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# Consciousness, Information Processing and Schizophrenia

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**SUMMARY The symptoms of schizophrenia can be interpreted as the result of a defect in the mechanism that controls and limits the contents of consciousness. This defect can be understood as excessive self-awareness. Normally most of the complex information processing which is continuously required by even simple acts of perception, language and thought goes on below the level of awareness; whereas in schizophrenic patients some of this processing, or the results of this processing, not in themselves abnormal, become conscious. This excessive awareness can account for the typical symptoms of schizophrenia and explains many of the specific cognitive abnormalities found in schizophrenic patients.**

## Introduction

The three principal positive symptoms of schizophrenia, hallucinations, delusions and thought disorder, are all disorders that manifest themselves in the consciousness of the patient. Indeed, two of these symptoms, delusions and hallucinations, can only be assessed on the basis of the patient's introspections concerning his conscious experience. The third symptom, thought disorder, is observed in the patient's speech; however, it is inferred that this language disorder is also a reflection of another disorder of consciousness, i.e. the stream of thought. Even though some important symptoms associated with schizophrenia, such as motor retardation, flattening of affect and muteness, can be assessed on the basis of the patient's behaviour rather than of his reported conscious experience, none of these symptoms would be sufficient on their own to allow an unequivocal diagnosis of schizophrenia. The only two symptoms which are both necessary and sufficient for a diagnosis of schizophrenia, according to some widely used standardized procedures (Wing, Cooper and Sartorius, 1974; Feighner, Robins, Guze, Woodruff, Winokur and Munoz, 1972), are hallucinations and delusions.

In this paper I shall try to show that a basic disorder of consciousness can account not only for the three principal symptoms of schizophrenia but also for a number of cognitive disorders associated with the illness. In order to throw some light on the nature of this disorder it will first be necessary to discuss some recent experiments concerning the differences between conscious and preconscious processing.

In the last 20 years experimental psychologists have made considerable advances in understanding the various cognitive processes that must be involved when a person interacts with the environment. These studies have provided a vocabulary and a methodology for studying the hypothetical processes carried out by the brain. For example, Broadbent's (1958) suggestion that human information processing involves a limited capacity system and the 'filtering' of information has had a considerable influence. This has lead to various models of schizophrenic cognitive deficit in terms of a defective filtering system (e.g. Payne, Matussek and George, 1959; Cromwell, 1968) and to a number of ingenious experiments on perception in schizophrenic patients.

This model has had success in explaining some of the cognitive disorders found in schizophrenia, but how it accounts for the principal symptoms of the disorder is much less clear.



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A more serious criticism of the theory is its assumption that stimulus selection in general has become defective. Perception is so dependent on selection that such a defect would result in a reduction in cognitive abilities to a level approaching severe subnormality. In contrast, many schizophrenic patients can function and communicate remarkably well in spite of continuous hallucinations and all-pervasive delusions. Thus a defect in filtering cannot be of a general kind, and it is necessary to specify at what level of processing a breakdown occurs. In addition, the defective filter model does not account for deficits in response selection, although such a defect is clearly an important component in the cognitive abnormalities found in schizophrenia (Broen and Storms, 1967; Chapman, 1966).

The model of schizophrenic cognitive deficit to be presented here, while being closely related to these defective filter theories, attempts to overcome these problems. It incorporates recent evidence on the nature and function of conscious awareness and specifies more precisely the nature and extent of the cognitive deficit. In addition, the model considers deficits in output as well as input processes.

## The Properties and Functions of Conscious and Preconscious Process

### (1) *Preconscious processes*

It is by no means a novel idea that certain processes operate outside consciousness (i.e. cannot be observed by introspection). There is now good evidence that these unconscious processes are multitudinous and extremely sophisticated.

Among these unconscious processes, I shall be particularly concerned with those which have been or can become conscious, that is, what Freud termed the preconscious. This restriction excludes various complex control systems, such as those carried out by endocrine or spinal mechanisms. A simple demonstration of one of these preconscious processes is given by Sperling's (1960) partial report technique. When people are shown very briefly a large array of letters, they can report only about four of these. If, however, they are asked after presentation to report letters from a particular row or a particular column of the array, they can still report about four. Thus for a brief period of time virtually the whole array of letters must have been available in the preconscious. Only about four letters from any part of the array can actually become conscious, although subjects are aware that other letters were present. This is taken as evidence for the existence of a brief, high-capacity 'iconic' store below the level of consciousness.

Preconscious processes include not only perceptual inputs but also motor outputs. Almost any repetitive skilled movement, such as typing or riding a bicycle, is carried out without conscious attention, and indeed rapid skilled movements can only be achieved by processes operating below consciousness since the reaction, time to consciously perceived signals is too slow to provide the necessary control (Poulton, 1966; Frith, 1973).

Perhaps the best example of a highly sophisticated preconscious process is that involved in word recognition. In order to recognize a written or spoken word the sensory input must undergo graphical or phonological analysis; and, probably at the same time, semantic properties of the word must be processed. The final result of the interaction between these processes is that some model of the actual word presented (its meaning and form) reaches consciousness (Allport, 1976; Marcel and Patterson, 1977).

There are a number of studies indicating that much of this processing occurs at the preconscious level. For example, Mewhort (1967) showed that some processing occurred in iconic memory before items reached awareness. Subjects were asked to report one of two rows of letters; which row was to be reported on was indicated after presentation. More letters could be reported from the target row if the letters in the other row obeyed the laws of English orthography (e.g. CERNALIT) than if they were random, even though the subject was unable to report what was in this second row. Thus subjects must have processed this second row to the extent of making use of the regular sequence of the letters, even though the contents of this row never reached awareness.

Preconscious and conscious processes do not

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differ from one another simply in their availability for awareness. There are a number of additional properties on which the two kinds of process differ.

(2) *Capacity*

As we have already seen, there is evidence that some preconscious processes involve the storage of large numbers of items (Sperling, 1960). It is not only the iconic store that has a large capacity: the long-term store has an even larger capacity. Material in this latter store is clearly preconscious in the sense given above, and the processes by which material (such as one's telephone number) is retrieved from this store are largely unavailable to introspection. We also have an enormous preconscious store of English words and their meanings, but we can only be conscious of a very few such words at any time. Atkinson and Shiffrin (1971) and Erdelyi (1974) have argued that the contents of consciousness may be equated with the contents of a short-term memory system of limited capacity (roughly seven items, Miller, 1956). Thus, in contrast to preconscious processes, the capacity of conscious processes is very small.

(3) *Multiple vs single meanings*

If a stimulus is ambiguous and has more than one meaning, only one of these interpretations can be in consciousness at one time. Marcel (1976) has demonstrated experimentally this difference between preconscious and conscious processes, using a word recognition paradigm. The perception of a word is facilitated if a word of similar meaning has just been seen (e.g. BREAD—BUTTER). This also occurs with ambiguous words. Thus PALM will be facilitated if it is preceded by either TREE or HAND. However, once one meaning of PALM has become conscious the other meaning is inhibited. Thus, WRIST will be facilitated if preceded by HAND—PALM, but not facilitated if preceded by TREE—PALM. If, however, by a masking technique, PALM is prevented from reaching consciousness and is only processed in the preconscious, then alternative meanings are not inhibited and WRIST is facilitated when preceded by TREE—PALM.

(4) *Serial vs parallel processing*

We have great difficulty in attending consciously to more than one task at a time. On the other hand, many different preconscious processes can be carried on simultaneously without difficulty. This difference between the two systems is perhaps a consequence of, or another way of describing, the differences in capacity. In conscious processing the relevant items must be dealt with one at a time, in other words serially. If items from more than one task are present, they will interfere with one another (Posner and Klein, 1973; Posner and Snyder, 1975). In a number of experimental situations, such as the dichotic listening task (Broadbent, 1958), people function as if all information had to be processed through a single 'channel' of limited capacity. These are all tasks demanding conscious attention. When a task does not demand conscious attention (as when a trained pianist or typist is required to touch a particular key); the person behaves as if the task were controlled by one of many channels simultaneously available for processing information (Shaffer, 1975).

(5) *Automatic vs strategic processing*

Turvey (1974) and Erdelyi (1974) have suggested that preconscious processing is regulatory or automatic, whereas conscious processing is strategic, implying that the crucial feature of conscious processing is flexibility. Automatic or regulatory processing does not involve flexibility; in such processing the repertoire of appropriate stimuli and responses is already known, and there is a fixed relationship between stimulus and response. Such tasks are those that can be carried on in spite of the fact that conscious attention is directed elsewhere, and they can be maintained in parallel with other tasks. Novel tasks in which the repertoire of stimuli and responses is not known and for which there is no fixed relationship between input and output have to be carried out by conscious processes. The learning of a skill involves the development of knowledge about the repertoire of stimuli and responses and the construction of fixed relations between them. Thus the performance of a skill is gradually transferred from a conscious process to an automatic preconscious process (Eysenck and

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Frith, 1977). To the extent to which our environment is continually presenting novel situations which require novel reactions, conscious processing is crucial for successful interactions with the environment.

(6) *The role of consciousness*

Shallice (1972) has suggested that the role of consciousness is that of a high-level executive system. Such an executive system must select one course of action from among many and then carry it out without hesitation or interruption unless the need for change becomes very strong. To achieve this aim there must be an unambiguous representation of the current situation and the desired goal. In addition, the system must have a certain amount of inertia so that a chosen course of action will not be abandoned simply because an alternative action seems momentarily more desirable. Thus, crucial for the successful functioning of such a system are the various limitations of consciousness discussed above: small capacity, intolerance of ambiguity, and serial processing. What we are conscious of is the selection and carrying out of the chosen course of action (the dominant action system, in Shallice's terminology). The chosen course of action is dominant both in relation to other possible courses of action and in relation to any automatic processes that may be going on simultaneously. In particular, the dominant action system has priority in the interpretation of perceptions and the selection of responses if there is any conflict with other on-going processes.

(7) *A mechanism for consciousness*

Shallice has shown that a simple mechanism can have the properties desired for this executive system. Although this mechanism is not of relevance to the symptoms of schizophrenia, it is of interest in relation to the possible causes of the breakdown, as it suggests the manner in which consciousness may lose its normal role. If each of many possible actions is represented by a single hypothetical neurone, then a network in which each neurone inhibits all the others will have the property that when many of the neurones are stimulated only one will finally become activated. In addition to this capability of selection, the network also has the property of inertia. Once one neurone has 'captured' the system it is relatively more difficult for others to take over.

## Schizophrenia as a Disorder of Consciousness

I suggest that the symptoms of schizophrenia occur when the selective capacity of consciousness breaks down. In terms of the filter theory, the filter that has become defective in schizophrenia is the one that determines which items in preconsciousness shall enter awareness. As a result, the patient becomes aware of ambiguous and multiple interpretations of events and finds it difficult to select and carry through an appropriate course of action. He also becomes aware of the functioning of various automatic processes. Why does this breakdown occur? We know that schizophrenic breakdown probably results from a combination of two factors. The first is some genetic predisposition, probably associated with an abnormality in brain biochemistry (Crow, Deakin, Johnstone and Longden, 1976). The second is some kind of social or environmental stress (Brown, Birley and Wing, 1972; Vaughn and Leff, 1976). Analogous factors could operate in the nerve net model for the selection of material to enter awareness. As the various component neurones become more strongly stimulated (in analogy with increasing stress and arousal), more overall inhibition would have to be generated in order that only one could finally become activated. If the system did not have the capacity to generate sufficient inhibition (in analogy with the genetic predisposition and biochemical abnormality), the system would break down and many neurones would become activated simultaneously. In the remainder of this essay I shall try to show how this disorder of consciousness can account for the various symptoms of schizophrenia and associated cognitive abnormalities.

(1) *Hallucinations*

Not only are the majority of schizophrenic hallucinations auditory, but they specifically involve the hearing of words (Fish, 1962). Thus, one of Schneider's (1957) first-rank symptoms of schizophrenia is 'hearing one's

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thoughts spoken out aloud'. The understanding of speech must rely to a considerable extent on sophisticated preconscious processing devices. Such processing probably involves a sequence of 'guesses' and 'checks', and a system of this type has been described by Lesser, Fennell, Firman and Reddy (1974). A similar model has been applied to reading by Rumelhart (1976).

When a speech sound is heard a number of hypotheses are made about its physical nature, its phonemic properties and its meaning. These hypotheses will depend partially on prior expectations and will interact with one another. Thus, for example, a hypothesis as to the meaning of the sound will suggest hypotheses about its physical characteristics which can then be checked. Finally a set of hypotheses that are mutually consistent at the various levels will emerge, and if the evidence for them is sufficiently strong this interpretation of the speech sound will enter awareness. (Note that it is not the speech sound itself that enters awareness but a hypothetical reconstruction of it). Only the final result of this very rapid process normally arrives into consciousness, but clearly a number of incorrect interpretations of the sound will be present in the preconscious while the correct interpretation is being made. Naturally this processing will be carried out for all sounds, not just speech sounds, and the possibility that any sound may be speech must usually be considered in the early stages of processing. I propose that the awareness of these incorrect early interpretations is the basis of auditory hallucinations in schizophrenia.

This explanation requires that hallucinations should have a basis in real sounds and involve the same processing channels as speech and other auditory stimuli. There is a certain amount of evidence for this point of view. Some schizophrenic patients report that their hallucinations are based on real sounds. 'When the door slams I hear the words "Get out".' This type of hallucination is known as a functional hallucination (Fish, 1962) but is only rarely described.

It follows from this explanation of hallucinations that schizophrenics should misinterpret genuine speech as well as other sounds. Bull and Venables (1974) found that schizophrenic patients were more likely than controls to misinterpret auditorily presented words, even though there was no evidence of any hearing loss for pure tones. Similar results have been obtained by Moon, Mefferd, Wieland, Pokorny and Falconer (1968).

Misinterpretation of sounds should be reduced if the correct interpretation is made to stand out from the incorrect alternatives. This is more likely to occur when we actively attend to some particular auditory signal as opposed to the situation in which we listen passively to sounds from a number of unrelated sources. Clearly auditory hallucinations should be more apparent in this latter situation (Prediction 1). It is in line with this prediction that Slade (1974) has shown that auditory hallucinations decrease in intensity when patients are required to perform some complex auditory processing task.

It also follows from the model of hallucinations proposed here that if no sound impinges on the patient then no misinterpretation is possible, and thus no hallucinations should occur. However, in practice it is impossible to place someone in a noiseless environment. Even in a situation of complete sensory deprivation a person eventually adapts to the new low level of sound, and low intensity noises, such as the heart beat, air molecules hitting the ear drums and breathing, enter awareness. Harris (1959) has reported that schizophrenics placed in a situation of sensory deprivation show a temporary reduction in hallucinations. This may have been a response to the initial 'quiet' period before adaptation had occurred. However, Harris's method of recording the presence of hallucinations was not entirely satisfactory. A corollary of this prediction concerns the effects of reducing the possibility for making correct interpretations (reducing the signal to noise ratio in the language of signal detection theory). If, as far as possible, all meaningful sounds are removed, as in the perceptual or sensory deprivation situation, any attempts to interpret the remaining sounds are doomed to failure. Since people apparently have a need to find 'meaning' in their environment (Bartlett, 1932; Garner, 1966), some of these incorrect interpretations will be accepted. This seems to be what happens to normal people in the later

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stages of sensory deprivation (Schulman, Milton and Weinstein, 1967).

Deafness also will increase the relative amount of meaningless noise that is to be interpreted. It is thus very interesting that Cooper, Garside and King (1976) have found that deafness is more common in elderly psychotic patients than in other types of elderly patient. It would be interesting to know if auditory hallucinations were predominant among their symptoms.

Misinterpretation of sounds also seems to underly the verbal transformation effect demonstrated by Warren and Gregory (1958), in which a word repeated over and over again seems to transform into other words or sounds. It is as if the dominant (correct) interpretation satiates, and less likely interpretations are allowed to enter awareness. Slade (1976) has found that people prone to auditory hallucinations hear particularly extreme transformations in this situation. Once again, this is consistent with the idea that hallucinations occur when unlikely interpretations of sounds fail to be inhibited from entering awareness.

Complex preconscious processing is as much involved in the reading as in the hearing of words, and this, too, probably depends on the selection of the most likely from a number of alternative hypotheses. One would therefore expect that schizophrenics should also have difficulty in reading. As far as I am aware this ability has never been systematically studied in schizophrenic patients. Misread words can of course be checked by re-reading (unless they are present tachistoscopically), which is not the case for misheard words. However, one would still expect that the flow of reading in schizophrenic patients would be considerably disrupted (Prediction 2).

(2) *Delusions*

Matussek (1952) and Maher (1974) have argued that the abnormality that results in delusions is not one of thought process, but one of the original perception on which it is based. Thus delusions can be seen essentially as attempts to explain and understand, using entirely normal principles of reasoning and experience, the basic misperceptions we have already discussed. At first sight this might be thought to imply that delusions are secondary to hallucinations and therefore cannot occur in their absence. However, it is quite possible for a percept to arrive in consciousness abnormally and not to give rise to an hallucination, since the original environmental event has been correctly interpreted. The abnormality lies in the fact that normally we would not bother to interpret such an event. The very arrival of this percept in awareness means (normally) that it is important and therefore needs to be explained. This hyper-awareness, noting and remembering, for example, the colours of the ties of all the guests at a party, is frequently observed in deluded patients, and these irrelevant details form an important part of their delusional system (Payne, Caird and Laverty, 1964).

The model of schizophrenic cognition presented here certainly emphasizes the initial perception as the primary cause of delusions. However, it is also clear that the thought process itself would not be expected to remain entirely normal. If thought is essentially a form of inner speech, we would expect that schizophrenic thought would be beset by all the problems of schizophrenic speech, the stream of thought being diverted by irrelevant associations and so on. This could account for the way in which some delusional systems become strangely generalized. Nevertheless, the prime cause of these delusional systems must be the initial erroneous percepts.

It could be that the greater intelligence and intactness of personality often found in patients with paranoid delusions compared to those with other types of schizophrenia occurs because only such people are capable of constructing the very complex systems necessary to explain all the irrelevant percepts of which they have become aware. Individuals without the knowledge or ability to construct such explanations might not develop delusions even when experiencing the same degree of hyper-awareness.

It should be possible to induce delusions of a paranoid type by requiring people to attend to large amounts of 'irrelevant' information (Prediction 3). A natural setting for such an effect would be an intelligence collection agency. The personnel of such an agency would be required to pay close attention to minor events concerning

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foreign countries or political organizations. Eventually a system for discovering the 'secret' significance of such events would be constructed.

(3) *Thought disorder*

Thought disorder is diagnosed on the basis of abnormal use of language. Typical abnormalities include 'knight's move', 'thought blocking', 'neologisms' or simply talking incomprehensible nonsense (Fish, 1962). These abnormalities can be seen as manifestation of the same defect as that causing the misperception of words, but at the level of production. The process by which the required meaning is converted into appropriate articulations is clearly very complex and requires the same process of guessing and checking as the understanding of spoken words. Thus, en route to the required word many related words will be selected as possible hypotheses. Once again we are not normally aware of these intermediate steps, but the schizophrenic will be distracted by these irrelevant words and will be likely to lose the thread of his conversation. In particular, one can see that the failure to inhibit alternative meanings of ambiguous words would be extremely distracting. Since we are assuming that the neologisms or unexpected words in this case are a result of too readily accepting inappropriate hypotheses, we would predict that the pauses before such words would be shorter than those before expected words (Prediction 4). This is the opposite of what happens in 'jargon aphasia' (Butterworth, 1977), in which there is a longer than normal pause before the unexpected words, suggesting a failure of the selection process to generate suitable hypotheses.

Lecours and Vanier-Clement (1976) have shown that in schizophrenic language disorders the underlying language-generating devices are working, but if anything too well, producing novel forms such as puns at a level normal speakers would find difficult to maintain. These neologisms may result from an attempt to describe the patient's abnormal experiences. Aphasic language disorders, in contrast, are characterized by a poverty of production, so that the afflicted patient cannot generate the words he wants at either the phonemic, morphemic or semantic level.

This model of schizophrenia clearly predicts that patients should fail to inhibit alternative meanings of ambiguous words. This failure should disrupt both the perception and the production of speech. Furthermore, if this deficit is associated with schizophrenia two very specific predictions about their performance on certain experimental tasks can be made.

As already discussed, the perception of a word is facilitated if a word of similar meaning has been seen previously. Only one of the meanings of an ambiguous word can produce this facilitation in normal people (Schvanevelt, Meyer and Becker, 1976). In contrast, for schizophrenic patients more than one meaning should be available. Thus for them the perception of TREE should be facilitated even when preceded by HAND—PALM (Prediction 5).

Essentially the same phenomenon can be investigated by another technique. Subjects are required to learn a list of words, such as JAM. During several recall trials they are given cues for each word, such as TRAFFIC. If they are then asked to recall the list when provided with equally associated cues, such as STRAWBERRY, they do very poorly, even worse than with no cues at all (Tulving and Thompson, 1973). Schizophrenics should not do so poorly when asked to recall the original list using a different set of cues, since the alternative meanings of the original words should not have been inhibited (Prediction 6).

(4) *Problems of movement and action*

In his important study of the early symptoms of schizophrenia Chapman (1966) describes certain disturbances of motor function and suggests that patients lose the ability to carry out automatic skilled movements. This hypothesis is based on statements such as 'none of my movements come automatically to me now'. 'I've been thinking too much about them, even walking properly, talking properly, and smoking —doing anything' and 'if I do something like going for a drink of water, I've got to go over every detail—find cup, walk over, turn tap, turn tap off, drink it'. I would interpret these data differently and would suggest that the patients have not lost the ability to carry out the skilled movements, but feel compelled to attend to

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these movements as they are carried out although this attention is unnecessary for correct performance. This awareness may in fact interfere with the performance, since the patient feels compelled to attend to and integrate the isolated elements of performance of which he is aware rather than letting the automatic procedures carry on.

A partial simulation of this aspects of schizophrenic deficit can be achieved by requiring subjects to attend to two activities simultaneously since, they will then at least attempt to be conscious of both. Posner and Keele (1969) required subjects to perform a reaction time task at various stages during the performance of a task requiring movement towards a target. In these circumstances the reaction time was slowed, particularly when it coincided with initiation of movement in the aiming task. Posner and Boies (1971) also looked at reaction times performed during a perceptual matching task and found that reaction times were slowed by response selection, but not by perceptual encoding. The general slowing of reaction time in schizophrenia is well known (e.g. Marshall, 1973). However Hemsley (1976), by studying RT tasks in which number of stimuli and number of responses are varied independently, has shown that this is due to slowness in response selection rather than stimulus selection. Thus schizophrenics perform in a manner similar to Posner and Boies (1971) subjects even though there is no other task competing for their attention. This is consistent with a failure of a system which should normally inhibit all but one response from becoming dominant.

(5) *Awareness of automatic processes*

(a) *Size constancy.* The model predicts that schizophrenics should have particular problems with any situation which involves the use of complex processing systems which normally function below the level of awareness. A very basic system of this type is used to estimate the size of objects. People are normally very good at this task even though it involves the integration of many diverse aspects, such as retinal size, depth cues, object recognition and so on. They are also largely unaware of how they arrive at their estimate. There have been a large number of studies of size constancy in schizophrenia which have tended to produce equivocal results, some studies finding under-constancy and some over-constancy. In their review of this literature, Price and Eriksen (1966) concluded that essentially schizophrenics are bad at this task and can show either kind of error. This sort of result is precisely what would be expected from our model of schizophrenic deficit. The patient is abnormally aware of the many cues involved in the performance of this task and in attempting to make use of them consciously over-rides the correctly functioning automatic system, and over-emphasizes one or another of the cues, thus producing various kinds of error.

(*b*) *Non-verbal communication.* A much more complex system that processes information below the level of awareness is the one concerned with non-verbal communication. In a conversation, we are principally aware of what the other person says to us, but are also making use of a number of non-verbal cues to interpret what he says and to control the flow of the dialogue. Thus, eye gaze has been shown to play an important role in the transition from one speaker to another, although the speakers are usually unaware of this (Kendon, 1967; Argyle and Ingham, 1972). The schizophrenic will have particular difficulty in this situation, since he will not only be distracted by his awareness of the non-verbal cues being presented by the other person but will also, through over-awareness, disrupt the non-verbal cues he is contributing to the conversation. It would be predicted that this particular disruption would result from a 'double bind' situation (Bateson, Jackson, Haley and Weakland, 1956). If one message is presented verbally while a contradictory message is presented non-verbally no problem arises, since we are conscious only of the verbal message although we react to the non-verbal one as well. The schizophrenic is aware of both messages at once and naturally finds this extremely difficult to comprehend and to deal with. Better communication with schizophrenic patients should be achieved if the communicant minimizes the number of non-verbal cues used in his part of the dialogue (Prediction 7).

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## Conclusions

In this essay I have presented a model of the cognitive deficits associated with schizophrenia in terms of a modification of 'defective filter' theory. In presenting this model I have had three basic aims: (1) To describe recent psychological experiments that seem to throw some light on the nature of consciousness and hence on the nature of schizophrenia. (2) To show how the hypothesized cognitive deficit relates to the principal clinical symptoms of schizophrenia. (3) To make some specific and testable predictions about the behaviour of schizophrenics derived from the hypothetical cognitive deficit.

In essence, it is suggested that the basic cognitive defect associated with schizophrenia is an awareness of automatic processes which are normally carried out below the level of consciousness but are available to consciousness. These processes are primarily concerned with the selection of the appropriate interpretation of stimuli and the selection of appropriate responses.

The consequences of this defect may be summarized as follows:

(1) The patient is aware of erroneous and multiple interpretations of incoming stimuli, giving rise to hallucinations. Reducing the ambiguity of stimulation (increasing signal-to-noise ratio) should reduce hallucinations. (Prediction 1).

(2) These misperceptions and multiple interpretations occur particularly with words, since these are very complex and arbitrary stimuli. This should give rise to problems with reading as well as with listening to words. (Prediction 2).

(3) The patient is aware of stimuli/events normally rejected from consciousness as unimportant. Attempting to understand why such events are apparently important gives rise to paranoid delusions. (Prediction 3).

(4) Awareness of the multiple meanings of words will also affect the patient's speech, giving rise to the typical features of thought disorder. He will be unable to inhibit alternative verbal responses, and this will lead to the rapid production of neologisms and inappropriate words. (Prediction 4).

(5) In certain experimental situations the patient's hyperawareness of multiple meanings should lead to better than normal performance. (Predictions 5 and 6).

(6) The patient is at a disadvantage whenever his situation involves information processing normally carried out in an automatic manner, but involves stimuli that can be perceived consciously. For example, he is aware of the many and frequently ambiguous components of a conversation (e.g. non-verbal aspects of communication). He should find communication easier if these aspects are eliminated. (Prediction 7).

The strength of this proposal for the basic cognitive deficit associated with schizophrenia lies not only in its ability to account for the symptoms of this disorder and for many of the performance abnormalities revealed by cognitive testing, but also in its ability to make a number of precise and testable predictions about the behaviour of schizophrenic patients.

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