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Schizophrenic Thought Disorder
A Psychological and Organic Interpretation

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It is suggested that schizophrenic thought disorder comprises four relatively independent components: delusion; intrinsic thinking disturbance; formal thought disorder; and deficient real-world knowledge – a new concept. Schizophrenic and neurotic control subjects were given tests of thinking, perception, appreciation of conversational discourse, and social and practical knowledge. Not all deluded schizophrenics had intrinsic thinking disturbance. Those that did tended to have overinclusive categorisation as the most apparent deficit. Formal thought disorder was associated with a poor performance on the test of conversational discourse. The most striking result was that 75% of schizophrenic patients were markedly deficient, relative to neurotic patients, on their knowledge of everyday social issues.

Much has been written about the way schizophrenic people think, but there remain many basic unanswered questions. There is agreement, however, on one issue, i.e. that what psychiatrists call schizophrenic thought disorder is not a unitary deficit, but one with several components (Table I). The first distinction, originally pointed out by Schilder (1920), is between a disorder of content (delusion) and a disorder of form. The latter, however, can be further subdivided, as suggested by Andreasen (1982), into an intrinsic disturbance of thinking (dyslogia, as she calls it) and a disorder of the form in which thoughts are expressed. The former covers all the claimed abnormalities which have been *inferred* from a schizophrenic subject's performance on psychological tests, e.g. overinclusion, concrete thinking, illogicality. The latter is a disorder of the form in which thoughts are expressed and is what psychiatrists generally mean by formal thought disorder. It is an *observed* phenomenon rather than an inferred deficit. Andreasen suggests that this formal thought disorder be called dysphasia because it usually takes the form of disorganised speech. This is not an appropriate term, in our view, because the term dysphasia, as it is understood by neurologists and neuropsychologists, refers to a disorder of the semantic, syntactic, and phonemic elements of language, and cannot be easily widened to include any abnormality of speech, such as "pressured speech, incoherence, tangentiality and associative loosening or derailment" as Andreasen suggests. Also, a disordered form in which thoughts are expressed could be manifest in painting, writing, or even in gesture. For these reasons, we recommend that the term formal thought disorder be retained, or replaced by a more accurate neologism such as 'dysconversation', because, as we shall show later, it is manifest in conversational discourse.

TABLE I
Proposed components of thought disorder

(1)	Disorder of the content of thinking – includes *delusion, overvalued idea*
(2)	Disorder of the mechanism of thinking – can be called *intrinsic thinking disturbance or dyslogia*
(3)	Disorder of the way thoughts are expressed – usually called *formal thought disorder* although, as it is essentially a disorder of language affecting conversational discourse, it could be called *dysconversation*
(4)	Disorder of the way a subject thinks about or judges events in the real world – *deficient real-world knowledge or lack of common sense*

The main purpose of this article, however, is to highlight a fourth component of thought disorder, which we believe is important in furthering our understanding of the nature of schizophrenia. This component we intend to call 'deficient knowledge of the real world' or more colloquially 'lack of common sense'. It has been alluded to in the past by several writers on thought disorder, but has generally been ignored, chiefly because mainstream psychology with its behaviourist orientation was averse to such notions. Before discussing this fourth component in detail and presenting some experimental data on the issue, it is necessary to clarify the nature and interrelationships of the first three components to show that the fourth is partly independent of them.

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Delusion

A delusion, a disorder of thought content of a special nature, may arise independently of any intrinsic disturbance of thinking (Table II). In many instances, it is the result of entirely *normal thinking processes* in response to an *abnormal perceptual or emotional state*. Maher (1974) made this point well in his account of how someone who is gradually becoming deaf, but who is unaware of this, will actually perceive those around him whispering, and may quite naturally assume that they are conspiring against him.

Matussek (1952) argued persuasively that a delusional perception was not a disorder of thinking at all, as had previously been supposed by psychopathologists, notably Gruhle (1915), but was a primary disorder of perception. Because of a breakdown in *Gestalt*, he believed, events or items in the world (e.g. a raised dog's paw) were actually seen as standing out from the background scene. It was as if they were "crying out" for significance to be attached to them, and hence any subsequent delusions (e.g. the dog's paw representing a divine message) were entirely reasonable attempts by the onlooker, considering he had no insight into his altered perceptual state, to explain such incidents. Experimental confirmation of the absence of intrinsic thinking disturbance but the presence of a perceptual disorder in some deluded subjects can be found in a recent study by Robertson & Taylor (1985). They gave a battery of psychological tests to a large group of psychotic men in prison. Those whose clinical picture was dominated by delusions tended to perform normally on tests of thinking but poorly on perceptual tasks.

Bleuler (1906) and notably De Clerambault (1921) considered that a pathological emotional state, other than elation or depression, could also provide the basis for a delusional state such as erotomania, in which an idea would become indissolubly attached to the emotion. This last mechanism, if correct, is usually invoked in the genesis of non-schizophrenic psychoses. However, some German psychopathologists (e.g. Wetzel, 1922) incriminated a complex emotional change, a true delusional mood, as the basis of delusions in schizophrenia.

It is probable that delusions can result from a primary disturbance of thinking. Serieux & Capgras (1909) gave a comprehensive clinical account of such "misinterpretative delusional states", and experimental evidence to this effect is provided by Huq *et al* (1988), who showed that a subgroup of deluded psychotic patients jump to conclusions on minimal evidence in certain reasoning tasks, more so than normal people or non-deluded psychotic patients. Nevertheless, it appears from the literature that a substantial proportion of deluded subjects do not have an intrinsic thinking disturbance, an issue which is examined in the experimental section of the paper.

TABLE II
Proposed mechanisms for delusional formation in functional psychosis

Disordered perception – e.g. deafness, *Gestalt* breakdown
Disordered emotion – e.g. heightened emotion, delusional mood
Disordered thinking – intrinsic thinking disturbance leading to misinterpretative delusional state (a form of paranoia)

Intrinsic thinking disturbance

The second major component of the term thought disorder is intrinsic thinking disturbance or dyslogia. This itself is made up of several different abnormalities, as one would expect when one considers the multi-faceted nature of normal thinking. One can think in images or in words; one can dream or solve a crossword puzzle; one can classify an array of objects or identify them all as unique. Most of the experimental studies on thinking disturbance, however, have been directed at identifying a single and specific way in which schizophrenic thinking differs from that of normal adults. There have been numerous suggestions. Some of these are merely metaphors based on astute clinical observation (e.g. knight's move thinking); others refer to ill-defined, pervasive psychological deficits affecting other mental functions as well as thinking (e.g. "inability to maintain an effective set": Shakow, 1946); yet others maintain that disturbed thinking is only manifest under certain conditions (e.g. when considering the psychological qualities of another person: Bannister, 1960). The range and value of all such suggestions are reviewed elsewhere (Cutting, 1985). For the purposes of this article, it should be noted that, so far, no single, specific, way of thinking has been convincingly linked with schizophrenia. Many of the claims have been found wanting when carefully examined using appropriate control subjects (depressive, manic, or demented people). Others are too atheoretical (e.g. the "bizarre, idiosyncratic thinking" suggestion of Harrow & Quinlan, 1985) or too linked to an outmoded psychological theory (e.g. "increased yielding to normal response bias": Chapman, 1958) to be of much heuristic value.

A handful of suggestions, however, have stood out from the others and have become accepted psychopathological features of schizophrenia. This is

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partly because they have remained fairly robust findings over a number of experiments, partly because they were in accord with clinical observations, and partly because they could be easily tested. The four most well-known are probably loosening of associations, concrete thinking, overinclusion, and illogicality. These four potential abnormalities are examined in the experiments to be reported here.

Formal thought disorder

The third component of thought disorder is an observed disorganisation in the way thoughts are expressed. Most of the clinical terms applied to thought disorder (e.g. derailment, tangentiality, incoherence, poverty of content) refer to this component. There is a tendency nowadays to regard this component as a disorder of language rather than thinking (Wykes, 1980), affecting, in particular, the pragmatic or discourse functions of language, rather than the semantic, syntactic, or phonemic elements. To take an example, a boss might say to a secretary, "There are too many mistakes in this letter". A normal person would take this as a request for the letter to be retyped, whereas a schizophrenic person, if his or her pragmatic language comprehension were impaired, would fail to appreciate the covert, but in fact intended, meaning of the utterance.

The evidence to this effect is that analysis of schizophrenic language, particularly in those with formal thought disorder, shows up a failure to observe conversational rules. Rochester & Martin (1979) found that thought-disordered schizophrenic patients were worse than non-thought-disordered schizophrenic patients in their ability to produce connections between the clauses in their conversation which referred back to a previous theme. Whereas a normal person might say, "John got a new bicycle, I got a second-hand one," they would say, "John got a new bicycle, then there was a second-hand one," omitting to mention the link between the second and the first clause. The link between formal thought disorder and failure to appreciate conversational rules is examined in the Method section.

Deficient real-world knowledge

The fourth component of thought disorder, unlike the first three, which can be categorised and psychologically examined, is speculative. It is best illustrated by the following examples of real patients. One of the authors was interviewing an intelligent chronically schizophrenic patient who had been a continuous in-patient for 27 years. The interview went like this:

Question: "What is the matter with you?"
Answer: "I've got pneumonia."
Question: "How long have you had this?"
Answer: "Twenty-seven years."
Question: "That's a long time to have had pneumonia. How did you get it?"
Answer: "I caught it from a thermometer at Guy's Hospital. The thermometer made everyone of the age of 21 get either 'flu or pneumonia, and I got pneumonia."
Question: "But in my opinion thermometers only measure temperature. They don't actually specify what illnesses people get."
Answer: "Well you'd better go back and look up your medical books."

With that riposte, the patient walked out of the door. Another patient, reported by Brown (1973), when asked what his plans after his discharge were, replied that he was going to Scotland to audition for a star part in *Fiddler on the Roof*. The first patient had incorrect knowledge about the function of thermometers. (He was undoubtedly intelligent, as he was training to be a barrister when his illness began.) The second patient had incorrect knowledge about the nature of that particular film, as it had already been made, Scotland was an unlikely venue for it, and anyway he was the wrong age. (Brown considered that the man was intelligent and abreast enough of current affairs to have been expected to have known these things.)

How can one explain these bizarre notions about the real world? One could argue that both patients were deluded, but this is stretching the meaning of delusion to include any bizarre statement about the world, whether it is a strongly held belief or not. (The nurses in charge of the first patient had never heard him express the idea about the thermometer before.) One could argue that they had an intrinsic disturbance of thinking, for example, an inability to follow logical inferences, or overinclusive categorisation whereby thermometers were classified among causes of disease rather than measures of it. The former is an inadequate explanation because it is the premise rather than the inference which is at fault. The latter is a possible explanation, but, as Brown (1973) noted in his patient, within the strict field of semantics, e.g. knowing that a bird always has wings or that snakes are reptiles, there was no abnormality. The disorder involved, according to Brown, "rules we really use rather than rules we ought to use". For these reasons it appears justifiable at least to consider whether a

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breakdown in knowledge of the real world as opposed to linguistic knowledge, what Chernigovskaya & Deglin (1986) recently termed "extralinguistic reality", occurs to a significant extent in schizophrenia.

Very few writers on schizophrenia can be said to have had even somewhat similar views. Minkowski (1927), a French psychiatrist, is closest, when he contrasted the intellectual dementia seen in general paralysis of the insane with schizophrenic 'dementia' in this way: "A sort of common sense and a knowledge of where to find things is retained in general paralysis . . . the behaviour of a schizophrenic is quite different. He usually knows the date, but the knowledge has no precise meaning for him; he cannot use it in a fashion appropriate to his circumstances. The pragmatic use of things is affected early in this condition". Cameron (1944), a North American psychiatrist, and Bannister (1960), a British psychologist, both stressed the dissociation between a schizophrenic patient's deficient social knowledge and his intact intellectual ability, a view which has some links with our own, if one replaces 'social' by 'real world'. The intactness or otherwise of a schizophrenic person's real-world knowledge is examined in the Method section.

Purpose of the current investigation

These foregoing considerations led us to examine the frequency of the different components of thought disorder in a representative sample of schizophrenics. Four questions were addressed.

(1) What proportion of schizophrenics have intrinsic thinking disturbance? This was examined by measuring performance on four tests, each covering a different facet of thinking – conceptual thinking, categorisation, abstract thinking, logical thinking – and aimed at identifying the four most well-established types of schizophrenic thinking disturbances – loosening of associations, overinclusion, lack of abstract thinking, and illogicality. Schizophrenic patients whose scores on all four tests fell within one standard deviation of the mean achieved by controls were to be regarded as definitely free of thinking disturbance; those whose score on at least one test fell two standard deviations beyond the controls' mean were to be regarded as definitely having thinking disturbance; scores falling between one and two standard deviations of controls' means were to be regarded as equivocal.

(2) Do deluded schizophrenics who are free of thinking disturbance have a perceptual abnormality instead? This was examined by measuring performance on two perceptual tasks and identifying 'normal' or 'abnormal' perceptual ability in the same way as in question (1), with reference to standard deviations from control means.

(3) Do schizophrenics with formal thought disorder have a particular problem with conversational discourse? This was examined by devising a task of conversational discourse and comparing the performance of formally thought disordered with non-formally thought disordered schizophrenic patients.

(4) Do schizophrenic patients have a deficient knowledge of the real world? If so, does this occur independently of thinking disturbance or formal thought disorder? This was examined by devising a test of such knowledge, evaluating schizophrenics' performance on it in terms of standard deviations from control norms as before, and then examining the relationship between a 'normal' or 'abnormal' performance and performance on the thinking and conversational discourse tests.

Method

Subjects

Schizophrenic subjects

There were 20, fulfilling RDC criteria for definite schizophrenia (Spitzer *et al*, 1975). Fifteen were subacute cases, five were chronic cases; 18 had previous hospitalisations with on average 2.3 admissions. All were on neuroleptic drugs at the time of testing. They were consecutive admissions to one hospital. The subjects were subdivided in two ways: into formally thought disordered and non-formally thought disordered patients, using a cut-off of 2 on the Thought, Language, and Communication Disorder (TLC) scale (Andreasen, 1979); and into paranoid and hebephrenic patients using the criteria of Tsuang & Winokur (1974). The paranoid subgroup was then taken as representative of a predominantly deluded subgroup. (None of these had hallucinations alone.)

Control subjects

Two control groups were obtained. The first comprised 20 subjects with a major depressive episode (Spitzer *et al*, 1975), consecutive admissions or out-patients under the care of two general psychiatrists. The second comprised 20 subjects with a non-depressive neurosis – anxiety, phobic, or obsessional – consecutive out-patients referred to one general psychiatrist.

Unfortunately there were significant age, sex, and premorbid IQ differences between the schizophrenic patients (mean age 28.1, 13 males/7 females, mean IQ 102.4), depressive patients (mean age 48.5, 16 females/4 males,

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mean IQ 109.0), and non-depressive neurotic patients (mean age 41.5, 13 males/7 females, mean IQ 101.7). Premorbid IQ was measured using the Nelson Adult Reading Test (Nelson & O'Connell, 1978). Both control groups were significantly older than the schizophrenic group, but this was un-important as performance on none of the nine tests given had a significant correlation with age. The depressive patients were significantly more intelligent than the schizophrenic patients, and this was important, as performance on seven of the nine tests was positively correlated with IQ. For this reason, data from the 10 most intelligent depressive patients was discarded and the remaining depressive patients joined with the non-depressive neurotic patients to produce a non-psychotic psychiatric control group of 30 subjects whose mean IQ of 101.9 and sex distribution (16 males/14 females) were not significantly different from the schizophrenic patients'.

It would have been preferable to have included manic, delirious, or demented subjects as controls. It is hoped to test those in a future study. But as the hypotheses to be examined here concern the different patterns of test performance *within* a group of schizophrenic patients, the nature of the controls is less crucial. The discarding of ten intelligent depressive patients makes the control group not entirely representative of non-psychotic psychiatric illness, but at least it controls for intelligence.

Tests

There were nine tests altogether: four of thinking, two of perception, one of conversational discourse, and two of real-world knowledge.

(1) *Conceptual thinking test*

Similarities subtest of the Wechsler Adult Intelligence Scale. Subjects are asked to say in what way two items (e.g. orange and banana) are similar, and their replies on 12 pairs are scored 0–2 according to a manual. A low score was taken as a measure of loosening of conceptual associations.

(2) *Categorisation test*

Epstein's (1953) method of measuring overinclusion. Subjects are shown six words, then six shapes, each with 10 related words or shapes, and asked to tick whichever of the related items 'belong or go together' with the first item. A high score was taken as a measure of overinclusion.

(3) *Abstract thinking test*

Proverb interpretation using the method of Andreasen (1977). Five proverbs are asked, and their interpretations recorded, which are then rated 0–2 on abstractness (independently of correctness or bizarreness) by five normal people blind of the diagnostic status of the proverb interpreter. A low score was taken as a measure of concrete thinking.

(4) *Logical thinking test*

Syllogisms according to the method of von Domarus (1944). Twelve logical problems with a formal structure were asked, e.g. People with red hair sometimes have a bad temper. Mary has red hair. So Mary must have a bad temper. True or false? The test was standardised in that the items were those out of an original 25 given to 20 normal subjects (hospital staff) where 17, 18, or 19 of these normal subjects had agreed on the answer. A low score was taken as a measure of illogical thinking.

(5) *Spatial perception test*

Thurstone's (1940) hand recognition test. Subjects have to decide if 12 line drawings of a hand portray a right or a left hand.

(6) *Gestalt perception test*

Thurstone's (1940) version of the Gottschaldt hidden-shapes test. Subjects have to trace a designated simple shape within each of 12 complex shapes.

[These two perceptual tasks were chosen because a breakdown in *Gestalt* and a disorder of complex form and spatial perception had emerged as the most consistently abnormal findings in a review of the literature (Cutting, 1985) and were particularly abnormal in Robertson & Taylor's (1985) study of deluded criminals.]

(7) *Conversational discourse test*

This comprised 12 items, each of an imaginary conversation between two people. Subjects were asked to select which of four alternative remarks the first person might have made to cause the second person to make one particular remark. For example, a wife could have said; (a) I wish you'd take the dog for a walk; (b) I wish you'd stop whistling; (c) I wish you'd wear a different tie; or (d) I wish you'd mend the kettle. The husband replies, "It's none of your business", and 18 out of 20 normal subjects (standardisation as for logical thinking above) had chosen (c) as the most likely remark to have prompted this. The test was designed to measure a subject's understanding of the intended meaning of an utterance as opposed to the formal meaning of the language symbols.

(8) *Practical knowledge test*

Twelve multiple-choice questions were asked. (Standardisation was as in the logical thinking test.) One of the items was: if you won the Football Pools how best would you guarantee a large income for the rest of your life? (a) buy shares in an Australian gold mine? (b) put it on the favourite in next year's Derby? (c) Give it to your neighbour to look after? or (d) place it with an investment company in the City ("correct")?

(9) *Social knowledge test*

This was developed and tested in the same way as (8), but the items all had a social or psychological rather than an everyday practical content. One of the items was: Why do you think some men gamble excessively? (a) They need continual excitement ("correct")? (b) They had overprotective mothers? (c) They enjoy losing money? or (d) They are of low intelligence?

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Results

The mean scores and standard deviations on all nine tests are shown in Table III. The test-performance profiles of each schizophrenic subject in terms of how many standard deviations his or her score fell away from the control subjects' mean are shown in Table IV.

Intrinsic thinking disturbance

From Table IV it can be seen that an intrinsic disturbance of thinking was definitely present in five patients (at least one score on the four tests outside 2 s.d. of control mean). Six patients definitely had no disturbance of thinking (all four scores within 1 s.d. of control means). Nine patients had equivocal evidence for thinking disturbance (scoring between 1 and 2 s.d. on one or more tests).

Of the four abnormalities investigated, overinclusion was the most conclusively identified: five patients fell outside 2 s.d. of control norms on the category inclusion test; all were overinclusive rather than underinclusive; and overinclusion was the only abnormality which occurred in all patients with thinking disturbance. Compared with this, only one patient definitely showed loosening (abnormally low score on the conceptual thinking test) and they too had overinclusion. Only two patients definitely showed illogicality and these too had overinclusion. No patient had definite evidence of concrete thinking, although the wide variation in control performance and low interrater reliability ($r=0.41$) of the proverb interpretations may have obscured a proportion of subjects with genuine concrete thinking. Four of the five with definite thinking disturbance were paranoid, and three of the six definitely without thinking disturbance were paranoid. The other three paranoid schizophrenic patients had equivocal evidence of thinking disturbance. There was no association between the presence or absence of intrinsic thinking disturbance and the presence or absence of formal thought disorder as rated on Andreasen's TLC scale. Two out of the five definitely with and two out of the six definitely without intrinsic thinking disturbance also had formal thought disorder.

The answer to the first question posed in the introduction – What proportion of schizophrenic patients have an intrinsic disturbance of thinking? – can be formulated as follows. About one quarter of schizophrenic patients in a relatively acute episode have definite evidence of an intrinsic disturbance of thinking, the most identifiable manifestation of which is a tendency towards overinclusive categorisation. Another quarter have no intrinsic disturbance of thinking, at least according to the tests we used, which had been designed to tap the four most well-established types of thinking disturbance. It is not clear whether the remaining 50% have thinking disturbance or not, as the reliability and validity of the tests used here was not good, and strict crtieria for the presence or absence of thinking disturbance were set.

Perceptual disorder

Only three schizophrenic patients did particularly badly on the spatial perception test and three on the Gestalt perception test, of whom two did particularly badly on each, making four patients altogether with definite evidence of perceptual disorder, according to our definition in terms of standard deviations from normal. All four of these had at least equivocal evidence of intrinsic thinking disturbance, two were paranoid and two hebephrenic.

With regard to the second question posed earlier concerning the possibility that a perceptual disorder rather than thinking disturbance might underlie some schizophrenic delusions, this small study provides no support for this. Not only was the proportion of schizophrenic patients with marked perceptual disorder very small, but, also, those with a predominantly delusional clinical picture were more likely to have an intrinsic thinking disturbance (four out of ten 'paranoids') than a perceptual disorder (two out of ten 'paranoids').

Conversational discourse and formal thought disorder

The schizophrenic patients clearly found the test of conversational discourse difficult, as 50% were more than

TABLE III

Mean and standard deviations of schizophrenics and psychiatric controls on nine psychological tests

Test/maximum possible score	*Mean (±s.d.)*	
	Psychiatric controls (n=30, IQ=101.9)	*Schizophrenics (n=20, IQ=102.4)*
Conceptual thinking/24	12.6 (4.9)	12.9 (6.0)
Categorical inclusion/120	27.3 (12.2)	41.2 (20.6)
Abstract thinking/10	7.4 (3.5)	4.6 (2.5)
Logical thinking/12	9.0 (2.1)	7.4 (2.0)
Spatial perception/12	8.2 (2.0)	7.9 (2.5)
Gestalt perception/12	9.8 (2.6)	8.3 (3.3)
Conversational discourse/12	9.9 (2.3)	5.7 (3.9)
Practical knowledge/12	10.4 (1.5)	7.9 (2.3)
Social knowledge/12	10.5 (1.6)	6.8 (2.8)

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TABLE IV
Test performance profile of schizophrenics in terms of standard deviations from control norms

Subject	*IQ*	*Formal thought disorder (T) or not*	*Paranoid or hebephrenic P or H*	*Tests*								
				1 Conceptual thinking	*2 Categorical inclusion*	*3 Abstract thinking*	*4 Logical thinking*	*5 Spatial perception*	*6 Gestalt perception*	*7 Conversational discourse*	*8 Practical knowledge*	*9 Social knowledge*
1	97	T	H	—	—	*	*	—	—	**	**	**
2	114	—	P	—	*	—	—	—	—	*	—	**
3	106	—	P	*	—	*	—	—	*	**	**	**
4	101	—	P	—	**	—	—	—	—	—	—	—
5	118	T	H	—	—	—	—	—	—	—	—	*
6	103	—	—	—	—	—	—	—	—	*	—	*
7	105	T	—	*	—	*	*	—	*	**	**	**
8	88	T	H	—	—	—	*	**	**	**	**	**
9	97	—	—	—	—	*	—	—	*	**	**	**
10	84	—	P	**	**	*	**	—	**	**	*	**
11	126	T	P	—	**	*	—	—	—	—	*	**
12	114	—	P	*	**	*	—	—	*	—	**	**
13	91	—	P	—	—	—	—	—	—	—	**	—
14	109	—	—	—	*	—	—	—	—	—	—	—
15	100	T	H	—	—	—	—	—	—	**	**	**
16	92	T	H	—	**	*	**	*	—	**	**	**
17	90	—	P	—	—	—	—	—	—	—	**	—
18	94	—	P	—	—	—	—	—	—	—	—	—
19	90	—	P	—	—	*	—	**	**	**	*	**
20	109	T	H	—	—	—	*	**	—	**	**	**

* = 1 s.d. from control mean
** = 2 s.d. from control mean

2 s.d. below the control mean. Six of these had formal thought disorder according to Andreasen's TLC ratings and only two with formal thought disorder did well on it, proportions which makes the association between clinically rated formal thought disorder and poor performance on the conversational discourse test just significant ($P<0.05$, chi-squared with Yates correction).

Knowledge of the real world

No less than 11 schizophrenics had abnormally low scores on the test of practical knowledge and 13 on that of social knowledge. Altogether, 15 scored poorly on at least one of the two tests, and more schizophrenic patients did badly on them than on any of the other seven tests given. There was no significant link between poor performance and membership of either the paranoid or hebephrenic subtype, nor with the presence or absence of formal thought disorder, intrinsic thinking disturbance or perceptual disorder. There was no significant correlation between the length of hospitalisation (recorded in months of any psychiatric in-patient stay) and performance on either of the two tests.

Discussion

Before discussing the implications of these results for the four-component model of thought disorder presented earlier, some methodological problems should be mentioned.

First, the control subjects were not representative of patients with severe psychiatric disorder. For this reason, we cannot claim that deficient knowledge of the real world, although 75% of the schizophrenic patients showed this, is specific to schizophrenia. It may occur to an equal extent in other psychoses or even severe neuroses. Further studies with manic and psychotic depressive patients are under way. We also plan to test patients with Alzheimer's disease in the hope that we can confirm Minkowski's (1927) observation that, unlike in schizophrenia, common sense is relatively preserved in true intellectual dementia. We are presenting the data at this stage, partly because the tests look promising, and partly to draw attention to a neglected aspect of thought disorder. The possibility that prolonged stay in hospital leads to impoverished practical and social knowledge is a distinct possibility for chronically ill, institutionalised patients. In the present case, our patients all had relatively acute illnesses, and there was no correlation between length of hospitalisation and test scores.

Secondly, there is a problem about the fact that all the tests are not equally sensitive (i.e. their means and standard deviations vary). Because of this, one cannot properly argue, for example, that deficient real-world knowledge is more affected in schizophrenia than are conceptual associations. Chapman & Chapman (1973) first pointed out the fallacy of using a differential deficit between two test performances to identify a specific psychological impairment in schizophrenia. This problem, however, is less crucial in the current study because we are interested only in individual performance profiles – whether individual schizophrenics have a gross abnormality on one test or not – and not whether schizophrenic patients as a group are more likely to show one deficit rather than another.

There is a further problem as to whether the tests which we devised are reliable and valid measures of the types of thinking and perceptual disturbances attributed to schizophrenic patients over the century. We can only point out that the four thinking tests chosen were based on a previously used or well-tried method and covered the most well-established abnormalities. The fact that so few patients exhibited any gross abnormality on these (with the exception of the 25% who showed overinclusion) highlights the unsatisfactory nature of traditional views on thinking disturbance. Even if this reflects the unreliability of our version of the tests rather than the invalidity of the abnormality tested, this in itself is not a satisfactory state of affairs. Clinicians over the years have tended to ignore the whole concept of schizophrenic thought disorder and distrust tests of it because of the unreliability of the latter. Compared with the traditional concepts and tests, our new tests of social and practical knowledge look distinctly more promising.

Despite these methodological problems, one can draw three tentative conclusions about schizophrenic thought disorder from this study. Firstly, a substantial minority of schizophrenic patients have an intrinsic disturbance of thinking, most apparent as overinclusive categorisation. Secondly, clinically-rated formal thought disorder is associated with an impairment in appreciating the rules of conversational discourse. Thirdly, the majority of schizophrenic patients have deficient knowledge concerning events and behaviour in the world around them.

The most profitable way to explain these findings, in our view, is to relate them to what is known about thought disorder in subjects with identifiable brain damage. It is more and more certain that schizophrenia is a disorder of cerebral function. What is not known is either its site or origin. Comparing the cardinal features of schizophrenic thought disorder, therefore, with those in patients with known brain damage, might at least give some clue as to the site of schizophrenic cerebral dysfunction.

The candidates for this comparison are generalised cortical dysfunction, subcortical dysfunction, focal dysfunction – frontal, temporal, or parietal – and

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hemispheric imbalance – left hemisphere dysfunction, right hemisphere dysfunction, or inefficient callosal transmission. The first two produce an entirely dissimilar pattern. Delirium causes slowness, irrelevance, and a particular kind of illogicality (Cutting, 1987). Cortical dementia tends to produce category underinclusion (Tutko & Spence, 1962). Subcortical dementia leads to an overall slowing of thought processes with no distinctive pattern (Cummings, 1986). Of the focal dysfunctions, the effect of frontal lesions on thinking has been the subject of most attention, but the pattern here is also dissimilar. The flow and control rather than the quality of thinking is affected, with perseveration and lack of initiative as the main features (Brickner, 1936). Temporal lesions may produce 'forced thinking', where thoughts intrude into consciousness against the wishes of the subject (Penfield & Jasper, 1954), but this too is unlike the typical schizophrenic pattern. Of the possible forms of hemisphere imbalance, isolated right hemisphere lesions give rise to a pattern of thinking which is most similar to a schizophrenic patient's. Brownell *et al* (1986), for example, found that such patients, in general, had a "susceptibility to following associations that are tangential to the overall meaning of a discourse . . . are often stuck with, or are satisfied with, a limited and piecemeal understanding, one based on personalisation as well as on other inappropriate associations". With regard to their categorisation strategies, they tend to select "less central" category members whose "referents hold less obvious features in common" (Grossman, 1981), i.e. a tendency towards overinclusion. On conversational discourse tasks "they are drawn to a literal incorrect interpretation rather than to a correct nonliteral interpretation . . . they are able to process individual sentences, but they are unable to combine information across sentences as is required for normal comprehension" (Brownell *et al*, 1986). With regard to their appreciation of extralinguistic reality, the following formulations of the role of the two hemispheres provides a clue: "the left hemisphere is a highly efficient, but narrowly programmed linguistic computer whereas the right hemisphere seems pivotal in the processing of extra- or paralinguistic facets" of the world (Gardner *et al*, 1983). Chernigovskaya & Deglin (1986) go even further than this. They believe that the right hemisphere is responsible for relating "sign to its referent", i.e. symbolising the real world; the left hemisphere, on the other hand, deals with the "interrelation of signs", i.e. the nuts and bolts of language. In our view, the three most clearly identifiable features of schizophrenic thought disorder to emerge in our study show a close resemblance to these findings. (Left hemisphere damage tends to produce underinclusion (Grossman, 1981), and no impairment in understanding conversational discourse or extralinguistic reality (Sacks, 1985). The effect of callosal section on thinking efficiency has not been adequately investigated.)

Conclusion

In conclusion, thought disorder in schizophrenia can be separated into four components, which may or may not coexist. Delusions may occur without intrinsic thinking disturbance; intrinsic thinking disturbance, most apparent in the form of categorical overinclusion, can occur independently of formal thought disorder; formal thought disorder is more related to the ability to express and understand conversation; and all three are relatively independent of a deficiency in social and practical knowledge of the real world, a sort of lack of common sense, which appears to be particularly common in schizophrenia. It is not clear to what extent these abnormalities and interrelationships are confined to schizophrenia, but it is expected that their pattern will differ across different psychotic conditions. This is a matter for future investigation.

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