British Journal of Psychiatry (1991), **159** (suppl. 14), 14–18

Reasoning and Delusions

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Delusions are among the most common psychiatric symptoms, but the psychological processes involved in their formation and maintenance remain a matter of controversy. This paper briefly reviews competing theories, particularly those involving abnormalities of perception and reason. An investigation of reasoning in deluded schizophrenic and paranoid subjects is presented, followed by a tentative model of belief formation in which abnormalities or biases in reasoning and perception, implicated in the formation of some delusions, are highlighted.

Definition of delusion

Perhaps we should start with a definition of the phenomenon. While there is scope for a separate paper on problems with defining delusions (Garety, 1985), for our purposes the DSM–III definition (American Psychiatric Association, 1980) gives an adequate summary of the standard psychiatric view.

> "Delusion: A false personal belief based on incorrect inference about external reality and firmly sustained in spite of what almost everyone else believes and in spite of what constitutes incontrovertible and obvious proof or evidence to the contrary. The belief is not one ordinarily accepted by other members of the person's culture or subculture."

Here a delusion is regarded as a false belief, which is fixed and idiosyncratic. Many definitions of delusions make implicit assumptions about the rationality of the delusional belief; this one is more explicit: the delusion is said to be based on incorrect inference. However, although ideas of irrationality are frequently embodied in definitions, they are less commonly found in the theories of the formation or maintenance of delusions.

Theories of delusion formation

There are many theories of delusion formation, not necessarily mutually exclusive, which implicate a variety of systems:

(a) Abnormal personality, unresolved conflicts or desires?
(b) Abnormal brain state?
(c) Abnormal affect?
(d) Abnormal perceptions?
(e) Abnormal judgement?

(a) The psychoanalysts have been foremost in seeing delusions as meaningful, and as essentially expressions of the individual's premorbid desires or fantasies, given full rein after decompensation has occurred (Freeman, 1981, 1990; Nelki, 1988). However, while I would agree that the content of delusions is very probably not accidental, it is not clear that they are always expressions of earlier wishes; on examination, they often appear to be descriptions of current experience.

(b) Clearly some delusions arise in the context of organic brain damage, and where a neurological disorder is reversible, may disappear as the condition is treated. Cutting (1985) has argued that delusions in some schizophrenics are caused by right hemisphere dysfunction, and discusses his views further elsewhere in this supplement (pp. 70–75). However, even if a location is identified in the brain which is associated with certain types of delusions, we also need to consider which psychological processes are disrupted, as McKenna also argues (this supplement, pp. 36–41).

(c) While many theorists have mentioned affect as relevant to the content of a delusion, or as an additional factor which influences its development, few have argued for a simple link between disturbed mood and abnormal belief, without the action of any intervening variables or systems (Winters & Neale, 1983). In general, little recent work has considered the relationship between mood and delusions (Grossman, 1989).

(d) & (e) The remaining two candidates, perception and judgement, I would like to consider in a little more detail.

Abnormal perception

The most prominent psychological theory of delusion formation (excluding the psychodynamic) is a perceptual one: that delusions are the result of an entirely normal attempt to account for abnormal perceptual experiences (Maher, 1974, 1988).

Professor Maher argues that the patient has an anomalous experience (e.g. hearing 'voices' in the absence of an obvious cause) which results in a sense of puzzlement; this in turn leads to a search for an explanation, which, because the initial experience is strange, is likely to be abnormal, e.g. that the voice is being transmitted through an invisible transmitter.

https://doi.org/10.1192/S0007125000296426 Published online by Cambridge University Press

The arrival at an explanation, albeit odd, is accompanied by relief, which serves to reinforce the explanation. Maher's view is that the explanation, i.e. the delusion, is essentially a product of normal reasoning: it is reached in essentially the same way that a scientist seeks an explanation of a puzzling phenomenon, and is maintained in the same way: the resistance to counter-argument involves the same processes.

The role of reasoning

Is the deluded person then not irrational? What, if any, is the role of reasoning?

It may seem surprising that at a time when judgement is being shown to play an important part in almost everything, even its traditional antithesis, affect, judgemental processes are not thought to be implicated in abnormal belief formation. One possible reason for this is the discrediting of the Von Domarus principle (1944). This famous early theory argued that deluded schizophrenics showed a failure of syllogistic reasoning. Experiments revealed that normals were not very good at syllogisms either, and the theory was jettisoned (Maher, 1988).

There is evidence accumulating in which a reasoning bias is implicated in delusion formation. Firstly, while delusions are common, not all subjects under the same conditions develop delusional beliefs. Delusions do not appear to arise necessarily from abnormal perceptual experiences. Chapman & Chapman (1988) examined the relationship of beliefs to experiences in a large group of students and found that subjects responded to similar experiences with beliefs which ranged from the normal to the fully delusional. Some subjects reported 'noises' they could not explain, while others asserted that apparently similar stimuli are signals, personally directed, from outer space.

Secondly, while the clinical evidence certainly does suggest that some delusions are accounts of abnormal experiences, such as hallucinations, it is proposed that abnormal perceptual experiences are not 'given' sensory events but themselves involve reasoning. There is evidence that hallucinators are more likely to be intolerant of ambiguous stimuli, and 'jump to perceptions' (Slade & Bentall, 1988). Thus not all subjects, under the same sensory conditions, may experience hallucinations. Slade & Bentall (1988) argue in their recent book that the key process in hallucinations is a failure of the judgemental skill of 'reality discrimination'.

Finally, reasoning abnormalities or biases in deluded subjects have been demonstrated in a number of recent studies:

(a) in a study of illusory correlations, involving judgements of the covariance of events, paranoid subjects were more likely than controls to report correlations between events, which in reality were not correlated (Brennan & Hemsley, 1984),
(b) in a study of attributional style (Kaney & Bentall, 1989), deluded subjects showed systematic biases in style and
(c) a 'jump to conclusions' style was demonstrated in deluded subjects on a probabilistic reasoning task (Huq *et al*, 1988). In this study, in which subjects were asked to make an (easy) judgement on the basis of probabilistic information, deluded subjects requested fewer items of information before reaching a conclusion, and expressed higher certainty levels than psychiatric and normal controls.

The present study

I would like to report briefly here on a replication and extension of the earlier Huq *et al* study, which I conducted together with two colleagues, D. Hemsley and S. Wessely, and which is reported in full elsewhere (Garety *et al*, 1991).

We were concerned with the following questions:

(a) Do deluded subjects show the same 'jump to conclusions' style as found in our earlier study?
(b) If so, are there sub-groups (in Huq *et al*, we found the bias only in about half the deluded subjects), and do these relate to abnormal perceptual experiences, diagnosis, or other factors?
(c) Once beliefs are formed, is there a bias to maintaining beliefs tenaciously in the face of contradictory evidence? Thus the study was concerned not only with belief formation but also belief maintenance.

Method

We had four groups of subjects – 13 patients (Group S) with a diagnosis of schizophrenia, who were deluded but also had other symptoms, such as hallucinations, thought disorder and deterioration in functioning, 14 patients (Group P) diagnosed as suffering from delusional disorders or paranoia, in which the delusion is the prominent or only symptom, 14 anxious control patients (Group A), and 13 normal controls (Group N). The groups were matched for gender, age and scores on the Mill Hill Vocabulary Scale.

The subjects were invited to take part in a reasoning task, in which they were asked to make judgements about from which of two jars, hidden from view, beads were being

https://doi.org/10.1192/S0007125000296426 Published online by Cambridge University Press

drawn, having been informed of the proportions of beads of a particular colour in each jar. The task's materials included two sets of two jam jars, each with 100 beads, 85 of one colour (e.g. yellow) and 15 of another (e.g. black), and the opposite proportions in the other pair of the set. The subject's task, in condition 1, was to decide, with certainty, which of the two jars (now hidden) had been chosen, on the basis of being shown beads drawn from (and replaced into) one of the jars. The subject was given as many items of information as she/he requested before reaching a decision. In condition 2, in which not only belief formation, but also belief maintenance/change was investigated, jars with different coloured beads, but in the same proportions, were used. In this condition, subjects were not asked to reach a decision, but were shown a pre-determined number of draws, and were asked to give their estimates at each stage of the probability of a particular jar having been chosen. At first, the draws favour one hypothesis, but after ten draws, by which point very nearly all subjects have reached a certain decision, the beads still apparently from the same jar, start to favour the opposite hypothesis. We were interested in whether deluded subjects showed a particular reluctance to change their belief.

Results

There were two main findings: firstly, deluded subjects (as in Huq *et al*) requested fewer items of information before reaching a decision, and secondly, deluded subjects were quicker to *change* their hypothesis in the event of apparently contradictory information, rather than being slow to change their belief.

Table 1
Mean scores for the four groups

Groups	Draws to decision	Effect of evidence	Draws to change
	mean (s.d.)*	mean (s.d.)**	mean (s.d.)
S	2.4 (1.9)	11.2 (49.3)	2.2 (1.3)
P	3.0 (3.3.)	9.1 (15.1)	3.7 (2.2)
A	3.7 (1.7)	0.1 (14.1)	4.2 (2.6)
N	5.4 (3.1)	−4.3 (12.0)	4.1 (2.6)

*$P<0.01$ **$P<0.05$

In Table 1, the mean scores for the groups on three selected dependent variables are shown. In the first column, the numbers of draws requested to reach a decision (Condition One) are given. The schizophrenic and paranoid groups requested fewer beads before reaching a decision than the controls. This is more strikingly demonstrated in Fig. 1. Here it can be seen that eleven deluded subjects, and only one control, reached a decision on the basis of one item of information.

In the second column of Table 1, the effect of (potentially contradictory) evidence on judgement is shown. In Condition Two, subjects were asked to adjust (or maintain) their probability estimates on being presented with each bead. After they had been shown three beads of one colour (pink) they were then shown a green bead. On being shown the green bead, the deluded subjects were more likely than controls to change their estimates, reducing their confidence in the hypothesis that the jar was the one with predominantly pink beads. The controls were more likely to make no estimate change or to increase a little their confidence in the pre-existing hypothesis. Full details of this are given in Garety *et al* (1991).

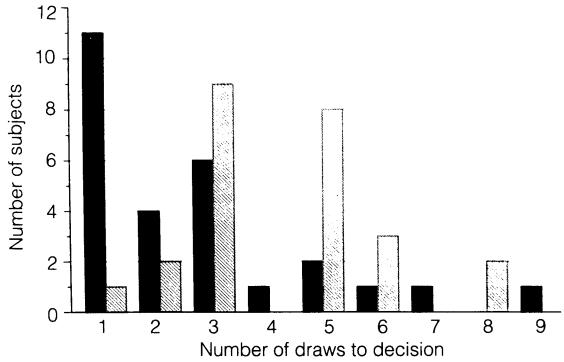


Fig. 1 Number of draws taken before reaching a decision in deluded (■) and non-deluded (▨) subjects.

The final column in Table 1 shows the mean number of draws to an estimate change, counted from after ten draws, when certainty had been reached. Although non-significant, the trend is again for the deluded subjects to show a greater readiness to change their beliefs.

As can be seen from the figure, the extreme responses applied to a subgroup of deluded subjects, while others responded normally. There were, however, no significant differences between the schizophrenic and paranoid groups on any variable.

We investigated the characteristics of the deluded 'abnormal reasoners': they had a lower verbal IQ (Mean Mill Hill Vocabulary 25.5, cf 28.2), expressed higher conviction about their delusional beliefs, and were more likely than the other deluded subjects to report current anomalous experiences. There were no demographic or mental state differences.

Discussion

There is therefore evidence of a reasoning bias in some deluded subjects, suffering from non-affective functional psychoses. We have found in two studies a 'jump to conclusions' style, in which deluded subjects appear to be excessively influenced by stimuli immediately present in the environment and make less use of previously acquired information. In the present study, a substantial number (41%) of deluded subjects reached a conclusion on the basis of only one item of information, compared with one (4%) of the controls. They were also more likely to respond rapidly to new, potentially contradictory information than controls. The bias is found only in a subgroup:

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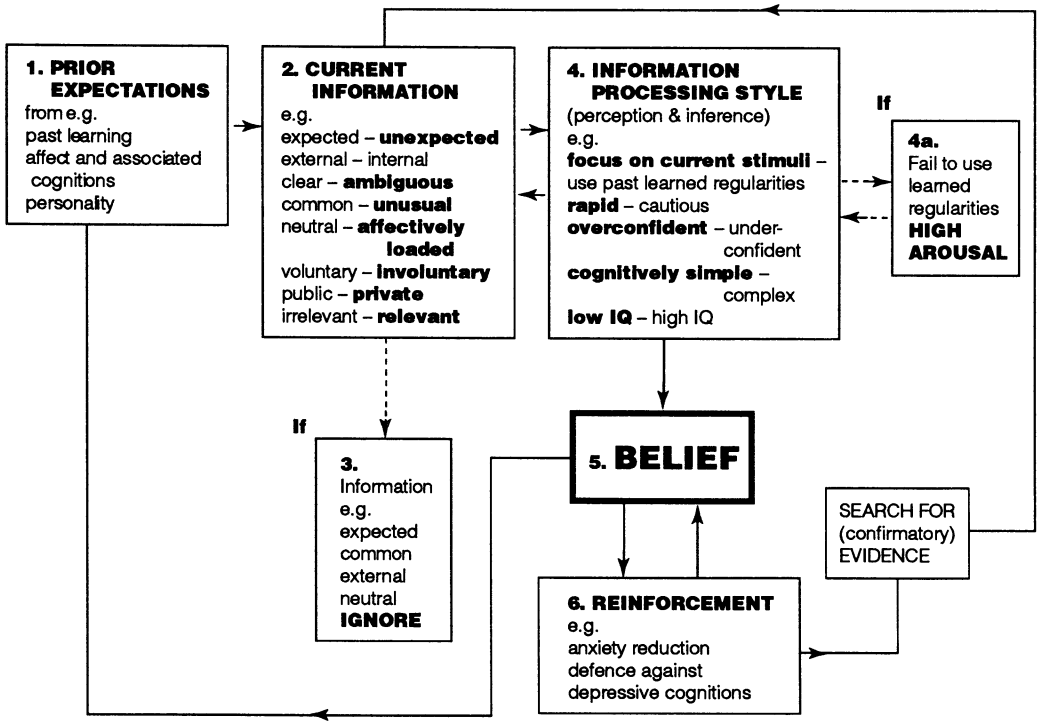


Fig. 2 Preliminary model of the judgemental processes involved in delusion formation.

it is plausible that not all delusions, even within diagnostic categories, share a common cause; however, where abnormal reasoning and abnormal perception co-occur, as in our study, is it possible that these do share a common cause, perhaps a more fundamental information processing abnormality? While I do not have space to explain fully the reasons for my proposal here, I suggest, on the basis of much of the literature on information processing in schizophrenia (Garety, 1990), that the failure to make use of knowledge, previously acquired, of regularities in the world, resulting in an over-reliance on information immediately present (Hemsley, 1990) may be one important deficit involved in delusion formation in schizophrenia and paranoia.

Figure 2 shows a preliminary model of the judgemental processes involved in delusion formation. The model outlines the acquisition and maintenance of beliefs in general, and highlights the features of the information being processed and of the way information is processed, which appear to be particularly implicated in delusion formation.

The model makes the assumption that any individual forming a belief starts with a set of pre-existing expectations, mood states and personality (box 1). This influences the selection of information in the environment which is detected (box 2) and varies along a number of dimensions. Some information is ignored (box 3) but more salient information is processed further (box 4). The belief (box 5) results from the interaction of the type of information and the style of information processing. Sometimes the abnormality will primarily be in terms of the type of information, so that, in accordance with Maher, perceptual abnormalities may account for some delusions, where they are very striking and salient, as for example in drug/alcohol induced psychosis, or neurological disorders. But where the perceptual system is less disrupted, judgemental processes, the way the information is processed, will, I suggest, play a greater role, so that in extreme cases, there need be no perceptual abnormality. The items in bold are proposed to be particularly implicated in delusion formation in the non-affective functional psychoses.

Boxes 6 and 7 deal with the maintenance of the belief, once formed. Many have argued that delusions may serve some positive function for the individual (e.g. Maher, 1988; Neale, 1988; Roberts, this

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supplement, pp. 19–28). The belief may modify the set of prior expectations and thereby influence the selection of information; in a more direct way, the individual may also seek confirmation of the belief. This confirmatory activity is not itself abnormal: the confirmation bias is well known in normals (Kahneman *et al*, 1982). If, however, the information processing style which led to the belief formation is particularly disrupted (rather than abnormalities of mood state, or the perceptual information itself) this biased reasoning may further influence the process of maintenance.

Clearly, this model is at a preliminary stage, and there is much work to be done to specify in more detail the perceptual and reasoning biases of patients, and to find reliable correlates of these. The role of emotion in these processes also requires proper consideration.

Finally, if indeed a reasoning bias is found, reliably, to be present in some patients, and if we can identify group patterns of abnormalities, and specify particular biases in individuals, perhaps this will help us to refine the cognitive behavioural treatments, a small number of which are already beginning to yield promising results (e.g. Chadwick & Lowe, 1990).

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