0.02$). For details of beta weights of each contributing variable, see Table 2.

Discussion

The SAI scores in our sample suggest that insight is moderately impaired in schizophrenia even at the time of first presentation to psychiatric services. Only about one in ten of the patients showed full insight across the three dimensions.

Insight and symptoms

We found an association between the severity of positive psychotic symptoms and both global insight and one insight domain, acceptance of the need for treatment. However, this association was limited to disorganisation symptoms rather than delusions and hallucinations, and in the regression analysis, disorganisation symptoms did not contribute uniquely to insight and its dimensions. Nevertheless, the finding is in line with a report by Keshavan et al. [34]: in a sample of patients in the early course of psychosis, these investigators found that the PANSS item for unusual thought content was the most highly associated with insight. Since disorganisation symptoms can be regarded as loosening of normal everyday associations and may reflect difficulties in reasoning, a plausible explanation for the association is that they lead to impaired insight via denial or misattribution of symptoms [25].

We found that the negative syndrome scores contributed the most to overall insight, as well as contributing significantly to other insight dimensions (awareness of illness and correct symptom attribution) and the supplementary item of hypothetical contradiction. This suggests that in the early stages of schizophrenia, the presence of negative symptoms is at least as important as positive symptoms in this regard. Supporting this view, Mintz et al. [36] reported that, following the first presentation of the psychotic illness, improvement in both positive and negative symptoms paralleled improvement in insight over the first year of treatment.

Our findings in relation to insight and positive and negative symptoms in our sample of people with schizophrenia of recent onset are similar to those reported in people with established schizophrenia. A meta-analysis of 40 studies in chronic patients found that insight was significantly related to both positive and negative symptoms with approximately equal effect sizes [10]. However, several such studies have reported a significant, inverse relationship between insight and negative symptoms [54–56]. Further, there is also evidence that in response to treatment in patients with established schizophrenia, insight and negative symptoms may change in parallel [57]. The nature of this relationship between insight and negative symptoms is a matter for speculation. For example, patients who have more severe negative symptoms may appear to have poor insight because they are more liable to accept delusional explanations, being less motivated to seek out or analyse any contrary evidence. It has also been postulated that negative symptoms such as social and emotional withdrawal, apathy and anhedonia might, by their nature, reduce a patient's ability to appreciate the social consequences of the disorder [36].

In our study, those patients with greater global insight were more depressed. This finding replicates previous findings in both early psychosis [58] and established schizophrenia [11, 15, 16, 59, 60]. Such an association may be partly understood in terms of 'depressive realism' [61, 62]; the concept that non-depressed individuals have an optimistic cognitive bias that produces an exaggerated belief in their own abilities while depressed individuals view themselves more realistically and accurately. However, another plausible explanation is that individuals who are aware of their illness are likely to react depressively [12], particularly, perhaps, if they have the subjective experience of associated psychological deficits [63]. From a psychodynamic perspective, poor insight, as a denial of illness, may serve a protective function, helping psychotic patients adapt to their reality. This hypothesis is compatible with the finding that poor insight is positively correlated with symptoms of elation in manic patients [64].

Insight and neurocognition

Although many studies of established schizophrenia have found a relationship between insight and more general aspects of intelligence, as reflected by IQ (see [65]), in our first-episode patients we found a rather weak association, which was strongest for the 'awareness of illness' dimension. We also found that those who showed the greatest decline in general intellectual function from pre-morbid levels tended to have the least insight. This allows us to postulate that the pathophysiological mechanisms that underpin awareness of being ill may be in part related to acquired intellectual impairment rather than life-long cognitive dysfunction. However, interpretation of our data should take account of the selection bias in respect of neuropsychological testing, in that patients with poorer insight were less likely to have undertaken such testing.

In established schizophrenia, studies have generally failed to determine any consistent relationship between particular neuropsychological deficits and insight [28–30, 36–30, 66]. Only executive function, usually measured by performance on the Wisconsin Card Sort Test, has yielded any replicated association with insight. The WCST is a complex task requiring a range of processes for effective performance, including working memory, planning, response inhibition and shifting of attentional set. A specific association has been reported between executive function and insight, particularly the ability to correctly attribute symptoms [14, 67]. In our study, this same insight dimension was the only one to show a significant relationship with any of the CANTAB measures: spatial working memory performance contributed significantly to correct attribution of symptoms. However, we failed to find any associations between insight and measures of executive function derived from the attentional set-shifting task. Overall, our sample of first-episode patients performed relatively well on this task [40], in contrast to patients with established schizophrenia, who tend to perform badly [68]. It is therefore possible that different executive processes may be more relevant to insight at different stages of the illness. An alternative interpretation is that the impairments in WCST performance seen in chronic patients simply reflect working memory dysfunction. Flashman et al. [69] have proposed a mechanism whereby cognitive impairment of this kind might influence insight, and in particular how it might influence the insight dimension of correct attribution of symptoms. These investigators hypothesised that the inability to hold symptom information in working memory while comparing it with past experiences might make it difficult to categorise the current symptoms as anomalous, and this may manifest itself as poor insight.

Insight and social function

In this study, poor scores on global insight, and the awareness of illness dimension in particular, were associated with better independent performance of the activities of daily living. This aspect of social function contributed significantly to overall insight and to the insight dimension of need for treatment in particular. It is tempting to speculate that an ability to function independently and competently could influence insight by increasing the threshold for both concern about symptoms and acceptance of the need for treatment. This would be in line with the suggestion that acceptance of the need for treatment is open to the influence of social factors [25]. However, another reasonable explanation is that patients with less insight tended to provide unrealistic self-ratings of their ability to function competently and independently on routine activities. These findings are at variance with those of Dickerson et al. [70], who examined the relationship between insight and social function in a sample of 87 outpatients with schizophrenia in remission. These investigators found that good insight was associated with good social function and vice versa. There are several possible explanations for the discrepancy between these findings and ours. First, there are differences in the study populations. Dickerson and colleagues examined insight in a group of stable outpatients with established schizophrenia. Secondly, in their study, insight was estimated using a single item from the PANSS. Thirdly, differences between these findings could be due to the estimation of social function. Whilst we sought information from the patients regarding their social function, Dickerson and colleagues also gathered information from carers and relatives, and averaged the scores derived from the patients' and carers' reports.

Insight and duration of untreated psychosis

We found that only the insight dimension of awareness of illness was related to DUP, and then only at trend level. This lends tentative support to the view that those patients who view themselves as not suffering from an illness are less likely to act on their own, or others', concerns, and seek help, thus delaying their first presentation to psychiatric services [8, 31]. But further work is necessary to try and elucidate the true nature of the relationship between insight and DUP.

Conclusions

The findings of this study suggest that during the early stages of schizophrenia, greater global insight is associated with depressive features, while poor global insight is influenced by the presence of negative symptoms and neurocognitive deficits, and associated with a perception of better performance on tasks related to independent daily living. Spatial working memory, an aspect of executive function, emerged as a key variable relevant to insight during the early phases of the illness.

These results also support more specific hypotheses: that the inability to correctly attribute psychotic symptoms may be linked to prefrontal dysfunction, and that the acceptance of the need for treatment may be influenced by a patient's perception of their ability to function independently in society. Overall, the relationships between insight, clinical symptoms and neurocognitive dysfunction in first-episode schizophrenia appear complex, perhaps reflecting the multidimensional nature of insight. The cross-sectional nature of our study did not allow us to test the stability of these interactions, and prospective longitudinal studies are required.

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