The Cognitive Basis of Disorganization Symptomatology in Schizophrenia and Its Clinical Correlates: Toward a Pathogenetic Approach to Disorganization

by Marie-Christine Hardy-Baylé, Yves Sarfati, and Christine Passerieux

Abstract

This article focuses on the schizophrenic disorganization syndrome, which was initially described by Bleuler (who used the term “dissociation”) as lying at the heart of schizophrenia. While adopting a neo-Bleulerian approach, we describe schizophrenic disorganization using a pathogenetic hypothesis and a three-part structure. First, we discuss previous approaches to characterizing and defining schizophrenic disorganization, providing arguments in favor of a complementary approach to describing schizophrenic disorganization that relies on a pathogenetic analysis of the disorganization syndrome, and especially thought and language disorders. Second, we present two possible cognitive pathophysiological mechanisms that may explain schizophrenic disorganization: (1) a deficit in the integration of contextual information, based on the results of semantic priming studies; and (2) a theory of mind deficit, based on the results of studies of the attribution of mental states to others. We propose a cognitive model of schizophrenic dysfunctioning on the basis of these two anomalies. Third, we summarize our published findings to examine the implications of these two cognitive pathophysiological mechanisms for schizophrenic disorganization. On the basis of the same two anomalies, we then propose and illustrate a neo-Bleulerian approach to the assessment of communication disorders that is critical to the improvement of schizophrenic disorganization’s clinical description.

Keywords: Schizophrenia, disorganization, semantic priming, contextual information, theory of mind, communication disorders.


The term “schizophrenia,” which means “a mind that is torn asunder” (Old Greek), was proposed by the Swiss psychiatrist Eugen Bleuler, who gave his authoritative work on dementia praecox the subtitle “the group of schizophrenias” (Bleuler 1911). Throughout his work, he insists on the fact that all the patients who develop this illness, however different they may appear outwardly, suffer from the same pervasive disruption of their mental processes. Schizophrenia as an illness is therefore not defined clinically but in terms of a unique underlying morbid process that he terms “Spaltung”—“a loosening of associations.” Although the term “schizophrenia” has been established for nearly a century, the same is not true of the concept of “loosening of associations.”

However, it is clear that the mental dissociation described by Bleuler is again being studied with increasing frequency and under new designations: formal thought disorders, disorganization subtype, misconnection syndrome. A variety of studies conducted over the last decade have undeniably reasserted the importance of mental dissociation by reaffirming both its existence and its relevance. On the one hand, it is becoming increasingly clear that specific abnormalities in information processing, such as thought and language disorders, are correlated with indicators of the disorganization of the illness. On the other hand, integrative approaches to schizophrenia propose that all the diverse signs and symptoms involved in schizophrenia could be the result of disruptions in functional neural circuits and even go so far as to speak of neo-Bleulerian models (Andreasen 1999).

We explicitly adhere to this neo-Bleulerian approach and base our work on the postulate that the disorganization syndrome is an important subject of study involving pathophysiological mechanisms that it is vital to understand. This article consists of three parts: the first part briefly looks at the different approaches previously used to define schizophrenic disorganization; the second part pre-
sents a cognitive approach to schizophrenic disorganization in terms of two cognitive anomalies that may explain it; and the third part presents experimental evidence in favor of this characterization and describes the implications of this approach for the clinical assessment of disorganization.

Defining Schizophrenic Disorganization: Precedents

Disorganization Symptoms Within the Bleulerian Description. Bleuler (1911) postulated that “mental dissociation” is the disorder that generates the illness of schizophrenia and from which all the symptoms of the illness derive either directly or indirectly. The so-called primary symptoms, including thought disturbance, represent the most direct clinical expression of mental dissociation. Thought disturbance is also considered to be fundamental—that is, it is both characteristic of and constant in schizophrenia. Bleuler therefore attributes considerable importance to thought and speech disorders. However, despite the importance of thought disturbance within both a pathogenetic and a clinical perspective, Bleuler’s approach to disorganization may be considered confusing and vague: confusing because thought disturbance is sometimes considered not as the cause but as the consequence of affect disturbance, and vague because the description of thought disturbance is imprecise: “the relations between ideas lose solidity; they can be replaced by others of whatever nature”; “the thought process turns away from the normal paths that are acquired by experience; thought is then so truncated that we speak of dislocated thought and incoherence.” The Bleulerian concept of dissociation has often been criticized for a lack of objectivity and for leaving too much up to the subjective impressions of the clinical practitioner, thus causing a significant level of diagnostic imprecision. These criticisms can be explained by the fact that Bleuler chose to describe thought disturbance in terms of an underlying theory of dissociation rather than on the basis of a precise observation of clinical indexes. The International Pilot Study on Schizophrenia confirmed the complexity covered by the term “mental dissociation” and the diagnostic expansion in which it has resulted (WHO 1973). Fortified by these criticisms, research that emerged in the 1970s, and especially the dimensional approach, chose to employ a logic radically different from Bleuler’s: it was based on the most evident (objectivized) and most operational (formalized) clinical indicators, while doing without any underlying pathogenetic theory.

Disorganization Symptoms Within the Dimensional Approach. The dimensional approach proposes that the symptoms of schizophrenia tend to cluster together to constitute dimensions. The procedure used to assess the different dimensions can be summed up as follows: the clinical characteristics of the illness are precisely described by instruments for assessing symptoms; several factor analyses are then conducted across different samples to confirm the structure of the clinical dimensions in schizophrenia. Many rating scales of schizophrenic symptoms and many factor analyses have been proposed during the past 30 years, and this article will not exhaustively examine all of them but instead show how the dimensional approach has contributed to the definition of schizophrenic disorganization.

The most frequently used instruments for assessing symptoms are the Scale for the Assessment of Negative Symptoms (SANS) (Andreasen 1983), the Scale for the Assessment of Positive Symptoms (SAPS) (Andreasen 1984), and the Positive and Negative Syndrome Scale (PANSS) (Kay et al. 1987). Factor analytic studies conducted using the SAPS, the SANS, and the PANSS have demonstrated the existence of a disorganization dimension that has become the object of attention because it has been shown to be strongly reproducible across many studies (Peralta and Cuesta 2001). The symptoms that most commonly tend to cluster together to constitute the disorganization dimension are positive formal thought disorders (pressure of speech, tangentiality, derailment, incoherence, illogicality), poverty of content of speech, bizarre behavior, alogia, inappropriate affect (item from the SANS), conceptual disorganization, difficulty in abstract thinking, poor attention, unusual thoughts, disturbance of volition, stereotypic thinking, poor insight, and mannerism (items from the PANSS) (Bell et al. 1994; Lindenmayer et al. 1994; Peralta and Cuesta 1994; Von Knorring and Lindstrom 1995; Sauer et al. 1999; Stuart et al. 1999). These data have provided evidence that formal thought and speech disorders are regular and fundamental components of the disorganization dimension. In contrast, some analyses have emphasized the heterogeneity of other items brought together under the term “disorganization” (Liddle 1987; Liddle and Barnes 1990; Brown and White 1992; Bell et al. 1994; Bryson et al. 1999); some seem to be more related to the positive dimension (unusual content of thought), others to the negative dimension (problems of volition), while others seem epiphenomenal to sample characteristics (inappropriate affect, mannerism).

To summarize, the dimensional approach has shed additional light on Bleuler’s intuition that the disorganization dimension is closely linked to the formal thought and speech disorders and has made it possible to provide a more precise definition of thought disturbance than that proposed by Bleuler. For example, the Thought and Language Disorder scale (TLC) (Andreasen 1979), which
although not the only instrument for assessing formal thought and speech disorders is certainly the most widely used, is an atheoretical scale composed of 18 clearly defined items. All the definitions of these items are based on observations of the speech and language behavior of psychiatric patients. Unlike Bleuler’s “mental dissociation,” most of the studies involving an analysis of the items of the TLC have shown a high level of interjudge reliability.

Why a Pathogenetic Approach to Disorganization? As defined today by most of the instruments for assessing symptoms, and despite dramatic improvements in achieving a description that is as objective as possible, schizophrenic disorganization continues to pose unresolved questions. First, there is some consistent evidence that items reflecting disorganization are particularly unstable (Peralta and Cuesta 2001). Second, the factor-analytically derived dimension called “disorganization” is formed differently by different factor analyses. There is an item overlap for the components linked to formal thought and speech disorders but a number of different item groupings have been proposed, and an unambiguous definition of the disorganization dimension is still not available. Third, items reflecting disorganization are not specific to schizophrenia patients: the formal thought and speech disorders reported as the direct expression of disorganization—tangentiality, derailment, incoherence, and illogicality—occur with almost equal frequency in schizophrenia patients and patients with mania (Harvey 1984; Andreasen and Grove 1986; Docherty et al. 1988).

Problems currently encountered in trying to improve the description of schizophrenic disorganization could be partially resolved by a pathogenetic approach. Current definitions of disorganization issues yielded by the dimensional approach do not refer to any pathogenetic theory and do without any underlying mechanisms of disorganization. Therefore, many authors currently stress that pathophysiological mechanisms to explain clinical symptoms must be found, and the search for a psychometrically and clinically relevant symptom-based method for measuring the disorganization dimension continues to be important (Bryson et al. 1999; Docherty et al. 2000; Peralta and Cuesta 2001). We assume that cognitive research may be a promising area of investigation.

In effect, one way of providing a more precise description of schizophrenic disorganization is to take cognitive abnormalities that underlie thought and speech disorders in schizophrenia as guides for rereading clinical symptoms and indicating new clinical signs. As far as cognitive psychopathology is concerned, Bleuler’s psychopathological approach has lost none of its relevance because it is an attempt to explain and describe the clinical indexes that are most specific to schizophrenic disorders on the basis of a pathogenetic theory. The cognitive research embodied in the model that we support in this article is inspired by the Bleulerian tradition: our pathogenetic approach, in which pathophysiologica abnormalities are considered, is intended to provide a description of schizophrenic disorganization that is valid from the cognitive point of view and potentially heuristic in clinical terms.

A Cognitive Model Specifying Candidate Mechanisms for Schizophrenic Disorganization

Cognitive Mechanisms of Schizophrenic Disorganization: Hardy-Baylé’s Model. The model that we propose postulates that two cognitive anomalies are common to all disorganized schizophrenia patients and could be considered as central pathophysiological mechanisms of schizophrenic disorganization: (1) a deficit in the integration of contextual information, and (2) a “theory of mind” deficit. The first deficit can be described as a difficulty in taking account of contextual information in a way that is appropriate to the situation. Formulations have been advanced about disorganized schizophrenia patients’ difficulty in using contextual information to select an appropriate response (Widlocher and Hardy-Baylé 1989; Cohen and Servan-Schreiber 1992; Cohen et al. 1999; Harrow et al. 2000). The second deficit corresponds to an inability to attribute mental states to others; to infer other people’s intentions, desires, and beliefs; and to respect the rules involved in communication. Innovative research has suggested that a difficulty in understanding other people’s mental states could induce signs such as poor, incoherent, or inappropriate speech (Frith 1992, 1994; Sarfati 2000).

Of all the situations encountered in everyday life, communication with others requires the greatest ability to adapt to the context and to attribute mental states: a conversation, consisting as it does of verbal and nonverbal exchanges with other people, is by definition a shifting and uncertain context, and the data associated with it must be constantly inferred and updated on the basis of peripheral information (Sperber and Wilson 1986; Leslie 1987). Many of the thought and speech disorders and the conversational difficulties observed in disorganized schizophrenia patients can therefore be understood as arising from impairments in these two cognitive processes.

The two cognitive processes underlying schizophrenic disorganization may not be unrelated: According to Pickup and Frith (1997), “theory of mind and contextual deficits may reflect a single underlying cognitive impairment in schizophrenia” (p. 121). The theory of mind...
deficit may have its roots in a key underlying deficit in the integration of contextual information, which is known to be the source of other cognitive impairments (Harrow et al. 2000). The ability to take account of contextual information, which is considered to be an elementary cognitive process, could have consequences at a higher cognitive level in the theory of mind abilities, which also require the absorption of the relevant contextual material in order to supply an appropriate response (Hardy-Baylé 1994, 1996). A deficit in the cognitive processes that make an action relevant within the context in which it occurs could compromise the inference of other people's mental states from the context in which they occur (Sarfati et al. 1997b).

Arguments in Support of a Deficit in the Integration of Contextual Information. When the use of contextual information is tested under precise experimental conditions, the deficit is often found in disorganized schizophrenia patients.

The lexical decision task, which permits the online study of the processes involved in the processing of the semantic context, has been by far the most popular paradigm for assessing the link between clinical patterns of schizophrenia and context-processing anomalies. The task consists of the sequential presentation of two items, a prime item (which constitutes the context) and a target item with a lexical decision based on only this target item and that consists of deciding whether the target item is a word or pseudoword. Results show that the subject’s response is facilitated when the context item is semantically related to the target item (e.g., doctor-nurse) (Neely 1977). This facilitatory (or priming) effect has been generally interpreted as the result of the integration of contextual information in which the target word is presented. The subject uses the regular occurrence of pairs of associated words to comply with the instruction: the higher the proportion of semantically related words, the greater the effects of integrative processes (de Groot 1984; Neely 1991; Shelton and Martin 1992; Passerieux et al. 1997).

All the studies that have used a lexical decision task to examine the integration of contextual information in disorganized schizophrenia patients (Manschreck et al. 1988; Henik et al. 1992, 1995; Spitzer et al. 1993, 1994; Spitzer 1997; Aloia et al. 1998; Weisbrod et al. 1998) have, with one exception (Blum and Freides 1995), identified anomalies in semantic processing in such patients. In the majority of these studies, schizophrenia subjects with disorganization were compared with those with no disorganization: the latter did not exhibit similar anomalies.

The link between the deficit in the integration of contextual information and disorganization has also been demonstrated using a phrasal context. To an even greater extent than the understanding of an isolated word, the understanding of a sentence requires the integration of the available information in order to construct a semantic representation of the sentence. Using an online word-monitoring task, Kuperberg et al. (1998) observed a reduced sensitivity to linguistic context in thought-disordered schizophrenia subjects.

Arguments in Support of a Theory of Mind Deficit. Frith’s team provided experimental evidence that some schizophrenia patients are unable to attribute intentions (Frith and Corcoran 1996) or beliefs (Corcoran et al. 1995) to others. The data provide support for the argument that patients with behavioral signs such as incoherent speech are the poorest at inferring mental states, while patients with phenomena of passivity exhibit normal performances. However, the groups of disorganized patients were too small for it to be possible to draw a conclusion. A more recent article confirmed that patients with behavioral signs scored significantly worse than remitted or paranoid patients (Pickup and Frith 2001).

Other studies have provided clearer evidence that subjects exhibiting incoherent speech and/or a pattern of disorganization have significant difficulty in attributing mental states to others, whatever the method used to test this ability: social skills (Cutting and Murphy 1990), understanding of metaphors (De Bonis et al. 1997), humor (Corcoran et al. 1997), or false beliefs (Mazza et al. 2001). The idea that there is a link between disorganization and difficulties in attributing intentions has recently received support, in particular in the form of statistics illustrating the correlation between the level of disorganization and the number of correct responses in tasks designed to evaluate theory of mind (Greig et al. 1999). However, the comparison of the different data is made more difficult by the fact that there are different ways of defining disorganized subgroups.

Confirming Hardy-Baylé’s Model of Schizophrenic Disorganization. As we have seen, various results have established the consistency of the hypothesis that two cognitive impairments could be considered to be central pathophysiological mechanisms of schizophrenic disorganization: (1) a deficit in the integration of contextual information; and (2) a theory of mind deficit. At the same time, a large amount of additional experimental evidence has been collected that runs counter to the hypothesis that the disorganization syndrome could be due to a single, generalized deficit (Weinberger and Gallhofer 1997; Schatz 1998). Of course, a number of other hypotheses have been proposed concerning the cognitive basis of schizophrenic disorganization. One of the most consistent suggests that schizophrenic disorganization might be associated with attentional dysfunction and a failure to suppress inappro-
appropriate responses (Liddle 1996). But recent data have shown that disorganization symptoms are not associated with attentional dysfunction as measured by the Continuous Performance Test; are not (or not specifically) associated with perseverations on the Wisconsin Card Sorting Test (WCST), which indicate a failure to suppress inappropriate responses; and are not associated with working memory problems as measured by the Span Apprehension test (Aloia et al. 1998; Goldberg et al. 1998; Nieuwenstein et al. 2001). Nonspecific abnormalities on the WCST may be considered a rough indication of some executive dysfunction in schizophrenic disorganization, but, as Frith claims, we think that “progress in our understanding of the signs and symptoms of schizophrenia requires studies of executive processes which are conducted at a high level of detail . . . and which require the development of novel test procedures” (Laws 1999, p. 32).

In the third part of this article, we present an exhaustive review of the literature—not of all the presumed cognitive mechanisms of schizophrenic disorganization but of all the research conducted within the cognitive framework of Hardy-Baylé’s model. This research provides a detailed analysis of the integration of contextual information, and of theory of mind—specifically in disorganized versus nondisorganized schizophrenia patients—and helps confirm the link between these cognitive processes and disorganization. At the same time, it represents a study of the nature of the contexts ignored by disorganized schizophrenic patients and of the conditions that influence this processing; helps identify the nature of the cognitive abnormalities; and helps clarify what conditions modify the functioning of these skills. Thus, the data concerning schizophrenia patients provided by cognitive neuropsychology will identify specific anomalies that can help us define the clinical items that are thought to represent the anomalies’ clinical expression.

Experimental Evidence in Favor of Hardy-Baylé’s Model: The Pathophysiological Mechanisms of Disorganization in Schizophrenia

Characterization of the Deficit in the Integration of Contextual Information. Our studies have attempted to provide direct experimental arguments in favor of the existence of a link between a specific deficit in the integration of contextual information and the clinical pattern of disorganization by using the well-known lexical decision task.

The primary experiments were designed to explore both the automatic mechanisms of spreading activation and the controlled processes responsible for the integration of contextual information. A first major result was the preservation of the automatic processes and a lack of application of controlled integrative processes in a group of 17 schizophrenia subjects who exhibited mild to severe formal thought disorders, compared with 10 normal subjects (Passerieux et al. 1995). The clinical specificities of patients presenting this cognitive pattern were better characterized in a second study, which compared three groups: 11 healthy control subjects; a disorganized group of 11 schizophrenia patients with a score greater than or equal to 7 on Andreasen’s TLC (mean score = 17.6); and a nondisorganized group of 11 schizophrenia patients with a score lower than 7 on the TLC (mean score = 4.3). The results revealed a significant facilitory effect of the contextual information in the healthy control group and the nondisorganized schizophrenia patients, with the disorganized schizophrenia patients differing significantly from these two groups in exhibiting no facilitory effect (Passerieux et al. 1997). These data were then replicated in an experiment that involved 14 inpatients suffering from a major depressive episode, 20 healthy control subjects, and 20 hospitalized controls from the surgical wards; and 34 schizophrenia patients, 10 of whom had no formal thought disorders, and 24 of whom had a score of at least 7 on the TLC. From this point on, the presence of thought and language disorganization with a score of 7 or more in the TLC is taken to define the disorganized schizophrenia group. Once again, it was only in the disorganized schizophrenia patients that no facilitory effect was observed, and this group differed significantly from the other four groups (Besche et al. 1997).

One other experiment was designed to determine whether the deficit in the integration of contextual information was generalized or specific to a certain type of context. Our hypothesis was that certain links between the context item and the target item are processed normally by disorganized schizophrenia patients, whereas others are not. We therefore compared the performances of these five groups of subjects in tasks involving syntactic relations versus semantic relations. This experiment was presented under two different conditions: a sequential presentation with a stimulus onset asynchrony (SOA) of 500 milliseconds as in the first experiment and a simultaneous presentation with an SOA of 0 milliseconds. The results revealed that only the semantic relations were ignored, while schizophrenia subjects processed the syntactic context normally, whatever the conditions of presentation (Besche et al. 1996, 1997).

To further investigate the functional character of the contextual deficit, we conducted a series of experiments into the role of both the experimental material and the instructions in the nonemergence of the facilitory effect in disorganized schizophrenia patients. First, we considered
one experimental variable to be crucial, namely the level of material structuring—that is, the more or less frequent occurrence of the semantically related word pairs (e.g., doctor-nurse) in the experimental material. We hypothesized that schizophrenia patients would neglect context under only limited conditions in which the context was "weakly structured"—that is, in a lexical decision task with only a low proportion of semantically related word pairs. In the earlier studies (Besche et al. 1997; Passerieux et al. 1997), context was weakly structured (17.5% of semantically associated words). We therefore further hypothesized that reinforcing the structuring of the context would enable disorganized schizophrenia patients to process the context normally and would provide evidence that the deficit in the integration of contextual information is a functional deficit. Second, we imagined that instructions that reinforced the semantic processing of the context word would help schizophrenia subjects implement the controlled operations that underlie the facilitory effect. This type of hypothesis has been indirectly verified in memory tasks (Koh 1978) but not in online tasks such as the lexical decision task. We considered the dual lexical decision task, in which subjects are asked to decide whether both the context item and the target item are words or pseudowords, to be an instructive situation. To test these two hypotheses, an experiment was designed in which we crossed two types of factors: the "level of material structuring" factor (strong or weak) and the "instruction" factor (single or dual decision). Fifteen disorganized schizophrenia patients and 15 healthy control subjects took part in this study. The results (Besche-Richard and Passerieux, in press) confirmed that the facilitory effect tends to be normalized in disorganized schizophrenia patients by the dual lexical decision task as well as by the enhancement of the structure of the material, and provided evidence of the functional character of the deficit.

We are currently continuing the characterization of the contextual deficit by using the evoked potential method (Passerieux et al. 1998, 2000a, 2000b). We are primarily concerned with N400, which is thought to be the electrophysiological counterpart of the integration of contextual information (Kutas and Hillyard 1980). N400 anomalies have been clearly established in disorganized schizophrenia patients (Grillon et al. 1991; Koyama et al. 1991, 1994; Mitchell et al. 1991; Adams et al. 1993; Nestor et al. 1997; Niznikiewicz et al. 1997; Strandburg et al. 1997; Condroy et al. 1999). We are currently conducting a lexical decision task that makes use of two types of context: a single word (a classical semantic priming task) and a phrasal context, as used in the majority of studies that have reported N400 anomalies in schizophrenia patients. A sentence represents a context that is stronger than a single word in the sense that such a context can be very difficult to ignore: the final word of the sentence, which is the target item, is therefore highly predictable (e.g., phrasal context = "He takes the letters to the post office"; target item = "post office"). The data that we recorded for a group of 8 disorganized schizophrenia patients revealed that N400 was modulated by the context. When the context is a sentence, patients behave like healthy controls. When the context is reduced to a single word, N400 modulation is reduced. This result therefore represents an additional argument in favor of a functional deficit in the integration of contextual information in disorganized patients. It also clearly argues against the concurrent hypothesis of a working memory deficit, because the context formed by a sentence imposes a greater memory load than that generated by a single word (Passerieux et al. 2000b).

Characterization of the Theory of Mind Deficit.

Unlike the study of the contextual deficit, which has been able to make use of existing tasks, the study of the theory of mind deficit has made it necessary to develop original material. In effect, it was necessary to test the attribution of intentions to others in adult subjects while avoiding the bias that verbalization of the material itself or of the response may constitute in thought- and speech-disordered schizophrenia patients. None of the tests used for assessing theory of mind fulfilled these conditions: because they generally test the attribution of incorrect beliefs in children and require an open, verbal response, they were suitable neither for the hypothesis in question nor for the tested population. In the light of an original experiment using picture stories (Baron-Cohen et al. 1986), Sarfati and coworkers developed a protocol that used cartoon strips but no verbal material. Each cartoon strip was designed to present a character in a series of 3 pictures and acquired coherence only when the character's intention was inferred from his or her behavior. A forced-choice response made it possible to determine whether the tested subject was attributing correct or incorrect intentions to the character.

An initial version of this material (Sarfati et al. 1997b) was used to test three groups of 12 subjects: healthy controls, depressed subjects, and schizophrenia subjects. The results showed that only certain schizophrenia subjects experienced difficulty in identifying the intentions of the cartoon characters. These were the subjects who exhibited clear signs of thought and language disorders, with a score higher than 7 on Andreasen's TLC scale. Following the same logic as with contextual deficit, the clinical specificities of patients presenting a theory of mind deficit were better characterized in a second study that compared four groups: a disorganized group of 12 schizophrenia patients with a score greater than or equal to 7 in Andreasen's TLC (mean score = 17.3); a nondisorganized group of 12 schizophrenia patients with a
Subjects behaved like the healthy controls, a theory of mind processing, our research is being continued with a study changes and can disappear in remitted patients (Drury et al. 1998; Pickup and Frith 2001).

The aim of the latter experiment was also to reveal the strategy used by these disorganized schizophrenia patients to provide their response. The type of answer cards that they chose (0% nonsense answer) formally refuted the idea that their responses could be due to chance, to a lack of attention, or to a general deficit. On the contrary, when these subjects failed to interpret the actions of other people as a function of their mental state, they used a cognitive strategy of substitution based on the frequency of the associated actions. These subjects answered as if they voluntarily relied on the everyday or dominant character of an action in order to make sense of the behavior of others rather than taking account of the mental state underlying it, as suggested by the specific context in which it takes place (Sarfati and Hardy-Baylé 1999).

To further investigate the functional character of the contextual deficit, we conducted a series of experiments into the effect of the introduction of verbal material on performance. To do this, we asked the patients to respond immediately by designating response pictures in some cases and response sentences in others (Sarfati et al. 1999, 2000). This variant was intended to demonstrate that verbal material is able to force the tested subjects to perform a more thorough processing of the relevant contextual elements when responding to a theory of mind task and that it improves performance. This precise hypothesis was not confirmed, even though the data demonstrated that the patients who were able to improve their performance as a result of verbalization were those exhibiting the shortest periods of evolution. This effect of the duration of the illness on the ability to restore a defective cognitive function had already been indicated within the framework of research into theory of mind and designated as a generative factor of social deficit. This suggests that in schizophrenia that has not yet become chronic there is a functional theory of mind deficit that is affected by clinical changes and can disappear in remitted patients (Drury et al. 1998; Pickup and Frith 2001).

Just as was the case with the deficit in contextual processing, our research is being continued with a study involving cerebral activity. We intend to establish a relation between the cognitive and the cerebral processes involved in the attribution of intentions to others. All published studies on this topic provide evidence that the ability to attribute mental states is mediated by highly circumscribed brain systems that are activated during tasks that directly call on a theory of mind; these are, in particular, the right or left anterior mediofrontal gyrus and, less frequently, the left temporoparietal junction (Baron-Cohen et al. 1994; Fletcher et al. 1995; Goel et al. 1995; Gallagher et al. 2000). The protocol developed on the basis of Hardy-Baylé’s model included 8 healthy adult subjects who took part in a positron emission tomography study. This was based on the contrast in activity between the target and control cartoons: the target cartoons called on a theory of mind while the control cartoons did not (Brunet et al. 2000). As reported in the literature, regardless of modality, the anterior mediofrontal gyrus was shown to be activated in the condition with theory of mind when compared to the condition without theory of mind. The right-hand lateralization of the activation can be explained by the sensory modality called on here: the cartoon task used only pictures, and it is a well-known neuropsychological fact that propositional representations are lateralized on the left and visuospatial representations are processed on the right. The role of the right hemisphere has been emphasized more than the role of the left hemisphere in the theory of mind literature (Siegal et al. 1996; Winner et al. 1998; Gallagher et al. 2000). Application of this task to disorganized schizophrenia patients reveals the existence of a deficit in the areas implicated in normal controls (Brunet et al. 2001).

Revisiting the Clinical Description of Schizophrenic Disorganization. Bleuler chose to describe schizophrenic disorganization in terms of an underlying theory of dissociation rather than on the basis of a precise observation of clinical indexes. In contrast, the dimensional approach has given rise to precise definitions of disorganization based on objective observations and descriptions of symptoms rather than on an underlying theory. Adopting a Bleulerian view of a clinical description based on a pathogenetic approach, we have assumed that it is possible to further improve the description of schizophrenic disorganization in terms of specificity and subtlety if the description of the clinical signs is based on underlying pathophysiological mechanisms. We have presented a volume of experimental evidence in favor of the involvement of two cognitive anomalies in schizophrenic disorganization. We propose that, now that they are precisely identified and characterized, these anomalies can serve as guides in the description of the clinical items that are thought to represent the anomalies’ expression at the clinical level.
Thus, we have proposed original clinical signs as part of an instrument designed for the assessment of communication disorders in schizophrenia patients (Schizophrenic Communication Disorder scale (SCD)). The SCD consists of 15 items, each of which has been designed to be as far as possible a clinical expression of one of the two pathophysiological mechanisms that have been shown to underlie the disorganization syndrome: deficit in the integration of contextual information, and theory of mind deficit. As an illustration, we present two of these items included in the version of the scale, which has been published in detail elsewhere (Olivier et al. 1997).

One of the items that is thought to reflect a deficit in the integration of contextual information is the inability to clarify a speech corpus: the patient is unable to make his or her speech clearer, more understandable, and more informative when asked to do so by the clinician. The clinician's request constitutes a conversational constraint that is thought to aggravate conversational difficulty: as soon as a patient's speech becomes vague, unclear, or incomprehensible, the clinician asks for clarification: "What do you mean by that?" "Can you explain what your answer means?" "Can you tell me what you are trying to say?" In effect, to clarify what has just been said, it is necessary to integrate the contextual information that has just been evoked in the conversational exchange. A normal subject with no deficit in the integration of contextual information should be able to clarify his or her speech, to adapt it within the conversation by using the elements of the conversational context, and to add information to clarify what he or she has just said (Harrow et al. 2000). We postulated that a patient who suffers from a deficit in the integration of contextual information would not be able to provide any information relating to the prior topic and would not make his or her speech any clearer.

Another item among those that are thought to reflect a theory of mind deficit is the inability to attribute an intention to another person: the patient has an impaired perspective as discussed in Harrow et al. (1989). The patient is unable to describe or recognize the intentions of his or her relatives. Once again, we should stress that the pathogenetic logic requires the patient to be placed in a constrained conversational situation that is necessarily artificial because it needs, to the greatest possible extent, to call on the cognitive functions that are thought to be defective in the patient: the clinician assesses the patient's ability to attribute intentions to others by asking him, during the interview, to describe the intentions of various familiar people: "In your opinion, what does your [father, mother, friend, doctor, team, neighbor] think about you?" In effect, to reply to such a question, the patient must possess a theory of mind—that is, a personal representation of the mental states of others. Without that, the patient is unable to provide his or her own view about the other person’s opinion together with all the doubts that go with it.

The frequency of the 15 items in the SCD has been assessed in a total of 80 subjects: 43 schizophrenia patients, 27 subjects with affective disorders, and 10 normal control subjects. The results of this study showed that most of these items were specific to schizophrenia patients and, in particular, the global scores made it possible to discriminate between schizophrenia patients and patients with affective disorders at a statistically significant level, while, according to the literature, TLC scores are comparable in schizophrenia patients and manic patients with psychotic symptoms (Harvey 1984; Andreasen and Grove 1986; Docherty et al. 1988). As attempted, the global SCD score was positively correlated with the global TLC score ($r = 0.75$, $p = 0.001$). When analyzed separately, the TLC items that had the highest correlations with SCD global score were poverty of content of speech, tangentiality, derailment, incoherence, illogicality, loss of goal, perseveration, and self-reference. These are the items that best represent Bleuler's concept of "loose associations" and that are thought to be specific to schizophrenia patients. More generally, the items of the preliminary SCD were positively correlated with the items belonging to the disorganization dimension: tangentiality, derailment, inappropriate affect, strange behavior, and alogia. By contrast, pressure of speech, distractible speech, and attentional impairment were not correlated with the global SCD score (Olivier et al. 1997).

The search for a psychometrically and clinically relevant symptom-based method for measuring the disorganization dimension is important (Bryson et al. 1999; Peralta and Cuesta 2001). We assume that items issuing from a pathogenetic approach could provide a way of assessing new clinical symptoms and a complementary group of signs that are relevant from a pathophysiological point of view. This kind of approach, although new, is beginning to be illuminated by a number of studies such as our own and those conducted by Frith’s team (Frith 1992). In the future, a new cognitive interpretation of clinical symptoms could be proposed.

**Conclusion**

As Frith (1992) pointed out, cognitive hypotheses are able to explain only abnormal behavior, not diagnostic categories. The aim of our research is to provide evidence that some cognitive hypotheses could explain, at least partially, schizophrenic disorganization especially in connection with communication disorders. In line with the literature, we hypothesized that two pathophysiological mechanisms are involved.
in schizophrenic disorganization: deficit in the integration of contextual information and deficit of theory of mind. We attempted to adduce experimental evidence of a cognitive-clinical link between these deficits and thought and language disorganization. The cognitive-cerebral validity of these two anomalies was then tested by revealing electrophysiological indicators of the contextual deficit and neuroanatomical indicators of theory of mind deficit.

The clinical interest of such research and of a pathogenetic approach is due to the fact that cognitive abnormalities can guide the description of a clinical pattern. The two well-identified cognitive abnormalities thus became the starting point in the search for new clinical signs thought to belong to the spectrum of schizophrenic disorganization symptoms. As Bleuler described thought disturbance on the basis of an underlying theory of "Spaltung," we were interested in a neo-Bleulerian way of describing schizophrenic communication disorders in terms of two underlying cognitive deficits. We have presented the way in which we constructed new clinical items issuing from this pathogenetic approach and reflecting either the deficit in the integration of contextual information or the deficit of theory of mind. The items were designed to be fine-grained and to identify specific communication disorders elicited under constrained conversational situations. Preliminary results show that this approach is promising, but much more is needed before the items we have defined can be implemented in clinical practice. In the future, it will be necessary to consider the permanent or intermittent nature of these communication disorders and their sensitivity in patients who exhibit few or no symptoms. Because the experimental data suggest that the two cognitive anomalies involved in disorganization have state variables, it is conceivable that the resulting communication anomalies may be normalized following an acute episode in patients undergoing a period of symptomatic remission. Studies are currently under way to address these points.

Clinical directions that attempt to define a more specific clinical view of schizophrenia on the basis of a pathogenetic approach and that are rooted in the European tradition are largely unrepresented in the literature. It is first necessary to prove their ability to explain, as here, a specific dimension of the illness before claiming that they can account for a large proportion, if not all, of the semiology of schizophrenia. We hope that our research has illustrated the value of such an approach.

References


**The Authors**

Marie-Christine Hardy-Baylé, M.D., Ph.D., is Professor of Psychiatry; Yves Sarfati, M.D., Ph.D., is Professor of Psychiatry; and Christine Passerieux, M.D., Ph.D., is Psychiatrist, Laboratoire Universitaire de Recherche, University of Paris V, and Department of Psychiatry, Centre Hospitalier de Versailles, Le Chesnay, France.
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For further information, please contact

Dr. R. Thara
Director, SCARF INDIA

e-mail: scarf@vsnl.com, info@icons-scarf.org