Hemispheric Imbalances Masquerading as Paranoid and Nonparanoid Syndromes?

by John Gruzelier

Abstract

Evidence from psychophysiological and behavioral investigations of lateralization in psychosis separates two clinical syndromes. A speculative model is offered in which the syndromes approximate the clinical features of paranoid compared with nonparanoid patients in investigations in which the groups have been distinguished in the psychology laboratory (Magaro 1980), and encompass the distinction between acute functional psychoses and classical schizophrenia (Kety 1980). A parsimonious account is provided of the hemispheric imbalances of function that underpin the syndromes.

Virtually all psychophysiologists would greet a review of the psychophysiological hallmarks of paranoid and nonparanoid schizophrenia as bad news. The distinction has been studiously observed time after time with very little yield to psychophysiologists. Few compelling anomalies of function have been found to characterize paranoid schizophrenia or paranoia. One is tempted to conclude from behavioral and psychophysiological evidence (Buss and Lang 1965; Lang and Buss 1965; Mirsky 1969; Gruzelier, Lykken, and Venables 1972; Magaro 1980) which shows that paranoid and nonparanoid patients do not differ, or that paranoid patients are more like normal controls, that the distinction is unhelpful, or possibly a peripheral manifestation of more general and primary syndromes.

Occasionally it is found that paranoid patients are more responsive to stimulation than controls while basic levels of activity do not differ (Gindis 1960; Thetford, Spohn, and Everds 1972). One group have harnessed such evidence to a theory of perceptual and cognitive differences between paranoid and nonparanoid patients (Inderbitzin, Buchsbaum, and Silverman 1970; Silverman 1972; Schooler, Buchsbaum, and Carpenter 1976). Paranoid patients react more to sensory stimulation, whereas nonparanoid patients reduce the impact of stimulation. Our foray into this methodology reveals paradoxes both over interpretation of earlier results and over measurement (Connolly and Gruzelier, in press), so that for the moment we prefer to suspend judgment.

New Approach

The view, supported by new data, will be developed that a dichotomy between subgroups within the diagnostic labels of schizophrenia and paranoia does exist but has only a partial bearing on the paranoid-nonparanoid distinction. Buss and Lang (1965) and Lang and Buss (1965) in a seminal review of psychological deficit in schizophrenia also expressed the suspicion that the clinical distinction was merely an approximation of a fundamental difference in the psychological functions of patients:

Paranoids have been found to show less deficit and clinically they have been observed to show less thought disorder and less deterioration over time than

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have schizophrenics of other subgroups. However, these statements are not true of all paranoids; some patients with delusions do manifest considerable deficit and deterioration of thought processes. Perhaps the presence of delusions is less important than the relative absence of deficit. Stated another way, perhaps the important dimension is intactness of sensorimotor and intellectual processes, and the paranoid-nonparanoid distinction partially reflects or is partially correlated with this dimension. [Lang and Buss 1965, p. 98]

The thesis now unfurled may be seen in the more general context of what is perhaps the pervasive problem in schizophrenia research, namely the nonspecificity of so-called "schizophrenic" symptoms (Abrams, Taylor, and Gaztanaga 1974; Taylor, Gaztanaga, and Abrams 1974; Harrow and Quinlan 1977; Carpenter et al. 1978; Pope and Lipinski 1978; Chapman 1979; McGlashan and Carpenter 1979; Andreasen 1979).

**A Left Hemispheric Dominance in Attention and Arousal**

A decade of research has focused on the proposition (Flor-Henry 1969, 1979) that schizophrenia in the broadest sense may reflect a dysfunction of left hemisphere functions and affective disorders a right hemisphere dysfunction. This bold approach to theorizing has been immensely productive (e.g., Gruzelier and Flor-Henry 1979). Attempts to lateralize schizophrenia to a single hemisphere have fared better than attempts to do the same for mania and depression. Nevertheless in view of the evidence both approaches require qualification, with perhaps the most persuasive dissent arising from an association of mania with the left hemisphere (Gainotti 1979; Gruzelier, in press a).

The issue of lateralization has a bearing on the work of two laboratories who unbeknownst to one another were working with an almost identical dichotic listening technique and revealed similar differences in processing between paranoid and nonparanoid patients.

Lerner, Nachson, and Carmon (1977) examined the recall of patients and controls to strings of three or four digits presented dichotically. The subject was free to choose the order in which the digits were reported. Of the 60 schizophrenic patients, 30 were paranoid according to the criteria of Tsuang and Winokur (1974) and 30 were nonparanoid. Ten of each group had been continuously hospitalized for more than 2 years whereas the remainder, termed acute, had been in the community for a year before their present admission which had not exceeded 6 months. All were on medication.

When the results were analyzed for ear differences, the groups were ranked as follows: paranoids (mean = 38.56), nonparanoids (mean = 17.53), controls (mean = 10.25). When they were examined for the number of shifts from ear to ear in the order of report, the rank order of the groups reversed: controls (mean = 10.32), nonparanoids (mean = 8.42), paranoids (mean = 2.50). Thus paranoid patients were distinguished by large ear differences in recall coupled with an inflexibility in switching attention between the ears. The results were not influenced by chronicity. Nachson (1980) subsequently reinterpreted the results as revealing an overactivation of left hemisphere processing in schizophrenics, particularly paranoid patients.

The other study (Gruzelier and Hammond 1979, 1980) used a dichotic technique with three-digit strings; in addition to conditions of free recall, subjects were also asked to recall the digits presented to one ear before recalling those presented to the other. By directing attention to either ear, it was possible to determine whether an ear bias in recall reflected an attentional factor or a structural deficit in the passage of information from the nonpreferred ear. An added load was imposed on some blocks of trials by providing an intensity difference between the ears of 20 dB. This was to increase the difficulty of withholding the recall of digits in one ear until digits in the other ear were reported—a test of hemispheric inhibitory properties. Eighteen chronic schizophrenic patients participated in a controlled chlorpromazine withdrawal study and were examined on six occasions over 12 weeks: twice on drug, twice on placebo, and twice on drug reinstatement (Gruzelier and Hammond 1976, 1978).
right ear digits before left ear digits. It was only when subjects were instructed to focus on their nonpreferred left ear that the frequency with which attention shifted between the ears increased; presumably the attentional bias to the right ear was difficult to overrule by instructions to attend to the left ear.

Regarding ear differences in recall, while paranoid patients on average showed a larger right ear advantage, this finding only reached significance when intensity differences between the ears were taken into account. A right ear preference distinguished the paranoid patients only because it outweighed the left ear advantage conferred when digits were 20 dB louder in the left ear.

A psychophysiological classification of patients into those with electrodermal orienting responses to mild, repetitive tones (responders) and those without responses (nonresponders) was related to ear preferences in recall. Responders showed larger right ear preferences than nonresponders, and when the patients were looked at individually, it was the electrodermally responsive paranoid patients who showed the larger ear differences.

The paranoid-nonparanoid distinction in this study was based on the requirement that at some time in the course of a continuous illness the patients had had a diagnosis of paranoid schizophrenia. All had evidence of Schneiderian first rank symptoms and satisfied the criteria for schizophrenia of the Present State Examination (PSE) supplemented by the Syndrome Checklist (Wing, Cooper, and Sartorius 1974). Manifestation of delusions and hallucinations at the time did not relate to the psychological variables. In other words we are dealing with a trait which pertains to the paranoid disposition—one which involved a rigid attentional stance in directing attention to favor left hemisphere processing.

This trait was seen to combine with other factors such as state arousal. Heightened electrodermal arousal enhanced the right ear advantage in recall, though the general recall of responders was in fact poorer than that of nonresponders. The patterns of electrodermal responding are here regarded as an index of state, not trait, arousal because they are not necessarily a stable characteristic (Gruzelier and Hammond 1978; Rubens and Lapidus 1978; Rippon 1979).

Thus dynamic factors, namely arousal and attention, were seen to contribute to the lateral differences in recall. That they do not reflect a structural deficit per se is revealed by the fact that patients were able to overcome their right ear bias when instructed to attend to the left ear. It was only when attention and the intensity of the digits were in competition that paranoids encountered difficulty.

### Relations Between Electrodermal Lateral Asymmetries and Clinical Syndromes

The theory of a dynamic imbalance in hemispheric processing and its relation to the paranoid-nonparanoid distinction has become more persuasive in view of a recent analysis of electrodermal response asymmetries in 48 undrugged new admissions with a PSE diagnosis of schizophrenia (see Gruzelier, Connolly, and Hirsch, in press, for a preliminary report).

Since the first examination of lateral asymmetries in electrodermal activity in schizophrenic patients, a consistent difference has been found when schizophrenic patients are compared with normal controls and depressed patients with a unipolar or endogenous disorder; the picture is not so clear in cases of reactive depression. On average schizophrenic patients show larger right-hand response amplitudes, controls and reactive depressives show no consistent asymmetry across individuals, and depressed patients show larger left-hand responses (see Gruzelier 1979b for a review, and Myslobodsky and Horesh 1978).

This consistency has been challenged by a recent study (Gruzelier et al. 1981) in which untreated new admissions with a PSE diagnosis of schizophrenia, confirmed at discharge, showed asymmetries in both directions. This was not a random sample of patients. They were selected for participation in a controlled comparison of the clinical benefits of treatment with chlorpromazine and propranolol (Yorkston et al. 1981). In order to qualify for the study, they first had to satisfy the PSE criteria for schizophrenia and then had to have a moderate or high rating on 2 or more of the 10 schizophrenia scales of the Brief Psychiatric Rating Scale (BPRS; Overall and Gorham 1962). It was also necessary for one such rating to be on one of the three thought disorder scales: conceptual disorganization, hallucinatory behavior, unusual thought content. The seven non-thought-disorder ratings
were: blunted affect, emotional withdrawal, suspiciousness, grandiosity, mannerisms and posturing, hostility, motor retardation. Thus all patients had positive symptoms which in the majority were of a florid nature.

The PSE is based on a hierarchical system which, instead of regarding the overall balance of symptoms, places emphasis on certain symptoms regarded as characteristic of a diagnostic category, e.g., Schneiderian first rank symptoms in the case of nuclear schizophrenia. Consequently the coexistence of Schneiderian symptoms and mania would lead to a diagnosis of schizophrenia, and when manic symptoms coexisted with a predominantly depressive picture, the diagnosis would be mania. We gained the impression that cases with the discrepant electrodermal asymmetry, namely larger left-hand orienting responses, had manic features and might be diagnosed differently by another diagnostic procedure.

This was explored by relating the direction of the lateral asymmetry to the 38 CATEGO syndromes of the PSE and 19 items of a modified version of the BPRS (Yorkston et al. 1978). The results obtained with the 23 patients in the drug study with psychophysiological recordings were re-examined in the next 25 consecutive admissions for schizophrenia with a PSE diagnosis and an electrodermal response asymmetry. The total sample of 48 patients consisted of 30 men and 18 women whose ages ranged between 18 and 68 years. Numbers of hospital admissions ranged from 1 to 24.

Electrodermal responses were examined to 15, 1,000 Hz tones with an intensity of 90 dB, all but one of which were of 5 seconds' duration with controlled rise and decay times. We have shown that the majority of recent admissions with schizophrenia who were nonresponders to mild tones responded to the louder tone series. Twenty-nine patients had larger right-hand responses and 19 had larger left-hand responses.

Syndromes and ratings in which there were significant differences between the two electrodermal asymmetry groups either in magnitude or in the number of patients so identified are shown in table 1. A bipolarity of features was revealed coloring self-concepts, cognition, speech, affect, and movement.

The features in table 1 were submitted to a principal components analysis to conceptualize the relationships between them. As the CATEGO syndromes are usually derived from more than one item in the interview, those items relating to the patients in this sample were examined in order to describe the factors in the analysis accurately. The two electrodermal groups were depicted by the first factor which was bipolar (see table 2) and contributed almost twice the variance of the second factor. The factor structure was then simplified by a conventional rotational procedure (varimax) which provided six main factors also shown in table 2. Three characterized the patients with larger right-hand responses: heightened arousal, exaggerated self-awareness, and exaggerated bodily concern. Three characterized the patients with larger left-hand responses: slowness and emotional withdrawal, simple depression, and social withdrawal.

A stepwise discriminant function analysis was carried out separately for the CATEGO syndromes and BPRS items to obtain the most economical set of discriminating variables. Seven CATEGO syndromes accurately classified 46/48 patients while 10 BPRS items were required to classify 43/48 patients. These are shown in table 3. The profiles of the two groups were enlarged to include unusual thought content, somatic concern, and mannerisms and posturing, which related to the patients with larger left-hand responses, and conceptual disorganization, self-neglect, and worrying, which characterized the patients with larger right-hand responses.

The thesis will now be developed that the hemispheric imbalance underlying the syndrome designated by the larger electrodermal responses on the left hand forms the substrate often approximated by the paranoid schizophrenia clinical category. Conversely the hemispheric imbalance underlying the syndrome depicted in the patients with large right-hand responses forms the substrate often approximated by the nonparanoid category.

The best discriminator was the CATEGO syndrome simple ideas of reference. This is defined in its moderate form as self-consciousness—the feeling of being noticed and having things observed which the patient would prefer to go unnoticed. In its severe form the patient thinks he is being laughed at or criticized and is ashamed of something of which he feels others are aware. This is not a delusion and the subject realizes it originates within himself, but it forms a substrate of the delusional experience. Seven L > R patients reported this, most in a severe form,
Table 1. Syndromes and ratings that distinguished the two electrodermal asymmetry groups

<table>
<thead>
<tr>
<th></th>
<th>Larger left-hand responses</th>
<th></th>
<th>R &gt; L</th>
<th>R &gt; L</th>
<th>F</th>
<th>p</th>
</tr>
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<tbody>
<tr>
<td>PSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple ideas of reference</td>
<td>.74 7</td>
<td></td>
<td>.07 1</td>
<td></td>
<td>10.93</td>
<td>.01</td>
</tr>
<tr>
<td>Hypomania</td>
<td>.74 7</td>
<td></td>
<td>.07 1</td>
<td></td>
<td>8.55</td>
<td>.01</td>
</tr>
<tr>
<td>Situational anxiety</td>
<td>.79 6</td>
<td></td>
<td>.14 2</td>
<td></td>
<td>6.48</td>
<td>.05</td>
</tr>
<tr>
<td>Delusions of grandeur</td>
<td>.90 8</td>
<td></td>
<td>.28 6</td>
<td></td>
<td>5.68</td>
<td>.05</td>
</tr>
<tr>
<td>Hypochondriasis</td>
<td>.32 3</td>
<td></td>
<td>— 0</td>
<td></td>
<td>5.21</td>
<td>.05</td>
</tr>
<tr>
<td>Depressive delusions and hallucinations</td>
<td>.63 5</td>
<td></td>
<td>.10 1</td>
<td></td>
<td>4.73</td>
<td>.05</td>
</tr>
<tr>
<td>BPRS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Pressure of speech</td>
<td>.68 6</td>
<td></td>
<td>.07 1</td>
<td></td>
<td>7.15</td>
<td>.05</td>
</tr>
<tr>
<td>Grandiosity</td>
<td>1.52 8</td>
<td></td>
<td>.55 7</td>
<td></td>
<td>4.56</td>
<td>.05</td>
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<thead>
<tr>
<th></th>
<th>Larger right-hand responses</th>
<th></th>
<th>R &gt; L</th>
<th>L &gt; R</th>
<th>F (x^2)</th>
<th>p</th>
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<tbody>
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<td>PSE</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Reticent in interview</td>
<td>.76 11</td>
<td></td>
<td>.11 1</td>
<td></td>
<td>7.25</td>
<td>.05</td>
</tr>
<tr>
<td>Slowness</td>
<td>.97 13</td>
<td></td>
<td>.32 3</td>
<td></td>
<td>4.95</td>
<td>.05</td>
</tr>
<tr>
<td>Irritability with interviewer</td>
<td>1.52 19</td>
<td></td>
<td>.84 8</td>
<td></td>
<td>4.17</td>
<td>.06</td>
</tr>
<tr>
<td>Simple depression</td>
<td>1.86 26</td>
<td></td>
<td>1.32 11</td>
<td></td>
<td>(4.88)</td>
<td>.05</td>
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<thead>
<tr>
<th></th>
<th>BPRS</th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Emotional withdrawal</td>
<td>1.79 17</td>
<td></td>
<td>.47 3</td>
<td></td>
<td>8.25</td>
<td>.01</td>
</tr>
<tr>
<td>Motor retardation</td>
<td>.79 10</td>
<td></td>
<td>— 0</td>
<td></td>
<td>7.77</td>
<td>.01</td>
</tr>
<tr>
<td>Blunted affect</td>
<td>1.38 15</td>
<td></td>
<td>.32 2</td>
<td></td>
<td>6.87</td>
<td>.05</td>
</tr>
<tr>
<td>Uncooperativeness</td>
<td>.93 12</td>
<td></td>
<td>.21 3</td>
<td></td>
<td>3.97</td>
<td>.06</td>
</tr>
</tbody>
</table>

compared with one R > L patient. Heightened self-consciousness also underlies preoccupation with bodily functions. Five L > R patients compared with one R > L patient expressed depressive delusions and hallucinations (see table 4), which included hypochondriacal delusions. This is also reflected in the syndrome hypochondriasis (table 1) and the BPRS rating of somatic concern (table 3). Fisher (1966) has documented the preoccupation with bodily functions in paranoid schizophrenia and its relative neglect in nonparanoid schizophrenia. Heightened self-consciousness extends further to exaggerated notions about the patient's ability and identity manifested in delusions of grandeur and higher ratings of grandiosity on the BPRS—a cardinal feature of paranoid schizophrenia.

This syndrome contrasts with the social unease, which includes lack of self-confidence, reticence in the interview, and self-neglect of the patients with larger right hand responses. These syndromes were ranked fourth, fifth, or sixth as CATEGO discriminants (table 3). However, a bipolarity in self-concepts is only part of the issue. If the syndromes relating to delusions of reference and persecution are considered, then they are manifested by both groups, though more so by the L > R patients: 14/19 L > R patients and 19/29 R > L patients. What distinguished them was the arousal dimension. The patients with exaggerated self-concepts possessed pressure of speech and the hypomanic syndrome which, in addition to euphoria and hypomanic affect, included components of ideomotor pressure, grandiose ideas and actions, and flight of ideas. They also manifested the syndrome of situational anxiety. In contrast the patients lacking in self-confidence more often had
Table 2. Factors, Items, and loadings in factor analysis

<table>
<thead>
<tr>
<th>Factor label and % of variance</th>
<th>Main Items and loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florid—nonflorid (L &gt; R—R &gt; L) 23.8%</td>
<td>Situational anxiety, phobias, anxiety avoidance (—.53); hypomanic affect and speech, euphoria, ideomotor pressure, grandiose ideas (—.49)</td>
</tr>
<tr>
<td></td>
<td>Depressive hallucinations, delusions, guilt, catastrophe, hypochondriasis (—.45)</td>
</tr>
<tr>
<td></td>
<td>Religious delusions and delusions of grandiose ability and identity (—.45)</td>
</tr>
<tr>
<td></td>
<td>Grandiosity: exaggerated opinion of self and abilities (—.42)</td>
</tr>
<tr>
<td></td>
<td>Simple ideas of reference (self-consciousness) (—.37)</td>
</tr>
<tr>
<td></td>
<td>Pressure of speech (—.37)</td>
</tr>
<tr>
<td></td>
<td>Emotional withdrawal: no contact with interviewer (.68)</td>
</tr>
<tr>
<td></td>
<td>Blunted affect: reduced emotional tone (.65)</td>
</tr>
<tr>
<td></td>
<td>Slowness: slow speech, movements, restricted quantity of speech, muteness (.64)</td>
</tr>
<tr>
<td></td>
<td>Motor retardation: reduced energy level, slowed movements (.60)</td>
</tr>
<tr>
<td></td>
<td>Reticent and unforthcoming in interview (.50)</td>
</tr>
</tbody>
</table>

Main factors after rotation

1. Slowness, emotional withdrawal 37.9%

2. Heightened arousal 18.3%

3. Exaggerated self-awareness 14.4%

4. Exaggerated bodily concern and depressive delusions 13.1%

5. Simple depression 9.8%

6. Social withdrawal 5.7%

The principal factor in factor analysis with iterative method.

features of simple depression (26/29 compared to 11/19) and exhibited blunt affect and emotional withdrawal. The syndrome of simple depression includes inefficient thinking explained as slow, muddled thinking. This presumably underlay the conceptual disorganization rating on the BPRS, which was included among the discriminants in table 3, and relates to the reticence with the interviewer shown by this group. The arousal dimensions also encompassed motoric behavior. The aroused group exhibited more mannerisms and posturing in contrast to the slowness and motor retardation that characterized the group low on arousal.

Thus the self-concepts central to the paranoid syndrome are inextricably related to an arousal dimension encompassing cognition, speech, affect, and motoric behavior. In fact, when delusions and simple ideas of reference were considered in conjunction with the arousal dimension, only 1 out of 33 patients was misclassified by the electrodermal asymmetry.

It is not uncommon to find that paranoid and manic patients are indistinguishable on clinical and behavioral features (Taylor, Gaztanaga and Abrams 1974; Buchanan and Abram 1975; Andreasen 1979; Brockington, Wainwright, and Kendell 1980; Naficy and Willerman 1980). Nevertheless a dissociation can occur. Only 33 out of 48 schizophrenic patients expressed ideas and delusions of reference or delusions of persecution. One patient in the present sample whose balance of symptoms gave rise to a diagnosis of paranoid schizophrenia could not be located toward either extreme of the arousal dimension.
Table 3. Variables in stepwise progression in discriminant function analysis of CATEGO, BPRS, and combined instruments

<table>
<thead>
<tr>
<th>Step</th>
<th>CATEGO</th>
<th>Step</th>
<th>BPRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (1)</td>
<td>Simple ideas of reference</td>
<td>1</td>
<td>Emotional withdrawal</td>
</tr>
<tr>
<td>2 (3)</td>
<td>Hypomania</td>
<td>2 (2)</td>
<td>Pressure of speech</td>
</tr>
<tr>
<td>3 (4)</td>
<td>Social unease</td>
<td>3</td>
<td>Grandiosity</td>
</tr>
<tr>
<td>4 (5)</td>
<td>Reticent in interview</td>
<td>4</td>
<td>Mannerisms and posturing</td>
</tr>
<tr>
<td>5 (8)</td>
<td>Self-neglect</td>
<td>5</td>
<td>Motor retardation</td>
</tr>
<tr>
<td>6 (7)</td>
<td>Worrying</td>
<td>6</td>
<td>Conceptual disorganization</td>
</tr>
<tr>
<td>7 (6)</td>
<td>Irritability</td>
<td>7</td>
<td>Somatic concern</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>Unusual thought content</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>Hostility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>Blunted affect</td>
</tr>
</tbody>
</table>

Numbers in brackets indicate the step when both instruments were combined.

Table 4. Hallucinations and delusions experienced by patients with larger left-hand electrodermal responses

- Delusions of grandiose ability: chosen by power or destiny for special purpose
- Delusions of grandiose identity: believes famous, rich, royalty
- Religious delusions: religious identification or explanations of voices
- Depressive hallucinations: voices calling name or a few words with affective connotations
- Delusions of guilt: believes has sinned greatly, brought ruin to the world
- Delusions of catastrophe: fears impending doom, world will end
- Hypochondriacal delusions: body is rotting, incurable cancer, etc.

Neuropsychodiagnosis

The dichotomy provided by the psychophysiological variable may offer a way out of the current dilemma over the nature of paranoid-nonparanoid differences; investigations which find reliable differences are in the minority. Peter Magaro with his recent book *Cognition in Schizophrenia and Paranoia* (1980) is one of the scientists most committed to this distinction. He holds the view that level of pathology is a crucial variable. This is exemplified by a study of Heilbrun and Heilbrun (1977) who, in carrying out a content analysis of delusions in paranoid patients subdivided on the process-reactive dimension, found that

The delusions of reactives were more integrated, varied in content, actively oriented toward the environment and less autistic. In short, the reactive paranoid showed better organization, greater articulation, and more modulation. The greater the pathology, the more the paranoid resembled the disorganized thought process of the schizophrenic. [Magaro 1980, p. 135]

For this reason Magaro places greater weight on studies that compare acute rather than chronic paranoids with other psychotic groups. Nevertheless the acute-chronic or the process-reactive distinctions have offered only a limited resolution of the paranoid-nonparanoid conundrum.

Such approaches would not have led to the dichotomy arrived at by the psychophysiological procedure. All of the patients would have fulfilled some acute criteria because all were tested within 4 days of hospital admission. Number of hospital admissions, time since last admission, number of episodes treated, time since first onset, and total length of hospitalization had no bearing on the groups defined by the psychophysiological lateral asymmetry.

The psychophysiological distinction outlined here offers a new slant to these issues. It taps the organization factor referred to by Heilbrun and Heilbrun (1977), as well as the reactive factor, insofar as this applies to present emotional state. It satisfies the requirement of an overlapping but wider encompass than the paranoid-nonparanoid distinction (Lang and Buss 1965).

Classical Schizophrenia Distinguished From Acute Functional Psychoses

The electrodermal dichotomy has a direct bearing on another diagnostic quandary: the definition of the syndrome of schizophrenia. Kety (1980) draws attention to the fact that recent advances in standardizing the psychiatric interview and enhancing diagnostic reliability have deflected attention away from the classical syndrome of schizophrenia of Bleuler and
Kraepelin. The focus has fallen on easily described features such as Schneiderian symptoms of first rank, which Bleuler and Kraepelin thought were accessory symptoms. Earlier matters had been complicated by extending schizophrenic to cover atypical psychoses encompassed by the reactive pole of the reactive-process dimension and referred to as good prognosis schizophrenia or acute schizophrenic reaction.

The group which Kety terms acute functional psychoses have much in common firstly with the type of paranoid patients who are more readily distinguishable from schizophrenic patients, and secondly with the clinical characteristics of patients whose electrodermal asymmetry is in the direction of larger left-hand responses. Patients with acute functional psychoses function well premorbidly, respond to treatment, do not deteriorate, have a good prognosis, and have an acute, reactive component to the illness with more florid, accessory symptoms than fundamental, negative symptoms. Reactive and florid features characterize the patients with larger left-hand responses.

On the other hand the classical syndrome of schizophrenia closely corresponds to definitions of nonparanoid schizophrenia and to the features of the patients with the larger electrodermal responses on the right hand. The classical syndrome includes emotional withdrawal, dulled affect, loss of energy, impoverished social relationships, negativism, the "loss of the inner unity of the activities of intellect, emotion and volition" (Kraepelin 1913), disturbances of associations, and autism. All such features that were covered by our clinical instruments were found to represent the R > L patients.

As the drift away from the classical syndrome was in part a solution to the problem of reliably describing symptoms in the clinical interview, the psychophysiological index may provide an objective aid to diagnosis.

A Neuropsychological Model of Hemispheric Imbalance

Finally a few words will be addressed to the nature of the underlying brain organization of the groups defined by the electrodermal lateral asymmetry. The syndrome typified by exaggerated self-concepts, pressure of speech, flight of ideas, euphoria, and increased motoric arousal reflects an enhancement of dynamic activation properties of the left hemisphere. Given the location of a predominance of verbal processing together with the location of the speech production mechanism in the left hemisphere of most patients, the left hemisphere represents the more parsimonious choice of hemispheres. Added to this is the evidence of exaggerated self-concepts in patients with left-sided temporal lobe epilepsy (Bear and Fedio 1977) around which a syndrome of sensory-limbic hyperconnection has been evolved (Bear 1979). Furthermore many would implicate left-hemisphere activation in euphoria and mania (Gainotti 1979, but see also Flor-Henry 1979). This model is supported by the right-ear preferences of the aroused paranoid patients in the dichotic listening studies outlined earlier. The paranoid patient, to his disadvantage, is locked in a left-hemisphere processing mode and hence his overly intellectualized orientation, yet ability to adapt to the majority of life's pressures given the dominance of left-hemisphere functions in the normal brain.

Conversely, the syndrome typified by a loss of self-confidence, reduced speech, slow muddled thinking, motor retardation, and blunted affect suggests an abnormal reduction in those activities that are enhanced in the aroused syndrome and therefore reflect a loss of left-hemisphere activation. Furthermore, Davison and Bagley (1969) in reviewing the psychotic sequelae of organic lesions note an association of blunted affect with left-hemisphere lesions but not lesions of the right hemisphere.

At the same time the right hemisphere's influences are diminished in the first syndrome and are enhanced in the second syndrome. In examining bilateral differences in electrodermal orienting responses in normal subjects, we observed in three separate investigations (n = 109) that there were reciprocal relations between the hemispheres in the control of electrodermal reactivity. Subjects who showed larger left-hand response amplitudes in their orienting and nonspecific responses habituated at fast or moderate rates to the repetition of an identical stimulus. Subjects who showed larger right-hand responses habituated slowly (Gruzelier, Eves, and Connolly, in press). Thus the degree of responsivity in the electrodermal system is tied to the prevailing balance between the activation properties of the hemispheres. This relationship holds for the majority of subjects with the notable exception of slow
habituating subjects with larger left-hand responses. These subjects reported higher scores on anxiety questionnaires.

Anxiety may reverse hemispheric influences on arousal. This may coincide with a selective disruption in left-hemispheric processing, for Tucker et al. (1978) have shown that high compared with low anxiety subjects do not show the expected right visual field advantage in processing verbal stimuli—a result we have replicated with a within-subject design comparing performance in the same individual both before university examinations and on another nonstressful occasion (Phelan and Gruzelier, unpublished data).

A parallel is found with the divided field tachistoscope studies of schizophrenic patients in which a common finding has been an impairment in left-hemisphere processing (Gur 1978; Colbourn and Lishman 1979; Connolly, Gruzelier, and Hirsch 1979; Eaton 1979; Hillsberg 1979). Support is provided for an old view that anxiety is an important dynamic in the schizophrenic dysfunction. This is also the implication of a recent examination of orienting and dishabituation in the electrodermal system (Gruzelier et al. 1981). Emphasis on dynamic processes such as arousal and attention which underpin hemispheric asymmetries of function in psychosis does not preclude a structural deficit. It is quite likely that there is a structural problem, possibly of a biochemical or metabolic nature in the majority of patients with schizophrenia. Nevertheless, this must have a role in the control of arousal, attention, and the hemispheric integration that is necessarily fundamental to these dynamic processes. This issue takes me away from my current brief, but critical thoughts about the state of evidence for lateralized and interhemispheric dysfunction in psychosis may be found elsewhere (Gruzelier 1979a, 1979b, in press a, in press b).

What is offered here is the most parsimonious neuropsychological interpretation of the psychophysiological and behavioral evidence. Of course, it is conceivable that in psychosis orderly relationships between the hemispheres and habituation, and between the hemispheres and cognitive specialization are turned upside down. The model at least has heuristic potential and may usher in a role for the neuroscientist in psychiatric diagnosis (cf., Brown 1977; Buchsbaum and Haier 1978; Small 1980).

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